AN EXPLORATION OF TEACHER PERCEPTIONS AND ACTIONS TO CONSERVE WETLANDS IN KENYA

A thesis submitted in fulfillment of the requirements for the degree of

Doctor of Philosophy

of

Rhodes University

By

Ayub Macharia Ndaruga

April 2003

ABSTRACT

This thesis presents the findings of an exploration of teacher perceptions and actions to conserve wetlands in Kenya. It reports findings of a case study survey done with 54 primary school teachers from seven of eight Kenyan provinces. The teachers were sampled from a larger group of 242 teachers who participated in an in-service course on wetlands conservation. The in-service course engaged teachers in exploring various aspects of wetlands and how they could enhance their conservation using both formal and non-formal contexts. The survey approach was used in the research and was augmented with a reflective process. Survey tools used were the questionnaires and interviews. The reflective process entailed observation, document analysis, field notes and the researcher's diary. Research data was analysed in several stages.

The study revealed that teachers were users of local wetlands just like other members of their communities. The teachers differed among themselves with respect to their perceptions of the value and threats to their local wetlands. The teachers also differed in their perceptions of community awareness of their local wetlands. The teachers' perceptions about environmental education and wetlands were not holistic.

The teachers recorded various opportunities to foster wetlands conservation in their local contexts at school and the community. These were their fellow teachers, the pupils, the subjects taught, clubs, environmental days and the community. The relative importance of these opportunities differed among the teachers.

Many teachers claimed being motivated to promote wetlands conservation using both formal and non-formal contexts. Their motivation was based on diverse aspects of wetlands, education and the in-service training they attended in 1999. However, the intensity of motivation differed for each aspect. For instance, at community level in-service training was a major motivator while the curriculum aspects were not mentioned at all.

Teachers reported having involved their pupils and the community in several activities to conserve the local wetlands. These activities seemed to be dominated by theoretical approaches,

eco-management activities and visits to wetlands. There was little evidence to indicate the teachers being engaged in addressing the implications for sustainability of the perceived local wetland values and threats. The activities reported also failed to show engagement with local environmental problems as a deliberate proactive process involving exploration, discussion, action taking and reflection. Most of the activities were presented as one off activities rather than as a cyclic continuously improving series of interventions. The overall scenario presented by the teachers is one of inadequacy in addressing the sustainable use of wetlands.

Teachers suggested various constraints that affect their realisation of environmental education for wetlands sustainability. The constraints traverse various aspects of the economic, biophysical, political, educational and social aspects of wetlands conservation. The study suggested the need for teachers to treat their contextual and personal conceptions as problematic rather than as simplistic or linear issues and to formulate ways to address them. This study suggests a potential but under-utilised opportunity to promote wetlands sustainability. The overall picture generated by the data in this study is a need to consider wetland training for teachers that integrates the holistic aspects of wetlands as well as the environmental education for sustainability perspectives grounded in local contexts.

TABLE OF CONTENTS

ABSTRACT ii
TABLE OF CONTENTS iv
LIST OF FIGURES xi
LIST OF APPENDICES xi
ACKNOWLEDGEMENTS xiii
DEDICATION xv
LIST OF ABBREVIATIONS xvi

CHAPTER 1: OVERVIEW TO THE STUDY 1

1.1 Introduction 1
1.2 Environmental education in Kenya 3
1.3 Background to the present study 6
1.4 Aims and objectives of the study 8
1.5 Outline of the rest of the thesis 10

CHAPTER 2: WETLANDS IN KENYA 13

2.1 Introduction 13
2.2 Types and distribution of wetlands in Kenya 15
    2.2.1 Coastal lowland region 16
    2.2.2 Central highlands region 17
    2.2.3 Rift Valley region 17
    2.2.4 Lake Victoria basin 17
    2.2.5 The drylands region 18
2.3 Wetlands in the context of the broader environment 19
    2.3.1 Biophysical aspects of wetlands in Kenya 24
    2.3.2 Economic values of wetlands 29
    2.3.3 Social aspects of wetlands 33
    2.3.4 Political aspects of wetlands 38
2.4 Implications for wetlands education 40
2.5 Conclusion 44

CHAPTER 3: ENVIRONMENTAL EDUCATION IN KENYA'S PRIMARY SCHOOL CURRICULUM 45

3.1 Introduction 45
3.2 Art and Craft 47
3.3 Geography, History and Civics (GHC) 50
    3.3.1 Geography 51
    3.3.2 History 52
    3.3.3 Civics 53
    3.3.4 GHC in the Kenyan curriculum 55
3.4 Science 56

3.5 Agriculture 58
3.6 Languages (English and Kiswahili) 61
3.6.1 English 61
3.6.2 Kiswahili 63
3.7 Christian Religious Education (CRE) 63
3.8 Home Science 64
3.9 Mathematics 65
3.10 Music 67
3.11 Conclusion 68

CHAPTER 4: THEORETICAL UNDERPINNINGS OF THE STUDY 69

4.1 Introduction 69
4.2 Environmental ideologies and environmental crisis 69
4.2.1 Technocentric environmental ideologies 70
4.2.2 Ecocentric environmental ideologies 71
4.3 The unfolding developments with respect to sustainable development 73
4.3.1 Sustainable development as an agenda of nature conservation 74
4.3.2 Sustainable development as an effort to keep within the ecological carrying capacity 75
4.3.3 Sustainable development as an agenda of needs satisfaction 76
4.3.4 Sustainable development as an agenda to care for the whole community of life 77
4.3.5 Sustainable development through radical, political and ethical approach 79
4.4 Lessons from the environmental ideologies and sustainable development debate 80
4.5 Implications of the sustainable development debate to wetlands education 84
4.6 Perspectives of enhancing environmental education for wetlands sustainability 86
4.6.1 The neoclassical educational framework 88
4.6.2 The liberal progressive educational framework 88
4.6.3 The socially critical educational framework 89
4.6.4 Perspectives considered by the present study 91
4.7 Lessons for wetlands education from the educational debate 94
4.7.1 Relevance 95
4.7.2 Environmental education and the holistic nature of environmental problems 96
4.7.3 Environmental education and the curriculum 97
4.7.4 Environmental education and the teaching of values and ethics 98
4.7.5 Environment and development as issues 99
4.7.6 Local environmental action 100
4.7.7 Active learning strategies 101
4.7.8 Sustainable development and futures education 102
4.8 Threefold approach to environmental education 103
4.8.1 Education about the environment 104
4.8.2 Education in/through the environment 105
4.8.3 Education for the environment 105
4.9 Synthesis and conceptual framework of the study 107
4.10 Conclusion 110

CHAPTER 5: RESEARCH METHODOLOGY 112

5.1 Introduction 112
5.2. Generation of theory 113
5.3 Paradigmatic orientation 115
5.4 Symbolic interactionism 117
5.4.1 Making of meanings in symbolic interactionism 119
5.4.2 Meaning making through individualized interactions. 120
5.4.3 Meaning making within the social structure 121
5.4.4 Criticisms of symbolic interactionism 123
5.5 Research design: The case study survey 124
5.5.1 The reflective process 126
5.5.2 Why the case study approach was selected 127
5.5.3 Criticisms of the case study approach 127
5.6 Sampling for research respondents 129
5.6.1 Sampling for research respondents in phase one of the study. 129
5.6.1.1 Negotiating access to the teacher for phase one of the study 131
5.6.2 Sampling of teachers for phase two of the study 133
5.6.2.1 Negotiating access to teachers during phase two of the study 134
5.7 Data collection 135
5.8 Research tools 136
5.8.1 Questionnaires 136
5.8.2 Interviews 137
5.8.3 Direct observation 139
5.8.4 Participant observation 140
5.8.5 Document analysis 141
5.8.6 Field notes and researcher's diary 142
5.9 Data analysis 142
5.9.1 Initial analysis and organization of data 142
5.9.2 Searching for meaning from the data 144
5.9.3 Search for patterns and key factors 145
5.10 Ethics, validity and reliability 145
5.10.1 Ethical issues 145
5.10.2 Validity 146
5.10.3 Reliability 147
5.11 Conclusion 148

CHAPTER 6 – TEACHER PROFILES 149

6.1 Introduction 149
6.2 Composition and distribution of the participants 149
6.3 Age and teaching experience of the teachers 153
6.4 Subject preferences by teachers 157
6.5 Classes most preferred by the teachers 159
6.6 Training status of the research respondents 160
6.7 Teacher perceptions about their pre-service training. 163
6.8 Teachers additional responsibilities at school 166

6.9 Teachers' responsibilities at community level 168
6.10 Conclusion 169

CHAPTER 7: TEACHER PERCEPTIONS OF THE LOCAL ENVIRONMENT AND WETLANDS 172

7.1 Introduction 172
7.2 Teacher perceptions about wetlands 173
7.3 Teachers special liking of wetlands 174
7.4 Personal use of wetlands by teachers 176
7.5 Teacher valuation of wetlands from a community perspective 177
7.6 Special uses of wetlands to the local community 184
7.7 Teachers' personal concerns (dislikes) about local wetlands 186
7.8 Teacher perception of the local wetland threats 188
7.9 Teacher perceptions of the local community's awareness about the wetland threats 192
7.10 Perceptions of teacher potentials locally 198
7.11 Teacher perception of the term "environmental education" 200
7.12 Conclusion 202

CHAPTER 8: INTEGRATION OF WETLAND ISSUES WITHIN THE FORMAL CURRICULUM 207

8.1 Introduction 207
8.2 Teachers' reflections on the wetlands training 207
8.3 Teacher motivation for integrating wetlands issues within the curriculum 209
8.4 Involvement of other teachers in local wetland issues 211
    8.4.1 Involving other teachers in knowing about wetlands 212
    8.4.2 Working as a team in school 214
8.5 Involvement of children in knowing about wetlands 217
8.6 Integration of wetland issues in the subjects 225
    8.6.1 Art and Craft. 226
    8.6.2 Geography, History and Civics (GHC) 228
    8.6.3 Science 230
    8.6.4 Agriculture 232
    8.6.5 Languages (English and Kiswahili) 234
        8.6.5.1 English 234
        8.6.5.2 Kiswahili 235
    8.6.6 Christian Religious Education (CRE) 236
    8.6.7 Home Science 237
    8.6.8 Mathematics 238
    8.6.9 Music 239
8.7 How teachers who were not in-serviced teach about wetland issues. 239
8.8 Source of instructions for teachers' practice 241
8.9 Teachers' benefits from the water and wetlands training 242
8.10 Teachers' reflections on teaching approaches after wetlands training 245
8.11 Teachers' views about pupils after learning about wetlands 248
8.12 Integration of wetland issues in exams 249

8.13 Use of the wetlands poster 251
8.14: Teacher expected outcomes from pupils 253
8.15 Teacher perception of constraints within the school context. 256
8.16 Conclusion 261

CHAPTER NINE: NON-FORMAL WETLAND EDUCATION. 264

9.1 The non-formal context 264
9.2 Use of clubs in schools 265
9.2.1 Personal motivation towards use of clubs for wetlands conservation 267
9.2.2 Use of clubs to address wetland issues in schools 271
9.2.3 Reasons for not using clubs to address wetlands issues 275
9.2.4 Summary: some major issues within the clubs. 283
9.3 Use of special (environmental) days in wetlands conservation 284
9.3.1 Celebrating environmental days in schools and the community 285
9.3.2 Special days celebrated in schools and the community contexts 287
9.3.3 Activities during environmental days 289
9.3.4 Reasons for not celebrating environmental days 291
9.3.5 Emerging issues on celebration of special (environmental) days. 294
9.4 Reaching out to the community 295
9.4.1 Teacher interaction with members of the community 296
9.4.2 Perceptions about community interactions with wetlands. 298
9.4.3 Teacher motivation to apply wetlands training at community level. 300
9.4.4 Involving the community in knowing about wise use of wetlands 303
9.4.5 Activities with members of the community 305
9.4.6 Constraints to teachers at community level 309
9.4.7 Summary: Emerging issues within the community context 319
9.5 Seeking support to enhance wetlands conservation 320
9.6 Conclusion: Emerging issues within the entire non-formal context. 323

CHAPTER 10: CONCLUSION 327

10.1 Introduction 327
10.2 Perceptions of teachers about their local contexts and wetlands 328
10.3 Opportunities available to teachers for integrating wetland issues 333
10.4 Use of various opportunities to champion for wetlands conservation. 335
10.4.1 Theoretical approaches 335
10.4.2 Visits to wetlands 337
10.4.3 Eco-management activities 340
10.4.4 Politically based activities 341
10.4.5 A synthesis 342
10.5 Motivation for teachers to use various contexts in wetlands education 343
10.6 Constraints to teachers at the local context 344
10.7 Seeking assistance 348
10.8 Summary of tentative recommendations 348
10.9 Reflections on the research 349
10.9.1 Research aim 349

10.9.2 Objectives 350
10.9.2.1 Teacher perception of wetlands 350
10.9.2.2 Integration of wetland issues within the formal and non-formal contexts. 351
10.9.2.3 Teacher actions in addressing local wetland issues 352
10.9.2.4 Teacher motivation in championing for wetlands conservation 353
10.9.2.5 Constraints influencing teacher action at local level 353
10.9.2.6 Implications of teacher perceptions and actions to conservation of wetlands 353
10.9.3 Assumptions of this study 354
10.9.4 Theoretical framework and methodology 355
10.9.5 Data collection techniques and tools. 355
10.9.6 The findings 356
10.10 Synthesis of areas for further research 357
10.11 Conclusion 358

REFERENCES 359

LIST OF TABLES

Table 2.1: Classification of total economic value of wetlands 21
Table 2.2: Comparison of similarities between two wetland categorizations 22
Table 2.3: Distribution of rainfall in Kenya. 24
Table 2.4: Projected domestic and industrial water demand for Kenya (1000m^3/day). 33
Table 4.1: A framework of environmental ideologies and their relevance to wetlands 73
Table 4.2: An exploration of various aspects of education within three educational frameworks. 90
Table 5.1. Teachers who participated in the wetlands training programme in 1999 130
Table 5.2: Teachers sampled for the research per workshop venue 131
Table 5.3: Summary of research participants 132
Table 5.4: Teachers sampled for phase two of the study 134
Table 6.1: Composition of teachers who participated in phase two of the study. 152
Table 6.2: In-service training of teachers in environmental education 161
Table 6.3: Teacher perceptions of teaching methodologies used in various colleges. 164
Table 6.4: Outstanding activities during college days that teachers still remember 165
Table 6.5: Teacher responsibilities at school 167
Table 6.6: Teacher responsibilities at community level 168
Table 7.1: Teachers' personal benefits from wetlands. 177
Table 7.2: Summary of ranking of teacher valuation of wetlands 179
Table 7.3: Teacher perceptions of the special uses of wetlands to the community 185
Table 7.4: Perception of wetland threats by teachers 189
Table 7.5 Teachers' perceptions about environmental education 200
Table 8.1: Post training rating of the wetlands workshop by teachers 207
Table 8.2: Teachers' additional comments about the wetlands training programme 208
Table 8.3 Teacher motivations to integrate wetland issues within the curriculum. 211
Table 8.4: Involvement of children in knowing about wetlands 218
Table 8.5: Methods used by teachers within various subjects. 225
Table 8.6 Teacher reflections of teaching approaches for wetlands after the wetlands training. 246
Table 8.7 Teachers' expected outcomes from pupils in learning about wetlands. 254
Table 8.8: Constraints to teacher practical actions for wetlands at school level 257
Table 9.1 Clubs that could be used in schools to foster wetland conservation. 267
Table 9.2 Teacher motivation in use of clubs to champion for wetlands conservation 269
Table 9.3 Use of clubs by teachers to address wetland issues 271
Table 9.4a Frequency of mention of environmental days celebration among teachers. 287
Table 9.4b Details of environmental days celebrated by teachers. 288
Table 9.5 Activities during environmental days at school and community contexts 289
Table 9.6 Motivation for teachers to apply water and wetlands training at community level. ... 301

LIST OF FIGURES

Figure 2.1 Distribution of wetlands in Kenya 16
Figure 2.2 A broader picture of the environment 20
Figure 2.3 Wetlands in the context of the broader environment. 23
Figure 4.1: Conceptualisation of environmental ideologies and sustainable development..... 81
Figure 5.1 The research process 135
Figure 6.1 Composition of teachers who participated in the research..... 150
Figure 6.2 Distribution of the research respondents in Kenya 151
Figure 6.3: Age distribution among research respondents 154
Figure 6.4a Teaching experience of the research respondents 155
Figure 6.4b. Length of stay by teachers in their present stations. 156
Figure 6.5a Subjects taught by the teachers 157
Figure 6.5b. Subjects most preferred by the teachers..... 158
Figure 6.6 Classes most preferred by the teachers 159
Figure 9.1a Celebration of environmental days at schools..... 286
Figure 9.1b Celebrating environmental days with members of the community 286
Figure 9.2 Teacher involvement of the community in knowing about wetlands 304
Figure 9.3 Strategies used by teachers in reaching out to the members of the community. 305

LIST OF APPENDICES

Appendix 1.0: A critical reflection on the wetlands training for teachers held in 1999 .. 381
Appendix 2.1: The Ramsar Convention definition and classification of wetlands 383
Appendix 2.2: Organisations dealing with wetland issues in Kenya 386
Appendix 2.3: Types, main features and examples of wetlands in Kenya 387
Appendix 3.0 Environmental education potentials in different subjects 392
Appendix 3.1 Art and Craft subject..... 392
Appendix 3.2 Geography History and Civics subject. 392
Appendix 3.3 Science subject..... 393
Appendix 3.4: Agriculture subject. 393
Appendix 3.5: English subject..... 393
Appendix 3.6 Kiswahili subject 394
Appendix 3.7 Christian Religious Education subject..... 394
Appendix 3.8 Home Science subject..... 394
Appendix 3.9: Mathematics subject. 395
Appendix 3.10: Music subject..... 395
Appendix 3.11: Insights from classroom visits..... 396
Appendix 3.12: Insights from the schemes of work and lesson plans..... 397
Appendix 5.1 Reminder letter to the teacher to return the questionnaire..... 399
Appendix 5.2: A letter to the head teacher introducing the questionnaire 400
Appendix 5.3 A letter to the teacher introducing him/her to the questionnaire 401
Appendix 5.4 A questionnaire receipt confirmation letter 402
Appendix 5.5: Questionnaire..... 403
Appendix 5.6 A letter informing the teacher about the interview..... 424
Appendix 5.7: Interview questions..... 425
Appendix 5.8 Acknowledgement letter..... 429

Appendix 5.9: List of plates 430

Plate A Teacher holding the wetlands poster 430
Plate B Writings about wetlands on the wall of a primary school 430
Plate C A dam next to the school. 431
Plate D The school up the hill depends on this water (plate E)..... 431
Plate E Water from river (Plate D) used to cook food for pupils 432
Plate F : Use of the river by the community..... 432
Plate G Teacher admires a community water project he initiated..... 433
Plate H Tree planting at school. 433
Plate I A tree nursery..... 434

ACKNOWLEDGEMENTS

This thesis is a gracious gift to me from God for His Glory. I am indebted to many people and institutions that played a role in making me realise my dream of conducting the research and writing this thesis. My great gratitude goes to my research respondents who dedicated their time to give me their opinions and insights. I also thank most sincerely my promoter Professor Pat Irwin for his kindness, patience and valued comments throughout the research process.

The financial and moral support of my employer, the National Museums of Kenya (NMK) is highly appreciated. Special thanks go to Dr. George Abungu, Dr. Nathan Gichuki, Mr Fredrick Karanja Mirara, George Ndiritu and other members of staff of the Education and Wetland Resources Programme of the NMK. I also thank the Kenya Wildlife Service for their financial support towards the fieldwork of this research. Mr. Ben Zech and Anderson Koyo deserve special mention in this respect.

My gratitude goes to the MacArthur Foundation for Peace and Justice for awarding me the scholarship that catered for most of my financial needs including fees, upkeep, travel, research and stationery. Special thanks to Dr. Eureta Janse Van Rensburg for her faith in me and facilitating the award of the scholarship.

I thank Rhodes University Education Department staff for their support throughout the study process. Of particular mention are Prof. Heila Lotz Sisitka, Prof. Cheryl Hodgkinson, Mack Schafer, Diana Gruneberg, Ronel Petersen, Judy Cornwell, and Phoebe. They inspired me in many ways and made my study life easier. I also thank my fellow students at Rhodes University who stood by me in times of discouragement during thesis writing. Special thanks go to Catherine Wambui, Justin Lupele, Charles Warui, Mweru Mwingi, Abel Atiti, Felistus Kinuna, Peter Kimemia and Daniel Babikwa. I am also indebted to Benjamin Mwangi for being such a good research assistant. I also thank Ms. Pam Marshall for her arduous task of proofreading and editing my final draft.

The members of my church in Kenya both in Nairobi and Kiawambogo deserve special mention for their encouragement and consistent prayers. I am also grateful to my brothers and sisters Sammy, Timothy, Benjamen, Leah and Hannah who tirelessly mentioned me during their joint prayers on Mondays. These prayers helped me to receive God's favour in terms of handling this arduous task of writing up a thesis and sustaining my family especially during my long stay abroad. May God bless every person who spared time to pray and support me and my family.

My family deserves greater praise. I was forced to be away from home for long periods and they endured my absence and preoccupation with academic work. I feel greatly indebted to my children Naomi, Elijah and Jeremiah who missed my presence and love during birth and earlier months of life. My sincere thanks go to my wife Deborah who single handedly catered for the family in my absence. My parents deserve thanks for inspiring me to higher heights academically despite their low formal educational achievement. They also rendered consistent encouragement and support to my family during my long stay abroad.

DEDICATION

This thesis is dedicated to Kenyan teachers who through difficult conditions and uncertainties are expected to nurture our generations towards embracing the virtues of sustainable living.

LIST OF ABBREVIATIONS

4K	*Kuungana Kufanya Kusaidia Kenya*.
CBO	Community Based Organization.
GoK	Government of Kenya.
HIV/AIDS	Human Immune Deficiency Syndrome/ Acquired Immune Deficiency Syndrome.
IGAD	Inter Governmental Authority on Development.
IMF	International Monetary Fund.
IPCC	International Panel on Climate Change.
IUCN	International Union for Conservation of Nature and Natural Resources.
JICA	Japan International Cooperation Agency.
KIE	Kenya Institute of Education.
KIFCON	Kenya Indigenous Forest Conservation Programme.
KUC	Kenyatta University College.
KWWG	Kenya Wetlands Working Group.
MENR	Ministry of Environment and Natural Resources.
NEAP	National Environment Action Plan
NGO	Non Governmental Organization.
NMK	National Museums of Kenya.
OECD	Organization for Economic Cooperation and Development.
RoK	Republic of Kenya
RU	Rhodes University.
SADC REEP	Southern African Development Community Regional Environmental Education Programme.
SADC	Southern African Development Community.
SPEK	Society for Protection of Environment in Kenya.
UNEP	United Nations Environment Programme.
UNESCO	United Nations Educational, Scientific and Cultural Organisation.
WCED	World Commission on Environment and Development
WCK	Wildlife Clubs of Kenya.
WWF	World Wide Fund for Nature (formerly World Wildlife Fund).

CHAPTER 1: OVERVIEW TO THE STUDY

1.1 Introduction

The world is currently facing many and diverse environmental problems. These problems range from the greenhouse effect, ozone depletion, population pressure, pollution and overexploitation of natural resources (WCED, 1987; UNESCO, 1992). The cause of these problems can be traced to human beings' way of living which blindly accentuates economic, social and political interests above the biophysical concerns of the environment (Ekins, 1993; Fien, 1993; Jensen & Schnack, 1997). The last fifty years has witnessed an increased environmental concern to reverse the continued environmental destruction. On the international front, governments have come together to review and renew their commitments to environmental conservation. They have also used these meetings to map the way forward and to seek broader collaboration and resources (Irwin, 1984; Janse Van Rensburg & Shongwe, 1994).

These international meetings have also continually refined the concept of environment from the earlier view of it as natural resource systems to the current view of the environment as a social construction (Janse Van Rensburg, 1995; O'Donoghue & Janse Van Rensburg, 1995; Fien, 1993; Di Chiro, 1987). Understanding the environment as a social construction accentuates the role of the human being in the meaning making process with regard to environmental issues and risks. The meanings emanate from people interacting with each other and with the environment. These meanings have various implications to the environment - either prioritising conservation or exploitation and degradation. Recognition of meaning making geared towards exploitation and degradation with little concern for conservation led to the birth of the current ongoing debate about sustainable development. According to UNESCO (1997:12), sustainable development is "not a fixed notion, but rather a process of change in the relationship between social, economic and natural systems and processes." This implies a process of change of meaning making process to consider "improving the quality of life for all, especially the poor and deprived, within the carrying capacity of the supporting ecosystems" (ibid). These changes in perceptions about the environment have also influenced the development of environmental education globally. Investment in environmental education is geared towards reaching all people to make them aware

of their relationships with one another and with the environment as well as to encourage them to formulate new sustainable relationships within their social and natural environment

Consideration of sustainable development has led to increased acknowledgement of education as having a major role to play in alleviating environmental problems and promoting sustainability. Various authors have expressed diverse sentiments in praise of the potentials of environmental education in bringing forth development, social change, and environmental sustainability (Janse Van Rensburg 1995; Fien, 1997). According to UNESCO, 1997:14,

> Education serves the society in a variety of ways. The goal of education is to make people wiser, more knowledgeable, better informed, ethical, responsible, critical and capable of continuing to learn. Were all people to possess such abilities and qualities, the world's problems would not be automatically solved but the means and the will to address them would be at hand. Education also serves society by providing a critical reflection on the world especially its failings and injustices, and by promoting greater consciousness and awareness, exploring new visions and concepts, and inventing new techniques and tools. Education is also the means for disseminating knowledge and developing skills, for bringing about desired changes in behaviours, values and lifestyles, and for promoting public support for the continuing and fundamental changes that will be required if humanity is to alter its cause, leaving the familiar path that is leading towards growing difficulties and possible catastrophe, and starting the uphill climb towards sustainability. Education in short, is humanity's best hope and most effective means in the quest to achieve sustainable development.

Whereas environmental education has been acknowledged globally, there still remain many unresolved problems relating to how learners can be motivated and mobilised to undertake local environmental action. The contentious issue is the fact that environmental education is in its infant stage of development and only a few people are familiar with what it entails, especially in Kenya (MENR, 1994). According to Jickling (1992), environmental education is a concept that is nurtured within the wider educational frameworks (Table 4.2). Environmental education is conceptualised in a diverse context and every discipline is regarded as having a unique opportunity to contribute towards understanding the holistic aspect of the environment (WWF, 1988:1). The focus of environmental education especially for trainers (including teachers) is to enhance the appreciation of the environment as relevant, valuable, diverse and complex as well as how it has shaped the people's way of life over the ages. The aim of sustainability education is to promote harmonious living between people and their environment (IUCN *et al.* 1991).

Studies done on teacher involvement of learners in local environmental action criticise the positivist notions of teaching and learning that are more inclined towards expert dominated transmission approaches. These positivist approaches are criticised for not acknowledging the environment as socially constructed and their imposing features that tend to treat the environment as unfamiliar to learners (section 4.6.1, Table 4.2). However, these approaches are still dominant in most schools while being simultaneously criticised for their inability to link relevance of learning to the local environment (Tilbury, 1995; Fien, 1993; Gough & Robottom, 1993). Research acknowledges the existence of multiple interpretations of the environment by learners and teachers. Environmental education for sustainability aims at creating opportunities for engagement with local environmental issues and to learn from one another as people define and construct their future environment (Stapp & Wals, 1993; Jensen & Schnack, 1997; Fien, 1993). Enhancing exploration of multiple interpretations involves development of learning opportunities that allow for encounters with the environment, dialogue and reflection geared towards meaning making and realignment as well as change (O'Donoghue & Janse Van Rensburg, 1995). The realisation of this change needs continued involvement of educators in environmental education processes to empower them to look at the environment holistically as well as local construction of knowledge and action taking consistent with the pursuit of sustainable development.

1.2 Environmental education in Kenya

Kenya has witnessed extensive destruction of its natural resources mainly caused by human activities (Manguriu, 1999; Wass, 1995; UNEP, 1987). This destruction cuts across all the major ecosystems in both protected and unprotected areas including wetlands such as rivers, swamps, lakes, estuaries and man made reservoirs (NMK, 1999; UNEP, 1993). These environmental problems can be traced to the economic, social and political structures and systems and the *status quo* that they accentuate as discussed in chapter two.

Environmental considerations in Kenya date back to colonial days (before 1963) when environmentally related policies and laws were instituted. Reviews were made after independence in 1963 so as to reflect the aspirations of the new politically independent nation.

The first serious concern for the environment in independent Kenya was initiated in April, 1971 with the setting up of an ad hoc committee to prepare the Kenya National Report on Environment that was presented in the United Nations Conference on Human Environment in Stockholm Sweden in 1972 (RoK, 1972:iii). Some of the environmental problems identified in the report included urbanization, settlement in marginal areas, soil degradation, pollution and drought. On environmental education, the report said that

> At the academic level, the School Science Project for secondary schools includes aspects of population growth and control, resource management and pollution in the curriculum while a proposed Humanities Project also for secondary schools, will deal with man's integration with his environment and impact of technology on the environment (RoK, 1972:94).

This suggests that by the time Kenya participated in the Stockholm Conference, environmental education was at its infancy and mainly confined to secondary schools. Integration of environmental issues was disciplinary with scientific fields being more favoured as carriers of environmental education than humanities fields. The topics mentioned seem unrelated to the environmental problems identified in the report. There is also a possibility of lack of emphasis on human-human-environment interactions and adoption of a technical approach that promotes technical teaching of environmental dos and don'ts. In other words, the holistic approach to addressing environmental issues and risks is missing.

The report also complained of a great shortage of trained research and teaching staff in the field of natural resources at university level (ibid, 96). This could also have hampered training of teachers. However, some NGOs like the Wildlife Clubs of Kenya were reported as doing useful educational work covering educational concepts as well as direct study of wildlife populations (ibid, 96). This aspect does not suggest looking at the human environment but possibly only addressing issues in well-protected areas.

The above mentioned committee formed in 1971 led to the establishment of the National Environmental Secretariat in 1974 to coordinate all environmental activities undertaken by various government ministries and departments. In October 1977, the Ministry of Education issued a policy stating its "responsibility to educate the young of Kenya towards preserving and enhancing our environmental heritage" (Kamunge, 1980:66). This policy directed the subject

inspectors and other senior education officials to consult and develop guidelines for the integration of environmental education in the existing curriculum. This policy statement enabled the entry of environmental concerns into the secondary school curriculum although it used a top-down approach. At primary school environmental issues were integrated in subjects such as Science, Agriculture, Home Science, Geography, History and Civics in 1985 (Lindhe *et al.* 1993:17). In 1986, environmental education issues were integrated in the curriculum of pre-service training of primary school teachers in subjects such as Science, Agriculture, History and Civics as well as Industrial Education (ibid). This brief historical outline demonstrates that environmental concerns in Kenya are about 30 years old.

Recognition of environmental education was again reiterated by the central government in the Sessional Paper No. 6 of 1988 (RoK, 1988), which stated that

- environmental studies be made part and parcel of the education and training curricula and be taught at all levels of education systems
- concerted efforts be made to educate members of the public on methods of and their specific role in the conservation and enhancement of the environment.

This recognition led to the inclusion of environmental concerns in Development Plans drafted by the government in the following years. Similarly, Kenya initiated and adopted the process of the National Environment Action Plan (NEAP) where environmental education received considerable attention (MENR, 1994: 137-145). The Curriculum Development Centre (Kenya Institute of Education) has also developed curriculum on environmental education for specialized environmental education personnel undergoing training in polytechnics (MENR, 1998). All universities have incorporated some teaching of environmental education either as a specialized area or as a compulsory module for teachers' pre-service training (Karembu, 2002; MENR, 1998). Several non-formal institutions are also involved in environmental education focusing on various target groups and natural resource priorities (Gichuki & Nasirwa, 1997; KIFCON, 1993). The discussion above suggests that there is considerable groundwork to promote environmental concerns in Kenya using the government ministries, formal and non-formal institutions.

The Kenyan government also advocates in-service training programmes for all people from all sectors especially on environmental conservation (MENR, 1994). Teachers are especially

targeted in environmental in-service programmes because the subjects taught at schools also address environmental issues and risks (RoK, 1992). Teachers are also well networked with the students and the community who steward the schools. According to Irwin (1993) teachers have a great potential to influence thousands of pupils during their professional careers. UNESCO described orientation of teachers to environmental education as a "priority of priorities" (UNESCO, 1990). In 1993, less than 10% of primary and secondary school teachers and teacher trainees in Kenya had participated in in-service training in environmental education (Lindhe *et al*. 1993). The possibility for more teachers participating in in-service training looked unlikely because of inadequate funds since the government had engaged in the World Bank/IMF sponsored structural adjustment programmes that required the government to reduce expenditure (Khalim, 1993:13). The government could only support a few in-service training programmes. The teachers who were in-serviced were expected to in-service their colleagues in their schools (Wanaswa, 1993:27). This study wishes to gain insights about considerations for local wetlands from teachers who attended the in-service training on this aspect in 1999. The emphasis is on studying their relationship with wetlands, pupils, other teachers and with the community and how they champion for wetlands sustainability.

1.3 Background to the present study

Kenya has many wetlands (Figure 2.1). The wetlands are of immense value and people use them for various purposes (section 2.3). This study argues that the values held by people about wetlands represent the meanings that people have developed after interaction with them (section 5.4). The values and meanings held by people are responsible for wetlands conservation or degradation. The teachers' actions to conserve wetlands in schools and at community level are also assumed to be guided by the meanings they hold about their local wetlands (section 1.4). Education for sustainability of wetlands involves empowerment of teachers to address wetlands' perceived values and threats and recognition of the need for improvement of human beings' quality of life (IUCN, UNEP & WWF (1991); UNESCO, 1992).

In 1998 the National Museums of Kenya's (NMK) Education Department initiated an in-service training programme on water and wetlands conservation for primary school teachers. This was in

line with the NMK education mission statement, which aims at "promoting people's understanding and sustainable use of natural and cultural heritage by enhancing access to the museums collections, research and exhibitions (NMK 1998:1). 242 teachers attended nine teachers' workshops held in seven provinces of Kenya (Figure 2.1). Each workshop lasted for two days and comprised both theory, encounter and reflection sessions focusing on how wetland issues are directly relevant to the teachers in the curriculum, at school and within the community and how they can champion for their sustainability. After the workshop, each teacher was given seven wetland posters (Plate A in Appendix 5.9) to distribute to neighbouring schools. They were required to conduct more workshops for teachers as well as involve members of the public in promoting wetland sustainability in their local areas. They were also required to integrate wetland issues in their teaching and to initiate wetland conservation activities in their schools and in the surrounding catchments (Ndaruga, 1999).

As discussed in section 4.9, these in-service training workshops were aimed at exploring with teachers the relevance of their local wetlands, the meanings attached to them, threats and conservation measures needed. The training also explored the role of the teacher in championing for wetlands conservation using formal and non-formal contexts. Although notes and posters provided were general and universal in nature, the trainers for each workshop venue were expected to ground these resource materials and the training to the local context and challenges. This implies that the role of trainers was facilitatory while the content and the activities done by teachers during the training were grounded on teachers' local experiences. This assumption concurs with the view by Fien (1993) and Di Chiro (1987) that the environment is confined to the people's constructed meanings of their surroundings and not imparted to the teachers.

My inspiration to participate in this research developed after being a member of the team that conceptualised the need for the teacher in-service training on wetlands as well as due to participation in the in-service course development and implementation phase. I felt motivated to explore how teachers perceived wetlands and carried out the task of championing for their conservation. I regarded the wetland in-service workshop for teachers as one example among many environmental conservation workshops done by various institutions (Lindhe *et al*. 1993;

IGAD, 1999). The findings of this study could provide useful insights to those trainers intending to engage in similar workshops in the future.

1.4 Aims and objectives of the study

This study was guided by the following aim:-

> To explore how teachers perceive wetlands and how they engage pupils and members of the local community in their conservation.

To achieve this goal, the following objectives were set

- To investigate how teachers perceive wetlands.
- To explore how teachers integrate wetland issues within the formal and non-formal contexts.
- To investigate teachers' actions in addressing local wetland issues.
- To establish what motivates teachers to champion for wetlands conservation in both contexts.
- To document constraints influencing teacher action at local level in both contexts.
- To explore the implication of teacher perceptions and actions to conservation of wetlands.

These objectives guided the formulation of the following research questions that guided me in the research process

- How do teachers perceive wetlands and the local environment?
- Are teachers able to identify opportunities within the formal and non-formal contexts that can be used to champion for wetlands conservation?
- How do teachers champion for wetlands conservation within the various opportunities available in both formal and non-formal contexts?
- What motivates teachers to champion for wetlands conservation?

- What outcomes do teachers wish to achieve locally in their campaigns for wetlands conservation?
- What hinders teachers from achieving their anticipated outcomes for wetlands conservation?
- What are the implications of teacher perceptions and action to wetlands conservation?

The goal, objectives and research questions were based on the following assumptions

1. The teachers perceive wetlands as resources. The teachers in this study were assumed to know their local wetlands and develop perceptions about them either to be of positive or negative value. The wetlands are considered as imbued with meanings regarding their biophysical, economic, social and political aspects (Figure 2.3).
2. There are opportunities within the formal and non-formal contexts where the teachers can integrate and address wetland issues.
3. Teachers are self-motivated to champion for conservation of local wetlands if they think they are of value and there are opportunities to do this (refer to assumption 1 and 2).
4. Teachers can help in alleviating wetland degradation problems within the locality where they live and work. This view concurs with Irwin's (1993:3) proposal that their status in society gives them the potential to influence thousands of pupils [and local community] during their professional careers.
5. Teachers view wetland issues holistically, that is the wetland biophysical, economic, social and political aspects (Figure 2.3).
6. The teachers are familiar with environmental education processes that involve the use of diverse teaching and learning methods and are informed by the local context.

This thesis is the first of its kind in environmental education for wetlands sustainability in Kenya. The study is exploratory and is expected to shed more insights on the pursuit of environmental education for sustainability of wetlands.

1.5 Outline of the rest of the thesis

Chapter 2 gives a detailed description of Kenyan wetlands. It starts with a description of what wetlands are, their characteristics, types and distribution in Kenya. The wetland issues in Kenya are addressed using categorization systems by O'Donoghue & Janse Van Rensburg (1995), Barbier, Acreman & Knowler (1997) and Emerton (1998). The chapter then explores what these wetland aspects entail and develops a conceptualized holistic model for wetlands that integrates biophysical, economic, social and political aspects of wetlands in Kenya. This holistic model was used to evaluate the issues and risks presented by the teacher responses. The implication of these aspects to wetlands education was also explored.

Chapter 3 explores the Kenya primary school curriculum. The primary school curriculum is divided into 16 subjects but some are not examined at the final year (RoK, 1992). This study engaged in an exploration of the provision for integrating environmental education in the various subjects (Appendix 3.2-3.10). This exploration of the official syllabus used in Kenya was augmented with literature from other sources. The purpose of this chapter is to present a grounded theory upon which the teacher responses in the use of various subjects (chapter 8) were reflected.

Chapter 4 focuses on the theoretical underpinnings of the study. It explores wetland issues using the environmental ideologies and how some can lead to environmental crisis in wetlands. The study looks at the trends in sustainability debate and its relationships with the environmental ideologies. There is an exploration of the relationship between education and environmental education using the three educational frameworks developed by Kemmis *et al.* (1983). The purpose of this is to develop a framework in which wetland activities by teachers are assessed in order to understand their practice. The study also explores the implications of environmentalism, the sustainability debate and the educational frameworks on the current practice of environmental education for sustainability with particular reference to wetlands. The aim is to locate the teachers' perceptions and practices in this study within this ongoing sustainability debate and to understand the challenges ahead in wetlands education as highlighted by this case study.

Chapter 5 looks at the research methodology used in this study. The chapter explores how the study was conceived, designed and implemented. The study looks at symbolic interactionism as a process by which the teacher generates meanings about wetlands, which form the basis in which his/her actions are motivated. The chapter explores how teachers were sampled, the data collection techniques and how the data was analysed. This was a case study survey whose survey approach was augmented by a reflective process. The survey research tools were the questionnaire and interviews. The reflective process involved observation, document analysis, field notes and a research journal. The data collection process was done in two phases. Analysis of data was done in several stages.

Chapter 6 presents an exploration of the profiles of teachers who participated in this study. The chapter explores the teachers' population, regional contexts and gender representation, local responsibilities and their pre and in-service training status. It also explores the teaching subjects of the teachers and their subject preferences. The chapter aims at providing details of the research participants before further exploring their actions within their local contexts.

Chapter 7 focuses on teacher perceptions about their local wetlands and the context in which they live and work. Since this study is founded on the principles of symbolic interactionism, this chapter looks at the meanings generated by teachers after their interaction with the local wetlands, including their value and threats. It also explores how teachers conceptualise community regard for the value of wetlands, how the local community come to know about wetlands and how the teachers perceive their potential locally as agents expected to champion for wetlands conservation. The chapter also looks at the teachers' perception of environmental education. This chapter presents the local reality about local wetlands using the perspectives of the teachers. The views presented in this chapter can be regarded as the teachers' socially constructed wetland environment. The values and threats identified are the ones which teachers' action locally are gauged or reflected against. The teacher perceptions about various aspects of their local context and wetlands is expected to set the wetlands agenda that the teacher is expected to address through the various approaches using diverse opportunities available within the formal and non formal context.

Chapter 8 focuses on the integration of wetland issues in the formal curriculum in schools. This chapter looks at how teachers integrate wetland issues in various subjects, how teachers interpret the wetland issues and the kind of practical activities that learners are involved in. There is also an exploration of how teachers teach in class and how they plan for their teaching. This exploration is done while reflecting on teacher's symbolic meanings about local wetlands as presented in the preceding paragraph (Chapter 7).

Chapter 9 focuses on teacher activities within the non-formal context, which in this study integrates the clubs, environmental days and the community contexts. The chapter looks at the activities done and reflects on their implications for wetlands sustainability. It also focuses on the problems faced by teachers in championing for wetlands conservation using the non-formal context. The chapter also looks at how teachers consult locally for different kinds of assistance. The teachers' activities within the non-formal context are also reflected against their perceptions of the local context and wetlands (Chapter 7).

Chapter 10 is concerned with the conclusion and recommendations as well as a reflection of the various aspects of the research process. This chapter is an exploration of the issues that emerged from all the other chapters, which are consolidated and discussed together. The discussion is used to generate tentative recommendations and useful insights that can be considered by future teacher training programmes on wetlands conservation or even other aspects of the environment.

CHAPTER 2: WETLANDS IN KENYA

2.1 Introduction

Wetlands is a generalised term that refers to a wide range of ecosystems associated with water and which share similar management needs. An international meeting to discuss the plight of wetlands was held in February 1971 in Ramsar, Iran and the participants came up with a broad but widely accepted definition of wetlands. According to the *Ramsar Convention on Wetlands of International Importance* (especially as Waterfowl habitats), wetlands are defined as

> "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres" (Dugan:1990).

The depth of six metres emphasised in the definition is considered to be the depth at which the association of light, water, soil and plants plays a major role to typify wetlands. Even where great water fluctuations occur between dry and wet periods, the presence of wetland associated plants serve as indicators of the presence of a wetland.

Since most countries are not endowed with all the types of wetlands prescribed by the Ramsar classification (Appendix 2.1), they have come up with different versions of the wetlands definition as they attempt to search for precise descriptions of wetlands within their borders in line with the Ramsar's general definition. According to Muthuri (1992:79), it is relatively difficult to find a single, correct, all encompassing, indisputable and ecologically sound definition of a wetland. This can be attributed to the diversity of wetland ecosystems and the fact that the demarcation between the dry and wet environments lies along a continuum. However research suggests that wetland soils are found in areas with slopes of less than 5% on physiographic units like bottomlands, river valleys and plains (Wamicha, 1997:1).

The Kenyan definition was formulated by the Kenya National Wetlands Committee in 1994 and defines wetlands as

> "areas that are permanently, seasonally or occasionally waterlogged with fresh, saline, brackish or marine water including both natural and man made areas that support characteristic plants and animals" (NMK, 1999:1).

These definitions point at wetlands being unique ecosystems formed due to interaction between light, water and the land surface (soil, minerals etc) for a considerable length of time and within an appropriate gradient. The resultant environment supports special flora and fauna (including man) and thus becomes a centre of activity with each organism benefiting in its own way.

Governments that have ratified the Ramsar convention have made notable efforts to conserve wetlands. Kenya has already listed Lakes Nakuru (1990), Naivasha (1995), Bogoria (2001) and Baringo (2001) as Ramsar sites. Various government departments, non-governmental organisations and community groups have stepped up campaigns to champion for wetlands conservation. A list of those institutions involved in wetlands conservation is given in Appendix 2.2. The Kenyan National Environment Action Plan (MENR, 1994) report devoted one chapter to wetland issues while the current Environmental Management and Co-ordination Act (EMCA - 1999), Part V section 42 and 55 recognises wetlands as unique habitats that require special conservation attention (RoK, 1999). The government is currently finalising the wetlands policy document that is intended to act as a national guide on how people should interact with or manage wetlands.

In Kenya most research on wetlands has been carried out in the shallow lakes of the Gregory Rift Valley, the edges of Lake Victoria as well as in coral reefs and mangrove forests along the coast (Howard, 1992:1; Hughes & Hughes, 1992). The country has many other smaller wetlands but only a few studies have been done on them despite the fact that they are very useful to the natural environment including human beings. Their inadequate coverage portrays the existence of a knowledge gap on wetland types, distribution and species diversity of their biological communities (Njuguna, S. 1996:1).

2.2 Types and distribution of wetlands in Kenya

Different types of wetlands occur in Kenya. Generally, a wetland is formed due to interplay of the topographic and the hydrological aspects in an area resulting from either natural or human induced manipulations. Topographic aspects refer to the morphological attributes such as slope or the depression that allows water retention at or very close to the ground surface (Nyamweru, 1992:5). Hydrologic conditions embrace aspects such as periodic water supply, which may be perennial or seasonal.

Examples of wetlands found in Kenya include shallow lakes, edges of deep lakes, rivers, man made dams, shallow wells, swamps, marshes, springs, deltas, estuaries, rice puddies, mountain bogs, peatlands, mangroves, open coastlines and coastal beaches (Njuguna, S. 1996). The types of wetlands found in Kenya, their prominent features and key examples are given in Appendix 2.3.

Wetlands within the Kenya borders cover an area of approximately 15,000 Km^2 constituting 2.5% of the country's total surface area (582,646kms^2) (Njuguna, S. 1996:1) while wetland associated soils cover 10% of the country (Wamicha, 1997:1). Wetlands are not evenly distributed and some areas have plenty while others have scanty or none. According to NMK (1999:5), wetlands in Kenya can be viewed to occur within 5 main regions namely the Coastal lowlands, Central highlands, Rift Valley, Lake Victoria basin and the Dry land regions. The main wetland types found in these five regions are shown in Figure 2.1 and described briefly in the proceeding sections of this chapter.

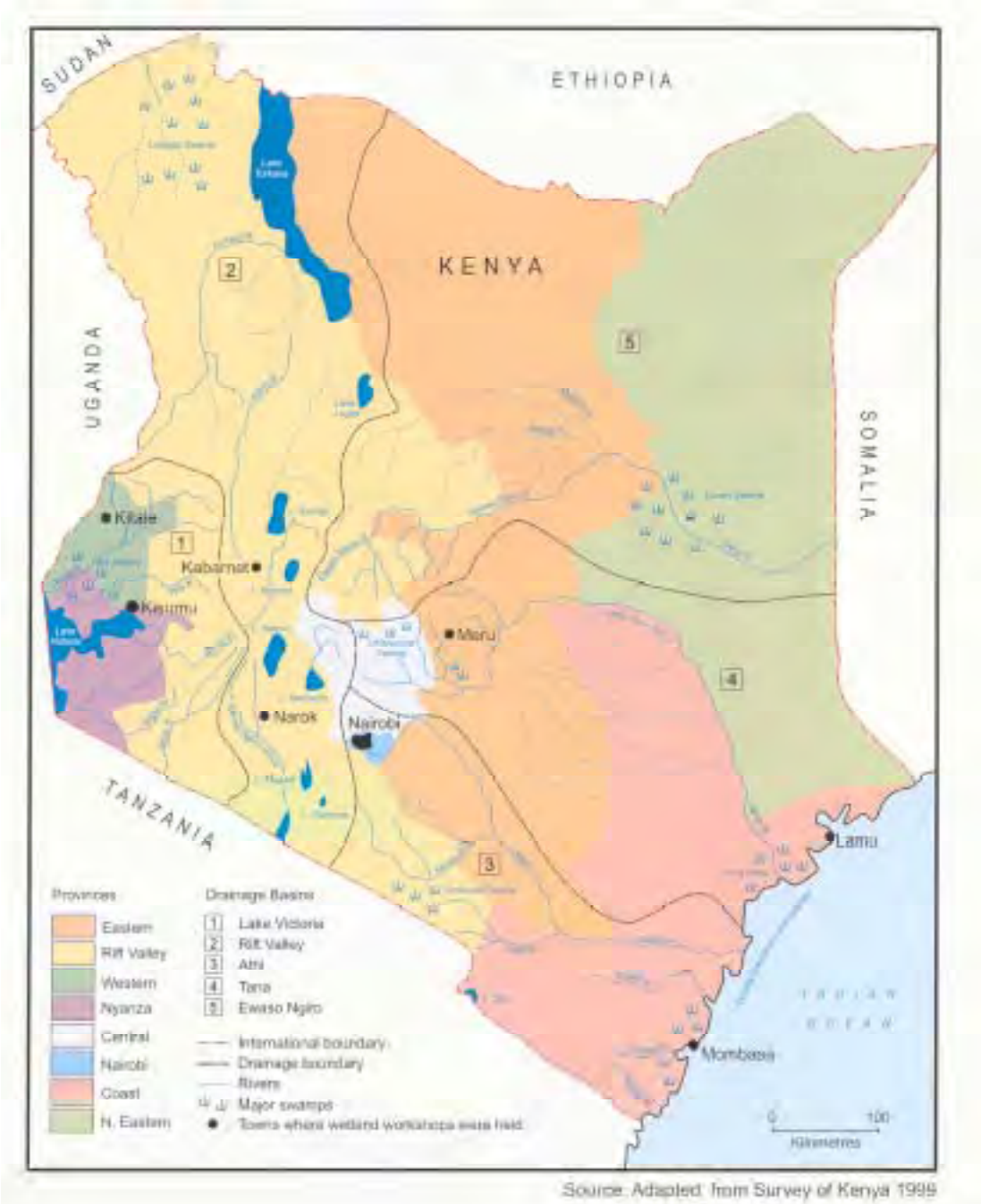


Figure 2.1 Distribution of wetlands in Kenya

2.2.1 Coastal lowland region

The main type of wetlands found here are those associated with the Indian Ocean coastline such as sea grass beds, coral reefs, beaches and mangroves. The other major ones are the estuaries of

Athi and the Tana delta drainage basins (Figure 2.1). Tana delta is the largest in Kenya (243 Km^2) and ecologically one of the most important (NMK, 1999; RoK, 1991). Human-made wetlands are also present such as rice, horticulture and cotton irrigation fields (such as Bura Irrigation Scheme), prawn aquaculture ponds in Kilifi and salt evaporation pans in Kwale district.

2.2.2 Central highlands region

This is a highland area and the major wetlands found here are those associated with river catchments such as springs and rivers such as Tana, Athi, Malewa, Ewaso Nyiro (north); swamps such as Ondiri, Limuru ponds and Ol Joro Orok, marshes, and lakes such as L. Olborosat (Figure 2.1). Others are crater lakes such as Hut Tarn, Tyndall Tarn and Curling pond and glacial lakes and montane bogs such as Vertical bog in Mt Kenya and also in Aberdare ranges.

2.2.3 Rift Valley region

The Rift valley in Kenya covers an area of 130,452km^2 (NMK, 1999:6). It forms an internal drainage basin. Numerous streams drain the Western and Eastern highlands and feed a series of shallow lakes found in the Rift Valley floor (Figure 2.1). The main lake basins include Turkana, Bogoria, Solai, Nakuru, Elmentaita, Magadi and Naivasha. These lakes occupy an area of approximately 8160km^2. Major rivers flowing into the Rift Valley include Ewaso Nyiro (South), Malewa, Molo, Waseges, Turkwel and Kerio. Hot and cold springs also occur adjacent to some lakes such as L. Magadi and L. Bogoria and these feed the lakes with mineral rich water. Numerous human made wetlands also occur on the floor of the rift valley the main ones being Turkwel, Chemeron and Nakuru wastewater treatment ponds.

2.2.4 Lake Victoria basin

Lake Victoria (68,000 Km^2) is the largest in Africa and is shared by three countries - Kenya, Uganda and Tanzania. The lake lies in a down warped basin, which was formed about 100,000 years ago by flooding of a dissected landscape (Nyamweru, 1992:10). The lakeshores are very irregular with many headlands, inlets and islands reflecting relief of pre-existing landscapes. The

Kenyan part of the lake extends for 500km with a total catchment area of 12,300km^2. Lake Victoria has extensive swamps, deltas and marshes, which includes the Yala-Nzoia swamp (17km^2), Nyando and Sondu delta. The periphery of the lake also has several satellite lakes such as Lake Kanyaboli, Lake Sare and Lake Nambongo. These small lakes are virtually surrounded by swamp and serve as important refugia for the highly diverse native fishes and other fauna of Lake Victoria. The main rivers draining into lake Victoria include Nzoia, Yala, Sondu Miriu and Nyando (Figure 2.1). The main river draining out of the lake is River Nile in Jinja, Uganda (NMK, 1999).

2.2.5 The drylands region

Drylands in Kenya cover approximately 346,000km^2 of which 1% is covered by wetlands (NMK, 1999). Drylands are dispersed in many parts of the country especially within the Rift Valley, Athi, Tana and Ewaso Ngiro drainage basins. These wetlands form a very valuable life support system whereby they act as important animal and human focal points of activity. The main types of wetlands in drylands include rivers, wells, swamps, seasonal lakes, dams, watering pans, springs and oasis. Arid and semi-arid areas are characterised by environmental variability resulting in variations in wetland size, water regime, seasonal movement of people, large numbers of game animals and livestock (Gichuki, Oyieke & Ndiritu, 1999:24). Wetlands in drylands experience a great fluctuation in water levels between the wet and dry periods. Reductions of up to 35% have been reported in Lake Kwenia (ibid) and some of the wetlands dry up completely during prolonged dry spells.

The main rivers include Namanga, Athi, Kiboko, Turkwell, Mara, Kerio, Ewaso Ngiro (North), Ewaso Ngiro (South) and Tana (Figure 2.1). The main seasonal lakes are Amboseli, Suguta, Marmar, Kisima, Stefanie, Logipi, Paradise and Chalbi. The main swamps are Tana Delta, Amboseli, Lorian, Sangoa and Mzima springs. Climate change has been implicated in the formation of some swamps such as Lorian swamp which was formed due to failure of R. Ewaso Nyiro (North) to maintain its flow to the Indian Ocean (Nyamweru, 1989). Lotakipi swamp also marks the course of an overflow from high level of Lake Turkana to the Nile system via the Pibor and Sobat rivers (ibid).

2.3 Wetlands in the context of the broader environment

Wetlands are multiple resource systems that provide multifunctional benefits (Lee, 1999:67) and are a product of interaction between water, soil, sunlight and the living organisms (plants and animals) within a particular topography. The resultant system is ecologically complex. Human beings are initially attracted to virgin wetlands due to their economic as well as their biophysical attributes such as water, plants, animals and beauty. People's interaction with wetlands is as old as human society itself (Barbier *et al*. 1997:3) and as a result, meanings emerge that are used to identify wetland resources. Over time, trade in the products from wetlands triggers a chain of economic ventures. This attracts other people and as population grows, social issues arise such as culture, heritage, mythology, art, religion and settlements all deriving their support from wetlands. With increases in the number of people and the diminishing wetland resources, issues of 'who is who' and 'who controls what' emerge. This political aspect involves issues of power, policy and decisions related to the wetland resource.

The positive meanings associated with wetlands have a contextual uniqueness, which results in wetlands symbolizing different things to different people (Howard, 1992:3). However wetlands also generate negative meanings in as far as they are associated with waterborne diseases, pests, dangerous animals and bad smell.

When looked upon in terms of human-human and human-wetland interactions, wetland benefits and issues can be categorized in different ways. According to O'Donoghue & Janse Van Rensburg (1995:8), the environment can be considered in terms of biophysical, socio-cultural, economic and political aspects (Figure 2.2). This study translated these aspects with a focus on wetlands and these are presented in Figure 2.3 and discussed in sections 2.3.1, 2.3.2, 2.3.3 and 2.3.4.

By contrast, Barbier *et al.* (1997:15) and Emerton (1998:7) classify wetland value into two major groups, the use and non-use value (Table 2.1). Use values are associated with human interaction with the resource. The use value can be divided into three categories; direct-use value, indirect-use value and option/quasi-option value.

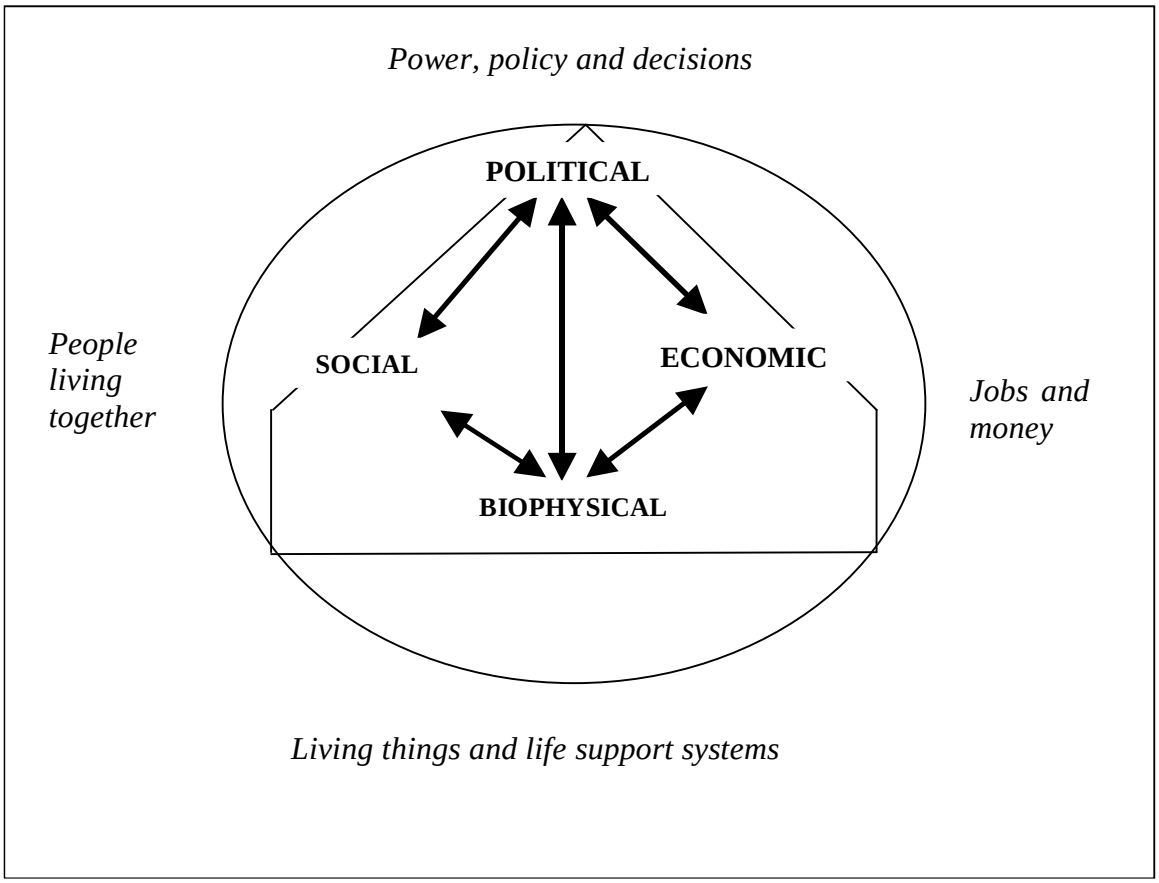


Figure 2.2: A broader picture of the environment (O'Donoghue & Janse Van Rensburg, 1995:8)

Direct use values are mainly commercial or non-commercial and include exploitation for several uses as shown in Table 2.1. Indirect uses include benefits from wetland regulatory ecological functions and they support the direct economic value. Option and quasi-option value of wetlands are closely related and both place premium on maintaining a pool of wetland species and genetic resources for future possible uses such as leisure, commercial, industrial and agricultural applications including water based developments some of which may not be presently known (Emerton, 1998: 7). Option value refers to when an individual delays development activities because of uncertainties of his/her future demand for the resource and its availability (Barbier *et al*. 1997:16). The individual opts to wait until its high value unveils itself. Quasi option value refers to expected value of information derived from delaying immediate exploitation and conversion of a wetland until a later date. It involves accounting for implications by gaining additional information (ibid).

Table 2.1: Classification of total economic value of wetlands

USE VALUES			**NON USE VALUES**
Direct use value	Indirect use value	Option and Quasi-option Value	Existence Value
Production and consumption goods such as Fish Agriculture Fuelwood Recreation Transport Wildlife harvesting Peat/energy Wild foods Building poles Thatch Water Medicine Pasture Studies etc	*Ecosystem functions and services such as* Nutrient retention Flood control Storm protection Groundwater recharge External ecosystem support Microclimatic stabilization Shoreline stabilization Water quality Water flow Water purification etc	*Premium placed on possible future uses and applications such as* Pharmaceutical Agricultural Industrial Leisure Water use Future value of information etc	*Intrinsic significance in terms of* Cultural value Aesthetic value Heritage value Bequest value etc

Source: Consolidated from Barbier *et al.* (1997:15) and Emerton (1998:7)

Non-use value is associated with current or future (potential) value associated with an environmental resource, which relies on its continued existence and are unrelated to use (Barbier *et al.* 1997:16; Emerton, 1998:8). There is no direct human interaction with the resource in the non-use value. Non-use value also incorporates existence value, which refers to the intrinsic value or existence value of not using the wetland, but rather preserving it for its own right. They include aspects of wetlands such as biodiversity, culture, heritage and bequest values (Barbier *et al.* 1997:14). Bequest value refers to the value of conserving a resource for future generations to use. Non use values are difficult to measure as they involve subjective valuation by individuals unrelated to either their own or others' use whether current or future (ibid:17). The classification by Barbier *et al.* (1997) is almost identical to that by Emerton (1998) and both are consolidated and summarized in Table 2.1.

These two classifications are used in the categorization of the teacher responses in later sections of the thesis. However the discussion in section 2.3 follows the classification by O'Donoghue and Janse Van Rensburg (1995) (Figure 2.2) because it is considered broader and more comprehensive. The classification by Barbier *et al*. (1997) and Emerton (1998) was mainly meant for economic evaluation of wetlands and only serves to enrich this discussion. The classification by Barbier and Emerton is integrated in the discussion in section 2.3 and the rest of the thesis. The integration of both classifications is based on the fact that there are many similarities between the two classifications as shown in Table 2.2 and Figure 2.3.

Table 2.2: Comparison of similarities between two wetland categorizations

Wetland value categorization	
O'Donoghue and Janse Van Rensburg (1995)	Barbier *et al*. (1997) & Emerton (1998)
Biophysical aspects	Indirect use value
Economic aspects	Direct use values
Social aspects	Use and non use values
Political aspects	Use and non use values

Figure 2.3 shows the relationship between various wetland attributes following the categorization by O'Donoghue and Janse Van Rensburg (1995:8); Barbier (1997) and Emerton (1998). Figure 2.3 shows that wetlands comprise of complex interactions between the water, soil, plants and animals which later give rise to a complex of interactions between biophysical, economic, social and political aspects. The next section of this thesis focuses on each of these aspects in Kenya and highlights their interrelationships with a focus on their contribution to wetland threats. Section 2.4 discusses the implications of these aspects to wetlands education.

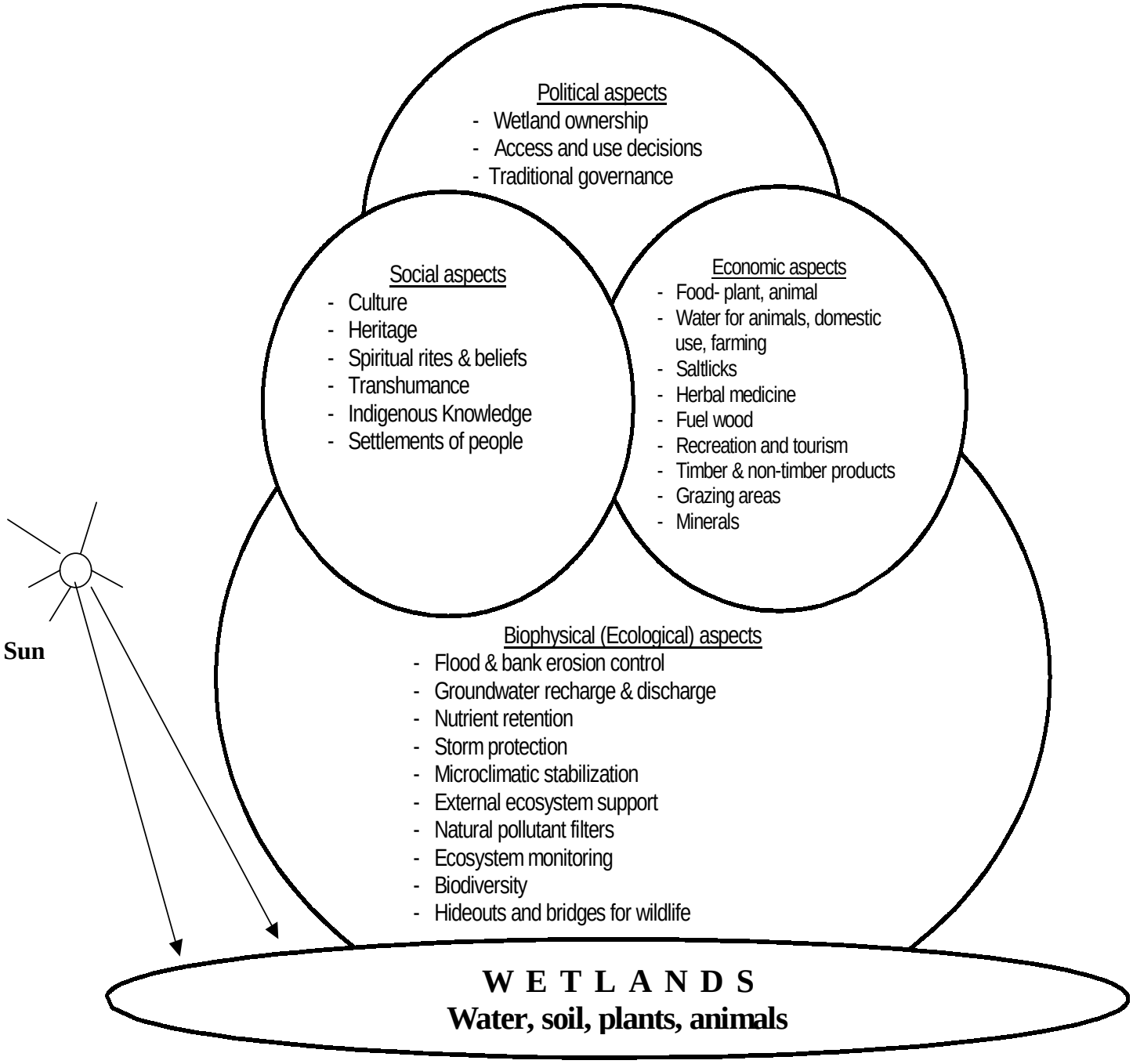


Figure 2.3: Wetlands in the context of the broader environment. (Adapted from O'Donoghue & Janse Van Rensburg, 1995:8; Berbier et al., 1997 and Emerton, 1998)

2.3.1 Biophysical aspects of wetlands in Kenya

This view regards wetlands as a natural world of water, plants and animals together with the landscape where wetlands occur. Wetlands are rich in natural resources such as water, soil, minerals, plants, animals and micro-organisms (NMK, 1999:8). Healthy wetlands play crucial regulatory and ecological functions which support all the other economic, social and political attributes. Living organisms (plants and animals) interact with each other and with the physical surroundings (soil, water, air and other matter) forming life support systems and processes (Barbier *et al*. 1997). Biophysical functions include provision of water, flood and bank erosion control, groundwater recharge, nutrient retention, storm protection, microclimatic stabilization, external ecosystem support, natural pollutant filters, ecosystem monitoring, biodiversity, and refuges for wildlife (Table 2.1 and Figure 2.3). The biophysical aspect of wetlands is subject to depletion due to over extraction and misuse of natural resources to support jobs and lives of people (Taylor & Paxton, 1994:8). Some negative impacts on natural resources by human activities include pollution, loss of biodiversity, degradation of life support systems, global climate change and ozone depletion (RU/SADC, 2000). These problems challenge the ecosystems and the ability of the earth to regenerate those ecological processes that sustain life.

79% of Kenya has less than 700mm rainfall annually as shown in Table 2.3. Only 11% receives more than 1000mm of rainfall per year. Water from precipitation is expected to provide surface water and recharge groundwater resources.

Table 2.3: Distribution of rainfall in Kenya.

Mean annual rainfall (mm)	Land area (Km^2)	% total land
> 1000	64,070	11.2
800 – 1000	32,960	5.8
700 – 800	24,260	4.3
500 – 700	73,140	12.8
300 – 500	270,410	47.4
< 300	105,730	18.4
Total	570,570	99.9

Source: MENR (1994)

Droughts and floods are common in Kenya and occur as anomalies in rainfall patterns (JICA/GoK, 1992a). Major droughts occurred in 1931-35, 1941-45, 1971-75, 1981-85 and caused widespread famine (Abira, 1997:50). Major floods occurred in 1937, 1947, 1951, 1957-58, 1961 and 1977-78 (ibid). Latest floods and droughts are blamed on El nino and La nina climatic phenomena. A latest El nino flood phenomena was experienced in Kenya in 1999. Sometimes long dry spells cause some wetlands to dry up completely and others to reduce in volume. In 1997 a 35% decline in wetland size was reported in Lake Kwenia (Gichuki *et al.* 1999). These phenomena affect wetlands by either increasing their pollution load (in the case of flooding) or increasing overexploitation and depletion (in the case of drought).

Anthropogenic influences are implicated with climate change in terms of an increase in carbon dioxide gas in the atmosphere due to the burning hydrocarbon fuels and deforestation. It is projected that if the current global trends of carbon dioxide emissions and deforestation continue, by 2050 carbon dioxide levels will double, mean global temperature will increase by a range of 1.5 to 4.5^0C and sea level will rise by about 0.3-0.5 metres while the temperature of the surface ocean layer will rise by between 0.2^0-2.5^0C (IPCC, 1990). In Kenya this would imply changes in evaporation rates and rainfall patterns resulting in acute water shortage and increased water rights conflicts especially in the arid and semi arid areas where wetlands symbolize 'an island of life' due to the complex association between soil, water and biota. It would also lead to increased flooding in the high rainfall areas and deterioration in water quality (ibid). However, the full manifestations of these impacts are still unclear and the magnitude of the consequences will depend on how that change is managed (Abira, 1997, 51).

Kenya's history of recurrent food shortages and droughts has made the government policies insensitive to wetlands. During the 1981/82 drought the government formally asked landowners with river frontage to reclaim swamps adjacent to their farms for food production (Olindo, 1992). The long dry spells also affect the groundwater resources. Excess water stored in swamps slowly sinks to underground aquifers and rivers and thus recharges underground water (Nyamweru, 1992). This stabilizes the water table and helps to avail water to people through shallow wells and boreholes. During dry spells this cannot happen and may lead to major water crises and conflicts.

Wetlands are able to retain excess water when it rains by expanding in size. Temporary wetlands such as pools and pans are formed when rain falls. These wetlands hold water and protect areas downstream from getting flooded and slowly release the water when rainfall reduces (Ng'weno, 1992). Wetlands also assist in the retention of nutrients by trapping effluents and soil collected during floods from diffuse and point sources. The sediments accumulate while the water gets filtered and the nutrient levels of wetlands increase. Research shows that pollutant loads decrease after passing through a wetland (Ndaruga, 1998; Mavuti, 1989, 1992:32; Gichuki *et al.* 1999). In mangrove forests the presence of nutrients encourages luxuriant growth of sea grasses and algae (UNESCO, 1987) which attract aquatic herbivores and carnivores forming a complex system of food interrelationships and biological diversity.

Wetlands are centres of high primary productivity and complex ecological interrelationships. Wetlands biological diversity can be viewed in terms of the variety of wetland communities and the diversity of biological components within each community (Rodgers, 1993). Kenyan avifauna comprises of 1079 species (Bennun & Njoroge, 1999) some of which are associated with wetlands. There are approximately 48 families of fish living in Kenya's wetlands (Okeyo, 1992:47). Many Kenyan cultures have an association with fish, in particular using them as food and for trade. Some wetlands are popular due to the presence of particular species. For instance Lake Kanyaboli is a home for rare *Oreochromis esculentus, O. variabilis,* and dwarf *Haplochromis spp.* These fish were the main tilapia fishery in the 1950's and 1960's but are now absent due to predation by the exotic Nile Perch (Mavuti, 1992:31).

Wetlands also act as homes for some wildlife and livestock which visit them to drink water and to graze (such as elephants, buffallo, zebra, antelopes hippos and birds) or get prey (such as hyenas, lion, leopard and crocodiles). The presence of tourists in an area attracts tourist lodges and hotels, villages, market places and the associated increase in population leads to more encroachment into wetlands and pollution. This threatens aquatic animals and plants and water resources as have been noted in Magadi, Nguruman and Kiserian (Gichuki *et al*. 1999:25). This depicts human presence as a threat to wetland resources.

Riparian forests along river valleys usually have thicker vegetation and act as bridges or migration corridors for birds, primates, herbivores and carnivores as they move from one part of a dryland to another (Gichuki *et al*. 1999:35). Wetlands also act as external ecosystem support where they serve as focal points for wildlife, livestock and man. They make life in adjacent and far away ecosystems possible through provision of food, water and other products. The fact that wetlands support a more luxuriant growth of vegetation than the surrounding drylands makes them a valuable source of medicinal herbs for livestock and human beings. Nevertheless, indigenous knowledge has not been well documented (ibid).

Wetlands can also be used for ecosystem monitoring whereby organisms such as fish, invertebrates and water dependent birds are good indicators of changing ecosystem integrity (Ndiritu, 2001; Gichuki & Ndiritu, 1999; Ndaruga, 1998). Monitoring shows that human activities such as planting eucalyptus trees, introduction of exotic fish species and land-based pollution are responsible for negative impacts on wetlands.

Various exotic plant and animal species have been introduced in wetlands to meet food and economic needs of the people. Some of these exotic species multiply and adapt quickly to new environments and may replace native species. Some introduced plant species in Kenya include water hyacinth (*Eichornia crassipes*), Nile cabbage, water lettuce *(Pistia stratoites*) and the water fern (*Salvinia Molesta*). Animal species include Nile perch *(Lates Niloticus)*, Louisiana crayfish (*Procambrus clarkii*) and coypu rat (*Myocaster coypus*), (Njuguna, 1992,). Nile perch has threatened indigenous fish species in L. Victoria while coypu rats destroy farm crops and aquatic vegetation.

Lakes, rivers and ocean edge wetlands are rich in plant life and these protect water edges against soil erosion by water currents. For instance, Ewaso Ngiro riverine forests of *Ficus natalensis* regulate river flow and control floods and soil erosion on the river banks (Gichuki & Ndiritu, 1999:9). Any activity that affects wetlands' ability to counteract floods and storms is a major wetland issue that should be addressed. A major threat to wetlands is the destruction of forests and some pockets of this have been reported in Mau, Marmanet, Oloolua, Karura, Aberdare ranges, Ngong and Cherangani hills as well as Mt. Kenya (Manguriu, 1999; NMK, 1999). Forests

play a major role in rain formation, prevention of soil erosion and water percolation to underground aquifers.

Wetland degradation is not confined to Kenya only but has raised concern globally. For instance loss of inland and mangrove wetlands globally stands at about 50% of those that existed in 1900 (Dugan, 1993; OECD, 1996). According to Moser *et al*. (1993), 84% of Ramsar-listed wetlands were threatened by ecological change. Agricultural development is regarded as the principle cause of wetland loss (Spiers, 2001:27). By 1985 it was estimated that a total of 26% of wetlands world-wide had been drained and this comprised of 56-65% of those in Europe and North America, 27% of those in Asia, 6% of those in South America and 2% of those in Africa (OECD, 1996). African wetland loss is lower possibly because of the low rate of technological development and the predominance of traditional ways of wetland utilization.

The coral reef wetlands along the coast comprise of shallow water and are rich in biodiversity. Coral reefs are adapted to and have been shaped by natural events such as rise and fall in sea level and fluctuations of ocean/sea surface temperature. Current studies on coral reefs have shown that 58% of world's reefs are endangered by human interference. Globally 36% of all reefs were classified as threatened by overexploitation, 30% by coastal development, 22% by inland pollution and erosion and 12% by marine pollution (WRI, 1998).

The discussion above is an exploration of the meanings associated with various biophysical aspects of wetlands. The discussion points at the complex natural processes that occur in wetlands naturally in terms of interrelationships between sunlight, water and organisms. The discussion suggests that both natural and human-made induced forces influence the biophysical aspects of wetlands. Human beings are criticized for interfering with the natural balance by bringing in aspects of exploitation, pollution and introduction of alien species. These interferences lead to depletion and degradation of wetland resources. These aspects support the strong linkage between human beings and the biophysical aspects of wetlands. Environmental education aims at ensuring that human beings continue enjoying their livelihood from wetlands while still maintaining the quantity and quality of the wetland biophysical environment (sections 4.3, 4.4, 4.5 and 4.7).

2.3.2 Economic values of wetlands

People have a long history of earning their livelihood from wetlands (Barbier *et al*. 1997). Interaction at economic level involves valuing and utilization of natural and other resources and people's access to such resources, money and employment (SADC REEP, 2002:5). Economic aspects are geared towards the improvement of livelihood of the local people and the country as a whole. According to Zerner (2000:4), economic considerations regard nature as an emporium or a commercial warehouse awaiting its brokers. Economic pursuits coupled with increased population lead to development crisis characterized by destructive and uncontrolled resource extraction, environmental destruction, resource depletion, poverty, hunger, conflicts and social oppression (Zerner, 2000:4; Ekins, 1993). This also leads to an increase in the gap between the rich and the poor together with an increased number of absolutely poor people. In the 'developed world' economic growth has led to increased consumption and increased demand on natural resources. In developing countries, exploitation and inequality has contributed to poverty and deprivation (RU/SADC, 2000). Economic attributes of wetlands include providing food in the form of plants and animals, providing water for domestic use and for animals, saltlicks, herbal medicine, fuelwood, recreation and tourism, timber and non-timber products, grazing areas, and minerals (Figure 2.3).

Kenya is a developing country and poverty is rampant (RoK, 2001b). The poor people are compelled to exploit wetlands for their livelihood in terms of food and employment. Poverty has adverse impacts on wetlands such as over-harvesting of wetland products. Some of the materials that are overharvested include water, fish and other wetland animals, papyrus and wetland associated forests (Amwatta:1999).

Although Kenya is endowed with numerous rivers, many are seasonal and cease to flow during the dry periods (Abira, 1997:46). Thus only a few rivers can be relied upon to support the country's economy. In the case of lakes all except lake Victoria, are located within the Rift

Valley, an arid and semi arid area with high evaporation that exceeds precipitation (JICA/GoK, 1992b). Most of the lakes are small and saline and vulnerable to environmental changes and impacts such as pollution (Abira, 1997:46). The few permanent freshwater wetlands are therefore threatened by overexploitation, pollution and siltation.

People derive various economic gains from wetlands. Globally, wetlands feed more than half of the world population (Muthuri, 1992:81). Kenyan economy depends greatly on her agricultural potential (RoK, 2001b). Wetlands attract farming activities because of the presence of water and moist fertile soils. Crops grown using wetlands include cereals, vegetables and fruits (Odongo, 1996; Njuguna, P. 1996; Mavuti, 1992, 1981; RoK, 1991). The food harvested from wetlands is consumed locally while surplus is sold to urban areas (Gichuki & Ndiritu, 1999:7). Many wetlands especially swamps, marshes and floodplains have been converted to agriculture and livestock use. For instance, the L. Victoria region (Yala, Kuja and Nzoia in Western Kenya), Kisii and Central province have been reclaimed for agriculture (Masese, 1997). The Nyando floodplain has been converted to rice fields (Ong'or *et al*. 2001). Chuiyat, Asururiet/Kesses river swamps have been subdivided into smallholder farms and have been reclaimed for agriculture (Njuguna, P. 1996). Wetlands also support agricultural activities such as horticulture in distant places where water is piped.

Irrigated agriculture helps in boosting food production even in marginal arid and semi arid areas. Population pressure forces people to live in marginal areas which increases water demand for irrigation purposes (Abira, 1997:49). Agricultural development brings with it other problems such as increased siltation of the wetlands and excessive water abstraction to support the farming activities. Inappropriate farming methods in arid and semi arid areas lead to soil erosion, which affects wetlands in terms in terms of siltation and pollution by farm chemicals that affect water quality and quantity as well as the wetland associated biodiversity such as fish and benthic organisms (MENR, 1994:115). Farming also leads to unplanned settlements as can be observed in Pasimoru forests, Mau, Nguruman escarpment and Oletukat areas which are the main catchments of River Ewaso Ngiro (South) (Gichuki *et al*. 1999:29, Njuguna, P. 1996).

Many Kenyan wetlands also provide communities with fish (RoK, 1991; Gichuki *et al*. 1999; RoK, 1997; Gichuru, 1999; Ndiritu & Gichuki, 1999:25). Fishing activities have led to the development of urban centres and migration of people (section 2.3.3). This encroachment and exploitation has adverse effects on wetlands.

Mangrove forests provide timber for building, poles, boats, houses, and furniture. Other products from wetlands include providing locals with firewood, material for canoe construction, medicinal products, bee hives, drum frames, tool handles, mats, baskets, twines and construction fronds, chairs, beds, thatching materials, rafters, traditional fishing traps, making bows, walking sticks, furniture and construction (Odongo, 1996:11; RoK, 1991; Njuguna, P. 1996:13; Ndiritu & Gichuki, 1999:27). Overexploitation and conversion of mangrove forests into other competing land uses such as fish ponds, (aquaculture), infrastructure development and salt pans has been reported in Kenya (Yap & Landroy, 1986; Karanja, 1997:30). This leads to increased acceleration of soil erosion, altered water cycle and local climate, reduced quality and quantity of freshwater resources and biota such as invertebrates, fish, reptiles and amphibians.

Wetlands support evergreen vegetation throughout the year making it a crucial wildlife and livestock refugia focal point during dry periods (Gichuki & Ndiritu, 1999:11). This plays a role in promoting tourism in the country. The wetland refugia can either be eaten by cattle directly or cut and used to feed cattle that are being zero grazed (RoK, 1991:19; Njuguna, P. 1996:13). Wetlands are popular grazing areas especially by pastoralist communities. Research has shown that the 15,600 ha of wetlands in Kajiado district support 80,000 head of cattle (Gichuki & Ndiritu, 1999:4). During dry seasons, wetlands are used extensively for livestock grazing. As plains dry up, cattle move into the wetlands to feed on wetland vegetation, and sometimes destroy other plants used by man such as *Basella alba* and *Solanum pseudonigrum* which are important sources of vegetables to people (Njuguna, P. 1996: 16). They also trample on the soil causing soil erosion and siltation. Overgrazing is common and it degrades wetlands.

Some wetlands are threatened by mining and industrial development. For instance Lake Natron, an alkaline lake in Tanzania is a major nesting site for flamingos and is threatened by a salt mining industry (Howard, 1994). Lake Magadi in Kenya is also used for salt mining. Clay is used

for making pottery, plastering walls and floors of houses and making bricks. Sand is harvested from dry riverbeds and used in house construction. Building stones and marble plates are mined where rock formations allow especially along steep river slopes. These mining activities provide a source of employment and livelihood for the locals and also improve the national economy (Gichuki *et al.* 1999). These practices can degrade the wetland by lowering the underground water table. Continuous monitoring is necessary.

Some wetlands have suffered the consequences of infrastructure development. For instance, in Tana Delta, the Malindi-Lamu road passes through the delta and this has caused damming in some sections. This causes water logging and some riverine forest trees have dried up (RoK, 1991:27). In Victoria region, Lake Kanyamboli was separated from Yala swamp in 1970 by a silt clay dyke leaving only a drainage canal to connect to the swamp. Livestock later destroyed the drainage canal. The salinity of the lake has more than doubled because of lack of replenishment from the river (Mavuti, 1989). Construction of hydroelectric power (HEP) dams and reservoirs across rivers also interfere with the culture of people, the water cycle and changes riverine to lacustrine habitats and blocks upstream movement of migratory fish during breeding periods (Bell-Cross & Minshull, 1988; Ndiritu & Gichuki, 1999:27). Hydropower production demands construction of huge reservoirs, which have major biophysical, social, economic and political impacts. HEP provides 78% (more than 6000 megawatts) of power in Kenya (Abira, 1997:49).

In Kenya demand for water is increasing constantly due to population growth, urbanization and industrial development (Abira, 1997:49) as shown in Table 2.4. Domestic water comprises water used in households, commercial enterprises, institutions and also livestock water in high potential areas. In urban areas, domestic water supply also includes water used in sewerage facilities for waste disposal. Industries require water for processing as well as for disposal of their effluents, which is done through public sewers or through water bodies such as wetlands (JICA/GoK, 1992c). Wetlands play a vital role in provision of water to people and over 60% of women obtain water for domestic use directly from rivers, lakes, dams, streams and other wetlands (Abira, 1997:50). Excessive water withdrawal for domestic use, urban use (for Nairobi, Nakuru, Kisumu, Mombasa) and irrigation of horticultural crops has been witnessed (Gichuki *et al*. 1999). Drylands have not been spared - for instance Kajiado, Laikipia, Makueni, Mwingi and Machakos

districts where wetlands are exploited to support farming activities. All these uses require a supply of good quality water in adequate quantities.

Table 2.4: Projected domestic and industrial water demand for Kenya (1000m^3/day).

Uses	Year and amount		
	1990	2000	2010
Rural	532.1	749.3	1,161.8
Urban	573.4	1,169.9	1906.0
Livestock	326.7	377.5	494.0
Industry	218.7	377.5	494.0
Total	**1650.0**	**2,722.2**	**4,183.2**

Source: JICA/GoK, 1992c

Pollution in wetlands comes from several sources which include agricultural chemicals, industries and domestic sources. Some towns do not have waste management systems and their untreated wastes are drained into wetlands (Masese, 1997; Njuguna, 1990; Gichuki *et al*. 1999; Ndaruga, 1998; Ndiritu, 2001; Kiithia & Musingi, 1995).

The discussion above explores the meanings associated with the economic aspects of wetlands in Kenya. It suggests that wetlands support various economic activities either directly or indirectly. The economic activities are either for commercial or non-commercial gains. However, the discussion also indicates that the pursuit of economic gain has led to wetland degradation of varying magnitude. The role of education for sustainability would be to recognize the economic aspects of wetlands and to explore ways of meeting these needs without compromising the quantity and quality of wetland resources (section 4.3, 4.7).

2.3.3 Social aspects of wetlands

The social aspect of the environment considers people as being part of the biophysical world and capable of developing diverse interpretive meanings of their environment through interaction with each other and the environment (Di Chiro, 1987:25). Traditionally, African societies had an intimate attachment to the environment and wetlands and identify themselves with natural resources in terms of having a language, culture, mythology, art and religious beliefs (Gatheru,

1996). This intimacy binds the community together with respect to social systems, structures and cultural practices that shape the people's interaction with each other and with the biophysical environment. This intimacy also determines people's perceptions of resources and influences resultant activities. People in Kenya have various cultural practices and artifacts associated with wetlands (Kareri, 1992). However, competition for resources is common influencing access and use of resources, and sometimes leading to conflicts and wars (SADC REEP, 2002:5). Some new technologies have led to the disappearance of culture, artifacts and social capital such as traditional farming and fishing methods and implements. Socio-cultural attributes of wetlands include culture, heritage, transhumance, indigenous knowledge, spiritual rites and beliefs, and settlements of people (Figure 2.3). Globally, conflict of interest has resulted in nations stockpiling nuclear and other weapons with potential of massive destruction and huge military budgets that substitute investment in social welfare (Ekins, 1993). Neglect of social issues leads to increased stress, abandoned children, divorces and degradation of social values (RU/SADC, 2000).

Water is needed for various purposes that include domestic, industrial, agricultural, livestock, wildlife, hydropower generation, navigation, recreation, and waste disposal. Depending on water availability and accessibility, a range of value and meanings tend to develop in communities for wetlands. Interaction between people and wetlands influences the life, culture and history of communities living in a wetland catchment area. With time, different cultural meanings and artifacts come to evolve within the community as wetland products are exploited. The natural characteristics of wetlands also change through the building of dams, reservoirs, irrigation canals and water barriers. People also change the biological composition of wetlands by introducing new plant and animal species to satisfy their needs (Kareri, 1992). Technologies to harness water also change. For instance those areas that have no reliable tap water or are a distance away from wetlands have a culture whereby people harvest rain water from rooftops of homes, schools and other buildings (Gichuki & Ndiritu, 1999:9; Abira, 1997:49). In some rural areas the community have dug small open pools to trap water during the rainy season that can last them until the next season's rains. In urban areas, water is supplied from far away through pipes. Its continued availability could result in people not placing a high value on rivers passing through urban areas, which are thus highly polluted (Ndaruga, 1999; Ndiritu, 2001).

Various communities have different values attached to fish from wetlands, for example pastoralist Maasai do not value fish as food and so do not harvest them from wetlands in their locality. Other communities usually harvest it. Turkana people are pastoralists and fishing is only for those who have lost livestock through drought and cattle raiding (Ndiritu & Gichuki, 1999:26). According to Njuguna, P. (1996:14), 13 out of 39 wetlands in Uasin Gichu district are used as sources of fish. Fishing is done for domestic consumption although it is not a popular activity partly due to traditional beliefs of the locals who associate fish with reptiles.

Fishing regions are also characterized by unique material artifacts associated with the fishing methods applied. For instance, fishing methods in Tana delta are traditional and they include spearing, trap and scoop basket, hook and the net (RoK, 1991:15). In L. Turkana most fishermen use traditional and simple methods of fishing, which include peddling boats, rafts and hooks (Ndiritu & Gichuki, 1999:26). In coastal Kenya, fishermen and women use dugout canoes, small dhows, nets and baskets for collecting fish, molluscs, crustaceans and corals, which fetch high prices at the market (Okeyo, 1992:50). These methods and artifacts are different and characteristic to the culture of each context. This supports the notion that reality is socially constructed.

A resource may have such a high regard within the community to the extent of being incorporated into their cultural heritage. For instance Kwenia is a Maasai name meaning beautiful place endowed with water and green pasture throughout the year. Lake Kwenia in Kajiado district is a cultural heritage site, which traditionally served as a salt lick for wildlife and livestock.

Some plants also have special meaning to the community. For instance, a palm (Sosiot – Nandi) is obtained from wetlands and is used in wedding ceremonies by Nandi people (Odongo, 1996:14). The fig tree (*Ficus natalensis*) that grows near wetlands is considered sacred by the Maasai community. They are regarded as holy and are never cut. This has facilitated their conservation.

Some wetlands, such as Otiwa bay in Lake Victoria, have since time immemorial been viewed as fish breeding and spawning grounds. In Otiwa bay the local community had common interest and viewed it as a common property and nobody was allowed to fish in it. Fishing in the open lake was also controlled and use of undersized nets was discouraged. Some areas were closed and were respected as areas where fishing cannot be done. As a result of these measures, fish numbers and diversity was high including those fish that are now extinct. Some rare fish like *Haprochromines*, endemic *tilapines*, *Lameo*, *Barbus*, *Mormyrus*, are still found in Otiwa bay (Ong'or, *et al*. 2001).

Community members have some indigenous knowledge of the dynamics of wetlands. For instance scientists visited Tana Delta wetland and saw some dead cattle along the shores of Lake Kenyatta. The villagers said that it was a seasonal phenomenon that occurs towards the end of the dry season when the algae was in bloom (RoK, 1991:20). This demonstrates the richness of indigenous knowledge in interpreting natural phenomena.

Availability of freshwater and nutritious forage for livestock influences the seasonal movement of nomadic and semi-nomadic communities (transhumance) and wild animals from one place to another in search for resources such as clean water, grazing areas, fish, soil and firewood from wetlands. Their movement is a result of changes in wetland dynamics. This influences the distribution of activities of people, livestock and wild animals especially during the dry season (Ndiritu & Gichuki, 1999:27). This is especially prevalent in Kajiado district where about 60% of the people rear livestock (cattle, sheep, goats and donkeys) in wetlands.

The presence of wetlands has also been implicated in influencing community's way of life. Wetlands play a major role in sub-dividing Kenyan communities into pastoralists and farming communities. Pastoralists are confined to the relatively dry areas and are ever moving with their cattle. Farming communities are found where water is easily accessible usually from wetlands. A study by Gichuki *et al*. (1999:104) and Thenya (2001) noted a change from a pastoralist way of life into settled farming of food crops and horticultural crops in Kajiado and Laikipia district in Kenya respectively. The same applies for fish farming where 35 landowners were rearing fish within a predominantly pastoralist area (Gichuki *et al*. 1999:104).

Population increase also poses a major social problem in wetlands. Kenyan population has increased over the years from 7.8 million in 1963 to 27 million in 2000 (RoK, 2001a). This increases the demand for resources from the environment and wetlands. The lack of adequate resources leads to a decline in overall living standards forcing many rural and urban dwellers to live in poverty and unhealthy surroundings. The demands of the resultant large number of people outstrip the capacity for provision of water, sanitation, waste removal, energy and health facilities (MENR, 1994). High use of natural resources results in soil erosion, conversion of water catchment forests into agricultural land and migration into fragile arid and semi arid land where demand for irrigation water increases. Others migrate to urban areas leading to expansion of urban areas and increased demand for water.

In Kenya, the proportion of total urban population rose from 15% in 1979 to 19% in 1989 and was projected to increase to 25% in 2000 (MENR, 1994:118). The increase is caused by rural-urban migration, natural population growth, influx of refugees, boundary extensions for a number of municipalities, and creation of new towns (ibid). Urbanization is accompanied by problems of inadequate housing, infrastructure and services. It leads to development of slum and squatter settlements with inadequate water, sanitation, waste disposal, health facilities and roads (ibid). This has an impact on nearby wetland resources, which are severely degraded through pollution and overexploitation (Ndiritu, 2001, Ndaruga, 1998).

In Kenya fishing has been noted to attract immigrant fishing communities (Gichuki *et al*. 1999:29; Mavuti, 1992: 28) and settlements. By 1991, the Tana River delta had 2 fishing villages on Lake Shakabobo shores. Lake Kenyatta has attracted settlements along the northern shore. Along Lake Dida Warebe a village and school are located right next to the lake on the northern shore. Migration to wetlands by other communities encourages cultural diversity and integration. The wetlands in this case can be viewed as influencing some aspects of culture held by members of the community.

Sometimes lack of equity in access to wetland resources has resulted into water related conflicts. A number of people have been killed in water related wars among the pastoralist and farming

communities along coastal Kenya (Nation Team, 2001). In other areas there has been heated debates brought about by upstream farmers disenfranchising lower stream farmers through draining all the water into their farms, not caring about other downstream users.

The discussion above presents social aspects of wetlands as mainly concerned with meaning making about relationships with one another and with wetlands. This results in integration of language, cultural practices, technologies, choice of place of living and technological changes to exploit wetlands. The role of environmental education for sustainability could be to address the meanings constructed by people about wetlands and the related cultural heritage. The motive could be to promote development of social relationships that encourage harmony with one another and with the environment.

2.3.4 Political aspects of wetlands

Political attributes include wetland ownership, traditional governance and access and use decisions (Figure 2.3). According to Leftwich (1983:11), "politics consist of all the activities of cooperation and conflict, within and between societies. It is involved with how resources are used, produced, organized, distributed and redistributed and by whom and with what consequences in the production and reproduction of human being's social and biological life". In Kenya, the availability, abundance, value, accessibility and quality of wetland resources have set forth political mechanisms to manage them. Some of the management mechanisms are cultural and emanate from decades of interaction with the resource. There is an interplay of governments, traditional authorities and other powerful individuals and groups who develop local, national and international policies and decisions which govern people's interactions with the biophysical world (SADC REEP, 2002:5). Conflicts of interest in the political realm, translate into a crisis in democracy, power relations, denial of basic human rights (such as access), discrimination, repression, exploitation of people for economic gain, oppression and displacement of people.

Political aspects related to the environment are also evident in Kenya. For instance in the Tana Delta, people were displaced to create room for development projects such as irrigation farming which was not related to their cultural farming methods (RoK, 1991). In the same area, water

wars have been witnessed whereby pastoralist and farming communities fight over access and use of water points (Nation Team, 2001).

Ownership determines the degree of access allowed and level of utilization of a resource. Kenya's land ownership is not uniform throughout the country. Communities have a complex of indigenous systems of land holdings by various ethnic groups. Each ethnic group has rules under which they hold and control land. For instance, some land is controlled by clan, or held in trust by elders of an ethnic group. Traditional land tenure still exists whereby clans, families and individuals are responsible for protecting natural resources including wetlands and water sources (Gichuki *et al.* 1999; RoK, 1991). Within the Maasai community, the elders are charged with decision making powers on management of natural resources such as care and use of grazing land, water and settlement areas through dialogue. This has led to the emergence of norms, rules and regulations which control the use of common resources in the community such as wetlands and grazing land (Gichuki & Ndiritu, 1999:10). Wetland such as Oloyiankalani spring in Kajiado district was protected through customary law as an important sacred site for Maasai community ceremonies and rites (Gichuki *et al.* 1999). In Tana River the land is either state owned (by government) or trust land (managed by district council) (IUCN/TDWSC, 1994:5; RoK, 1991). Communally owned wetlands are threatened by overexploitation and degradation due to loose customary laws governing use of resources. There is also a don't care attitude among local and emigrant people (RoK, 1991; Ndiritu & Gichuki, 1999:28). This suggests the need for environmental education for the members of the community on how to manage communally owned resources.

Privately owned wetlands are either owned by individuals or private companies and are more protected because they are situated on private land. These wetlands if owned by landowners with large pieces of land may therefore have high biodiversity (Njuguna, P. 1996, 1). However, farming around the wetland and use of chemicals such as pesticides and herbicides may threaten these wetlands. (Odongo, 1996:18).

Wetlands owned by the government include forests, game reserves and national parks. These are reserved for wildlife. Others include wetlands that fall under the care of the municipality. There is

limited access and utilisation by local community. Wetlands are used for special purposes such as supplying domestic water (for instance those owned by urban municipality) or as wildlife reserves. The dams are well protected and have higher biodiversity and grazing close to the dam is usually prohibited (Odongo, 1996:18).

In Kenya there has been concern over wetlands management, which is criticized for being shared among many institutions leading to lack of coordination (Ramsar, 2002). According to Gichuki (1997:14), there are 13 laws and policies relating to wetlands in Kenya. These include acts on sectors such as agriculture, water, wildlife conservation and management, fisheries, forests, malaria prevention, chief's authority, marine zones, irrigation and those dealing with land resources. This creates competition and conflicts since some institutions advocate conservation and others exploitation. There has been confusion and some landowners consider wetlands their property while others see them as being owned by the government. This makes management of wetlands difficult. In 1999, a new environmental act was put in place (RoK, 1999) and wetland issues were given prominence and their management seems harmonized through the National Environmental Management Authority, the institution mandated to coordinate the implementation of the act.

The discussion above shows that the political aspects may have an impact on wetlands. The weakening of communal management practices makes wetlands free for all and competition may set in depending on the meanings people have concerning various aspects of wetland resources. This competition may bring forth ownership and access to wetlands crises and conflicts. The private wetlands are not safe either since they depend on decisions from the landowner. These findings strongly suggest the need for environmental education to foster change in people's attitudes in order to embrace aspects of concern and responsibility to enhance wetland sustainability.

2.4 Implications for wetlands education

The discussion above portrays environmental and wetland issues as complex and interlinked systems. Meanings about wetlands are contextually specific and diverse. These meanings come

as a result of people interaction and use of wetlands for different purposes. According to Di Chiro (1987:25) “an adequate understanding of environmental problems requires that they be viewed as the products of contesting discourses, activities and interactions among human societies.” Each subject, club activity or special (environmental) day addresses an environmental issue that can often be traced to all the four dimensions. It is therefore important for educators to enhance opportunities for exploration, discussion and reflection to understand the local wetland problem in order to formulate appropriate environmental action.

The biophysical aspect regards the wetlands as a natural world of water, living organisms and landscapes. The biophysical aspects of wetlands as water, soil, minerals, plants, animals and micro-organisms and their interactions which play crucial regulatory and ecological functions are mentioned several times in the curriculum (Appendix 3.1-3.10). These biophysical aspects support jobs and lives of people (Taylor & Paxton, 1994:8). Man’s uncontrolled exploitation of wetland resources interferes with the biophysical environment resulting in problems such as pollution, loss of biodiversity, degradation of life support systems, global climate change and ozone depletion (RU/SADC, 2000). The biophysical aspects discussion suggests the intimacy of man’s reliance on the biophysical environment and the consequences of negligence and overexploitation. The role of education is to help learners explore these biophysical aspects of wetlands (section 2.3.1) to make them understand and think critically about their relationship with the wetlands. The biophysical aspects greatly emphasize aspects of biophysical cycles that are sustained by complex relationships between living organisms and the biophysical environment. The biophysical aspect suggests the need for teachers to facilitate learners to explore and assess how wetland resources are exploited and depleted, to establish whether the ecosystem can regenerate itself with the current state of exploitation and to establish the kind of jobs and livelihoods sustained and likely be lost if exploitation continues. This is important in adding relevance (section 4.7.1) to teaching pupils as well as members of the community.

Economic issues entail valuing, access and utilization of natural and other resources for commercial, non-commercial and employment benefits (SADC REEP, 2002:5). Economic aspects are geared towards improvement of livelihood of the local people and the country as a whole. Section 2.3.2 explains that there are many benefits derived from wetlands in Kenya.

Teachers also reported benefiting directly from wetlands and also view members of the community as benefiting from them (section 7.3-7.6). This concurs with Zerner's (2000:4) view that nature is regarded as an emporium where people get various products and services. Since wetland resources are finite it is necessary that learning activities be directed towards active learning (section 4.7.7) of the people's attraction to economic benefits from wetlands as well as making decisions on sustainable exploitation levels. The role of increased population on the economic aspects of wetlands could be explored practically so as to reflect on future implications. Economic aspects of wetland exploitation have resultant effects such as destructive and uncontrolled resource extraction, environmental destruction, resource depletion, poverty, hunger, conflicts and social oppression (Zerner, 2000:4; Ekins, 1993). These are aspects already visible in Kenyan society (Manguriu, 1999; MENR, 1994) and are therefore areas worth wider exploration through various environmental education processes (sections 4.6, 4.7 and 4.8). Environmental education can play a greater role in exploring the cost-effect relationships between wetland resource management, conservation, cost of pollution control and economic benefits on a long-term basis (UNESCO, 1988:27). This can go a long way in initiating pupils and the community members into being lookouts for any unsustainable activities locally and rejecting or proposing and implementing mitigation measures for any potential negative impacts.

The social aspect of wetlands considers people as being capable of developing diverse meanings of their environment through interaction with each other and the wetlands. The meanings emanate from local people's intimate attachment to the wetlands and natural resources. This social aspect is expressed in terms of having a language, culture, mythology, art and religious beliefs (Gatheru, 1996). This implies that education should recognise these rich non-tangible attributes from wetlands which bind the community together with respect to social systems, structures and cultural practices that shape the people's interaction with each other and with the biophysical environment. This intimacy influences the people's perceptions of resources and the resultant conservation activities. Of particular concern is an exploration of conflict of interest that emanates from the various meanings and which influences access to and use of resources, and sometimes leads to conflicts and wars (SADC REEP, 2002: 5). The aspects can be extended to the national, regional and global context focusing on aspects such as misuse of funds for amassing stockpiles of nuclear and other weapons and the huge military budget diversions instead

of inputs in conservation activities (Ekins, 1993). Education could also explore the symptoms of crisis brought about by neglect of social issues such as increased stress, abandoned children, divorces and degradation of social values (RU/SADC, 2000). This strengthens the need for involving learners and community members in research and environmental education processes focusing on the linkage of these social aspects to wetlands.

The social aspect also recognises the role of technology and its influence on dynamism and disappearance of culture, artefacts and social capital such as traditional farming and fishing methods and implements. There are many wetland related technologies that can be studied from a social, historical, economic and political perspective to shed light on how they have influenced culture, heritage, indigenous knowledge, spiritual rites and beliefs and settlements of people. In Kenya, for instance, people have various cultural practices and artefacts associated with wetlands (Kareri, 1992) that could be explored during teaching and celebration of the World Wetlands Day.

Section 2.3.4 sheds some light on the political aspects related to wetlands. The political aspects in Kenyan wetlands were traced to the interplay of governments, traditional authorities and other powerful individuals and groups in developing policies and decisions that govern people's interactions with the wetlands. This is a rich area worth exploration in wetland education. Along the same aspect are issues of conflict of interest which can lead to a crisis in democracy, power relations, denial of basic human rights, discrimination, repression, exploitation of people for economic gain, oppression and displacement of people (RU/SADC, 2000). These political aspects related to wetlands are evident in Kenya. Examples include displacement of people in the Tana Delta (Figure 2.1) to create room for development projects such as irrigation farming and wildlife sanctuary that were not compatible with the local people's cultural heritage (RoK, 1991). Water wars in the same region between pastoralists and farming communities have caused the death of many people (Nation Team, 2001). It is highly likely that every place in Kenya has its own unique politics related to wetland resources that teachers can explore with pupils. This can be a potential aspect of study in order to put in place sustainable conflict resolution mechanisms. These developments warrant exploration of political issues related to wetlands by teachers in both formal and non-formal contexts.

2.5 Conclusion

The preceding discussion in this chapter has been an exploration of what wetlands are, the types found in Kenya and their distribution. There is also lengthy discussion on their categorization using two categorization systems, the holistic approach by O'Donoghue and Janse Van Rensburg (1995) and the total economic valuation by Barbier *et al*. (1997) and Emerton (1998). This chapter explored the harmony between the two classifications and developed and discussed the holistic structure for wetland categorization in Kenya. The chapter concluded with an overview of what these wetland aspects mean for wetlands education.

This chapter shows that there are many issues to teach about wetlands. There are also many provisions for teaching about wetland resources in the formal curriculum (chapter 3, Appendix 3.1-3.10) and the non-formal context (chapter 9). The four dimensions of the environment (Figure 2.2) are very relevant in Kenyan wetlands (Figure 2.3) and can be instrumental in enhancing learning since the teacher would use living examples. The teacher therefore is not perceived as the only one with the wealth of knowledge but as a participant in knowledge construction together with other members of the society including pupils and members of the community. This calls for teachers to facilitate learning to link with relevant wetland knowledge held by the pupils and the community. The approaches to do this are discussed in section 4.7 and 4.8. However the major emphasis is on increasing relevance and allowing participants to generate their own working knowledge (Gough & Robottom, 1993) about the biophysical aspects of wetlands, identify their identity with wetlands, value and uses of wetlands in their local areas and identify any injustices related to wetland access and use. This is geared towards enabling learners to establish their impacts on the wetland resources, the general environment and the human well being. This approach can be useful in facilitating learners to actively generate solutions and actions to promote sustainable use of wetlands. The discussion on sustainable development and aspects of how this can be achieved are presented in the next chapter.

CHAPTER 3: ENVIRONMENTAL EDUCATION IN KENYA'S PRIMARY SCHOOL CURRICULUM

3.1 Introduction

The Kenyan education system is ideally designed to lay emphasis on practical skills, independent learning and continuous assessment (Waithaka, 1992:iii). At primary school level[1], it is supposed to cater for those for whom this level of education is terminal and for those who continue to secondary school level[2]. The primary school curriculum[3] used in Kenya is set to fulfil six main goals of education (ibid). These goals are fostering national unity, national development which addresses both economic and social development, individual development and self-fulfilment, social equality, respect and development of cultural heritage and international consciousness (ibid: v).

These goals are translated into several objectives (ibid). Some of the objectives with a greater relevance to environmental education at primary school level include enabling the learner to:-

- develop awareness and understanding of the immediate environment and foster positive attitude to other countries and to the international community.
- grow into a strong and healthy person.
- develop a constructive and adaptive attitude to life based on moral and religious values and ones responsibilities to his community and the nation.
- appreciate one's and other people's cultural heritage, develop his aesthetic values and make use of his leisure time.

These objectives seem inadequate in addressing environmental issues confronting Kenya especially wetland problems (section 2.3). Kenya participated in the Stockholm conference of 1972 (RoK, 1972) and the government acknowledged the efforts put in place to enhance

[1] Primary school level of education in Kenya runs from class one to eight after which successful pupil joins secondary school (RoK, 1984).

[2] Secondary school level takes four years after which successful students join other tertiary institutions including the university (RoK, 1984).

[3]Curriculum in this study refers to the syllabus used by teachers in schools. The version used in this study was developed in 1992 and is the one currently in use in schools.

environmental education (section 1.2). Kenyan environmental education literature over the years acknowledges the importance of efforts done internationally in fostering environmental education and emphasises the need for Kenya to adapt these international guidelines to environmental education (KUC, 1980; UNEP, 1987; Koech, 1991; MENR, 1994; IGAD, 1999). Kenyan environmental education conferences have also continually endorsed the importance of the Tbilisi principles and other international guidelines to environmental education (Lindhe *et al*. 1993, KUC, 1980). However when the Kenyan environmentally related objectives mentioned above are analysed in reference to the UNESCO-UNEP Conference on Environmental Education held in Tbilisi in 1977 (UNESCO, 1978), they do not seem to address all aspects of the environmental objectives agreed internationally. The Tbilisi objectives[4] reinforce environmental education that fosters awareness, knowledge, attitudes, skills and participation (ibid). The Kenyan objectives seem to address only awareness, knowledge and attitudes objectives but fail to overtly highlight the development of skills and participation in identification and solving of environmental problems. The skills and participation objectives of the Tbilisi conference could have been captured in the emphasis on developing a constructive and adaptive attitude to life (third objective above). However, this Kenyan objective fails to emphasise the critical thinking entailed in challenging the current *status quo*. This Kenyan objective states that the development of a constructive and adaptive attitude to life should be based on moral and religious values and one's responsibilities to his community and the nation and fails to emphasise autonomous and critical engagement with the *status quo* upon which these values and morals have developed. This appears to endorse the present *status quo* as the upper limit upon which any attitudes and moral development should be informed. This is captured well in the other objective that emphasises appreciation of one's and other people's culture…. (fourth objective above). Culture is in itself a *status quo* which besides being appreciated should be subjected to critique to promote its foundations on principles geared toward promoting sustainable human-human and human-environment relationships (section 4.3). Proposing an upper limit may be a constraint to development of autonomous, critically informed attitudes and actions. This portrays environmental education in Kenya as based on some neoclassical ideals (section 4.6.1) of

[4] The Tbilisi principles were reviewed in 1992 to make them more focused on environmental action, emphasise broader understanding on environmental issues and to encourage local community action in resolving environmental issues and risks (RU, 2002). However, the curriculum used in Kenya (RoK, 1992) came into force before this review and has not changed. I assume that the curriculum was informed by the Tbilisi principles proposed in 1977.

determinism and adoption instead of engagement of learners with current issues to enable them to think critically to resolve the ever-emerging environmental crisis. Chapter 4-10 will shed more light on these issues.

The formal primary school curriculum in Kenya comprises of sixteen[5] subjects (section 6.4) but only twelve[6] are examined at the final year (RoK, 1992). This study engaged in a document analysis of the primary school syllabus used by the teachers to explore the provisions for integrating environmental (and wetlands) education (Appendix 3.1 – 3.10). This chapter is an exploration of the appropriateness of using various subjects to teach environmental education. This chapter forms the basis for reflection on the teacher responses in Chapter 8 on integration of wetland issues in the formal curriculum. Although the Kenyan primary school curriculum comprises of sixteen subjects, this chapter focuses on those subjects that teachers mentioned in the questionnaire data (section 8.6). Using a questionnaire, this study asked teachers to identify the subjects, topics and practical activities that they do in schools that also integrate wetland issues (question 25 in Appendix 5.5). The subjects[7] identified by the teachers and which this chapter will focus on are Art and Craft, GHC, Science, Agriculture, English, CRE, Home Science, Mathematics, Kiswahili and Music. These are also some of the popular subjects teachers prefer teaching in their schools (section 6.4).

3.2 Art and Craft

Art encourages people to express their feelings about the environment in which they live and work. Art incorporates media such as music, writing, the graphic arts and sculptures (Martin,

---

[5] These subjects are Kiswahili, Art and Craft, GHC, English, Science, Mathematics, Agriculture, Business Education, Christian Religious Education (CRE), Islamic Religious Education (IRE), Music, Home Science, Mother Tongue, Physical Education, HIV/AIDS and Pastoral Programme of Instruction (RoK, 1992 a & b).

[6] The examinable subjects are Kiswahili, Art and Craft, GHC, English, Science, Mathematics, Agriculture, Business Education, Christian Religious Education (CRE), Islamic Religious Education (IRE), Music and Home Science (RoK, 1992 a & b).

[7] In section 6.4, one teacher reported teaching Islamic Religious Education (IRE). In Kenya, this subject is second to Christian Religious Education (CRE) in popularity as a religious subject taken by pupils and examined. In this study,

1993:24, Hardy, 1988). Although scientific, technological and geographical investigations have the potential to generate sufficient knowledge about the environment, they are inadequate due to their narrow approach especially in addressing aspects of beauty and ugliness of the environment (Wenham, 1994:75). Wenham argues that "if we care about the environment and wish to improve it, an essential part of what we have to learn about it concerns its visual quality, both what is positive and negative and what it might become." For instance, wetlands are places of beauty (section 2.3) that may not be captured well through various kinds of texts in books and published papers. Use of the visual dimension through art adds a new aspect at looking at people's feelings about wetlands.

Art itself is a product emanating from external stimuli (such as wetlands and their resources) invoking intangible feelings in a person that trigger a desire for conversion into some expressive medium. This process involves a combination of observation, identification, information gathering and reflection (Martin, 1993:24) as well as speaking out through various forms of media. Art involves some deeper personal environmental awareness and critical observation that enhances individual consolidation and enrichment of feelings about situations and issues (ibid). This personalised relationship with the environment may act as a motivation to action geared towards improving the environment. The expressions presented in art are personal and context specific and may integrate empathetic feelings with the people affected by environmental issues. In the case of wetlands, this involves deeper thought about wetlands to an extent that the artist conceptualises a mental picture of the processes in a wetland cutting across the *status quo* of wetlands in terms of past and present state as well as the projected future. All this is consolidated into some simplified, easily conceivable visual or oral representation that people can see, hear, identify and comment on. This can help in facilitating development of insightful judgements of the situations such as wetland conflicts. Use of drama and play may also help explore and experience the feelings of people about a particular situation as well as to explore the complex set of values and vested interests that motivate views and behaviour of people involved in the issues (ibid).

IRE is not given further consideration since no teacher mentioned teaching it (section 8.6) and the teacher who proposed it did not support it as a preference subject (Figure 6.5b).

According to Wenham (1994:73) art is a synthesis between the individualised and the social nature approaches. The individual approach lays emphasis on creativity, originality and expression while the social nature views art as an activity rooted in tradition but centred on investigation, exploration and communication. Wenham contends that all learning involves exploration and dialogue with the world around us and art is an activity founded on visual exploration, investigation and understanding. He further argues that

> …when designing and making, the artist or craftperson carries on what is in effect an investigative dialogue with materials and the developing work piece, whether it be painting, drawing, sculpture, pottery, textiles, woodwork or whatever. In the course of this dialogue, new opportunities arise and are exploited: the process is one of constant dialogue experiment and criticism, modification acceptance and rejection". … the object of art, the actual physical object which the artist or craftperson produces, is distinct from the work of art, which is seen as the response of the spectator to the object; the meaning and the emotion which persons create for themselves as a result of seeing and interacting with the object. The significance of this idea in the educational context is that it emphasises the importance of what is learned, felt and experienced by the artist through the process of making the object, and by the spectator through the process of interacting with it visually. The point is made that art gives us the opportunity to evoke intuitive, emotional responses as well as rational ones through visual rather than verbal language (Wenham, 1994:75).

This means that art enables communication with what cannot be captured easily by exploratory research data and reports. It also underscores that art involves a great deal of active learning (section 4.7.7) where the artist is involved in research to understand as well as trying many alternatives of communicating what s/he learns about wetlands. Art is therefore an act of communicating with self (section 5.4.2) and with real audiences. Wenham (1994:76) also underscores the role played by symbols and images saying that it is crucial that they be familiar to the local community so that they can be read immediately as well as be recognised as being of importance. This observation emphasises the role of shared meanings within the community which are a product of symbolic interaction processes with objects and symbols (wetlands) as well as dialogue with other people (section 5.4). This discussion presents art as a strong tool that teachers can use in teaching about the local wetlands.

The Kenyan curriculum recognizes Art and craft as an integral part of everyday life in the physical, social and cultural environment. It is taught from class 1-8 (Appendix 3.1). The teacher is advised to organize visits to places of interest and to invite local craftsmen for demonstration

purposes. An environmental objective for learning art and craft is to enable learners to appreciate their own and other people's artistic and cultural heritage and use that as a source of inspiration for creativity. The pupils should also be able to use locally available materials for various art and craft activities (RoK, 1992:183). These provisions in the curriculum suggest that teachers are not restricted and can explore the uses of wetlands in promoting learning of art. The opportunities for using art and craft to learn more about the environment is given in Appendix 3.1 and there seems to be no major emphasis on using wetlands in teaching. There is no direct call for the teacher to use wetlands to teach art and it requires greater teacher innovation to promote use of wetlands. However, some of the activities prescribed such as basketry and pottery are culturally known to use materials from wetlands (section 2.3.3). Children can also use wetland plants to make paints. An innovative teacher has many opportunities of using wetlands even during drawing.

The syllabus advises teachers to incorporate visits to places of interest as a teaching methodology. Some of the resources recommended to teachers include the environment, social cultural items, local craftspeople, guest speakers, visual aids such as models and pictures and sample of real works of art and craft. However, these approaches of learning art and craft fail to recognise that critical thinking and creativity is centred on investigation, exploration, communication and reflection (Martin, 1993:24). It seems not to champion for deeper personal environmental awareness and critical observation that may enhance taking action that is geared towards improvement of the environment. The curriculum presents art and craft simply as a discipline to promote environmental appreciation and not as a tool to develop critical skills to query and communicate environmental malpractices. Teachers who are not familiar with environmental education processes such as the use of active learning (section 4.7.7) and the socially critical orientation (section 4.6.3, 4.8.3, Table 4.2) may not use this valuable opportunity to develop critical skills in learners. The use of this subject to promote wetlands conservation is revisited in section 8.6.1.

3.3 Geography, History and Civics (GHC)

GHC is a combined course comprising of geography, history and civics. The role of each subject in environmental education is discussed below.

3.3.1 Geography

Geography is commonly conceived as a discipline concerned with environmental issues. Geography addresses environmental relationships of the past and present times both directly and indirectly with respect to interaction between man and the natural environment. According to Bailey (1994:65),

> all environments are created and sustained by processes, some natural and some generated by human actions. Natural processes produce climates and vegetation climaxes. Processes generated by human actions create for example, global markets for producers and consumers of oil, coffee, bananas, sugar, aluminium and steel among a myriad of others. They also establish different kinds of economic, social and political systems.

Interaction between environmental conditions and human activities impacts on landform, weather, climate, biodiversity, water and soils. The human induced environment is characterised by various types of farming practices, settlements, industries, mines, quarries, power stations, transport, and communication systems and modified natural areas for recreation. These aspects play a role in influencing the quantity and quality of wetlands and thus form essential raw materials for environmental education.

Geography is credited for its emphasis on the promotion of development of knowledge and skills for systematic observation, recording, interpretation and representation of geographical information (ibid: 66). This includes local surveys (even of wetlands) that encourage learners to be inquisitive about relationships between local environment and human activities. It also encourages discussion of local environmental problems to come up with diverse ideas as well as to evaluate interventions needed. This also integrates issues of how to influence local decision making to act ethically to conserve the environment. This implies that geography as a discipline integrates exploration of various political, economic, cultural and social forces influencing the local environment and their relationships to global trends (Martin, 1993:25, Bailey, 1994:67).

3.3.2 History

According to Kerr (1994:60), the relationship between history and environmental education is not readily accepted nor is its potential fully explored by history teachers. This is attributed to the relative newness of the emphasis on worldwide environmental concerns and also the perception that environment is more related to other areas of the curriculum such as geography and science. Kerr contends that if environmental education is to be part of the concerns of school history, then history teachers must be persuaded of its relevance to their teaching (ibid). They need especially to be convinced of the overlap in aims and purposes between history and environmental education. Kerr continues to argue that a useful starting point is to raise teachers' awareness of two developments in environmental education namely

- the growing interest in investigating environments in the past
- the important role played by such historical perspectives in informing the debates about the modern environment (Kerr, 1994:60)

Some of the issues that have generated global concerns over the years include population, energy resource development and demands, migration and urbanisation (WCED, 1987). These global concerns have also affected wetlands in Kenya (section 2.3). Environmental history plays a vital role in educating people about how the decisions of past societies have shaped not only the world where we live but also our view of that world (Kerr, 1994:61). Kerr argues that the role of history in environmental education is to "help pupils to develop the knowledge, understanding, and skills which will enable them to participate in present and future environmental challenges" (ibid). This view is supported by Barrington (1984:25) quoting Agar (1973) that there can be no real understanding of the environment without reference to activities of man in a historical context. One has to account for human migration, development of farming systems, industries and settlements to explain present situations such as migration, influence of disease, famine and drought on human existence. Martin (1993:25) holds a similar view and argues that a historical perspective explores forces that have had impacts over time on human beings and provides insights to root causes of environmental problems as well as giving a better chance of defining effective solutions to current problems. History creates understanding to stimulate need to get involved in redefining the future.

In the context of this research the views by Kerr, Barrington, Agar and Martin would mean that the teachers become more sensitive to the local wetland issues in terms of giving their teaching a historical dimension in order to illuminate the issues that contributed to the current *status quo* as well as to project future trends. This would help to clarify the role of man in the process of wetland destruction as well as locating, reflecting on and supporting local interventions to counter those destructive activities already in place.

3.3.3 Civics

Civics as an aspect of study is geared towards preparing the learners for citizenship by making them to consider and make informed judgements about their nature of civic life, politics and government (Branson, 2001:5). For instance, it makes them to explore on issues such as why politics and government are necessary, the process of government, the nature and purposes of constitutions and alternative ways of organising constitutional governments. These considerations help in promoting understanding of the historical, philosophical and economic foundations of the country's political system and the values and principles basic to the governing process. This includes aspects such as individual rights and responsibilities, concern for public good, the rule of law, justice, equality, diversity, truth, patriotism and the separation of powers (ibid).

Study of civics enhances knowledge of ideals, values and principles set forth in the nation's core documents such as the constitution of their respective countries and the other rules that apply within their locality. These documents act as criteria that citizens can use to judge the means and ends of the government as well as for other groups constituting the civil society (Branson, 2001:5). Wetland related issues in Kenya are dispersed in various acts of the constitution governing sectors such as agriculture, water, wildlife conservation and management, fisheries, marine zones irrigation and forests (Gichuki, 1997). The study of these documents enables students to understand the workings of their political systems with regard to management of wetland and other natural resources. This study could also be extended to exploration of relationships of the politics and government of their own country to world affairs.

Civic education also promotes an understanding of how and why one's own security, quality of life and economic position is connected to that of neighbouring countries. This is particularly relevant when referring to wetland resources that traverse countries and regions such as the Nile basin that runs across countries such as Kenya, Uganda, Rwanda Sudan and Egypt. Civic instruction is instrumental in enlightening the learners about their rights and responsibilities as citizens in the society particularly in enhancing conservation of natural resources. It helps learners to understand personal responsibilities such as taking care of one's self, supporting one's family including education of the children, accepting the consequences of one's actions, adhering to moral principles, considering the rights and interests of others as well as behaving in a civil manner (Branson, 2001:5). It also reiterates the need to respect civic responsibilities such as obeying the law, being informed and attentive to public issues, assuming leadership when appropriate, paying taxes, voting, monitoring the adherence of political leaders and governmental agencies to constitutional principles and taking appropriate action if that adherence is lacking and also performing public service (ibid).

Civics instruction reiterates the need for learners to be actively involved in the political process that goes beyond the electoral politics (Branson, 2001:7). Citizens should understand that that through their involvement in political life and in civil society, they can help to improve the quality of life in their neighbourhoods, communities and the nation. The subject could therefore be very ideal in enhancing exploration and addressing the political aspects of wetlands as discussed in section 2.3.4 and 2.4.

The Kenyan schools curriculum also recognises the role of the local community as a partner with the schools in enhancing learning (RoK, 1992b). Learning of civics at community level should integrate recognition of existence of governance structures as well as the relationships among the local people and the opportunities available to improve local livelihoods. The learners could explore the various governance structures that exist locally which enhance wetlands conservation including both indigenous and modern systems. This could make learners aware of and exploit available opportunities to serve their schools and communities in improving their relationships with one another and with the local environment. Learning about the local community

organisation would enlighten the learners on the responsibilities of the individual members within the larger social and political context.

3.3.4 GHC in the Kenyan curriculum

The two subjects above are taught as one subject abbreviated as GHC from class 1 to 8 (RoK, 1992). Some environmental aims of the subject include to make the pupil:-

- understand him/herself as a social being and his relationship with his family, local, national and the international community.
- understand how the environment has moulded man's development and how in turn man has moulded the environment for his benefit (RoK, 1992b:55).

These aims concur with those held by Kerr, Barrington, Agar, Martin and Bailey - that history traces developments in the environment including the role of man in order to understand the present and project future challenges. Some specific Kenyan objectives (RoK, 1992b:55-56) that have a bearing on the environment include:-

- Identify problems in his environment.
- Identify the potential use of local resources.
- Acquire and use skills for the study of environment such as map reading, and interpretation.
- Acquire the correct attitudes and values for the conservation and improvement of the environment.
- Understand the relationship of environmental factors for individual, national and international needs.
- Understand and appreciate the importance of local, national and international cooperation in the use of the environment.
- Identify the position and size of the area of study.
- Relate migration of people to geographical and environmental influences
- Understand the distribution and values of natural resources.
- Demonstrate willingness to share resources fairly with others.
- Respect our own culture and other people's cultures.
- Identify and preserve valuable cultural artefacts and other aspects of culture.
- Understand how foreign cultures have influenced African culture.
- Identify and appreciate the socio-economic implications of a rapid population growth.
- Develop understanding on the relationship between population and quality of life.

The objectives portray GHC as a subject that is rich in environmental issues. However, the objectives are deficient since even though they address the acquisition of awareness, knowledge, skills and attitudes (values), they fail to emphasise the aspect of making the learner critical. The

objectives mention ‘identifying, acquiring and understanding’ several times but do not mention the development of critical skills to make one autonomous. After understanding, what follows next? The objectives by Tbilisi conference (UNESCO, 1978) addressed the aspect of participation (section 3.1) and this calls for objectives that are critical and emancipatory of the *status quo* (Grundy, 1987). This aspect is not evident in the Kenyan GHC curriculum objectives. The objectives appear to be geared towards ‘grooming’ a pupil into a good citizen who can interact with the environment (Grundy, 1987:13) but not to emancipate and to empower him/her to face challenges of life through critical engagement.

Content distribution in various classes from class 1-8 is given in Appendix 3.2. GHC is rich in opportunities for learning about wetlands. Up to class 5 pupils learn about the local environment and resources, some of which include wetlands. Class 6, 7 and 8 also integrate various aspects of wetlands issues but some may refer to those located far away from the school.

However GHC teachers are expected to be more innovative because, unlike the Agriculture syllabus (Appendix 3.4, section 3.5) that directly tells teachers to use the outdoors, the GHC subject gives guidelines on what is to be taught but does not indicate how. The wetland issues also do not come out as distinctly as in the Agriculture syllabus. The teacher may therefore fail to use an appropriate teaching approach due to its not being emphasized in the curriculum layout. Use of this subject to champion for wetlands conservation is discussed further in section 8.6.2.

3.4 Science

Kenyan teachers consider Science to be a key subject in environmental education. A study by Karembu (2002:142) revealed that Kenyan primary school teachers ranked Science as the subject that can most comfortably handle environmental education.

According to Martin (1993:23) the role of science in environmental education can be traced to the variety of life, form and functions of living things, the natural cycles such as carbon and water cycles and food chains and webs. Other important areas of study are the chemical structure of the biosphere and human interferences such as the impact of pesticides, fertilizers and industrial and

agricultural wastes. All these aspects are relevant to wetlands (section 2.3). Environmental education tries to promote understanding of the relationships and impacts of the biogeochemical systems to the lives of human beings and vice versa. The human interference is accused of such adverse effects as ozone depletion, the greenhouse effect, acid rain, various forms of pollution, ill health, poverty and extinction of species. Other areas of relevance are energy and its sources together with its efficient use. The environmental aspect provides relevance and contemporary importance to essential aspects of the science syllabus such as health issues, air, food and water availability as well as global biodiversity and its associated issues of identity, development, consumerism, degradation and poverty (Tilbury, 1995; SADC REEP, 2002).

In Kenya Science has many topics relevant to the environment and is taught from class 1-8 (Appendix 3.3). Teachers are encouraged to deal with the topics in their own constructive way as might be dictated by the environmental conditions and the children's interests (RoK, 1992a: 47). This suggests that the teacher and the pupils are given the autonomy to decide on what to learn in wetlands as well as what to do. Teachers are reminded that science is doing and not being told and learners should be actively involved in the learning process and should use a variety of methods such as nature walk, group activity, project work and demonstration among others. Pupils and teachers should collect or construct most of the resource materials required. These directives endorse teacher and pupils' visits to wetlands for learning as well as active involvement in wetland projects.

The aim of science teaching in Kenya is to acquire a basic scientific knowledge, acquire manual and thinking skills useful in solving practical problems and also to enable children to acquire attitudes about themselves and their relationship with the environment (RoK, 1992a:47). For wetlands this would mean involving pupils in generating knowledge and skills of wetland management. The distribution of topics (Appendix 3.3) shows a skew whereby topics that directly discuss water and wetlands occur in lower classes 1-3 where issues such as sources and uses of water are integrated. The topic on living things occurs in all the classes but there's no major requirement to visit wetlands. The topic on environment at the higher classes 7 and 8 urges teachers to teach about pollution in soil, water and air and also teach about conservation of soil, water, air, plants and animals. This topic presents a major opportunity to learn about wetlands. In

class 5 the topic on living things includes the study of fish and amphibians and this can entail a visit to a wetland. Use of science to address wetland issues is revisited in section 8.6.3.

3.5 Agriculture

The purpose of teaching agriculture in Kenyan schools is to modernise agricultural practices. Agricultural content is closely related to other subjects taught in school such as science, mathematics and geography, although agriculture lays more emphasis on appreciating modern technology (Eisemon:1989:14). Modern agriculture in Kenya as a discipline in learning institutions was transplanted with western schooling by the British colonial government with an aim of increasing productive capacities of rural communities (ibid:25). Agriculture integrates a variety of activities including the use of agricultural chemicals, inorganic fertilizers, new crop varieties and other production technologies that have significant impacts on the environment and wetlands (section 2.3).

Kenyan agricultural content is criticised for a lack of linkage to indigenous scientific knowledge and practices. According to Eisemon (1989:14)

> indigenous crops, livestock and poultry breeds, implements used for production and patterns of land use are acknowledged as starting points for agricultural modernisation. But the cognitive and social premises of indigenous production systems are almost totally ignored.

Eisemon argues that because schooling and western agriculture were presented as products of superior scientific culture, a positivist ideology of modernisation that made tradition antithetical to modernity was transplanted as well (ibid:10). This has promoted the diminishing of beliefs, practices and customs held by communities for a long time with regard to agriculture. The same has happened to wetlands whereby introduction of better farming and fishing methods have led to disappearance of past cultural practices and artefacts (section 2.3.3). The new technological improvements in fishing and farming methods are faster and highly destructive to wetland resources through over-harvesting, non-discriminative fishing and faster drainage of wetlands.

Agriculture discipline in Kenya gives priority to the school gardens which are supposed to have demonstration plots set aside for experiments relating to use of fertilizers and pesticides as well as effects of various farm implements. Pupils are expected to grow various types of crops in those plots including those that are not native to the local area. The plots are supposed to be sites of pupils' projects used for real food production (Eisemon, 1989:13). Teachers can utilise the process of plot preparation and plant growth as an opportunity to teach environmental education in terms of food security, the farming practice and implements and their impacts on the environment. Teachers are discouraged from using the school garden for punishments as this may affect the children's perceptions about agriculture. The garden should be seen as a place of learning, a laboratory to carry out experiments and a resource for ideas (RoK, 1992b:159). The garden should have 3 major parts including demonstration plots, museum of crops from various places and pupils' plots for projects.

In Kenyan primary schools, agriculture is offered from class 4 to 8 and is built upon science concepts learnt in lower primary school (RoK, 1992b). The course is meant to give pupils a foundation for real life agriculture. Some guidelines are given to teachers such as having good knowledge of the local environmental changes; relating school activities to those being carried out by the community such as weeding, and prioritising projects so that those in need of more time start early. The need to coordinate with other subjects so that related topics may be taught at the same time is stressed. Every school is supposed to have a 4K[8] club and the teacher should coordinate with the local agricultural officer in running the club. The 4K club members are expected to have projects at school and at home (RoK, 1992b: 160).

Resources for agriculture include research stations, farmers in the local area, farmer training centres, companies which deal with agricultural materials, agricultural shows, agricultural field days, cooperative societies and marketing boards, Kenya Institute of Education, journals (regular supply), teacher advisory centres and agricultural extension workers. The school is advised to

[8] 4K club is abbreviated from Kiswahili. Its full names are *Kuungana Kufanya Kusaidia Kenya* (Coming together and working to help Kenya). These clubs are expected to be in all primary schools and are to be coordinated by the local agricultural office. The clubs involve pupils in agricultural projects of growing crops and selling them. The money generated is sometimes used to transport pupils to attend annual national, provincial and district agricultural shows. Sometimes the clubs are also involved in environmental projects such as planting trees, environmental cleanups etc.

cultivate good relationship with the community and to participate in community projects (ibid: 161). The community around the school are expected to use the school ground as a good example. This demonstrates the wide consultancy expected from the Agriculture teachers in schools. It also demonstrates collective responsibility in farming where all people and agricultural institutions do similar things and consult one another.

Water conservation is recognized as a major objective in agriculture. The specific objectives in water conservation include the learner being able to:-

- describe and practice the methods of conserving water
- describe and practice various methods of irrigation
- construct usable water storage containers

Other wetland related topics include farm chemicals whose objective is to maintain high standards of hygiene in the farm through use of chemicals and proper drainage. Soil conservation topic has a wetland related objective to describe and to practice soil conservation methods. The topic on fish has objectives to construct a fishpond, name types of fish in a pond and to rear fish (RoK, 1992b).

The occurrence of environmental and wetland related topics within the classes is shown in Appendix 3.4. Wetland related issues have been given prominence especially in class 4, 5 and 7. Integration of practical activities and emphasis on project work for pupils makes agriculture very well suited to addressing local wetland issues. There is also greater emphasis on looking at what the community around the school do and to participate in their projects such as water conservation. This underscores the recognition by the government of the close relationship that community have with the school and recognition of the school as a good training ground for the community in both agricultural and environmental issues. These views concur with the socially critical view of the school whereby the school and the society are expected to reflect and assist each other (sections 4.6.3, 4.8.3 and Table 4.2). This is also a strong area that concurs with aspects of sustainable development education (section 4.3, 4.7 and 4.8). The use of agriculture to address wetland issues is addressed further in section 8.6.4.

3.6 Languages (English and Kiswahili)

According to Martin (1993:25) language literacy plays a great role in empowering people to participate in local decision-making. In Kenya, English and Kiswahili are the two major languages taught in all public schools. The languages present an opportunity to integrate environmental education to teaching and learning.

3.6.1 English

The contribution of English to environmental awareness can be enhanced through involving pupils in developing poems, stories, discussions and dramatisation that emphasise personal responsibility for the natural world. This helps learners to express their beliefs about their environment. McCulloch (1994:44) argues that since pupils passing through the school system may later become prominent scientists, politicians, economists etc, English teachers can help them to develop a sense of personal responsibility by empowering them to later influence what happens to the world. He contends that poems have the power to impel a pupil to write and explore their own personal feelings. McCulloch (1994:44) quotes Nichols (1988) who says the following about a poem: -

> A poet can discover things in her own poetry. It is like going on an adventure. You don't know quite where the poem will take you because it has a living mind or spirit of its own. So one of the most important things in writing a poem is to tune into the feelings of the poem, to listen to that small voice in the poem, instead of forcing it to say the things you think it ought to say.

This quotation demonstrates that the poem is a powerful tool that could be used to enhance active learning in pupils (section 4.7.7). Since environmental issues are numerous, pupils could be encouraged to speak out their feelings about these issues. This promotes cultivation of a cross-curricular view of issues. Encouraging pupils to bring in evidence from other subjects such as science, geography, history etc can enhance this further and the English class provides a forum for heated debates on issues cutting across the disciplines (McCulloch, 1994:45). This can enhance group work and division of roles in discussing various issues that are later presented in

class to enable pupils to come up with a communally owned consensus over an environmental issue. The skills from other disciplines enrich the responses and this promotes development of individual abilities, confidence and creativity in pupils.

Other approaches are those that involve pupils identifying threats to the environment from newspapers, magazines, and from what they learn in other subjects. Such information can be put together in the form of a collage made up of media articles, pupils' own findings, poems and stories written by pupils especially about wetlands. Such contemporary materials displayed in classrooms or school corridors will help environmental issues to linger in pupils' minds (McCulloch, 1994:45).

Texts that depict environmental destruction can also be provided to pupils to provoke their reactions and discussions. This can be followed by a practical engagement with environmental issues using approaches such as eco-management, writing to authorities, newspapers, pamphleteering, persuasion and advocacy (section 4.7.6). McCulloch contends that these approaches portray "pupils making something out of the powerful feelings evoked in them as they reflect about the environment" (ibid:46).

In Kenya, the main emphasis in English is learning, speaking, reading and writing. Some prescribed activities that may be of environmental importance are given in Appendix 3.5. Some forms of assessment include matching spoken statements to objects, pictures, situations in the classroom and outdoors, describing objects, pictures, actions, dramatization and matching objects with objects and pictures. The English subject appears quite open and can allow diverse ways of doing things so long as the required concept is learnt. This presents a great opportunity to teach wetlands issues. The use of English language by teachers to champion for wetlands conservation is explored further in section 8.6.5.1.

3.6.2 Kiswahili

The Kiswahili language has similar features and potentials for promoting wetlands conservation like the English subject above. The objectives relevant to environmental education in Kiswahili include enabling learners to be able to:-

- listen, read and understand Kiswahili
- express oneself and environment in Kiswahili (RoK, 1992:27).

The subject is organized within themes that include listening and talking, reading and writing. The distribution of environmental themes within classes is shown in Appendix 3.6. Relevant themes are spread over all the classes. Kiswahili language also seems open ended and the teacher can use a variety of environments to promote vocabulary and self-expression. Wetlands being habitats with multiple uses could be used for this purpose. The curriculum recommends that teachers use various methods to assess the pupils such as looking at sentence constructions, creativity in poems, songs and drama. The use of Kiswahili by teachers to champion for wetlands conservation is explored further in section 8.6.5.2.

3.7 Christian Religious Education (CRE)

Various cultures hold a diversity of beliefs about God and their environment. The beliefs influence people's perception of the world and their relationship with it. The beliefs usually prescribe roles that people ought to adopt in their relationship to the environment (Martin, 1993:24). In CRE, there is a religious insight that the world including man is God's creation. Man's survival depends on good stewardship of the world and its resources. This involves seeking sustainable living that does not deplete resources, that promotes equity in access and distribution of resources as well as respect for human rights (Daly, 1996:219). According to Martin (1993:25),

> exploring these doctrines and their often very positive and careful concern for the environment can provide a very powerful motivation for accepting personal concern for the environment both for those who are believers as well as those who are not.

CRE has opportunities for learning about wetlands since they are beautiful landscapes with abundant life created by God and play a role in supporting life of living organisms. Wetlands are good areas worth visiting during leisure time. Various communities have cultural attachments to wetlands such as hosting traditional circumcision ceremonies (Kareri, 1992). Christians also use wetlands for their baptism ceremonies. It is important for teachers to teach learners in a way that can ensure more spiritual closeness to the environment and other fellow human beings. CRE is rich in values and ethics that can enhance this closeness (Appendix 3.7) but this can only be realised if teachers use the appropriate teaching approaches. In Kenya, CRE is taught from class 1 to 8. Its main environmental theme is to enable children to accept the environment as God-given and their responsibilities to respect, conserve and develop it (RoK, 1992b). The distribution of relevant environmental education content is given in Appendix 3.7. However, there is no direct mention of wetlands in CRE subject although the activities mentioned can be done in wetlands. The use of CRE by teachers to champion for wetlands conservation is explored further in section 8.6.6.

3.8 Home Science

Home science is a domestic issues related subject centred on aspects of the family such as childcare, health education, food and nutrition, laundry work, care of the home and clothing and textiles (RoK, 1992b:71). Home science education attempts to help the pupils to realise and solve family problems as well as adapt more easily to the changing living conditions in the home, community and in the society as a whole. The syllabus is designed to give the learner basic skills, knowledge and attitudes which can be applied in day to day living to improve the quality of life of an individual and the society in which s/he lives as well as laying a foundation for higher learning (ibid).

The subject is taught from class 4 to 8. Some relevant environmental education objectives include enabling learners to:-

- practice correct methods of refuse disposal
- carry out daily and weekly cleaning of the house (RoK, 1992b:72)

Distribution of relevant topics in the syllabus is given in Appendix 3.8. Home science greatly recognizes wetlands as sources of water for home use. There are provisions in the subject to involve pupils in carrying out activities to protect the wetlands to avoid water contamination. However, the coverage of wetland issues is still minimal and more confined to the lower classes (Appendix 3.8). The use of Home Science by teachers to champion for wetlands conservation is explored further in section 8.6.7.

3.9 Mathematics

According to Martin (1993:24), the environment can provide relevant and important areas of study for development of mathematical skills. This includes collection, analysis and presentation of numerical data to help determine trends relating to issues like crop yields, population, consumption levels, rate of loss of various environmental resources or habitats. It could also relate to development and use of indices to assess quality of life, economics of wildlife or marketing local products such as crops or timber (ibid).

Mathematical skills are also useful in environmental problem solving - for instance creating a garden or a pond where skills of measuring, estimating and calculating are needed. These also bring up issues such as the weighing up of priorities, gathering of information to inform decisions and creating balance between theoretical and realistic outcomes. All these call for sophisticated thought that require other disciplines not specifically mathematical tasks (Cain, 1994:49).

Mathematical techniques can also be used in looking for efficient techniques in environmental management such as ways of packaging items for sale, the materials used and their impact on the environment. Packaging and wrapping could provide a lot of insights into the amount of waste generated by our lifestyles (ibid:50). This could influence pupils' decisions on issues such as consumerism (section 4.7.7). Other areas that children can pay closer attention to include efficiency of transport systems, waste disposal systems, heating systems, manufacturing or processing systems and recycling systems as they will help them to look critically at their environment. It will also assist the development of skills of collection, handling and display of

data and also in the use of statistical analysis of data (ibid). In this way mathematics can help in promoting a healthier environment for people.

According to Madiba (1987:19), teaching mathematics in primary schools should be closely linked to the reality of the learner through the use of school grounds and the local environment. The subject should be full of fun, excitement and activities. It should borrow from home environment activities such as counting the number of rooms at home, number of pets, buying items from the local shop and negotiating the correct change. In the classroom environment, Mathematics should make use of objects such as the chalkboard, walls, desks, window frames, doors, ceiling etc (ibid). Madiba argues that there should be no difference between the home language and school language since this will confuse the children. From the schoolyard pupils can learn through measurements of various objects for example the soccer ground, the girth and height of trees etc. The same could apply to wetlands whereby learners work using familiar symbols used in the society (section 5.4). Cain (1994:48) reiterates that the walls and corridors of the school should be decorated with posters, children's mathematics and mobiles of solid shapes suspended on the ceiling. He argues, "if we want our children to appreciate aesthetic beauty of mathematics, then we need to create them a working environment which is full of this beauty" (ibid: 48). Wetlands are beautiful and full of diverse life that can provide opportunities for learning mathematical concepts. The wetland related aspects could also form part of the materials beautifying the mathematics classrooms.

In Kenya mathematics subject is taught from class 1-8. It has several objectives some of which can best be realised by use of the outdoor environment including wetlands. Some relevant objectives for this purpose include

- Counting
- Using basic addition, multiplication, subtraction and division with ease
- Measuring length, area, capacity, volume, weight, time, money, temperature, angles
- Identifying common properties about shape and size of objects in their environment.
- Planning a farm and planting seedlings according to required spacing.
- Collecting, recording, representing and interpreting data
- Making models, patterns, puzzles and playing mathematical games.

The objectives have great potential for engaging learners to explore and do activities for their environment such as planting trees, collecting litter, marking wetland edges, etc. These objectives however can be realized at different classes as shown in Appendix 3.9. The curriculum acknowledges the teacher's role in observing pupils when doing activities as a form of assessment (RoK, 1992a:22). Teachers are advised to look for opportunities to use appropriate skills and have dialogue with pupils while the activity is being done. The use of mathematics by teachers to champion for wetlands conservation is explored further in section 8.6.8.

3.10 Music

Music can provide opportunities for pupils to express their ideas and views about the environment, examine and interpret the environment from an aesthetic perspective, become aware of and curious about the environment as well as to participate actively in resolving environmental problems (Hargreaves, 1994:83). Despite its worthiness, music also has negative effects on the environment in terms of being a consumer of rare timbers, a source of pollution (noise) and a weapon of psychological warfare (ibid). Music is rich in communicative power and can also assist pupils in learning the alphabet, grammar, learning about environmental processes such as natural cycles, ecosystems and environmental changes by examining songs of different ages. Music lessons can be used to teach about noise pollution and recycling by making musical instruments using paper, cans, glass etc (ibid). Pupils can also be encouraged to express their feelings about various developments in the environment and their future environmental aspirations using music.

In Kenya the objectives of music that are of relevance to environmental education include among other things to enable learners to:-

- perform a variety of songs and dances from his/her own and other cultures
- express his/her own ideas, feelings and experiences through creating music and dance
- acquire a sense of cooperation through participation, contribution and organization of musical activities.

These objectives are distributed in the content of various classes from class 1-8 as shown in Appendix 3.10. Music can help in popularising wetlands information. Pupils can be involved in

writing music on many aspects of wetlands as perceived by different cultures. The pupils can also explore songs related to wetlands that are still in use or were used by the community and this can give wetlands education using Music subject an interesting historical approach (section 3.3.2). The subject's prescribed activities look open and can accommodate a variety of ideas depending on teacher or pupil's ingenuity. The use of Music by teachers to champion for wetlands conservation is explored further in section 8.6.9.

3.11 Conclusion

This chapter was an exploration of the potentials of integrating wetland issues in different subjects. The discussion demonstrated that every subject presents unique opportunities for integrating environmental education. Some subjects such as Art and Craft, English, Kiswahili and Music lay greater emphasis on exploration, analysis, synthesis and expression. The medium of expression differs from visual, oral, text and simulation or role-play. Subjects such as GHC, Science, Agriculture, Home Science and Mathematics lay emphasis on interacting with the environment physically through experiments, investigations, analysis, discussions and synthesis. They also emphasise taking practical action to address the environmental issues. Subjects such as History and Christian Religious Education give the study of environmental education a more historical approach in an effort to explore the root causes of the environmental problems. CRE also explores the moral and ethical aspects relating to wetlands.

The discussion in various sections of this chapter portrays the different subjects as providing different potentials to promote understanding, knowledge, skills, attitudes and participation (UNESCO, 1978) in environmental (and wetlands) conservation. The subjects provide attempts geared towards cultivating pupil understanding and expression of appropriate human-human and human environment interactions. These are virtues advocated for in pursuit of sustainable development (section 4.3). This chapter presents subjects as appropriate avenues that could be useful to nurture pupils in promoting dialogue and development of sustainable societies. Teachers are expected to innovatively use these provisions to address local wetland problems identified in section 7.7 and 7.8. How teachers use these provisions to champion for wetlands conservation is explored further in section 8.6.

CHAPTER 4: THEORETICAL UNDERPINNINGS OF THE STUDY

> The concept of sustainable development is not a simple one, and there is no road map to prescribe how we should proceed (UNESCO, 1997:1).

4.1 Introduction

This study is an exploration on integration of wetland issues in teachers' day-to-day activities in Kenya. It explores how teachers perceive wetland value and threats together with the local community's awareness of wetland issues and risks. It also explores how teachers view themselves locally in terms of potential contribution towards wetlands conservation. The study goes further to look critically at what teachers do to conserve local wetlands, how they do it and why. The study also explores the barriers and constraints encountered by teachers in the process of championing for wetlands conservation.

Teacher perceptions and action in different contexts are evaluated against diverse views of environmentalism, the ongoing debate on sustainable development and education theoretical frameworks. This is aimed at understanding the contribution of Kenyan teachers to the process of realisation of sustainable use of wetland resources within their locality.

4.2 Environmental ideologies and environmental crisis.

Chapter 2 presented the status of wetlands in Kenya. It is evident that there are issues and risks that need to be addressed to save further wetland destruction as well as to rehabilitate those that have already been interfered with. The discussion traced the root causes of wetland crisis as related to the economic, social and political interests held by various individuals, groups and even the government. This chapter traces the wetland threats as inclined towards various viewpoints about the environment, what is popularly known as environmental ideologies (Fien, 1993; Eckersley, 1992). An ideology is defined as "a value or belief system which is accepted as fact or truth by some group. It provides the believer with a picture of the world as it should be. It often

simplifies the complexities of the world into something simple and understandable" RU/SADC, 2000).

Ideologies steer people towards pursuing different interests from the environment and this has different implications for the health of the environment. Environmental ideologies reflect societal goals and aspirations and show the social dynamism with regard to various value and belief systems towards resources. In this study environmental ideologies are considered at two major levels namely technocentrism and ecocentrism (Fien 1993:27; O'Riordan, 1989a). Wetlands, being multiple resource systems (Lee, 1999:67), are considered to generate various environmental ideological interests in people leading to varying levels of exploitation. The motivation behind various environmental ideological positions are discussed below.

4.2.1 Technocentric environmental ideologies

Technocentrism or anthropocentrism is an environmental ideology whereby human interests are given a more elevated consideration over the natural environmental concerns (Pepper, 1984). It is characterised by a strong belief in scientific and economic rationality to resource exploitation, environmental regulations and management strategies guided by technical approaches and economic incentives. Technocentrism embodies two approaches, the cornucopian and accommodationist positions (Fien, 1993:26). The cornucopian position is founded on the belief that the environment should be exploited for economic growth and human well being and any problem experienced in the process can be solved through science and technological quick fixes (O'Riordan, 1989b). In the case of the wetlands this would mean, for instance, accentuating over-harvesting of fish with the assumption that the wetland can later be restocked with the same or another species as well as giving the wetland time to recover. This neglects the fact that besides human beings, the depleted fish species are part of the wetland's complex food web and other organisms are affected in the process.

The accommodationist/managerialist/light green reformists on the other hand contend that "the environment can be managed to satisfy human needs and wants provided certain accommodations to ecological principles are made through improvements in environmental

legislation and management practices" (Fien, 1993:26). In the case of wetlands this may entail identifying the resources being exploited and enacting restrictions towards exploitation of those at higher risk. This is a popular practice and is currently represented by the various acts including the Environmental Management and Coordination Act in Kenya (RoK, 1999) which accentuates cost benefit analysis, environmental impact assessments and legal redress to environmental issues. These managerial methods are weak especially where manpower resources and facilities to monitor and determine the threshold levels of exploitation are low. There is likelihood of abuse of the natural resources leading to extensive environmental degradation especially where the legal prescriptions are not adequate or specific.

The technocentric views portray having great faith in scientific, technological and legal quick fixes to address wetland problems and manage people. The views give the impression that wetlands are infinite resources with an endless use. These views are geared towards promoting wetland exploitation and usually give minimal consideration to conservation. Their aim is development and exploitation while conservation is treated as an obstruction to development. These considerations usually lead to environmental crisis since they are ignorant of the complex nature of wetland problems and solutions. This position is also likely to manifest itself in the curriculum at various levels whereby wetlands are portrayed positively in terms of potentials to provide resources without reciprocating with the negative impact of continued exploitation and technological deficiencies of the current generation of people. In this case the teacher and pupil visits to the wetlands could be for leisure and extraction of resources and not necessarily for conservation activities. The curriculum may also be loaded with 'dos and don'ts' about wetlands instead of acknowledging the role of empowering people to make their own choices and decisions on how to relate with and conserve wetlands. The aspects of sustainable use of resources and the focus on carrying capacity may not be given adequate attention in these considerations.

4.2.2 Ecocentric environmental ideologies

Ecocentric environmental ideologies (Fien, 1993) are characterised by a strong belief in the importance of nature's role in influencing people's identity and sustainable living. There is

recognition that man needs the environment for his survival and that threats to the environment are brought about by his/her influences such as materialism, economic growth and the associated social inequities such as in gender, race and class (Fien, 1993:27). Ecocentric ideology can be viewed at two positions, the dark green and the red green positions.

The red green position (Fien, 1993:27) is also referred to as human welfare ecology (Eckersley, 1992:36), communalism (O'Riordan, 1989a) and ecosocialism (Eckersley, 1992). This position views the environment as a social construction and capable of sustaining natural systems, economic development and just human societies (Eckersley, 1992). Environmental crisis is considered to result from inequality in distribution of resources coupled with unjust selfish economic practices (Pepper, 1996; Capra, 1983). For wetlands this would mean recognition of the many valuable products and services identified, exploited and enjoyed by people, but also acknowledgement of disparities in access, distribution and use of wetland resources due to varying human interests. The disparities could also occur as a result of ownership and governance (section 2.3.4), which gives some people sweeping powers over resource use decisions (such as wetland draining) without considering other people directly or indirectly dependent on that resource. Ecosocialists seek for harmony between society and nature and also between individuals and groups within society (Ryle, 1988).

The dark green position (Fien, 1993) is also referred to as biocentrism (Daly & Comb, 1990) or Gaianism (Lovelock, 1979:vii). This position views the environment as inseparable from people. It views people, land and other species as equal at every level and champions for respect of rights of nature (Fien, 1993:28). They argue for ecological laws to regulate social relationships and institutions to realise the utopian ideal of man's behaviour being governed by his/her cooperative living in harmony with the natural surrounding in a classless society. For wetlands, this would mean recognition and respect for the value of wetlands and human dependence on them just like other animals and plants. This ideology seeks appropriate human-human and human-wetland interactions that recognise and respect everybody and every species's rights to resources from wetlands. A summary of the two major environmental ideologies is presented in Table 4.1.

Table 4.1: A framework of environmental ideologies and their relevance to wetlands

Environmental ideologies	
Technocentric	**Ecocentric**
People are separate from the natural world	People are part of the natural world
The natural world has utilitarian value to people	People have a stewardship responsibility for the natural world
People ultimately have control over the natural world	People are ultimately constrained by natural laws
People enjoy exceptional abilities that enable them to create new technological responses to perceived environmental problems	People seek to promote better human-human and human-nature interactions.
For instance, people living at a coastal location devise a desalination plant to provide them with freshwater	For instance, people cannot naturally survive in a place without freshwater and should not settle there.

Adapted from Ramsar, 2001:13

4.3 The unfolding developments with respect to sustainable development

The development of environmental ideologies in section 4.2 did not happen in one day but was a result of a lengthy process of increased human understanding of the environment, its value, his/her interaction with it as well as the resultant impacts and implications to human beings' future survival. This process of change in understanding spread over centuries but gained greater momentum in the 1960s (Irwin, 1984; Janse Van Rensburg & Shongwe, 1994:9). In 1987 the Brundtland Report used the term "sustainable development" to refer to this process of environmental considerations prescribing where the world should aim to go in future (WCED, 1987). In the course of time the process of sustainable development has been differently interpreted (Jickling, 1999; Fien, 1993) and other terms such as "sustainability", "sustainable living" and "sustainable societies" have emerged. These changes in terminology were facilitated by the consideration that "to identify necessary changes and to understand their full complexity, people should think in terms of sustainable societies not sustainable development. Changes for sustainability will affect individual lifestyles, expectations and attitudes to and relationships with nature" (Slocombe & Van Bers, 1991:12). However in this thesis, these different terms are used synonymously.

A number of authors have expressed different interpretations of sustainable development (Fien, 1993; Huckle, 1991, 1996; IUCN *et al.* 1991; Smyth, 1995; UNESCO, 1992; WCED, 1987; UNESCO, 1996). After the Brundtland report (WCED, 1987) and Agenda 21 (UNESCO, 1992), the concept of sustainable development has been used as a yardstick, informing many local, national and international policies, programmes and strategies related to environment and development concerns (Fien & Tilbury, 2002; Apel, 1998:iii). Sustainable development represents a process of continuous change in strategies with new understanding of environmental issues and risks. Section 4.3.1 explores the process of conceptual development of sustainable development as reported by various authors. There will also be an exploration of what these changing concepts would entail in terms of wetlands education and sustainability.

4.3.1 Sustainable development as an agenda of nature conservation

This view was first held by the western nations in the 1960s (Janse Van Rensburg & Shongwe, 1994:9) who realised that cornucopian ideologies (section 4.2.1) of increased industrialisation and exponential growth in resource consumption and human population seriously jeopardised the continued existence of a safe, healthy and diverse environment (Hattingh, 2002:6). The environmentalists were critical about the impacts of various developments on the environment as well as the social values and practices that guided development systems. One of the early critical environmentalists was Rachel Carson whose book *Silent Spring* (1965) questioned the production and negative effects of use of agricultural pesticides on the American countryside.

Early proposals to counteract the environmental crisis recommended the pursuit of a steady state (zero growth) economy (Daly, 1973), which called for structural adjustments to the economy and social life to ensure equilibrium and a halt to material growth. This was to be coupled with an expansion in services that promote higher quality of life such as education, cultural activities, nature experience and enjoyment of leisure time (ibid). To these early conservationists, development was regarded as an enemy to be opposed. This suggests the beginning of application of the managerial environmental ideologies (section 4.2.1) although in a more mild form. The use of education, cultural activities and nature experience suggests the beginning of awareness of the need to appreciate nature including wetlands.

4.3.2 Sustainable development as an effort to keep within the ecological carrying capacity

In the 1970s and 1980s most scientists took a more neutral position on the nature conservation agenda and considered sustainable development as exploiting the natural resources but staying within the carrying capacity of supporting ecosystems (Hattingh, 2002). The scientists, however, conceptualised the carrying capacity within the biophysical environmental aspects, problems and their solutions. According to Janse Van Rensburg & Shongwe (1994:9), this gave rise to "preservation behind fences of …remaining natural areas …" This portrays the strengthening of the managerial approach (section 4.2.1). However, scientific research later revealed the existence of ecosystem interconnectivity between protected areas and the unprotected areas in terms of pollution and wildlife migration. This caused scientists to shift attention from protection to conservation and management of natural resources such as soil, forests, energy, water and other natural resources (*ibid*). These issues were also infused in the curriculum in various disciplines or subjects. However, these new concepts were integrated as nature study and ignored the social, political and economic issues regarding the resource utilization. The programmes also failed to address inequality issues in society and tended to reproduce and maintain the *status quo* by remaining silent about the advantages of the affluent while most poor people were not allowed to freely utilise nature directly to secure their livelihoods (Eckersley, 1992). Programmes advocating minimum impact on natural resources and maximum environmental protection are still prevalent today (Hattingh, 2002:8; Tilbury, 1995; Gough, 1987) and these may impact negatively on opportunities for the poor to use the natural resources.

It is important to recognise that people, especially the poor may use wetlands as their main source of livelihood, as well as their only means of survival. Addressing the holistic aspects of wetlands (section 2.3) is crucial to ensure that everybody (including the poor) has access to wetland resources. This view's recognition of people and the need to meet their needs within the ecological limit entails close interaction with the community to enquire about their needs from wetlands through dialogue.

4.3.3 Sustainable development as an agenda of needs satisfaction

These views are embodied in documents such as the *World Conservation Strategy* (IUCN *et al.* 1980) and the *Brundtrand Report* (WCED, 1987). These two reports explored the concept of development and its relationship with the physical limits of the supporting ecological systems. The Brundtland Report considered sustainable development as "development that meets the needs of the present generations without compromising the abilities of future generations to meet their needs" (WCED, 1987:43). The report explored how social and economic factors contribute to environmental problems and sought to protect essential ecological processes, life support systems, and genetic diversity through the sustainable utilisation of natural resources. It also explored the links between economic growth and environmental preservation and linked poverty, development and environment. The report particularly implicated rural people in their destruction of natural resources for survival against poverty and starvation. The report advocated a re-conceptualisation of some aspects of environmental education to give greater prominence to the root social, political and economic causes of environmental problems. This report presents the entry of ecocentric considerations (section 4.2.2) into the sustainable development debate arena.

However, the Brundtland Report's definition of sustainable development has been criticised as being anthropocentric. Hattingh (2002:9) says that the definition portends that

> the sacrifice of natural resources could be justified indefinitely by (and balanced or traded against) what is gained in terms of financial capital (expressed in monetary terms) or in terms of human capital (gains for example in infrastructure such as roads and buildings, or advances in science and technology).

This is viewed as 'weak sustainability' in the sense that it is technocentric and views sustainability in terms of making changes to current human activities to sustain humanity, largely unchanged and unchallenged into the 21st century (Veranu, 1998:3).

When applied to wetlands (and nature), this would mean protection of parts or aspects where it pays to do so. This means that the wetlands' continued existence (conservation) could be traded (substituted) for a higher price in monetary or human terms than it would otherwise fetch in an open market of commodities or services (Hattingh, 2002:9). This may not encourage seeing

wetlands holistically (Figure 2.3) with many unquantifiable benefits (section 2.3) but as a resource to be exploited and conservation as only a remedy to counteract depletion. This anthropocentric approach is still in use within the current dominant thinking about environmental policy and decision making that makes judgements about development based on cost benefit analysis (Lee, 1999). In the process, ecological processes are traded off with financial or human gains such as job opportunities creation. The problem is that in the long run, financial and human capital cannot always balance or compensate for the loss of nature and it could after a short lived profit lead to long term accelerated destruction of both humanity and nature.

4.3.4 Sustainable development as an agenda to care for the whole community of life

As humanity continues to understand the realities of sustainable development, a need to take care of the fragile community of life on earth within the overall development agenda has become stronger. This is a step forward and dominated the discussion in the document, *Caring for the earth: A strategy for sustainable living* (IUCN *et al.* 1991). This document identified sustainable development as improvement in the quality of human life, so far as it is possible within the boundaries of the carrying capacity of the ecosystems on which it is dependent. This marks a shift in terminology from sustainable development to the concept of sustainability. It calls for environmental education that enables citizens to understand, appreciate and implement sustainable practices. It underscores that

> Sustainable living must be the new pattern for all levels: individuals, communities, nations and the world. To adopt the new pattern, will require a significant change in attitudes and practices of many people. We will need to ensure that education programmes reflect the importance of an ethic for living sustainably (IUCN *et al.* 1991:5).

Caring for the Earth defined the process of living sustainably as

> a kind of development that provides real improvements in the quality of human life and at the same time conserves the vitality and diversity of the earth. The goal is development that meets these needs in a sustainable way.
>
> Living sustainably depends on a duty to seek harmony with other people and with nature. The guiding rules are that people must share with each other and care for the earth.

> Humanity must take no more than nature can replenish. This in turn means adopting lifestyles and development paths that respect and work within nature's limits. It can be done without rejecting the many benefits that modern technology has brought, provided technology also works within these limits (IUCN *et al.* 1991:8).

The report proposed nine principles that should form the ethical platform of sustainable living. These principles fall within two broad categories or aims, that is, maintaining ecological sustainability and promoting social justice. These principles are

Aim: Maintaining ecological sustainability – linking people and nature
- respect and care for the community of life
- conserving the vitality and diversity of the earth
- minimising the exhaustion of non-renewable resources
- keeping within the carrying capacity of the earth

Aim: Promoting social justice – linking people and people
- improving the quality of human life
- changing personal attitudes and practices
- enabling communities to care for their own environments
- forming a national framework for the integration of development and conservation
- forming a world alliance to implement sustainability on a global scale.

Most of these principles, values and duties were noted to be alive in the cultural and religious practices in most parts of the world (IUCN *et al.* 1991:12). Similar sentiments had also been raised in many UN conferences since the early 1970's when environmental concerns were publicised. So the principles were more or less an effort to consolidate what was happening and had been documented in the global arena. This is captured by Hattingh (2002:11) who comments that, "the challenge for sustainable living from this perspective is therefore not to justify it, but rather to help individuals to apply it to concrete actions and practices".

The principles of the *Caring for the Earth* report (IUCN *et al.* 1991) coincided with the Rio Summit when world leaders met and committed their countries to implement the United Nations sustainable development blueprint, *Agenda 21,* through a great variety of means including education. This international document was seen to be more accommodative of nature conservation and environmental protection ideology of the developed western nations and also development as needs satisfaction of the poor nations (Hattingh, 2002:11). The document underscored the role of education:

> education is critical for promoting sustainable development and improving the capacity of people to address environment and development issues (UNESCO, 1992, para. 36.3).

Chapter 36 took an overarching and holistic approach to education, training and public awareness. This covered formal and non-formal, informal, all forms of academia, professional and adult workforce training and underscored the importance of media awareness and other forms of learning. It thus presented education as an activity focused beyond the formal system calling the players to reconfigure the traditional perception of education to an open-ended life long process of learning and changing towards promoting environmental sustainability. The teachers' activities within the community in this study hinge on this expanded notion of education.

The approach presented by *Caring for the Earth* and *Agenda 21* strengthens the ecocentric environmental ideology with recognition of the environment as a social construction (Fien, 1993; Di Chiro, 1987). This era brings to focus the fact that people are at the centre of environmental meaning making, exploitation and subsequent degradation. It also strongly recognises the role of the environment in supplying human needs. The search for improved human-human and human-nature relationships recognises the holistic nature of the environment (Figure 2.3). The need to share with each other presents a major call for addressing inequity in availability, access and use of resources and these issues had not received major attention before. The foregoing debate has implications for wetlands because it entails recognition of the holistic aspects of wetlands (Figure 2.3) as well as undertaking educational practices that promote equity and participation of all stakeholders in decision making processes impacting on their well being. This is geared towards ensuring that the quantity and quality of wetland resources is considered as well as enjoyed by all generations.

4.3.5 Sustainable development through radical, political and ethical approach

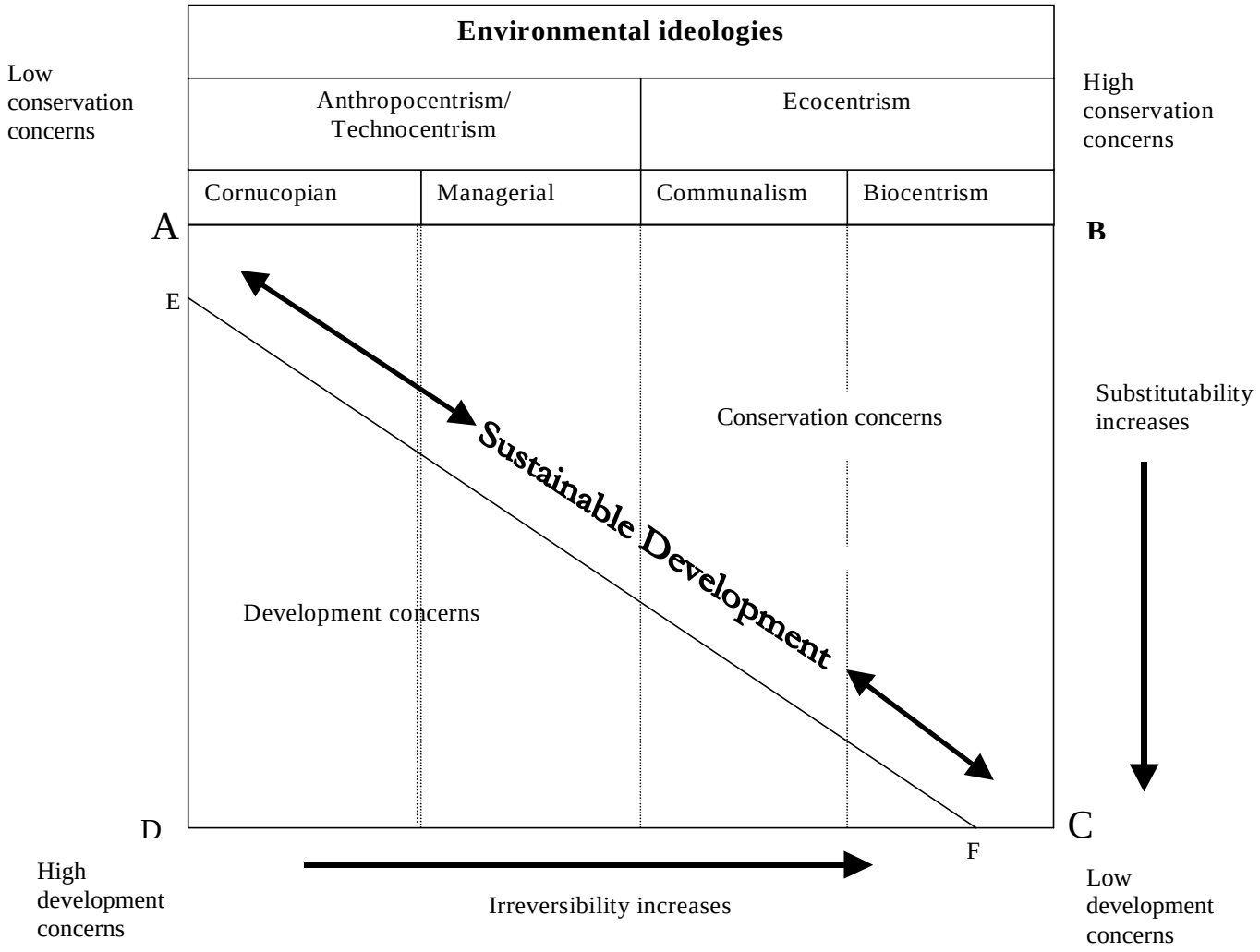
In recent years civil society has increasingly used a radical political approach to address sustainable development issues. They have questioned issues of feminism, peace, third world aid and development, HIV/AIDS, poverty etc (Hattingh, 2002: 13). Major demonstrations were evident during the World Trade Organisation meeting in 2000 and during the Rio+10 World

Summit for Sustainable Development (WSSD) in Johannesburg in 2002. Most of the issues raised were more inclined towards social, political and economic justice. The radical approaches are used by people to question the urgency of any proposed development as well as its priority. They present the people's construction of their world and subsequent communication of their urgent needs and problems. The radical, political and ethical approaches to environmental issues, present an opportunity to learn about people's perceptions of sustainable development. Usually these approaches present a more emancipatory and transformative stance to issues that could not have been known before by policy makers, researchers and educators. Eckersley speaks in praise of radicalism saying that they inform theorists in finding ways of overcoming the destructive logic of capital accumulation, acquisitive values of consumer society and all systems of domination, patriarchy, imperialism, racism, totalitarianism and domination of nature (Eckersley, 1992:21). This approach for wetlands would mean paying close attention to what people say when participating in environmental demonstrations and any other comments from people regarding wetlands. This view presents a message to wetland educators that they do not know everything and should pay attention to emergent concerns from the people.

4.4 Lessons from the environmental ideologies and sustainable development debate

The discussion in section 4.2 and 4.3 suggests that environmental ideologies and sustainable development processes are complex since environmental issues and risks are emergent and dynamic. The equity issue relating to wetlands sustainability is quite complicated because it involves intergenerational and intra-generational equity (Lee, 1999:73). Equitable distribution of wetland resources across generations depends on an increase (at least non-decline) of human welfare (which includes cultural and economic dimensions) of the present and future generations (*ibid*). This means that if there could be increased conservation concerns for the future generations, the present generation should enjoy fewer rights to freely utilise wetlands. These aspects are to be cultivated in a situation where population is increasing and demands for development are increasing exponentially. This calls for a change of values, beliefs and lifestyles to adopt those consistent with sustainability (section 4.3). Classical economists emphasise technocentric cost benefit analysis as a guide to identify and support development. The data obtained from cost benefit analysis usually accentuates wetland substitution and technology

change for other developments and uses leading to changes in the biophysical, social, economic and political aspects of wetlands (Figure 2.3). Ecologists (both social and natural), on the other hand, give more prominence to ecocentric conservation concerns and only accentuate substitution and technology changes that do not adversely affect the natural environment. Thus environmental ideologies and sustainable development debates presented in section 4.2 and 4.3 are documentation of a process of ongoing ideological contests between the classical economists and the ecologists. The contests between different ideologies for conservation and development are illustrated in Figure 4.1.



Source: Developed by author from various sources quoted in the text.

Figure 4.1: Conceptualisation of environmental ideologies and sustainable development

Wetlands are finite renewable resources. Developments exceeding ecological threshold lead to irreversible damage. Wetlands differ in value and are vulnerable to substitution to other uses (development) (Lee, 1999). Figure 4.1 suggests that cornucopian ideologies are dominated by development concerns (E-D) which accentuate substitution of wetlands for other uses as well as introducing new technologies in wetlands such as improved fishing and farming. There is very little attention to conservation concerns (A-E). The managerial environmental ideologies accommodate more conservation concerns but still support substitution and technologies that cost benefit analysis does not object too strongly.

Communalism ideologies uphold the greater need for conservation of resources and proposals for development have to undergo greater screening to ensure that the natural environment is not adversely degraded. Biocentrism on the other end gives great credit to the conservation concerns (B-C) and accentuates (little) substitution and technological changes that work within the limits of sustainability (IUCN *et al*. 1991:8). Biocentrism contends that man is supposed to be guided by rules of nature. Sustainable development process also follows similar trends like the environmental ideologies in Figure 4.1. Sustainable development process over the years has been a struggle across plane A-B following plane E-F. According to Jickling (1992:65), sustainability (plane E-F in Figure 4.1) represents different interests, assumptions, lifestyles, worldviews and conceptions of human place and purpose in ecosystems. He therefore proposes that proponents of sustainability should address issues of cultural identities, respect, society nature relationships, tensions between intrinsic and instrumental values and other ideas that lie beyond sustainability (ibid). The emergent views of sustainable development require a refocus on aspects of issues and risks in wetlands (section 2.3) to ensure that the concepts are grounded on local realities and are not impositions from elsewhere. Prior to the 1960s cornucopian ideas dominated (section 4.3.1). In the 1970s and 1980s managerial and communalist ideologies set in (section 4.3.2). The current ideologies concerning environmental sustainability vary between contexts and could be driven by interests ranging from cornucopian to ecocentric ideas and this presents a diverse scenario of ecological sustainability (Orr, 1992; IUCN *et al*. 1991) and social justice (Fien, 1993). This makes the concept of sustainability complex to such an extent that UNESCO (1997:1) contends

that “the concept of sustainable development is not a simple one, and there is no road map to prescribe how we should proceed.”

Increase in conservation concerns is proportionately related to considerations of irreversibility of environmental destruction and is also characterised by increased scepticism about the ability of scientific, technological and legal quick fixes in alleviating environmental problems. The same applies to substitutability whereby greater conservation concerns (B-C) seek for harmonious integration of development within the environment in a non-destructive way. At the ideal utopian position (F-C) all species are regarded as coexisting without substituting one another.

In the contemporary world, the rich and the poor nations do not have similar social and economic needs and this influences the local definition of sustainable development. For developed countries sustainable development challenges the dominant patterns of production and consumption and calls for changes in lifestyle, social organisation, governance and mode of material production (Fien, 1993). The developed nations can afford to substitute wetlands development for conservation by providing alternative livelihoods for their people whereas these wetlands form a lifeline for developing countries. For poor countries, sustainable development calls for equitable distribution of resources amongst all people and an expanded notion of justice to include future generations as well as to address the needs of the poor and the destitute (Hattingh, 2002:12). Attainment of sustainable development in poor countries may entail developing suitable alternatives to entice people to shift their focus from wetlands. With a lack of alternatives, sustainable development may continually be misunderstood by the poorer nations as “a green attempt to get away from development, or that it disguises sustaining a ‘northern’ affluent lifestyle” (Smyth, 1995:11).

Sustainable development should be implemented where people are able to learn, feel and be empowered to act in fostering wetlands conservation at the local level (Maser, 1996: 166). This is in line with enabling people to think globally while they act locally (UNESCO, 1997). As recommended by IUCN *et al.* (1991) and RU/SADC (2000) this calls for the involvement of people in environmental education processes that empower them to adapt sustainable lifestyles including decision making about local environmental problems and implementing them. It also

involves taking measures to redistribute wealth and opportunities to promote integrity of the environment and human dignity as well as a sense of well being. Education is challenged to achieve this through diverse approaches as discussed in sections 4.6, 4.7 and 4.8.

Seeing the wide range of knowledge, skills, attitudes and approaches prescribed for ensuring the sustainability of wetlands, it is imperative that there is a closer look at environmental education and wetland issues. Teachers cannot assist their students in taking environmental action if they themselves lack environmental 'literacy' (Loubser *et al.* 2001:318). A view held by Disinger and Roth (1992:166) described environmental literacy as follows:

> environmental literacy is essentially the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems. Environmental literacy should be defined….. in terms of observable behaviours. That is, people should be able to demonstrate in some observable form what they have learned – their knowledge of key concepts, skills acquired, disposition towards issues and the like.

Addressing wetland sustainability issues requires that teachers be well endowed with varying levels of environmental knowledge, skills and attitudes to enable them to develop their own decisions on how to address local environmental problems (Jickling, 1999). Each change of view of sustainable development calls for a change in orientation of teaching as teachers get into terms with the dynamic changes in ideology. Some of the new considerations needed are outlined in the proceeding sections of this chapter.

4.5 Implications of the sustainable development debate to wetlands education

The earlier sections of this chapter portray sustainable development as a dynamic process of man's understanding of his/her relationship with nature while in pursuit of development and livelihood. The existence of different interpretations of sustainability (section 4.3) has sometimes resulted in 'paralysis in analysis' and in delays in key changes essential for a more sustainable society (Fien & Tilbury, 2002). Fien and Tilbury reiterate that sustainable development suffers from social and cultural contests as people try to interpret meanings between different interests within societies. Some questions arise such as:

> Over what time period are we talking sustainability? The human lifespan? This generation and the next? Or are we concerned with sustainability on ecological time scales? And what kind of development do we want to sustain: social cultural, political, spiritual or economic? (And are these separable?). What changes are required to achieve sustainability and how are they to be achieved? What are the implications for economic growth? Are there limits to economic growth in a sustainable society and if so what are they? (Fien & Tilbury, 2002).

An attempt to address these questions is a reflection into probable and alternative futures and ties closely to empowerment and action. These questions traverse personal, professional and political realms and challenge daily lifestyles, ambitions and visions giving students an opportunity to contemplate a better economic, social and political society (Tilbury, 1995:207). Some philosophers, however, have condemned sustainable development as patronisingly imposed on people (Jickling, 1999). Jickling criticises the idea of sustainability for its determinism, exclusivity and conceptualisation problems arguing that

- It seeks to suggest that there could be something like "a coherent and cohesive set of guiding principles that can define sustainability and infuse meaning into the term sustainable development". This he argues is not possible since there are over three hundred definitions for sustainability and sustainable development implying the great diversion of ideas among people. Any attempts to infuse these terms with meaning would lead to more confusion (ibid, 61).

- The assumption that "education is an instrumental endeavour that can be used to achieve predetermined goals". He blames adherents of sustainability for predetermining outcomes for students and failing to "see sustainability and sustainable development as stepping stones to future visions." He argues that sustainable development as a process is being threatened when proponents treat the ideas as outcomes. This may "constrain possibilities" and this may "expose educators to serious and sometimes hostile criticism" (ibid, 62). He argues that learners should be involved in creative and open-ended processes and refuse reflecting particular normative stances despite their being intellectually thought and fashionable. This can be done by exposing learners to a variety of ideas which they can explore, evaluate and critique in order to create possibilities instead of defining the future for the students (ibid, 62).

- The concept of sustainability is not sufficient to direct our imperatives since it is dependent on the people's values. People have misconceptions that the term sustainability only refers to positive values. This may lead to harmonic existence of radically different ideas such as economically driven and ecologically driven motives (Figure 4.1). Thus sustainability when not critically analysed leads to a flattening out of contradictions leading to people having contradictory meanings for the same term or acceptance of both ideologies (ibid, 63). This influences people's ability to critically evaluate an issue.

- Sustainability talk also masks critical engagement on issues of why particular actions derived from particular set of values are privileged over others (ibid, 64).

People have various definitions of wetlands sustainability based on how they have used them over the years (Barbier *et al*. 1997). Sustainability means different things to many people depending on the knowledge already grounded within the community. Some of these concepts about sustainable development may not be relevant to promoting sustainability of local wetlands since they may comprise of misconceptions. The diversity of conceptions of sustainable development underscores the difficulty in developing single comprehensive guidelines applicable to the whole country. This acknowledges the value of contexts (section 5.3) in wetland education and the need to recognise local knowledge instead of predetermined alien assumptions.

The discussion so far points to the fact that sustainability education is abstract and is not a neutral endeavour. Every sustainable development position taken [conservative (section 4.3.1), carrying capacity (section 4.3.2), social economic needs (section 4.3.3), caring of the community on earth (section 4.3.4) and the radical political and ethical approach (section 4.3.5)] needs a teaching approach that emphasise on local relevance. The teacher plays a dual role of being within an established school framework and also being a member of civil society. The wetland resources are of great value (MENR, 1994; UNESCO, 1992; Lee, 1999) and any intervention is a challenge against vested interests. The teacher's view of sustainable development and wetlands has a role to play on how he/she champions for their conservation locally. The next section presents various positions within the education arena to respond to the challenges of sustainable development.

4.6 Perspectives of enhancing environmental education for wetlands sustainability

Chapter 2 presented the many problems facing wetlands in Kenya. The preceding discussion in this chapter presents the complex nature of environmental ideologies and sustainable development. However there is increasing recognition that education can play a crucial role in addressing many of the environmental problems that afflict society (WCED, 1987; IUCN *et al.* 1991). This view is also underscored by Fien (1997:7) who contends that "education has an important role to play in motivating and empowering people to participate in working for sustainability." Some philosophers are not happy with education for 'sustainability, sustainable development and even for the environment'. Jickling (1992:7) criticises the inadequate

conceptualisation of the concept 'sustainability' and questions how education can target something that is not clearly understood. He also argues that by educating for sustainability, education is treated as a tool and this therefore becomes an instrumental approach that hinders students from developing autonomous thinking (ibid, 8). He therefore argues that the role of education should be to engage learners in a process of exploring their world so that they critically think about and decide on their destiny and this could even involve moving beyond the present conception of sustainability. However Jickling (1992), like other philosophers, agrees on the important role that education can play in championing for care and action to conserve the environment. Education is considered to be one of the strongest and most effective means societies have for confronting current and future challenges (UNESCO-EPD, 1997:2). According to Jickling (1992), since environmental education is a concept related to an *a priori* conception of the education, there is a need for practitioners to reconcile definitions of environmental education to match those of education. He considers both environmental education and education as abstractions or ideas that describe various perceptions (ibid, 5). Even the earliest environmental conferences acknowledged the role of the already laid down educational structures and suggested that environmental education be integrated in the disciplines learnt in schools. For instance the Tbilisi Conference of 1977 recommended that:-

> Environmental education is not to be added to educational programmes as a separate discipline or a subject for special study, but as a dimension to be integrated into them. Environmental education is the result of a re-orientation and re-articulation of the various disciplines and of various educational experiments (natural sciences, social sciences, arts and letters etc) providing an integrated perception of the environment…. (UNESCO 1978:1).

Being an integral part of the other disciplines at school, the practice of environmental education has been influenced by developments witnessed in the conceptualisation of the practice of education over the years. Educational practices are conceptualised as located within three major frameworks. These theoretical frameworks present different ways of addressing various perspectives of teaching and learning (Kemmis *et al.* 1983; Fien, 1993; Janse Van Rensburg, 1995). These perspectives include the neoclassical, liberal progressive and the socially critical education orientations which are discussed below.

4.6.1 The neoclassical educational framework

The neoclassical educational framework shares relationships with the Habermas technical knowledge interest whose emphasis is on the need for mastery and control over the physical world (Habermas, 1972:309). This knowledge interest is based on need for verifiable observation, experience, explanations of cause and effect and predictions as the basis for control of the environment. According to Fien (1993:19), this knowledge interest accentuates the need for instrumental knowledge and education that can satisfy physical and economic needs to allow one to fit into the society as it is presently constructed. Programmes informed by this interest regard education as a technical activity geared to achieving specific educational and environmental ends (Janse van Rensburg, 1995; Higgs, 1998). A view held by Carr & Kemmis (1986:35) is that it treats education as a set of alternative means to achieve given ends. Grundy (1987:12) refers to technical interest as "a fundamental interest in controlling the environment through rule-following action based upon empirically grounded laws."

When applied to wetlands this orientation would entail respect for factual, verifiable and instrumental knowledge about wetlands that can be used to perform simulations to predict the causes and effects of various activities in wetlands. This would imply that people have adequate knowledge about wetlands' attributes to the extent of being able to explain everything. Education would serve as a means of recruiting people to the already discovered and verified knowledge on wetlands. This would also imply that all wetland problems could be identified and solved through the application of science and technology. As discussed in section 2.3, not all attributes of wetlands are quantifiable and verifiable. Some aspects are non-touchable and subjective and this approach may not be adequate in addressing these issues.

4.6.2 The liberal progressive educational framework

The liberal progressive educational orientation (Fien, 1993:22) shares similar features with the Habermas (1972: 310) practical knowledge interest. Its main emphasis is on understanding the environment (such as wetlands) so that one is able to interact with it, to live in it as part of the world but not to compete with the environment for survival (Grundy, 1987:13). This is a

realisation of the inherent significance of nature's role in influencing people's identity and sustainable living. Human beings are considered as inhabiting both the social and physical world. The main interest is understanding and participating in the cultural traditions that shape social life (Fien, 1993:22). Emphasis is on communication and interaction, which provides for personal and social development including development of inter-subjectively constituted meanings that are laden with historical, political and social dispositions. Habermas (1972:309) argues, "access to the facts is provided by the understanding of meaning, not observation. The verification of lawlike hypotheses in the empirical-analytic science has its counterpart here in interpretation of texts." In the case of wetlands understanding is judged according to whether the interpreted meanings assist in the process of making judgements about how to act rationally and morally (Grundy, 1987: 14). Actions such as wetland considerations and conservation activities are subjective, arising from symbolic interaction, communication and building of consensus (section 5.4). Carr & Kemmis (1986:135) argue that through interaction the participants generate symbols. For an outsider to understand these symbols an understanding of social meanings that constitute social reality is required and this is not reducible to scientific knowledge (ibid).

4.6.3 The socially critical educational framework

The socially critical educational framework concurs with Haberma's (1972) emancipatory or socially critical knowledge interest that is driven by the recognition of the existence of deception about the true meaning of events (Grundy, 1987:19). This view emphasises the need for freedom of individuals from false consciousness in terms of addressing injustices and inequality within the society that could emanate from the influence of ignorance, authority and tradition upon human reason (Fien, 1993:22). This interest is geared towards liberation from restrictions that hamper freedoms of individuals and communities towards realisation of self identified needs. According to Higgs (1998:8), emancipatory interest seeks to promote 'self knowledge' in learners to emancipate them from irrational beliefs and misunderstandings they inherited from habit, tradition and ideology. The learners are involved in self-reflection "to be aware of ideological origins of their existing beliefs and purposes of life, conscious of inequalities and other problems created by unequal power relations in society" (Fien, 1993:19). This is geared towards helping them to think and act in the interests of promoting social justice and democratic principles.

In the wetland situation this orientation could be more inclined towards the political dimension with an aim of encouraging development of self awareness of one's relationship with other people and with wetlands as well as one's rights and responsibilities in championing for wetlands conservation and degradation. It would also promote self realisation of the limitations hindering actions for wetlands. The orientation involves going deeper into exploring the root causes of the wetland problems including aspects that are both internal and external to the teacher. This could entail the teacher reflecting about his/her context, personal dispositions and exploring how they influence personal perceptions and local action.

Table 4.2: An exploration of various aspects of education within three educational frameworks.

	Educational orientations		
	Neoclassical	Liberal Progressive	Socially critical
Role of the school	Select and 'fill-up' students with technical knowledge and skills for later work roles in society.	Develop an autonomous, good and virtuous individual to reform society within the existing social structures	School and society reflect each other. Society viewed as having inequities. School prepares students to participate in economic, social, moral and political conflict resolution immediately.
Expected learner outcomes	Technical skills to fulfill work roles	Personal and social development through engaging in critical thinking and problem solving. Pupil is self actualizing, reflective and potent.	Student is a critical constructive co-participant. Self-actualization viewed within a social context. Learner participates in social transformation and is transformed in the process. Learners engage with ideologies underpinning the current reality.
Teacher and learner roles and relationships	Teacher more endowed with knowledge which s/he transmits, has more power and control, relationship hierarchical. Learner receives	Teacher is a facilitator or organizer. Learners explore the environment and construct own knowledge. Low teacher power and control.	Teacher and the learner are partners, co-learners. Teacher is a project organizer or resource person. Shared responsibility, power sharing and participatory control by both parties.

	(empty vessel).		
Value of knowledge and knowing	Knowledge objective, external to the knower, prescribed as facts and concepts, little emphasis on manual skills	Knowledge is subjective, private and individual matter and context specific. Developed through practical exposure, involvement in decision making	Knowledge socially constructed through a dialectical process, teacher and student participate, integrate subjective views of the world and historical and cultural frameworks of that context.
Learning methodologies	Authoritarian behaviorist transmission methods such as show and tell, guided questioning, lecture method.	Active learning, inquiry, negotiation and problem solving. Emphasis on research to understand context. Project work, issue based methodologies, cross curricular themes, simulation games, role play, dramatization, solitaire, environmental studies, environmental audits and environmental impact assessments.	Active learning methods, socially critical inquiry, reflection
Resources – people, places and publications	Dependence on books, posters, experts, RDDA (Research, Develop, Distribute and Apply) approach	Material development is an individual affair. Teacher is slightly influenced by experts but s/he participates fully.	All people participate in planning, development and critical reflection of the resources being developed. Very weak boundaries between school and non-school resources.

Source: Adapted from Kemmis *et al.* (1983); Fien (1993); Janse Van Rensburg, (1995); Lotz (1995); Gough & Robottom (1993); Le Roux (2000).

4.6.4 Perspectives considered by the present study

This study selected several perspectives within these broad educational frameworks whereby deeper exploration would be done in an effort to generate a grounded theory to be used to look critically at the action by teachers in promoting wetland sustainability. Selection of these

perspectives was based on the need to give a closer look at teachers' perceptions, outcome targets, local relationships and actions at school and community level. These aspects are discussed briefly in the proceeding sections and summarised in Table 4.2. Some of the issues that will be looked at in greater detail include

- **View of the school's potential as an institution to steer local environmental action**

The school is an institution located within and founded by the society and is expected to assist in fulfilling certain social roles to ensure continuity and change (Carr & Kemmis, 1986; Fien, 1993). The school was considered as a focal point where the teacher can influence both the pupils and the community to conserve the local wetlands. More details on this aspect are provided in sections 8.4-8.6, 9.2-9.4.

- **Outcome targets of teachers for learners at school and the community members**

Outcomes are regarded as "end products of a learning process. Outcomes refer broadly to everything learned, including social and personal skills, learning how to learn, concepts, knowledge, understanding, methodologies and so on. Outcomes can be both intended and unintended" (Le Roux, 2000:12). This study considers teachers identification of the desired outcomes conservation of wetlands in the programmes they facilitate as a significant aspect in understanding the conceptualisation of wetlands sustainability. According to Le Roux (2000:13), "it is impossible to plan for all outcomes but it is useful to keep a number of outcomes in mind so that learners and facilitators have a clear sense of what they are working towards." Evidence of learning environmental education is clearly seen when learners' dispositions have a bearing on the environment (and wetlands conservation). A teacher's choice of a certain educational approach and promoting certain outcomes is ideological in terms of the perceptions of the dispositions needed in learners. This aspect is explored further in sections 8.3-8.6, 8.9-8.11, 8.13-8.14 and 9.2-9.4.

- **Teacher relationships with students and the community members**

Teaching is establishing relationships. Relationships exist between the teacher, students, parents and members of the wider community. These relationships enhance development and exchange of meanings with each other. Depending on the relationship, education can be a top-down system or the teacher can be a facilitator or act as an equal partner with learners in knowledge generation (Kemmis *et al.* 1983; Carr & Kemmis, 1986). In the three cases the types of relationships differ as shown in Table 4.2. These aspects are explored further in sections 6.8-6.9, 8.4-8.6, 8.10-8.11, 8.14 and 9.2-9.4.

- **Knowledge about wetlands valued at school and community level**

People have differing information or knowledge about wetlands. Some of the knowledge may not be true and may not be justified. An exploration of knowledge held and valued by teachers is important in order to notice and address gaps in Figure 2.2 and in the anticipated teaching approaches (section 4.7 and 4.8) for promoting sustainable development of wetlands. These issues are explored further in sections 7.2-7.11, 8.3-8.7, 9.2-9.4.

- **Methodologies selected and used most frequently by the teachers**

Teaching involves an interplay of methods to ensure internalisation of information by the learner. The methodologies used are diverse and show inclination towards each of the three education orientations. Adoption of suitable methods is crucial in realising the ambitious outcomes of sustainable development (Jickling, 1999; Tilbury, 1995). These issues are explored in sections 8.4-8.7, 9.2-9.4.

- **Resources available, developed and used by teachers**

Integration of EE in curricular subjects and use of appropriate methodology cannot achieve much in the absence of availability of human and material resources. These resources include textbooks, charts, illustrations, field guides, posters, videos, slides and specimens together with

resource persons conversant with local problems. Other resources include outdoor environments, other people's ideas and experiences as well as the surrounding community. Educational resources should be readily available, locally prepared and must clearly illustrate the purposes of the activities planned. Materials should be of good quality, produced in sufficient quantity and must be appropriate to meet the needs of the group. Instructional aids are context specific and the needs and concerns for environmental education are different between countries and also between different regions of a country (Otiende, 1997:30). Materials produced should be relevant to the areas for which they are being used. These aspects are addressed further in sections 8.4-8.7, 8.13 and 9.2-9.4

These five perspectives are relevant in addressing various objectives of this study (section 1.4). The theoretical underpinnings of each of these aspects are summarised in Table 4.2. This categorisation is used to evaluate teacher responses in chapters 6-9.

4.7 Lessons for wetlands education from the educational debate

Section 4.6 sheds insights on the structure of educational ideas upon which environmental education practice is integrated. The discussion portrays education as a continuum of practices that range from a teacher centred to an interacting learner centred system. These approaches have also had implications for environmental education since its inception in the mid 1900s. The earliest approaches to environmental education in the 1960s did not treat education in its own right but dispersed it in a diversity of disciplines that used environment as a vehicle in teaching (Tilbury, 1995; UNESCO, 1978). Environmental education was mostly treated as nature studies, outdoor education, conservation education and urban studies. With the increase in environmental problems in the 1970s and 1980s, international concern over environmental awareness also increased. International Conferences such as Stockholm, Belgrade and Tbilisi all increased the momentum of countries to prioritise environmental concerns and education. There was also a need to rethink the approaches used in teaching environmental education. One concept that emerged in the 1980s was the concept of environmental education for sustainability. According to Tilbury (1995:197), this refers to

> An educational approach which not only considers immediate environmental improvement as an actual goal, but which also addresses educating for sustainability in the long term. This form of environmental education is concerned with integration of the contemporary disciplines of environmental and developmental education and requires reconciliation between environmental conservation and economic development.

This new direction in environmental education required a re-conceptualisation of some aspects of environmental education to give more prominence to the root social, political and economic causes of environmental problems (ibid, 197). The proceeding sections shed more light on the necessary adjustments needed in environmental education to embrace sustainability concepts.

4.7.1 Relevance

This view proceeds from acknowledgment that "the environment is a human creation, a result of the way we use nature and its resources to satisfy our needs and wants" (Fien, 1993:3; Di Chiro, 1987). Wetlands have many important features that are notable and valuable to people (section 2.3) including pupils and teachers (Chapter 7). The curriculum also refers several times to the environment as a medium of learning (Appendix 3.1-3.10). According to Tilbury (1995:199), contemporary environmental education is an approach to education that seeks to create interest and involve students in world problems. Addressing issues that are visible and close to the pupils makes the disciplines more relevant and real to the pupils. The same case applies to the community when they are involved in activities that address their own local wetland problems and enable them to deal with their future livelihoods and natural resources.

This socio-ecological picture puts people at the centre of environmental exploitation and degradation. Imbalances in man's interaction with the environment are responsible for the current environmental crisis and its management "depend upon changes in environmental values and lifestyle choices" (Fien, 1993:3). Sustainability debate, being an exploration of the social contemporary aspect of environmental issues, tries to bring the environment closer to human daily life. Environmental education in these contemporary developments is seen as a way of making education more relevant to human needs including that of students. Gayford (1991:77) observed that

> Environmental education can therefore be said to be highly relevant to both the needs of the society and to the pupils present needs. As a consequence the inclusion of environmental concerns adds relevance to the curriculum.

Exploration of relevance lays more emphasis on environmental systems and the environmental concept is broadened to integrate ecological interrelationships in the total environment (O'Donoghue & Janse Van Rensburg, 1995:8). Addition of relevance is a re-conceptualisation of environmental education in contemporary society to enable people (including students) to face the current environmental realities. It seeks to achieve this through engagement in exploration of links between their personal lives and the wider environmental and development concerns. Being useful resources (chapter 2) wetlands are supposed to be used during teaching and in community gatherings by teachers to add relevance and to emphasise the close and intimate relationship between people and their environment (refer to Table 4.2).

4.7.2 Environmental education and the holistic nature of environmental problems

The sustainability debate broadens the outlook of aspects of the environment and its problems to the intersection and interaction between the human social, political, economic and cultural aspects with the natural environment (Figure 2.2 and 2.3). Teaching for sustainability is a holistic approach, which explores these interactive aspects of human beings and the environment. Investigation of the intersection and interaction of these elements leads to visualisation of a multifaceted picture of the real environmental situation. The final perception by the students becomes a synthesis of the environment and development problems based on macroscopic analysis of diverse interactions (Tilbury, 1995:200). This approach therefore goes beyond perceiving the environment as just nature, natural systems or environment with problems (O'Donoghue & Janse Van Rensburg, 1995) to viewing it as a totality of interactions between lifestyles and use of nature. In the case of wetlands, this implies that environmental education tries to capture the complexity of the wetland problems (Figure 2.3) and encourages a higher level thinking which involves initial analysis of individual wetland aspects or components and later synthesis to form a complete whole. Learning is a process of exploration of links between the individual wetland components. This is supported by Meadows who argues that

> Environmental education is learning to see the whole picture surrounding a separate problem like air pollution – the history, the values, perceptions, emotions, techniques, traditional processes that cause the problem and suggest action to cure it (Meadows, 1990:5).

This approach, in essence, is inclined towards the liberal progressive and the socially critical education orientations (Table 4.2). By exploring local wetland issues and involvement in the synthesis process, the pupils and members of the community may be able to reflect on regional and global problems and how they relate to each other.

4.7.3 Environmental education and the curriculum

The learning institutions and the teachers are regarded highly in all sustainable development debates (Fien & Tilbury, 2002). Many environmental meetings have endorsed the need to integrate sustainability into all areas of learning (UNESCO, 1977,1978, 1992). Kenya has also integrated wetland issues in the subjects (chapter 3). Each subject area or discipline provides a unique contribution to the holistic understanding of the environment since each subject

> …explores different aspects of human understanding and experience. So, each subject can be mobilised to help young people to develop their own coherent insight into human behaviour and the effect of this on people and the environment (WWF, 1988:1).

This edifies the need for a holistic curriculum and teaching approaches. This may go beyond integrating issues in the curriculum to giving more recognition to the social, economic and political aspects of human-nature interactions. A holistic approach characteristic of education for sustainability combines and develops scientific inquiry, social science thinking and practical skills together with the creative and aesthetic sensibilities of the language and arts (section 3.2, 3.6, 3.10) and thus contribute to the education of the whole person (Tilbury, 1995: 200). This implies that education for sustainability does not attempt to replace any subject but rather to strengthen and broaden it by exploring the wider relationships and implications. This entails also calling for contributions from professionals drawn from diverse fields including teachers, pupils, parents and other members of the community in curriculum development and taking action (Gough & Robottom, 1993).

4.7.4 Environmental education and the teaching of values and ethics

The sustainable development debate focuses on changing people's values[9] to those that are consistent with sustainable development (IUCN *et al*. 1991:5). Education should encourage the learners to explore alternative ideas and scenarios to make them engage in critical thoughts geared towards making decisions and acting accordingly. People's action depends on the value systems they hold. Values are not taught but they develop in the person after being exposed to diverse experiences (UNESCO, 1986). Tilbury (1995:201) argues that a person's decision to participate in environmental improvement is not dependent on the cognitive realm, but on personal motivation and a sense of responsibility that results from the development of a personal environmental ethic. This view is relevant to wetlands conservation by teachers since the teachers are expected to be motivated to act on wetlands problems locally since they are useful to them (section 2.3).

The development of an environmental ethic plays a great role in promoting sustainability practices. IUCN *et al.* (1980) reiterate the need for a new ethic, embracing plants and animals as well as people is required for human societies to live in harmony with the natural world on which they depend for survival and well being. The long term tasks of environmental education are to foster or reinforce attitudes and behaviours compatible with this new ethic. Teaching environmental education, especially about wetlands, is geared towards allowing pupils to confront diverse but linked issues such as poverty and consumerism. The pupils are encouraged to address these issues in a process whereby the teacher initially helps them to clarify their own wetland values (Tilbury, 1995:202). The value clarification step allows pupils to 'constructively perceive the problem'. The teacher hears the different perceptions but does not judge 'wrongness' or 'rightness' of the pupil constructions. They simply assist the teacher in understanding the value position of the pupil. Development of an environmental ethic involves students understanding of the consequences of their value positions, awareness of alternative values and expression of the rationale behind their particular viewpoints (ibid, 202). The process of environmental ethics development suggests a need for discussion and consideration of different value systems.

[9] A value is a certain belief, attitude or conviction that is consistently reflected in ones behaviour (Tilbury, 1995:201)

Environmental education can only succeed if it is able to foster development of an ethic of sustainable development (UNESCO, 1992).

Development of sustainable development ethics for wetlands could be a complex process requiring constant inquiry of the pupil's values and intense discussion. There are different value systems attached to wetlands and these differ among pupils, teachers and the members of the community. The valuation is context specific. Teachers are expected to create an environment where these values can be discussed and considered in order to arrive at some action consensus. According to Tilbury (1995:202), "teachers actively promote the consideration of values required for development of sustainable lifestyles and do not uphold a neutral stance".

4.7.5 Environment and development as issues

Most documents that address sustainable development approach the subject as broad issues. Some of the issues identified are climate change, depletion of natural resources, water, air, pollution, population growth, poverty, famine, desertification and land use management (UNESCO, 1976, 1977, 1992; IUCN *et al*. 1980, 1991). Environmental education calls on pupils to be actively engaged in resolving environmental and developmental issues. This involves a process of identifying issues, investigation, seeking solutions, carrying out actions to address the issues and evaluating the impact of the environmental actions taken to resolve these issues (Tilbury, 1995:202). Learners have to go through the whole process because

> It is not merely about discussing solutions in order to enhance awareness. It is about active exploration of issues, about identifying potential solutions and acting upon them (Oulton & Scott, 1991:42).

The issue based approach suggests the need for teachers to operate within the liberal progressive and socially critical educational frameworks (Table 4.2). This involves a process of identification of wetland problems, visit to local wetlands, active engagement with wetland problems and reflection on the action taken to inform later intervention.

4.7.6 Local environmental action

The sustainable development debate champions for the reversal of environmental problems and prevention of emergence of new ones. The implementation of practical action serves as an indicator of involvement in confronting an environmental problem. *Agenda 21* praised education for sustainability as a "basis for action" (UNESCO, 1992:2). Active engagement in environmental problems helps to develop action skills to investigate, evaluate and take action to solve the problems. According to Tilbury,

> Environmental education for sustainability generates action by challenging pupils, on a personal level, to change parts of their lives so that they are engaged in leading more sustainable lifestyles. At a public level, they are encouraged to take responsibility for the care and management of the environment directly through participation in practical conservation projects or indirectly as informed and concerned adults through the democratic process (Tilbury, 1995:203).

To be motivated towards taking environmental action suggests the need to work within a framework of education guided by a liberal progressive (section 4.6.2) to socially critical orientations (section 4.6.3). Tilbury (1995:203) itemises six categories of environmental action which this study set forth to explore. These are

1. Negotiation: attempting to reach an agreement over an environmental issue, policy or practice through discussion.
2. Persuasion: attempting to modify others' viewpoints, through public debate, speech making, letter writing, pamphleteering or media campaigns.
3. Consumerism: discriminating through social action or boycotting goods and services; economic actions aimed at changing business policy and products.
4. Political action: attempting by means of lobbying, voting or supporting candidates to persuade an electorate, a legislator or government to adopt a particular environmental policy.
5. Legal action: attempting to ensure the enforcement of a law or the constraining of certain behaviour by legal means.
6. Eco-management: maintaining or improving the landscape through physical action.

Use of these approaches requires ethical considerations and understanding of the values served by the driving interests and to be careful not to be unjust or offensive to other people. The views above suggest that teachers have a wide array of choices of action they can take to conserve wetlands. These actions are possible at both school and community level. Some activities can be

undertaken privately while others call for collaboration with other teachers and members of the community. Some of the activities suggest that taking action is a process and it could be wise if the teacher treats it as a learning process from which to reflect on to improve later interventions (Stapp & Wals, 1993).

4.7.7 Active learning strategies

Active learning strategies involve participation of the learner in ways that generate an action orientation (Tilbury, 1995:204). This can be done in various ways for the wetlands education. In the classroom, teachers could balance between lecturing or show and tell methods with opportunities that allow learners to actively search for wetland information from books, newspapers, journals and on the internet (RU, 2002). This can be supported by making them critically examine and question issues and suggest better management and lifestyle choices. It can also involve some fieldwork and experiential exposures to wetlands where learners can explore the environment, propose wetland issues, problems and risks and investigate more about them. The students can be encouraged to develop stories for a writing competition or to tell their colleagues. However the process of searching for information and exploring issues and problems is more useful if it can lead learners to taking critical action in order to bring about change (Murdoch, 1993; Jensen & Schnack, 1997). The involvement of the learners in the active learning process that leads to taking action makes learners feel ownership over the projects and value the wetland as theirs. They can also develop motivation and confidence that their knowledge is valued and that they can do something for their local wetlands.

The concept of active learning for sustainable living allows the possibility of many small and diverse solutions to environmental problems at local level. These solutions are developed together (co-constructed) between experts and ordinary people including teachers and pupils (Janse Van Rensburg & Shongwe, 1994:10). The learners are subjected to many questions about the local context that entail social, economic and political aspects regarding resource availability, access, use, threats and how to take action to conserve wetlands.

4.7.8 Sustainable development and political literacy

The political aspects of wetlands were discussed earlier in section 2.3.4. The discussion portray policy making in distribution access and use of wetlands in Kenya as being developed by various authorities, which include the government, traditional authorities and powerful individuals. Political literacy focuses on enlightening learners and community members on how these policies came about, who makes them and which criteria were used to arrive at particular decisions. It also requires that they reflect, discuss and make personal and collective decisions on whether the policy making process was developed through wider consultation and consideration of holistic wetland concepts or whether the policy emanates from coercion of the poor and the powerless by the powerful people.

Political literacy provides pupils with understanding and skills that empower them to participate actively and in a critical way in resolving environment and development problems (Tilbury, 1995:205). The critical dimension encourages learners to enquire in an effort to understand the root causes of an environmental or a development problem. The people can also critically explore issues like why people invade wetlands, which resources attract people to wetlands, who are the customers, who controls marketing and what injustices characterise trade in wetland products and services. Asking critical questions promotes understanding and skills required to challenge bias, support rational decision-making and examine solutions and prospects for change (Tilbury, 1995:205). These skills are also instrumental in promoting personal involvement in making decisions to improve and sustain environmental quality.

4.7.8 Sustainable development and futures education

The sustainability debate discussed in section 4.3 is a process of people reflecting on their present relationships with each other and with the natural environment and its implications for the future generations. In the wetland context, it could be more or less a contest of economic, social and cultural interests that people have on wetlands (Figure 2.3) while considering the future generations. Consideration of the future makes education for sustainability different from the

conventional environmental education since this approach is more visionary, free from selfishness, collaborative and more respectful to other people and the natural environment.

According to Tilbury (1995:207), an attempt to address the future aspects leads to examination into relationships, probable alternatives, appropriate empowerment and action. These questions traverse personal, professional and political realms and challenge daily lifestyles, ambitions and visions. This would give students and members of the community an opportunity to contemplate a greener economic, social and political society (ibid).

4.8 Threefold approach to environmental education

The broad picture of sustainable development and the associated environmental education processes discussed above suggest the need for a balance of environmental education about, in and for the environment. Teachers are challenged to provide a range of learning opportunities for dialogue, encounters and reflection using a variety of methods. Confronted with these ideological aspects of environmental crisis and risks as well as teaching needs and the varying learning contexts, O'Donoghue and Janse Van Rensburg (1995:14) reiterate the need for a good educator to be alert, observe, listen, criticise or justify a point, be investigative, take own decisions and actions, or do whatever the context demands.

Environmental education practice is characterised at three levels (Fien, 1993; Tilbury 1995; Le Roux, 2000) that is education about, in and for the environment. The three levels are characterised by different theoretical underpinnings. This study gathered various suggestions from teachers on how they promote wetlands learning and action. Some of the teachers' suggestions concur with the ideas of this threefold approach. My experience with data showed that this threefold system could be confusing especially when one wants to separately describe an environmental activity precisely into a particular level. It is not easy to locate some environmental responses within these frameworks because the activity may traverse across them depending on how it is interpreted. For instance, planting a tree is an action about the environment, done in the environment and for the environment. The proceeding section explores the attributes of the three levels. My personal view is that environmental educators should not

allow themselves to be enslaved in this bracketing proposed by the threefold approach discussed in this section. The best teaching process could be one that traverses between and beyond the limits of the brackets as contexts dictate (Jickling, 1999). Each section in the threefold system has its own strengths and limitations and it's not advisable to ignore these aspects. For this study, the analysis of teacher actions was broadened so as to deal with every method/approach separately and to allow for more clarity and detailed analysis. The threefold levels of environmental education include:

4.8.1 Education about the environment

This orientation is based on the assumption that exposing learners to nature experiences and information about conservation issues can lead to solutions to environmental problems. It is concerned with creating awareness and imparting knowledge, often factual, with an aim to promote understanding about the human environment interactions. It is the most common approach to environmental education that is currently practiced (Fien, 1993) and is common in subjects such as Geography and Science where environment is treated as a topic of study. This approach is supposed to make students develop ecological and environmental understanding. This view assumes that people degrade the environment because of lack of knowledge, appropriate attitudes and behaviours. This view of environmental education is associated with the neoclassical educational framework (section 4.6.1, Table 4.2), the technocratic environmental paradigm (section 4.2.1) and the earlier conceptions of sustainable development (section 4.3).

This approach is characterised by education methods that aim at transmitting facts and filling up supposedly naïve empty learners (Table 4.2). The environment is presented as nature with a heap of problems or nature at risk (O'Donoghue & Janse Van Rensburg, 1995). This view has the problem of assuming a linear relationship between knowledge, awareness and behavioural change. The approach is disempowering to learners since it treats them as encaged waiting to receive all the time from the teacher as if they do not know anything on their own. The approach is criticised for being depoliticised and modernist (Orr, 1992) and not encouraging learners to learn about the environment holistically (Fien, 1993). However, Tilbury (1995: 207) argues that sometimes education about the environment can lead to development of environmental concern.

4.8.2 Education in/through the environment

This approach capitalises on learner centred experiences in the environment as a basis for learning and developing new knowledge. It usually takes the form of outdoor education where the learner uses the senses to see, touch, hear, smell and taste. The outdoor experience could foster skills such as handling of apparatus, data gathering (observation, sorting, classifying, interpreting, analysing and interviewing) and social skills including cooperation and teamwork (Fien, 1993). The strong experiential orientation aims at developing environmental awareness and concern by encouraging personal conceptual growth through contact with nature (Tilbury, 1995:207).

Local sites are very important since they are familiar to both teachers and children and this enhances continued and progressive observations of environmental phenomena. It also gives pupils increased freedom to construct their own investigations and develop their own theories to explain specific environmental phenomena (Hale, 1986:181). Outdoor learning leads to increased understanding of natural processes and their interactions and is enjoyable. This approach is inclined to the liberal progressive education orientation (section 4.6.2) and the ecocentric ideologies (section 4.2.2). Nevertheless, this approach is blamed for putting a lot of emphasis on development of the individual without considering the other people with whom they share the environment. The approach thus fails to promote critical environmental consciousness, critical thinking, political literacy and critical praxis in the learner (Fien, 1993; Grundy, 1993).

4.8.3 Education for the environment

This approach is geared towards taking action to improve the environment. It is usually an integration of socially critical orientation (section 4.6.3) and ecosocialist ideology (section 4.2.2) aimed at social and political change (Fien, 1993; Gough & Robottom, 1993). The ecosocialist ideology upholds the view that environmental problems cannot be understood without reference to socio-economic and political values (Fien, 1993). Besides awareness, understanding and experience, education for the environment aims at developing a sense of responsibility in learners to get involved actively in resolving environmental problems. It adopts a holistic interdisciplinary

approach to solving environmental problems. It acknowledges the role of political elements that underpin any study of environmental situation and incorporates critical education goals within issue-based teaching (Tilbury, 1995:207). This orientation emphasises the ideological nature of education and environmental problems and is committed to the promotion of social justice, equality, and democracy through critical examination of social problems and active participation of people in transforming their societies (O'Donoghue & Janse Van Rensburg, 1995).

Some philosophers have a tendency to favour certain orientations to environmental education over others. For instance, Sia, Hungerford and Tomera's (1986) and Iozzi's (1989) proposals about behaviour change in environmental education are inclined towards education about the environment. Others such as Fien (1993), Huckle (1996), Robottom (1987) and Gough and Robbotom (1993) openly declare their favour of education for the environment and speak strongly against use of the 'in' and 'about' approaches. The proponents of education for the environment are, however, criticised by Jickling and Spork (1998:312) for sloganeering, not being careful at looking for the original ideologies associated with use of language and thus trivialising and creating misconceptions. They are also criticised for being uncritical about their practice and faith in the slogan and in the process concealing particular agendas (ibid). Some philosophers have however taken a broader, all encompassing position. For instance Tilbury (1995:207) suggests that the three approaches should be integrated in environmental education. Rhodes University, which is a great player in environmental education in the Southern African region adopts the environmental education processes approach and this involves recognition of the three approaches but acknowledgement of the need to seek higher critical active learning and action taking for the environment as contexts dictate (RU/SADC 2000; RU 2002; Le Roux 2000). For instance teaching about wetlands could involve some short lecture and documentary research for local wetland information from books, newspapers and the internet. This could be followed by some fieldwork where pupils are involved in data collection using methods such as observation, measurements and interviews of the members of the community. This would lead to investigation of an issue, seeking solutions to the wetland problem and practical conservation action such as cleaning the wetland. The cleaning provokes questions about waste management and pollution leading to development of more environmental knowledge and understanding. This illustration suggests that knowledge generation and understanding is a process and occurs as part

of the activities that the pupils are involved in and not only through neoclassical manipulation (section 4.6.1).

The discussion above suggests that teachers have a wide range of action alternatives and this makes environmental education natural, refuting enslavement into any particular framework, but rather using what suits particular contextual situations. This is a pluralistic approach and is also supported by Higgs (1995:16) who states that we "….are not condemned either to be imprisoned within a single perspective or to flit from one position to another" but rather should appreciate the contribution of each perspective. However Janse Van Rensburg (1995:65) is cautious of using a pluralistic approach and warns against accommodation of "inconsistent views" and "contradictory underpinnings" or "a tendency …to be eclectic…". This study explores whether teachers use single or pluralistic approaches in teaching for wetlands conservation.

4.9 Synthesis and conceptual framework of the study

This study is conceptualised along the environmental education for sustainability perspective. The study acknowledges that wetlands are vital resources (section 2.3) that must be used sustainably. These wetlands provide the community with many benefits. Over time the community has developed meanings pertaining to values and threats to their wetlands. There is also an inherent system of traditional and modern based conservation methods for wetlands held by communities. The process of knowledge construction is as old as the conceptual development age of the teacher since s/he has grown up interacting with wetlands. This conception of teachers by this study assumes that they are not empty vessels but active constructors of meaning who bring their existing understanding into the learning situation (O'Donoghue & Ashwell, 1994:15). Despite developing meanings through interaction, teachers have the benefit of having undergone some sensitisation to wetlands through the training programme by the NMK (Ndaruga, 1999). During the wetlands training the wetland educators' words and actions did not themselves contain meaning (Mildren, 1993:14) because understanding results from interaction with the environment and not because meaning is transmitted to the teacher. Wetlands training and education may not have been a new experience for the teacher. Instead it could just have been a re-ignition of "linkages of related incidents, perspectives and disciplines which may not previously have been

thought to be connected at all" (Solomon, 1994:1). The teacher as a member of the community where wetlands are located and used and having passed through the school system, had actively interacted and developed a pool of wetland meanings. Any new knowledge especially during the wetland workshop could be one of the common ideas within the pool of wetland knowledge held by the community or just "use (of) language in new ways" (Solomon, 1994:2).

Teachers in this study are viewed as having come into the training session with prior ideas about wetlands and how local people interact with them. This view concurs with Fien (1993) and Di Chiro (1987) that environment is a social construction and does not exist outside the people's conceptions. The wetland environment in this study is considered to be the teacher conceptions of the interactions between social and biophysical systems. In this research teachers are considered to be 'using what they know' from the training and their own experiences to 'make sense of what they see' around their schools during their daily practice of communication, education and public awareness.

The teacher is expected to promote the sustainability of wetlands within his/her locality. This study focuses on development of sustainable societies by the teachers through assessment of their ideological perceptions about the local wetlands together with their actions in both formal and non-formal contexts. Sustainability in this study is conceptualised along ideologies presented in international documents such as the *World Conservation Strategy* (1980), *Our Common Future* (1987), *Caring for the Earth* (1991) and *Agenda 21* (1992) which conceptualise sustainability as the need for

- reconciliation between economic development and environmental conservation
- considering the environment in totality, that is the biophysical, social, economic and political components of the environment (Figure 2.2 and 2.3)
- combining environment and development concerns

These growing concerns over the environment and development problems point to the need for an education approach which considers the improvement of the immediate environment as a goal as well as educating for sustainability in the long term. This education differs from the apolitical, naturalist and scientific work characteristic of environmental education in the 1970s and early 1980s (Tilbury, 1995:185).

The approaches required to cultivate concern and care for the environment have been changing over the years as new ways of looking at the people-people-environment interrelationships also change. According to Fien (1993:15), there exists "multiple discourses and contestation over the nature and meaning of educational activities…(and) this is true of environmental education". The environmental educator's perceptions about the environment, environmental education and the appropriateness of teaching resources plays a great role in determining the success of the teaching practice and the learning process of the pupils.

The approaches used worldwide in environmental education present an unfolding narrative of changing pictures of environmental understanding, from "early natural ecosystem and nature experience approaches to broader socio-historical, problem solving and socially critical approaches" (O'Donoghue and Janse Van Rensburg, 1995:3). This tallies with the changing ideologies of sustainable development globally (section 4.3). In the past the environment was considered to be a physical world of nature at risk. However with the realisation of continued environmental crisis, recent studies in evolution, environmental and social studies have broadened the view to include historical and life experiences that have shaped the environment, and people's contemporary daily actions. This has led to an increase in the range of approaches used by educators to suit various contexts. However features of the early approaches to environment and development education still predominate in schools, field centres and community development contexts (O'Donoghue & Ashwell 1994:14; Fien, 1993). These methods cannot be blamed as wrong but it is important to draw upon their strengths and reflect on their pitfalls. The methods used could be a result of a certain view of sustainable development (section 4.3). As Fien (1993:vi) writes, "the attitudes and skills of teachers are central in determining the mix of different knowledge, skill and affective objectives in environmental education programmes and the social and political interests they serve". It is therefore important to explore the 'wealth of teachers' that could translate into environmental sustainability actions. Fien (1993:23) regards teachers and students as active members of the society who through critical reflection and action in society may free themselves from the influences of consumerism, the media and other vested interests. The society and the school have a reciprocal relationship and

formal education is both shaped and responsive to the needs of the society and in turn helps to shape the society of which schools are a part (ibid).

This study was constructed as an exploratory exercise to search for signs and expressions of environmental education for sustainability for local wetlands as documented in sections 4.7 and 4.8. The teachers are expected to present open-ended opportunities during teaching to enable learners and members of the community to think critically (Jickling, 1999) and make decisions as well as take action to conserve their wetlands. The study investigated the social interactions between teachers within the school (with teachers, pupils, parents) and with the wider community and how these interactions are harnessed to promote conservation of the local wetlands. This was aimed at illuminating the teachers' alternative environmental and education frameworks, or even their development.

4.10 Conclusion

This chapter has been an exploration of the concept of wetland education within the main framework of environmental education for sustainability. The environment is considered to be a social construction and environmental crisis arises as a result of differing environmental interests. The teacher has a wealth of social capital on wetlands (chapter 7), which has accumulated over the years through symbolic interactionism (section 5.4). Any 'new' knowledge re-ignites linkages of related incidents, perspectives and disciplines that may not have been conceived as connected before (Solomon, 1994:1). In other words the new knowledge sharpens the teacher's perceptions giving him/her more clarity to confirm already accumulated predispositions.

Education is implicitly a purposeful undertaking and a teacher is obliged to have a reason to explain whatever he/she does. The teacher's interests could be manipulative to make the pupil think in a similar way as the society (technical interest), or could allow learners to encounter, experience and engage in dialogue with each other to deliberate on how to relate well with wetlands (practical interest). Some teachers may have an emancipatory agenda to question the ideological origins of existing beliefs, inequalities and power relations in wetland issues (emancipatory interest). Each of these positions requires the teacher to adopt particular

epistemological, ontological and pedagogical positions with regard to the view of the social role of the school, teaching, pupils, relationship between teacher and pupil, knowledge and knowing, learning methodologies, teacher control and use of spaces and resources. These aspects entail different approaches within the neoclassical, liberal progressive and socially critical educational frameworks.

Education for wetlands sustainability is guided by differing views of sustainable development that are a product of different environmental ideologies. In Kenya the definition of sustainable development is problematic because it is does not entail much about 'sustainable development' but about 'sustainable living'. With a big population living in extreme poverty (RoK, 2001b; MENR, 1994), the communities who live near wetlands are compelled to depend on them entirely for their survival. The teacher has to contend with local issues of survival as s/he negotiates and persuades the community to conserve wetlands. Environmental education becomes a struggle to win community support on the need to use wetlands wisely to ensure their sustained future survival.

Kenya is endowed with many wetland resources (chapter 2) that are threatened by human activities. Better strategies of ensuring sustainability of the few remaining wetlands as well as for restoring the degraded ones are needed. This calls for proactive strategies in environmental education that embrace utilization of the environment in a sustainable way. How teachers do this forms the basis of discussion in the chapters that follow.

CHAPTER 5: RESEARCH METHODOLOGY

5.1 Introduction

This study acknowledges the importance of proper orientation of the research activity within the major existing research traditions. Understanding of the philosophical issues in research helps in clarification of the research design which incorporates appropriate decisions about the research approach, methods, types of data, techniques and tools for gathering, analysis and interpretation of data (Easterby-Smith, *et al.* 1994:76). Appropriate philosophical positioning of the research activity helps the researcher to explore diverse choices thoroughly and creatively and this promotes harmony between research goals, process and outcomes. Embracing a particular research tradition is a political choice on the part of the researcher either in implicit or explicit terms (Fien & Hillcoat, 1996:27) in the sense that it involves making choices for particular research approaches (Greenall, 1987:3).

Research paradigms have a major impact in the direction of the research and the intended generation or clarification of theories. Patton (1990:37) argues that

> Paradigms are also normative, telling the practitioners what to do without the necessity of long existential or epistemological consideration. But it is this aspect of paradigms that constitutes both their strength and their weakness ---their strength in that it makes action possible, their weakness in that the very reason for action is hidden in the unquestioned assumption of the paradigm.

Knowledge of the diversity of ideas embodied in different paradigms helps to keep the researcher on track preventing him/her against 'being all over the place'. As the research problem unfolds, the researcher may be confronted by many ideas and choices in designing the research. According to Easterby-Smith *et al*. (1994), when a researcher is confronted with these diverse and sometimes conflicting choices and some sharing different philosophical positions, an awareness of the latter can help to ensure consistency and unity between different elements of the research design. This chapter explores the research design of this study in terms of the paradigm guiding the study and how it was interpreted in terms of research approaches, techniques and the

data gathering tools used. The chapter also provides a justification for choice of each aspect of the design and addresses issues of validity, ethics and reliability considerations in the research process.

5.2. Generation of theory

According to Glaser & Strauss (1967:32), theory development is an "ever developing entity and not a perfected product". This research laid emphasis on approaching the study in an open, fact-finding manner. The intention of this research was to have a dialogue with teachers and observe them using various tools (section 5.8) and then critically reflect on what they say and do in relation to the research aim and objectives (section 1.4). This is geared towards encouraging teachers to help generate a theory on what motivates and guides them in working for wetlands conservation within their local contexts as well as exploring any constraints they face. This approach concurs with what Glaser and Strauss (1967) labelled as 'grounded theory'. The theory development is based on teacher interactions with wetlands and with people within their locality and the meanings generated (section 5.4) as well as how they act to conserve the local wetlands (Chapter 8 and 9).

The theory generated will have its building blocks composed of the meanings and purposes of the teachers participating in this study. This study assumes that these teachers interact with wetlands and participate in the meaning making process with children and members of the wider community (section 1.4). The meanings generated are assumed to steer the teacher's participation in wetlands conservation locally. The theory generated is grounded on the teachers' socially constructed meanings (Fien, 1993; Di Chiro, 1987) of the various wetland aspects (section 2.3) and their relevance to the local context. Hence, the grounded theory is not a product of some preconceived idea, but 'emergent' from the indications identified from fieldwork data from the teachers. The theory development is based on careful search for signs that sound an alert that 'something is up', or looking for something odd from the data, or noting connections between events previously unsuspected or pattern that is gradually revealed over time (Woods, 1992:383).

Grounded theory is an open-ended process and there is room for emergence of unexpected and exciting insights. But it is a time consuming process and there is a risk of not realising anything new from the research data (Easterby-Smith *et al*. 1994). However, this is not a deterrent to the researcher since the process is equally as good as the product and there is a possibility of emergence of new ideas and questions as the study proceeds. The grounded theory in this case is more accommodative of any emergent issues that arise in the course of the study.

However the grounded theory approach postulated by Glaser & Strauss (1967) has been criticised by several authors. Some of the criticisms documented by Woods (1992) that could be of particular interest to this study include lack of clarity on distinction between theory and data categories, how to accommodate plausible explanations from elsewhere, how to remain non-committal until the grounded theory appears and when the process of theory development will end. In response to these criticisms, Glaser and Strauss (1967) acknowledged construction of theory on existing knowledge that already has claims to being well grounded. Woods (1986) refers to the well-grounded claim as an area where ethnographies have accumulated to the point of 'saturation' of concepts. Further studies would only involve movement to higher levels of analysis in which all related studies are examined and their interconnections explored. This wetlands education study despite being a pioneer piece of research in Kenya was grounded on current ideas on environmental crisis, environmental education processes and the ongoing debate on sustainable development (Chapter 4). The research was an engagement with the empirical social world of the teachers with regard to local wetlands. Theory generation was done through data coding, categorisation and 'comparative method' (Woods, 1992; Kirby & McKenna, 1989) as documented in chapters 6-9. This facilitated generation of concepts, categories and patterns (section 5.9.3) that are instrumental in generation of a theory grounded on these responses (Yin, 1994). The next section explains the process of the research that provided the data for generation of the grounded theory for this study.

5.3 Paradigmatic orientation

The intention of this study was to understand how teachers perceive wetlands and how they involve pupils and members of the local community in their conservation (section 1.4). To achieve this, the study was designed within the interpretive paradigm, a complex term that embraces many research approaches such as phenomenology, ethnography, naturalistic, constructivist, hermeneutic, symbolic interaction and micro-ethnographic approaches (Denzin & Lincoln, 1994; Easterby-Smith *et al.* 1994). These interpretive paradigm approaches however share a similar objective, to "understand and interpret social structures as well as the meanings people give to phenomena" (Cantrell, 1993:83). In this study a symbolic interactionism approach was used (section 5.4). This study considered teachers to be active agents who continually interact with wetlands as well as with other people, make their own meanings about wetlands and act upon these emergent meanings and symbols (section 1.4). This study is an exploration that seeks to understand the 'teacher's world' by means of reflecting on their experiences after interaction with wetlands, pupils, members of the community, contexts and challenges. Wetlands knowledge in this study is considered as "internally constructed" (Fien & Hillcoat, 1996:27) and as "the product of individual thinking and consciousness, constructed by individuals in unique settings through interaction with their worlds" (Mcfarlane, 2000:27).

Interpretivist research is sceptical about the existence of objective knowledge in the form of natural laws for social affairs and people's behaviour. Instead it advocates that knowledge is only generated through interaction with the people being researched to understand how they create their social reality through their personal interpretations and actions (Guba & Lincoln, 1989). This study upholds the view that in order to understand the teachers' actions in promoting wetlands conservation, the researcher should interact dialogically with them (Cantrell, 1993). This dialogic interaction with the teacher using various research tools (section 5.8) seeks to document and reflect on those subjective, speculative, metaphysical and experiential attributes towards wetlands by the individual teachers. This method goes deeper into understanding the individuals' feelings, values, attributes, experiences and cognitive constructions (Cohen & Manion, 1994; Guba & Lincoln, 1989).

The interpretive paradigm also acknowledges the role of context and underscores that human behaviour is "context specific" (Fien & Hillcoat, 1996:27). Context includes aspects of geographical location as well as issues of total interaction of human beings, their relationships, values, norms, and socio-political, economical, historical and ecological influences in their locality (Lotz & Janse Van Rensburg, 2000; Le Grange *et al.* 2000). Contexts are unique and people act differently to them. This makes the social reality of different people as diverse as the people and contexts involved. It is therefore impossible to describe human perceptions and actions through generalisations and universal theories since each person experiences the contextual situations differently. Reality is multi-layered and can be well explained within the specific context to which it applies. It is important to allow the person to speak about his/her contextual experiences since people act consciously and in a creative way depending on the challenges at hand (Grundy, 1987:19; Blumer, 1969).

However the interpretive paradigm has been criticised by various authors, especially those inclined towards the critical research orientation. Of special interest to this research are criticisms that the interpretive paradigm is more contemplative and does not initiate engagement with social affairs. It is criticised for its great emphasis on illumination and recommendation (Carr & Kemmis, 1986; Stevenson, 1993; Popskewitz, 1984) instead of acting on the findings to bring about change. The other criticism is on its focus on meanings people make of their experiences. According to Goodman (1992:121), social reality entails more than perceptions and meanings only. It should also consider social structures and social relationships, which the individuals may sometimes not be aware of and which could influence their perceptions and action.

This research holds these criticisms as real and as a major challenge. This study is an exploration of teacher perceptions and action within the local context to conserve wetlands. The social structures and relationships are expected to have some influence on meanings developed by teachers as well as their subsequent action. It is true that the research is designed in such a way so as not to interfere with the teacher's actions but to understand and recommend. However every effort was made to allow teachers to speak out about their perceptions, actions and limitations. The data analysis (Chapter 6-9) engaged in a process of reflection on the teacher responses and their categorisation so as to illuminate teacher engagements with the local challenges together

with the social structures and relationships. The study tried to identify these individual and socially based limitations and made recommendations on how teachers can be assisted in overcoming some of these constraints (section 10.8). The study went a step further into exploring the implications of the data from teachers to the aspects of sustainability of wetlands. Thus, although this study is more explorative in that teachers are engaged in a process of self-reflection on their perceptions, actions and future aspirations, the findings possibly provide crucial insights upon which future intervention measures for wetlands can be reflected on.

5.4 Symbolic interactionism

This a sociological theory developed by G.H. Mead (1934) but popularised by H. Blumer who coined the term 'symbolic interactionism' in 1937. According to Blumer, symbolic interactionism refers to:-

> ….a down to earth approach to the scientific study of human group life and human conduct. Its empirical world is the natural world of such group life and conduct. It lodges its problems in this natural world, conducts its studies in it and derives its interpretations from such naturalistic studies… Its methodological stance, accordingly, is that of direct examination of the empirical social world (Blumer, 1969:47).

Blumer (1969) identified three central principles of symbolic interactionism:-

- Human beings act toward things on basis of meanings that these things have for them.
- Attribution of meanings to objects through symbols is a continuous process.
- Meaning attribution is a product of social interaction in human society.

Symbols are signs, language, gestures or anything that conveys meaning (Woods, 1992:338). In this study symbols would mean the knowledge about wetlands and their resources held in language, gestures and meanings that people use during their daily interactions with each other. This view by Brumer considers human beings as social and capable of having an elaborate symbol-producing capacity, which enables them to produce a history, a culture and very intricate webs of communication (Plummer, 1991:x). These symbols attribute meaning to their daily encounters. These meanings are subjective (section 5.3) and to understand a situation as

experienced by another human being requires one to enquire, listen and capture the "'inmates' own accounts" (Cohen *et al.* 2000:26).

Wetlands are multiple resource systems with which societies have a long history of interaction (Barbier *et al.* 1997). There is dynamic interaction between people and wetlands and this causes wetlands to be imbued with diverse biophysically, economically, socially and politically related symbols (section 2.3). Woods (1992:338) comments on symbolic interactionism as follows,

> [a] person (is) a constructor, creator, coper, continually interacting with the world, adjusting means to ends, both influencing and being influenced by structures. As action builds up among groups of people, so cultures develop; however like the person, these are processes continually under change and construction and with which the person has a loose dialogical relationship… people do not respond to an objective reality or to how others perceive it but rather how they interpret it" (ibid:351)

This position concurs with the constructivist view of knowledge whereby the human being is regarded as actively generating knowledge rather than knowledge being transmitted to him/her (Solomon, 1994). According to O'Donoghue and Ashwell (1994:15), "learners are not empty vessels but active constructors of meaning who always bring their existing understanding into the learning situation." This implies that understanding results from interaction with the environment and not because meaning was transmitted to the teacher or the pupil. The teachers in this study are viewed as always being in contests with self (section 5.4.2) and contexts (section 5.3) and always developing new meanings and symbols for wetlands in every context they find themselves in. Giving meanings to objects (wetland aspects) through symbols is a continuous process, always emerging, in a state of flux and subject to change.

The attribution of the meaning making process to social interaction within the social context shifts the focus of interactionists from the individual or the society *per se* to focus more on the joint acts through which lives are organised and societies assembled. It is concerned with how people do things together (Plummer, 1991:xi). In this study symbolic interactionism focuses on the nature of interaction and the dynamic activities taking place between teachers, pupils and the members of the community towards conservation of wetlands. It doesn't place emphasis on the individual teacher, his/her personality characteristics and on how social structure or social

situation causes individual behaviour (Cohen *et al.* 2000:26). This research is interested with the joint shared meanings of the aspects of wetlands (section 2.3) as well as on teacher motivation and actions to conserve them.

5.4.1 Making of meanings in symbolic interactionism

Making of meanings in symbolic interactionism takes place through interaction and interpretation in the social context. During the interaction process people define and assign meanings, align and realign their actions in an effort to satisfy their interests. They also compare and contrast the meanings with those of others, adjust them if necessary and devise strategies (Woods, 1992:360). Meanings are created through interpretation of symbols made during interaction (Melia, 1997; Stryker, 1991). Stryker (1991) argues that people will organise their "…response [in an interactive situation], on the basis of what the gestures mean to [them]; the person who presents the gestures advances them as indications or signs of what [they are] planning to do as well as what [they] want the respondent to do and understand".

People interact with wetlands on many occasions for various interests. This interaction leads people to actively generate language, symbols and meanings to the various wetland resources depending on how they perceive them. People's continued interaction with wetlands has generated structured systems of interests and relationships that can be categorised into broad categories presented in this study as biophysical, economic, social and political aspects (section 2.3). These aspects represent different meanings and interests held by different groups of people after interaction with wetlands. Development of these meanings and interests could be as a result of personal encounter with wetlands (Section 5.4.2) or the meanings could be adapted from the society (Section 5.4.3). As Woods (1992:342) puts it,

> construction of meaning in interaction occurs by means of the ability to take the role of the other, and to interpret from that position. Thus people imaginatively share each other's responses. This sharing and mutual imbuing with meaning makes the behaviour truly social, as it would not be if it were mere response.

This means that wetland meanings constitute a complex interplay of social considerations. The current status of wetland meanings and interests represent a pool of diverse views of social

interests that have come up and have been nurtured by the members of the community. A view upheld by Woods (1992) is that the society, which comprises of diverse related meanings and values through which individuals interact and which set up some expectations of appropriate behaviour, exists before the individual. This suggests that the wetland meanings have existed in the society since time immemorial and generations have used these meanings as well as generated others over time. People could thus find themselves working within these 'social meanings' in which case their actions are not a mere response but an action informed by an already existing structure. This implies that instead of the individual 'making' up meanings of objects (wetlands) and contexts, they are already prescribed by the society and s/he just 'takes' them and internalises them as they are or modifies them to suit their situations. However symbolic interactionism contends that the individual teacher actively interprets the social wetland meanings and hence adapts (and does not adopt) wetland meanings to suit the need at hand. This makes the meaning making process dynamic and creates room for new meanings to emerge. In this study the teacher is viewed as being subjected to twofold phases of meaning making processes, both through individual interaction with wetlands and through adoption and adaptation of socially prescribed meanings.

5.4.2 Meaning making through individualized interactions.

The teacher interacts freely with wetlands resources and members of the community in the local context. S/he observes, utilises and talks about wetlands, exchanging meanings and symbols freely. The teacher has over time developed personal perceptions about wetlands. This inner experience interacts with any new experience and helps the teacher to make the appropriate judgements and motivates action. This concurs with what Woods (1992:341) describes as communicating with the 'self'. Rock (1979:146) argues that "the self is the lens through which the social world is refracted and a medium which realises the logic of social forms". The self is analogically like two people communicating with each other within a person. It is an inner experience of the individual and the self arising within the social process (Rock, 1979:146). The self implies that the idea of 'the other' is always present in one's life and one can never be alone with a self (Plummer, 1991:xi). Construction of meaning occurs by means of the ability to take the role of the other, put oneself in that position and interpret from there. Cohen *et al*. (2000:26)

argue that “one may try to put on a ‘performance’ to try and influence others definition of a situation”.

The teachers in this research have interacted with wetlands since birth as well as with the in-service training experiences. They are assumed to be in a position to make decisions depending on their interpretations of meanings and contexts they find themselves in (section 1.4). This study explored the teacher’s ‘communications with self’ with an aim of generating a greater understanding of wetland perceptions and conservation decisions and actions among individual teachers. The study involved teachers who had over 20 years interaction with wetlands from childhood (section 6.3). According to Woods (1992:342) “the internalisation of symbols and meaning patterns and stimulation of thought through language increases human being’s powers of reflectivity and the ability to see one’s self as an object, to make indications towards one’s self and to act as one might to others”. This implies that the teachers in this study have the ability and discretion to make decisions on what to do to influence wetlands conservation through the school and the community since they have internalised the various aspects of wetlands (section 2.3) and the local people after extended interaction with them (section 6.3).

5.4.3 Meaning making within the social structure

Social organisation acts as a framework inside which people construct their actions and this comes into existence before the individual (section 5.4.1). This study recognises that teachers work within a rigid school and community framework such as the centralised curriculum (RoK, 1992) and that they had little or no role in its construction. In Kenya curriculum is developed by the government (RoK, 1988) and schools have their own rigid systems agreed upon by the government and members of the community. The teacher has little control over the rigid systems that are imposed on him/her externally. Their roles within these frameworks are already predetermined and the teachers are coerced into fulfilling the requirements of these externally prescribed frameworks. Sometimes the social structure and organisation may act as a constraint to social action. Woods (1992:358) argues that teachers change according to contexts they find themselves in. He reiterates that the teacher adopts an ‘educationist’ context outside the class characterised by theoretically led definitions which change when the teacher goes to the

classroom. The teacher in this case portrays two contrasting pictures, one of high optimism outside the classroom and of pessimism when in the classroom. In the case of wetlands, the teacher's views may be full of optimism to take action to conserve wetlands but the social environment acts as a constraint. The actions that the teacher proposes theoretically are therefore not realised in the classroom. The change could be imposed by constraints such as class size, examination pressure and curriculum related problems and community imposed constraints (sections 8.3-8.15, 9.2-9.5 and 10.6-10.7).

In the social context the individual is also sensitive to generalised norms, values and believes what Mead refers to as the "generalised others" (Woods, 1992:345). According to Mead (1934, quoted by Woods, 1992:345) it is in the form of the generalised other that the social process influences the behaviour of the individuals. The community exercises control over the conduct of its individual members whereby the social process or community determines the individual's thinking. These social factors can have an impact on a teacher's subsequent action. In Africa where gender roles are more defined (Karembu, 2002; Ongile, 1999; Boserup, 1989), social issues may inhibit women from initiating action at community level especially where the presence and support of men is needed (section 9.4.8).

Woods (1992:367) underscores the need to monitor the developing self within the context of local factors such as at school (among pupils, other teachers and parents) and within the community (local leaders and general public and significant others) as well as wider concerns which the passage of time has brought into focus such as social class, religion and social, political and economic climate. Their influences can be visible in the acted out life and on the formulating self (Goodson, 1980; Berteaux, 1981). This study upholds the view that the teachers' perceptions and consequent actions concerning wetlands will be more of a proactive engagement with these deterministic social frameworks. Some teachers may be able to dissolve and overcome these social blockades and their experiences will serve to illuminate new insights for environmental education practices especially for wetlands conservation. It is important for programme developers and recipients to understand each other and to have similar interpretations of the local contexts. For wetlands conservation using teachers as facilitators of local change, it is important to seek their views so as to understand their symbolic interpretation of wetlands, their local

context and their actions. This would help to foster partnership and development of common objectives and strategies towards wetlands conservation.

5.4.4 Criticisms of symbolic interactionism

Symbolic interaction research focuses on a small-scale detailed understanding of everyday life of people's interactions with nature and society. It strives to understand the processes, relationships, group life, motivation and adaptations among other things (Woods, 1992:365). This study set out to explore the teachers' subjective perceptions, motivation and local action to conserve wetlands (section 1.4), which in a way depicts the locally adapted strategies used by the teachers. However, symbolic interactionism is criticised for placing too much emphasis on the empirical world, which makes the approach "idealist", "situationist" and "empiricist" and unable to theorise the larger system and to see how the 'everyday' is affected by it (Sharp & Green, 1975). But Woods (1992) defends symbolic interactionism arguing that it also explores wider issues of social structures and concerns. He argues that people respond to situations by constructing an autonomous response and not through correspondence with the wider society.

The teachers in this study gave their individualised views about wetlands, some of which may be contrary to those held by the wider society. This is important, especially for the grounded theory used in this study, because it could bring forth a modification of existing theories about people and wetlands by embracing a cultural production of theories of resistance (Aggleton, 1987). Theories of resistance in this case refer to those new constructions by the teachers which are used as building blocks of the developing grounded theory and which may portray some resistance or deviation from the traditional theories held by the society. This would be a major contribution to the body of knowledge about wetlands because as Woods (1992:366) comments, "by monitoring the attribution of meanings as well as how they sustain situations and processes, and how people define and redefine each other's and their own perspectives, patterns may be identified that exhibit both personal creativity and external constraint". This study is speculative and looks out for surprises from teachers' report on their creativity in their engagement with self and social predispositions towards local wetland resources conservation.

5.5 Research design: The case study survey

Research design is defined as "the logic that links data to be collected (and the conclusions to be drawn) to the initial questions of the study" (Yin, 1994:18). The wetlands training (section 1.3) acted as a window for gaining access to the research respondents. The research was designed along a case study survey approach (Yin, 1994). "Case study" has been defined differently by different authors (Bassey, 1999; Stake, 1995; Yin, 1989:13; Miles & Haberman, 1994; Wolcott, 1992; Merriam, 1998). For the purpose of this study a case study is considered as "an empirical enquiry that investigates a contemporary phenomenon [wetland education] within its real life context [school and community contexts] especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 1989:13). In this study, the wetlands are assumed to be relevant to teachers' daily life at school and within the community contexts and the boundaries of teachers' perceptions and action towards wetlands conservation in both contexts may not be clearly evident. The relevance of local wetlands to the teachers is assumed to motivate them to champion for their conservation using both school; and community contexts (section 1.4).

The research was an exploration of the 'constructed social world' of the teachers on conservation of local wetlands using the school and community contexts. The 'constructed social world' in this case refers to the "the minute to minute, day to day social life of individuals as they interact together, as they develop understandings and meanings, as they engage in 'just action' and respond to each other as they adapt to situations and as they move, resolve problems that arise through their circumstances" (Woods, 1992:348). The study is an exploration of the teacher's daily routine to conserve wetlands within both the school and community contexts. This qualitative study was interested in exploring the "operational links needing to be traced over time rather than mere frequencies or incidence" (Yin, 1994:6). The research was interested in looking for interpretations from teachers about their links to local wetlands, to local community (and pupils) and to sustainable development ideals.

The case study survey integrated both exploratory as well as reflective processes. According to Cohen *et al.* (2000:169),

> Surveys gather data at a particular point in time with the intention of describing the nature of existing conditions or identifying standards against which existing conditions can be compared, or determining the relationships that exist between specific events. Thus surveys may vary in their levels of complexity from those which provide simple frequency counts to those which present relational analysis.

Surveys are characterised by data collection techniques such as questionnaires (section 5.8.1), interviews (section 5.8.2) and standardised tests of various kinds. The standardised tests were not used in this study. According to Irwin (2002:3),

> Surveys are generally associated with a positivistic approach to research but need not necessarily be so. The entire approach as well as the analysis of data may, for example, fit comfortably within an interpretive approach or even a conflict approach.

In this study most questions in the questionnaire were open-ended (Appendix 5.5) to allow research respondents to express themselves more openly and to express personal prejudices or to emphasise particular issues. Survey was selected for this study because of its ability to accommodate research tools such as the questionnaires and interviews. The questionnaire enabled the gathering of data from many teachers across the country (Figure 2.1, section 6.2) with minimal costs in terms of finances, time and effort. The interviews allowed the teachers to speak out and clarify pertinent issues about their experiences within their local context (section 5.8.2).

The survey technique has a number of limitations. It is criticised for unreliability and inaccuracy due to its vulnerability to manipulation of responses by respondents (Cohen *et al.* 2000). The respondents and the researcher may also not perceive the questions the same way and this threatens validity. These issues are discussed in section 5.8. As Irwin (2002:3) puts it, “facts and opinions or realities and their interpretations are often difficult to unravel.” The questionnaire and the interviews provided vast data (chapter 6-9) that was not easy to interpret. Despite these weaknesses, surveys are still useful and strong in many ways (Morrison, 1993) since the respondents are given freedom to speak out on their experiences. The data is therefore not imposed as options for the respondents to choose from but presents a reflection of the respondents’ issues of interest.

5.5.1 The reflective process

According to Smyth (1989:36), reflection "entails a commitment to enquire into, and look differently at, the commonplace of life". In this study reflection was used to address questions that the researcher had regarding the link between theory and practice by teachers. Reflection involved inquiry into the data provided by teachers using the survey tools above through a confirmatory exploration of the local context of the teacher as well as his/her activities within it.

The purpose of the reflective techniques was to enrich, triangulate and confirm or reject the data provided by teachers using the questionnaire and interviews. The reflective approaches looked at both 'what happens' and 'what does not happen' in the whole research process (Patton, 1990:235). This involved use of judgement, common sense and experience to provide information that the researcher may have failed to request from the teachers (ibid). The reflective process also presented an opportunity for the researcher to explore the teachers' action as well as the artefacts on the ground that show evidence of engagement or non-engagement with wetland issues. The reflective process was used throughout the research process.

Some of the tools used in this study's reflective process include use of document analysis (section 5.8.5) of the schemes of work, lesson plans, primary school syllabuses, pupils' books and a popular Kenyan newspaper (*Daily Nation*) for the year 2000. It also involved classroom observation of the teacher in the process of teaching (section 5.8.4), and direct observation of activities done by teachers such as planting trees and water conservation activities. Some of the practical activities done by teachers were captured in photographs and these are presented in the appendices (Appendix 5.9) and also discussed in the text. Other tools used involve the use of field notes and a research journal (section 5.8.6).

The study was done in two phases and the later phase was dependent on the former. Phase 1 of the study (section 5.6.1.1) was conducted using questionnaires as the main research tool. Phase 2 (section 5.6.2.1) of the study involved visits to selected schools and the research tools were interviews, observations and document analysis.

5.5.2 Why the case study approach was selected

The case study approach is more flexible in terms of accommodating use of multiple techniques of gathering data such as surveys and reflective processes. Some of the sources of evidence include questionnaires, interviews, direct observation, participant observation, physical artefacts and document analysis (Yin, 1994:79), which allows for triangulation to enhance validity and reliability. It is also adaptable to contextual (section 5.3) changes (Anderson, 1990; Stenhouse, 1985) and the researcher could be assured of exploring deeper for 'thick descriptions' of wetlands phenomena. The reflective process was useful in enabling the researcher to be immersed deeper into the research process and contextual diversity as well as to harmonise data from various survey tools. Case study methods using multiple sources of evidence are rated more highly in terms of their overall quality than those studies relying on single sources of information (Yin *et al*. 1983; Patton, 1990) although it is more expensive in practice.

5.5.3 Criticisms of the case study approach

The case study approach has been criticised for several shortcomings. Some criticisms are that although interaction between the researcher and the respondents is guaranteed, there is lack of rigour and it is feared that the researcher is likely to admit biased views from respondents or from his own subjective judgements and this may influence his research direction and conclusions (Sudman and Bradburn, 1982). In this study this shortcoming was avoided by having many closely related questions (Appendix 5.5 and 5.7) to test for consistency of responses. The use of multiple methods also served to ensure that what teachers said in the questionnaires was verified using interviews and clarified using reflective processes during observations and document analysis. This boosted the validity (section 5.10.2) and reliability (5.10.3) of the data obtained from the teachers.

The case study approach provides very little room for scientific generalisation because there are very few respondents. The case study results are not generalisable and apply only to specific contexts with reference to the data. For this study the results are only relevant to the teachers who participated in this study and cannot be generalised. The findings are only generalisable to

theoretical propositions and not populations or universes (Yin, 1994:10). The population is not adequate to represent an 'acceptable generalisable sample' based on positivistic considerations (Guba & Lincoln, 1989). This limits the researcher's goal to expanding and generalising theories (analytic generalisation) and not to enumerating frequencies (statistical generalisation) (Yin, 1994:10).

According to Walker (1983: 156-165), case studies can be criticised for :-

- Being interventionist in the lives of others
- Providing a biased and distorted view of the way things are especially when different techniques are triangulated.
- Being conservative as they capture an instant in time and space, which can then be held against a moving changing reality.

Being interventionist in this research is likely, but would be considered valuable in the sense that it could revive feelings of concern for wetlands among the teachers. The study objectives traverse the holistic aspects of wetlands (section 2.3) and their relevance to teachers in schools and the community contexts. The teachers in this study are viewed to have developed meanings about wetlands through symbolic interactionism (section 5.4). When these issues are discussed inquisitively during the interviews, the teachers may "keep rethinking lines of thought that first came to light in the interview" (Walker, 1983:157) and this may give him/her hints of how to act later. The research may therefore reactivate wetlands concerns and actions towards their conservation.

In this research there is a possibility of deviations between 'respondent accounts' during the interview and 'researcher accounts' during the reflective process involving observation and document analysis. However, these deviations may not be considered a weakness in a case study approach but rather an enriching opportunity whereby the 'said' and the 'observed' are critically reflected upon to explore the future implications of teacher perceptions and actions on environmental education for wetlands sustainability. In essence this research undertaking is not neutral or value free (Lather, 1986b; Smyth, 1987) as it seeks to find out the 'secret untold stories' of teachers towards wetlands based on the value they attach to them.

The criticism of case studies being conservative is possibly valid in this study. Symbolic interactionism portrays meanings for wetlands as always emerging depending on people's change of interests and interactions (section 5.4). This qualitative research study presents the grounded theory of the teachers based on data captured during the specific time and context when the research was done (section 5.7). The context may have changed as well as the meanings held by the teachers who participated in this study (section 5.10.3). Some of the findings by this study may hence be conservative and 'outdated'.

5.6 Sampling for research respondents

This was done in two phases as described below.

5.6.1 Sampling for research respondents in phase one of the study.

In 1999 a total of 242 teachers participated in nine teachers' workshops on wetlands conservation held in various regions in Kenya (Ndaruga, 1999) and they were distributed as shown in Table 5.1. The discrepancies in teacher distribution per workshop venue made sampling for the intended research quite a difficult task for the researcher. Non-probability sampling design (Sanders & Pihey, 1983:119; Cohen & Manion, 1994:88) was used to select the appropriate research respondents to participate in the study. The aim of using this design was to gather views from teachers representing wider regional contexts (Figure 2.1). Within this design various sampling strategies were used to select 81 teachers who participated in phase one of the study. Both context[10] (urban and rural) and gender (male and female) categories of teachers were considered. Sampling for female teachers was purposive since they were fewer (Table 5.1).

The rural male teachers were numerous especially in eight workshops (Table 5.1) and a quota sampling technique was used (Cohen *et al.* 2000:103). Sampling was done on a per workshop basis to give every workshop venue, which represented different administrative provinces, equal opportunities since the workshops were held in different regional contexts (Figure 2.1). This is shown in Table 5.2.

[10] See section 6.1

Table 5.1. Teachers who participated in the wetlands training programme in 1999

Workshop venue (Figure 2.1)	Catchment (Figure 2.1)	Total number of teachers before sampling				Total	Comments (section 6.2)
		Urban		Rural			
		Male	Female	Male	Female		
Lamu	Coast province	0	0	19	5	24	No urban teachers attended
Kisumu	Nyanza and Western Provinces	14	1	14	0	29	No rural female teachers Only one urban female teacher attended
Narok	Rift Valley province	1	0	18	2	21	No urban female teachers attended
Kitale	Rift Valley province	7	3	20	3	33	Both rural and urban teachers attended
Kabarnet	Rift Valley province	5	0	20	5	30	No female urban teachers attended
Nairobi	Central province	8	1	21	3	33	Only one urban female teacher attended
Meru	Eastern province	9	2	11	8	30	Both urban and rural teachers attended
Naivasha	Nairobi city and its environs.	9	11	1	0	21	Had no female rural teachers, only one rural male, and many urban female teachers
Mombasa	Coast province	10	5	6	0	21	Had no female rural teachers
Total	Seven provinces	63	23	130	26	242	
Total		86		156		242	

Prioritisation in sampling among the workshop venues was justified by the contextual reality in Kenya where some areas are considered urban and others rural (RoK, 2001a) and each has unique environmental problems (UNEP, 1987) (also refer to section 6.2). This was later confirmed by the teacher's responses to the questionnaire and researcher's personal judgements during the school visits (section 5.7). The male and female categories were deemed necessary since research in other fields have shown disparities in access and use of resources between gender categories (Karembu, 2002; Ongile, 1999; Boserup, 1989). It was suspected that there could be a possibility of contextual and gender differences influencing teacher perceptions, use and practices to conserve wetlands in this study.

Table 5.2: Teachers sampled for the research per workshop venue

Workshop venue	Sampled teachers				Total
	Urban Group		Rural Group		
	Male	Female	Male	Female	
Lamu	0	0	2	4	6
Kisumu	3	1	3	0	7
Narok	1	0	2	2	5
Kitale	3	3	2	3	11
Kabarnet	3	0	2	4	9
Nairobi	3	1	3	3	10
Meru	3	2	3	4	12
Naivasha	3	10	1	0	14
Mombasa	3	2	2	0	7
Total	22	19	20	20	81
Total for urban and rural categories	41		40		81

5.6.1.1 Negotiating access to the teacher for phase one of the study

The postal questionnaire was selected as the main research tool since the aim of the research was to reach many teachers within a short time with minimum costs in terms of time and finances (Cohen *et al*. 2000:129). The questionnaire questions and access negotiation were initially piloted using ten teachers who were participants in the wetland in-service training course in 1999. These teachers suggested appropriate minor reviews (Cohen *et al*. 2000:260). The reviewed questionnaires were sent as one parcel to the head teachers of the 81 schools where teachers came from. The parcel sent to the head teacher contained the following:-

- A letter to the head teacher introducing the questionnaire and requesting him/her to forward the questionnaire to the teacher concerned (Appendix 5.2).
- A letter to the teacher introducing him/her to the questionnaire and with instructions on what to do (Appendix 5.3).

- A questionnaire receipt confirmation letter that the teacher was required to fill in with his/her location details and to post to the researcher (Appendix 5.4).
- The questionnaire to be filled in by the teacher concerned (Appendix 5.5).
- Two self-addressed and stamped envelopes for postage of the questionnaire receipt confirmation letter and the other one for replying the completed questionnaire.

The choice of this access approach to the teachers was based on the assumptions that:-

- Every school had a head teacher and this could ensure that somebody is responsible for sending back the questionnaire to the researcher in case the teacher had transferred from that school.
- Through involving the head teacher, the researcher was more confident of accessing the teacher.
- The head teacher being the main administrator should be aware of all that happens in the school.
- The researcher needed to develop rapport early in preparation for school visits in phase two of the study (section 5.6.2.1).

A summary of the teacher participation in phase one of this research is shown in Table 5.3. This study received 63 responses of which 54 were filled questionnaires. Nine of the 63 schools reported that their teachers who attended the in-service training had transferred to other schools or had retired (refer to Figure 5.1). To get the 54 completed questionnaires, the researcher had sent some teachers three reminder letters (Cohen *et al*. 2000:263) to respond back as shown in Appendix 5.1.

Table 5.3: Summary of research participants

Details	Urban		Rural		Total
	Male	Female	Male	Female	
Total population	63	23	130	26	242
Research participants	22	19	20	20	81
Questionnaires returns	11	11	19	13	54
Percentage returns per group	50	58	95	65	67
Percentage returns for rural and urban groups	54		80		67

Table 5.3 shows that 80% of the rural teachers and 54% of the urban teachers responded to the questionnaires. It is not easy to explain the differences in percentage responses, but it could be as a result of teachers' attachment and use of the local wetlands. The rural teachers use wetland resources more than urban teachers (section 7.5) and they may feel obliged to give more views about them. Urban wetlands are usually polluted and they may not be very useful to the teachers and this could have made them to ignore responding to the questionnaires since they may have had fewer issues to report.

5.6.2 Sampling of teachers for phase two of the study

Thirty nine teachers participated in phase two of the study - ten from the questionnaire group and twenty nine from the same schools but not participants in phase one. (section 5.8.2). The sampling was based on the teachers' responses to the questionnaire (section 5.6.1.1). This phase was motivated by interest in understanding teacher perceptions and action from two information rich cases (but not extreme cases) of the continuum of responses. The one extreme of the continuum consisted of teachers who reported having done many activities at school and the community and the other extreme consisted of those who reported few activities. This research was interested in getting rich information from participants from both ends. From the questionnaire data, the key factors (section 5.9.3) that guided sampling and further research in the second phase included the context of teachers (urban or rural), gender (male or female), interactions in the formal curricular and the non-formal (extracurricular and community) contexts and wetland related activities in each context.

Eight teachers were initially selected to represent four categories in the rural and urban groups of both gender respectively. These teachers were selected on the basis of being either relatively active or inactive in water and wetland conservation activities as shown in Table 5.4 (also refer to Table 6.1). Non-probability sampling design was used. The sampling technique used was purposive and concurs with what Patton (1990:171) refers to as "intensity sampling technique" where cases are selected in terms of being rich in information that manifests the phenomenon of interest intensely (but not extremely). Patton (1990:171) refers to intensity sampling technique as

selection of, for instance, above average or below average, good and poor teachers and not selecting the exceptional cases.

Table 5.4 shows that two more urban teachers were subsequently added and this was done for various reasons. During sampling it was assumed that Lake Victoria, which is the largest lake in Africa, could have an influence on teacher perceptions on wetlands and perhaps it's being used in teaching since it is mentioned several times in the syllabus (RoK, 1992). One female teacher whose school was in close proximity to the lake (15 minutes walk) but who appeared to have done very little in school and within the community was selected. The second teacher was selected on the basis of having been active within Nairobi city. This study felt it necessary to explore how the teacher (from Nairobi) views urban wetlands and how she contributes towards their conservation. Incidentally, the most active teacher within Nairobi turned out to be a female also, causing the female teachers to be more than males during the interview phase.

Table 5.4: Teachers sampled for phase two of the study.

Nature of the teacher	Urban		Rural	
	Male	Female	Male	Female
Relatively active	1	2	1	1
Relatively inactive	1	2	1	1

5.6.2.1 Negotiating access to teachers during phase two of the study

The researcher wrote letters to the research respondents explaining the need to visit the school and the date for the interview. The letters were sent through the head teachers (Appendix 5.6) just like in phase one (section 5.6.1.1). The second phase involved interviews, direct observation, participant observation and document analysis of the schemes of work and lesson plans used by teachers. The researcher also made extensive use of field notes and the research journal (section 5.8).

5.7 Data collection

Data collection was done in two phases. Phase one of the study used postal questionnaires and was conducted between September 2000 and June 2001. Ten pilot questionnaires were used to validate the questionnaire questions and access negotiation to the teachers (section 5.6.1.1). The teachers who participated in the pilot study (Sanders & Pinhey, 1983) were also selected from the larger group of 242 teachers who participated in the wetlands workshops. The pilot study enabled some minor revisions of the questionnaire to be made. The questionnaires were then posted to 81 teachers (Table 5.2). However, despite sending some teachers three reminder letters to return the questionnaires, only 54 responded them (Table 5.3).

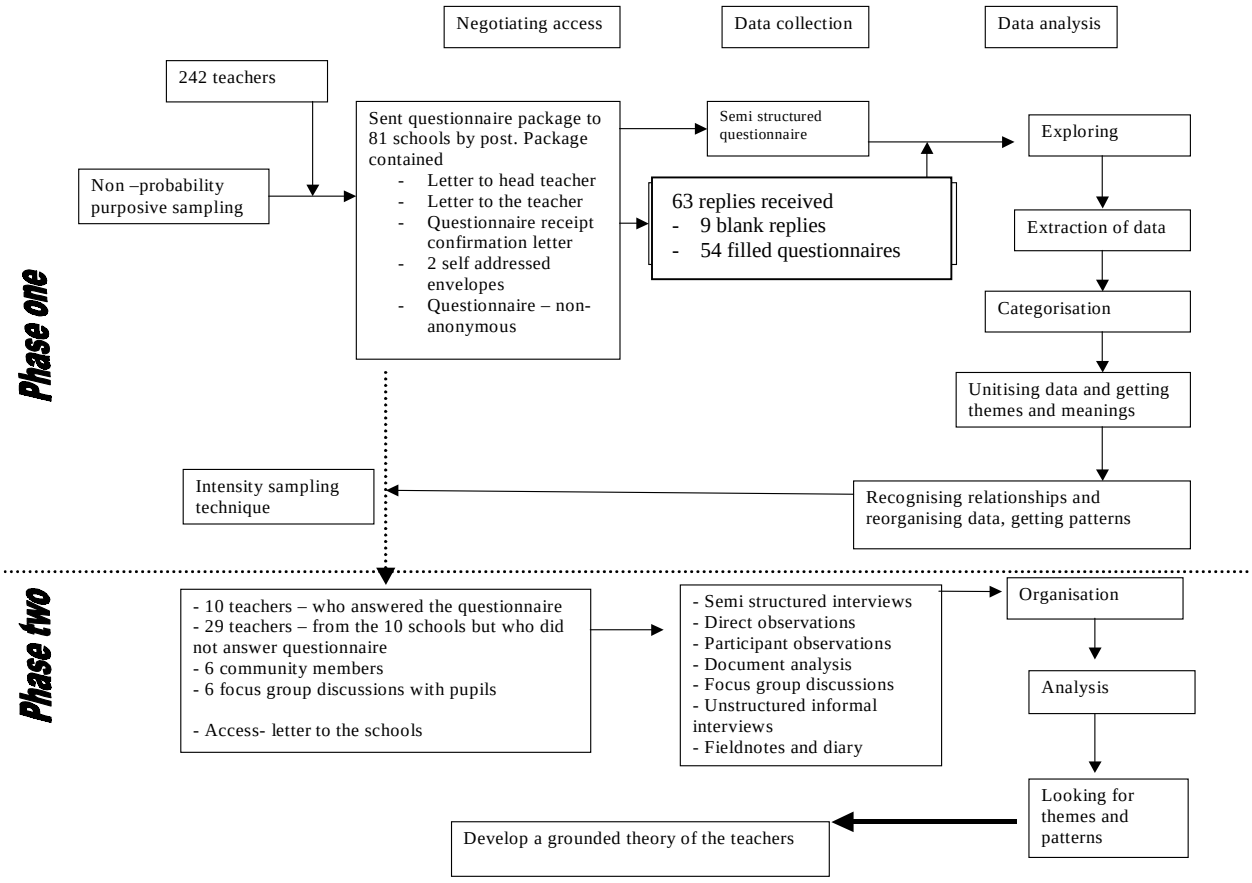


Figure 5.1 The research process

Phase two was conducted between July 2001 and February 2002. It involved ten teachers (Table 5.4, 6.1). A pilot study involving three schools was done prior to the real study and these involved teachers who responded to the questionnaire in phase one of the study. Reflection on the pilot study process as well as the findings enabled minor adjustments to be made.

Figure 5.1 shows the summary of the research process including the data collection tools that were used in both phases of the study. The details about the research tools used are discussed in section 5.8.

5.8 Research tools

A number of research tools were used as shown in Figure 5.1.

5.8.1 Questionnaires

Questionnaires can be used for both quantitative and qualitative data collection. In this study, the questionnaire was considered appropriate since the researcher wanted "to see what information and what kind of information is readily/easily available… (about wetlands, which can enable the researcher) …to focus on specific areas for more detailed information" (Irwin, 2002:5) using a variety of other methods (Figure 5.1).

Postal questionnaires were favoured because of various reasons such as

- the respondents were literate
- the researcher had their addresses
- it was cost effective in terms of time and distance (finances) and thus appropriate for reaching many teachers with reduced efforts since this was a 'national study'.

The questionnaire was not anonymous since the researcher considered the respondents as participants in a training programme which they would feel proud to contribute towards improving (section 1.4). Both open-ended and closed-ended questions were used. According to Irwin (2002:9), "open-ended questions are associated with qualitative data but this is not

exclusively so." The closed-ended questions were nominal, ordinal (ranking), interval, matrix and contingency questions (ibid). Some questions made use of an agreement (Likert) scale (Cohen *et al.* 2000; Sanders & Pinhey, 1983).

The questionnaire design used a progressive questioning approach whereby each question led to further in-depth probing in the proceeding questions (Appendix 5.5). It also made use of validating questions that sought similar answers using different questions and this increased and tested reliability and validity of the responses (Irwin, 2002:17).

The use of questionnaires had some problems. Some pertinent ones experienced in this study were:-

- It was not possible to get 100% returns. This study only managed 67% questionnaire returns.
- There was no room for further probing of responses.
- Some questions were not answered as shown in the data presentation (chapter 6-9) and especially those concerning community, clubs and also use of environmental days.
- The researcher was not in direct contact to clarify any misconceptions or to allow teachers answering the questionnaire to ask their own questions. This problem made the researcher consider one question as invalid (question 9 in Appendix 5.5) and was not used at all in this analysis.

Since the questionnaire was a major source of data, this implies that the researcher did not get as much data as earlier anticipated. However, the sample was still large enough to warrant making significant conclusions. The use of interview and observation in phase two of the study (section 5.6.2.1) helped in addressing some of the limitations cited above.

5.8.2 Interviews

Semi-structured interviews were conducted for ten teachers who were selected on the basis of their responses to the questionnaire using an intensity sampling technique (section 5.6.2, Table 6.1). Semi-structured interviews were preferred because of their ability to guide the researcher on

questioning sequence using pre-prepared questions (Appendix 5.7) but also allowing for flexibility to alter sequence and wording as well as to probe further (Patton, 1990: 287-290). This method ensured detailed discussion of issues and also gave room for revisiting the issues as the interview progressed to seek more clarity, validation and to explore relationship between themes.

Unstructured informal interviews were also carried out with the ten teachers during the observation session in class and outdoors (section 5.8.3 and 5.8.4). This session was intended to allow the teachers to clarify their actions and why they did them. According to Cohen *et al*. (2000: 271), questions in informal interviews emerge from the immediate context and are asked in a natural course of things with no predetermination of question topics or wording. This is, however, criticised for being less systematic and comprehensive, especially if some questions fail to appear naturally. In this study, the informal interviews were considered as important opportunities for the researcher to understand the surrounding areas of the school and to engage the teacher in demonstrating his/her passion for the local community, wetland resources as well as the remedial measures to conserve wetlands. The informal sessions did not have a rigid framework but were more inclined towards reflection on what was observed from and said by the teacher.

At each school, three other senior teachers (except for one school where only two teachers were involved) were interviewed to determine whether their interactions with the teacher who participated in the wetland training influenced their perceptions and practice of championing for conservation of local wetlands (Table 6.1). The interview schedules for these 29 teachers were shorter and the questions were also semi structured (section 7 of Appendix 5.7). The inclusion of the 29 teachers was an effort by this research to examine interactions and sharing of information, skills and resource materials among teachers in the same school (section 8.4).

Focus group interviews were also done with children who belonged to different clubs from six schools (the other 4 schools did not have clubs). These interviews were intended to explore what pupils do in their clubs and especially activities related to wetlands (section 8 of Appendix 5.7). The emphasis of the researcher was to explore whether pupils understood the relevance of their activities to the local wetlands. Patton (1990:335) accentuates focus group interviews due to their

unique feature of allowing “participants to hear each other’s responses and to make additional comments beyond their own original responses as they hear what others say”. This may enhance gathering of rich and highly refined data since every answer builds on the former making it more precise. Some of their responses are provided in chapter 8-9.

Interviews are, however, criticised for problems of bias, poor recall by interviewees and poor or inaccurate articulation and thus there is need to corroborate the interview data with information from other sources (Yin, 1994:85). The data from the interviews in this study was triangulated with that obtained from questionnaires, observation and document analysis to enhance reliability and validity. During the interview, a tape recorder was used after seeking approval from the interviewees (section 5.10.1).

The interviews were successful and provided enormous text of data for the researcher which had to be sorted out to get meaningful data. Some of the problems identified with interviews include some teachers contradicting themselves. For instance, Plate F in Appendix 5.9 shows people washing clothes in the river while the teacher had reported absence of this practice during the interview (section 9.4.2). It is therefore hard to unearth the truth unless one uses multiple methods and triangulation. However, as mentioned in section 8.5, the interviews gave more detailed data some of which had not been captured in the questionnaire.

5.8.3 Direct observation

The teacher was requested to take the researcher around the school to show the activities s/he had initiated since the wetlands workshop. When doing this, the researcher was keen to probe further (informal conversational interview) on the teacher’s perceptions of relevance of the activity to the local wetlands (section 5.8.2). Direct observations help to add new dimensions to the phenomenon being studied by providing additional information especially during the reflective process (section 5.5.1). The field activities done by teachers were photographed and this help to depict important case characteristics to outside observers (Dabbs, 1982). These photos are referred to in later sections of the thesis (Appendix 5.9). The researcher also took some field notes during the observations and later updated the research diary (section 5.8.6).

The direct observations were successful and they revealed some information that was contradictory to the interviews as discussed above (refer to section 5.8.2, plate F in Appendix 5.9). The direct observations assisted the researcher in probing further for more responses from the teachers.

5.8.4 Participant observation

The researcher participated in the lessons conducted by the teachers and later developed a critique of the teaching and learning process (Appendix 3.11). The interest in this aspect was to explore learner involvement in learning in the process of dialogue, encounter and reflection (O'Donoghue & Janse Van Rensburg, 1995). The purpose of participant observation was to "perceive reality from the viewpoint of someone 'inside' the case study rather than 'external' to it" (Yin, 1994:88).

Yin (1994) proposes some arguments against participant observation. He argues that the participant observer has problems of bias where the investigator assumes positions or advocacy roles contrary to the interests of good scientific practices or even become a supporter of the group organisation being studied. Some participation may leave the researcher with less time to take notes or be analytical about events from different perspectives (Yin, 1994:89). In this study the time set for participant observation was only 40 minutes. There were no opportunities presented by the teacher for the researcher to participate actively since the learners were only minimally involved in practical learning activities (Appendix 3.11). The level of participation of the researcher was mainly limited to writing notes just like the other pupils and writing down suggestions of what the teacher could have done. At the end of the lesson, there was further probing of the teachers on areas that needed further clarification especially on what teachers do when teaching a wetland related topic. The observation also suffered the limitations that the teachers had no direct link with wetlands. The results of the observation were only implied as relevant to wetlands.

5.8.5 Document analysis

Document analysis was done on schemes of work and lesson plans (Appendix 3.12) used by the teachers, the primary school syllabus (Appendix 3.1-3.10) and some books used during teaching. This activity was driven by the motivation to explore the kinds of activities slotted in to facilitate learning during teaching. Teachers proposed the books for document analysis during the interview visits. Other documents analysed in this study include a popular Kenyan newspaper (*Daily Nation*).

Document analysis assisted in clarification and validation of data obtained in the survey and the reflective processes of the research (section 5.5.1). The main purpose of looking at the documents was to corroborate and augment evidence derived from other sources. While doing the analysis the researcher was aware that the schemes of work and lesson plans were "written for some specific purpose and some specific audience other than those of the case study being done. In this sense, the case study investigator is a vicarious observer, and the documentary evidence reflects a communication among other parties attempting to achieve some other objectives" (Yin, 1994:82). The teachers could have written these documents for various reasons such as to please the school administration or as a requirement by the Ministry of Education (RoK, 1992). This study thought it was useful to examine whether the wetland agenda was incorporated, albeit in minimal proportions within the day-to-day activities of teachers at school.

The documents were evaluated using external and internal criticism (Cohen & Manion, 1994: 52-53). With regard to external criticism, the researcher looked for authenticity and genuineness of data, that is, the document (or other source) itself rather than the statement it contains (Cohen *et al*. 2000:162). In this case it involved looking at the teacher's familiarity with the schemes of work and lesson plans to establish whether the teacher concerned wrote them by him/herself.

Internal criticism involves analysis of accuracy and worth of data contained therein and is concerned with credibility of the author of the documents, their intent of writing the documents and whether they record the success or shortcomings of their programmes (Cohen *et al*. 2000:162-163). According to Wagiet (1997:135), internal criticism entails analysis of texts,

discourse and contexts. For this study this involves analysis of how detailed and comprehensive the description of the learning activities is and how this depicts professionalism of the author.

For the syllabus and books used by teachers, internal criticism was done and this looked at the objectives related to environmental education which advise teachers on the goals of teaching. It also assessed the activities prescribed for the pupils during the learning process, which may act as a guide to teachers in selecting pupil involvement during learning. The data obtained from document analysis enhanced greater understanding of the teacher and his/her practice. For the newspapers, internal criticism looked at whether the special (environmental) days were advertised at all and whether there were special prescriptions for schools (section 9.3).

5.8.6 Field notes and researcher's diary

This involved taking notes on what was happening throughout the research process (Clandinin & Connelly, 1994: 421; McNiff, 1988:77). According to Patton (1990: 241) field notes contain the observer's own feelings, reactions to the experience and reflections about the personal meaning and significance to the observer of what has occurred. They contain the observer's insights, interpretations, initial analysis and working hypotheses about what happens in the setting.

5.9 Data analysis

The gathering of data and its analysis proceeded simultaneously as is typical of qualitative research. The collection and analysis of the data obtained go hand in hand as theories and themes emerge during the study (Cohen *et al*. 2000; Patton, 1990). In this study data analysis was done in several stages at different times.

5.9.1 Initial analysis and organization of data

The questionnaire data was analyzed before engagement in the interviews. The questionnaires provided a lot of qualitative data from the many closed and open-ended questions (section 5.8.1). The first task involved data reduction (Miles & Huberman, 1984:21) and this entailed "a process

of inductive reasoning, thinking and theorising" (Taylor & Bogdan, 1998: 140). This involved initial exploration through all the questionnaires to establish the questions that teachers gave valid answers to as well as those with invalid answers or not answered at all. This was an analysis at a superficial level without giving the answers much thought. Percentages were calculated on the number of questions considered to have valid answers and the results revealed that these ranged from 61% to 92%, which was considered a fair rating. This superficial assessment suggested that teachers enthusiastically responded to most of the questions and that further analysis could go ahead with more confidence. The teachers were coded by giving them numbers and letters to denote them as urban, rural, male, female and their age. A code refers to a symbol applied to a group of words to classify or categorise them (Robinson, 1993:385). This was followed by extraction of data from each question for all the teachers.

For the interview data, the analysis was an ongoing process during data collection and entailed

- Transcribing the interviews
- Recording direct quotes used by the interviewee to specific questions during interview or informal discussions.
- Noting additional comments and responses to specific questions
- Taking field notes on emerging issues during the case study.
- Looking for relationships between the findings of different methods of the case study and noting consistencies and inconsistencies.
- Compiling all responses to specific questions for all the schools to make an initial analysis file.
- Responses were compared for different teachers per site to a specific question (intra-site comparisons) and also from different schools (inter-site comparisons).
- Teachers were given codes and this assisted in organising the data as well as in initial data conceptualisation (Burgess *et al*. 1994).

While doing the initial analysis and organisation of data, caution was taken to consider validity of the responses in relation to the questions asked (Section 5.10.2).

5.9.2 Searching for meaning from the data

This step also involved a higher level thinking and theorising to look for insights from the data. Glaser & Strauss (1967:251) contend that "the root causes of all significant theorising are the sensitive insights of the observer himself." This step started after all the data was collected. Patterns, in this study referring to "a relationship between categories" (Schumacher & McMillan, 1993:495) had started to show up in the data and the researcher adopted a coding system for the various emerging categories. The data was categorised into concepts and propositions (Taylor & Bogdan, 1998: 145).

The coding was done from the data obtained for each question documented in the initial analysis file. The researcher used different colours, patterns and symbols to identify the different emerging categories, sub-categories and properties (Taylor & Bogdan, 1998; Mason, 1994; Hughes, 1994). The "category" in this case refers to a conceptual element of a theory while "properties" refer to an element of a category (Glaser & Strauss, 1967:36). A concept is identifiable from the data in the form of a word/phrase/idea/theme/typologies. These served as labels for further analysis of data.

The data was carefully scrutinised, sorted and regrouped where necessary to develop new categories. Comparisons were done for the data between teachers from the different schools (inter-site comparisons). This constant comparative method enabled the identification of similarities and differences, interconnections and interrelationships in the data between the various categories (Glaser & Strauss, 1967). Identification of categories is a form of data reduction (Miles & Huberman, 1984:21) and is important because it helps in management of data, which in this study was enormous. Direct quotations from the interviewees were also incorporated in the text. At the end of this analysis, data was grouped in "categories analysis files".

5.9.3 Search for patterns and key factors

The categories analysis files were analytically scrutinised further and regrouping and rearrangement of categories was done. The aim was to identify links and relationships between different pieces of data. This resulted in generation of bigger "clusters" that link the data together (Wagiet, 1997:135). These key factors are possibly the ones that exert a major influence on the teacher in integration of wetland issues in school and the local context. Patterns also began to emerge which bound a group of categories together. The patterns were related to the original goal of the study.

For the overall data, the key factors are discussed in greater detail in the proceeding chapters in the form of narrative texts, matrices and charts (Miles & Huberman, 1984:21). Narrative texts can be very long and that's why other methods of data presentation are necessary. The use of various methods of data display is to provide the relevant data in a way that can easily allow drawing of conclusions. According to Robinson (1993: 391), the main function of display of data is "to collect data in one place so that you can see more readily what they are telling you".

5.10 Ethics, validity and reliability

This study also paid attention to issues of ethics, validity and reliability within the entire research process (Figure 5.1).

5.10.1 Ethical issues

All research is value bounded (Denzin, 1970; Lather, 1986a). Qualitative research involves interaction with people, which results in construction and production of knowledge that represents them. This illuminative strength of research underscores the need for researchers to be responsible. Bassey (1999) contends the need for researchers to consider three main ethical values, that is, respect for persons, truth, and democratic values. Ethical considerations should also guide researchers during interpretation and representation of research results (Cameron *et al*.

1992; Atkinson, 1990) and also consider the personal dimension ethics of modesty, trustworthiness and responsibility (Eisner & Peshkin, 1990; Morphet, 1994).

In this research ethics were upheld through

- clarification of research intents to the respondents (Appendix 5.2 and 5.3).
- involving head teachers in forwarding research information to the teachers (Appendix 5.2).
- informing interviewees in advance about the dates for the interviews (Appendix 5.6).
- seeking for permission to tape record interviews as well as to conduct participant observations (section 5.8.2).
- during gathering and analysis of data, truthfulness and validity were considered so as to report teachers' responses as accurately as possible (Cameron *et al*. 1992:11; Atkinson, 1990: 175-180).
- acknowledging research respondents after the survey and case study research phases (Appendix 5.8).

As Murray (2001: 152) writes, "it is through taking responsibility for one's subjectivity that one avoids subjectivism, and ethics cannot be separated from quality of research".

5.10.2 Validity

Validity involves being truthful and is interpreted as "the extent to which an account accurately represents the social phenomena to which it refers" (Hammersley, 1990:57). It acts as the bridge between a construct and the data. Qualitative research is broadly interested in authenticity, which refers to "giving fair, honest and balanced account of social life from the viewpoint of someone who lives it everyday" (Neumann, 2000:171). It is difficult to ascertain attainment of validity in qualitative research as this requires a subjective judgement upon the researcher usually referred to as face validity (ibid). Neumann points the need for the researcher to consider looking for 'internal', 'external' and 'statistical' validity (ibid, 172) as early as the research design stage and to uphold this during the entire research process.

Use of triangulation is cited as an essential tool to test for validity (Yin, 1994; Cantrell, 1993). Patton (1987) discusses four types of triangulation: data, investigator, theory and methodological triangulation. This study used a variety of data collecting tools (section 5.8) that generated different types of data referring to various aspects of wetlands education. The data from these multiple sources was triangulated to enrich each other as well as to check for consistencies and inconsistencies. However, triangulation is criticised for not displaying a coherent and cohesive picture of social reality. According to Arksey & Knight (1999:24), " it implies that there is only one true social reality, and researchers simply have to decide on the most appropriate methods to measure or describe it". Other people have criticised triangulation arguing that it is only said and not done. For instance, Van der Merscht (2002) argues that researchers often just present their data from various sources and there is no real triangulation

This study considered validation in the research design and throughout the research process. The validity aspects are highlighted in appropriate sections throughout the thesis.

5.10.3 Reliability

Reliability means dependability or the consistency with which research results are likely to be replicated based on same data source and theory (Cantrell, 1993). Reliability in non-positivist research is difficult to determine since it involves the study of processes that are not stable over time. In qualitative research social life is regarded as fluid and not static. The subject matter and the researcher's relationship present a negotiated and evolving process that is metaphorically like a living organism that naturally matures. A view held by Neumann (2000:170-171) is that

> …different researchers or researchers using alternative measures will get distinctive results. This is because they see data collection as an interactive process in which particular researchers operate in an evolving setting and the setting's context dictates using a unique mix of measures that cannot be repeated. The diverse measures and interactions with different researchers are beneficial because they can illuminate different facets or dimensions of a subject matter.

Since this study is qualitative, reliability cannot be assured because the situations are expected to change as aforementioned. However, the study used various methods of collecting data (section

5.8) to enhance validity and reliability. The analysis of data was also done in steps (section 5.9), each comprising of conglomeration of data from these multi sources, which were critically reflected upon. This enhanced the researcher's efforts to ensure validity throughout the whole research process (Figure 5.1). This study assumed that with consideration of validity, reliability was also ensured. Consequently, original research materials such as audiocassettes, photos, filled questionnaires, transcribed interview scripts and field notes are available to show the entire research process and findings.

5.11 Conclusion

This chapter presents an exploration on how the study was conceived, designed and implemented. This was a case study survey aimed at understanding how teachers perceive wetlands after interacting with them physically and symbolically. It also explored how teachers' perceptions and actions influence and are influenced by context. In doing this, the researcher assumes that the teachers had interacted with wetlands since childhood. The study was done in two phases, each using different tools. Various survey tools were used such as questionnaires and interviews. The survey tools were reinforced with reflective processes using document analysis, field notes, observation critiques as well as reflection of the whole research process and the data. Analysis of data occurred in stages. The results of the study are presented in the proceeding chapters. A review of the research process and tools used is presented in chapter ten.

CHAPTER 6 – TEACHER PROFILES

6.1 Introduction

This chapter provides an overview of the teachers who participated in this research. It describes and discusses the research participants in terms of their gender (male and female), age, context (work and living), training (pre-service and in-service) as well as their subjects and class (grade/level of pupils) preferences. It also provides an overview of the teachers' other responsibilities within the school and the society. The aim of this discussion is to explore and understand the teachers, the opportunities at their disposal together with the challenges they may have to contend or engage with in the process of promoting environmental action for wetlands.

6.2 Composition and distribution of the participants

This study was done in two phases (section 5.6) and each phase involved a different number of teachers. The first phase of the study (section 5.6.1) involved 54 out of 81 teachers of both gender from both rural[1] and urban[2] contexts (Table 5.3). 32 (60%) of the respondents were rural while (22) 40% were urban. 30 teachers were male and 24 were female. This is represented graphically in Figure 6.1.

[1] Rural areas in Kenya are home to about 80% of the population (MENR, 1994:117) who live in dispersed settlements. Most rural areas face serious water shortage problems. The presence of water attracts settlements near water points. Increased human activities near water points results in some wetlands being overexploited causing degradation. Over reliance on firewood for energy and timber for housing causes deforestation. Most rural people lead subsistence livelihoods of crop cultivation and livestock rearing and this usually leads to vegetation destruction and soil erosion to wetlands. Other problems include inadequate transport network, educational, health and recreational facilities as well as an influx of refugees in some areas (ibid). All these issues threaten rural wetlands. These are some of the issues that rural teachers are expected to address.

[2] Urban areas in Kenya are characterized by an increase in the area under buildings as compared to 'natural areas'. The factors responsible for this change include provision of housing, places of work, recreation facilities, water, transport facilities, energy and sanitation (MENR, 1994:115). However, high population causes the majority of urban dwellers to live in poor sanitary conditions, substandard shelter or are homeless. Mismatch between urbanization and economic development brings forth increased poverty, unemployment, underemployment, crime, drug abuse and street children. Other problems include proliferation of slums and squatter settlements with inadequate water, sanitation, waste disposal, health facilities, roads and other infrastructure. Leaching of wastes into urban wetlands pollutes the water and the land and this affects human health and the environment (ibid, 118). Industrial development and urban agriculture also cause substantial pollution to the wetlands. The urban teachers are expected to address some of these issues in their locality.

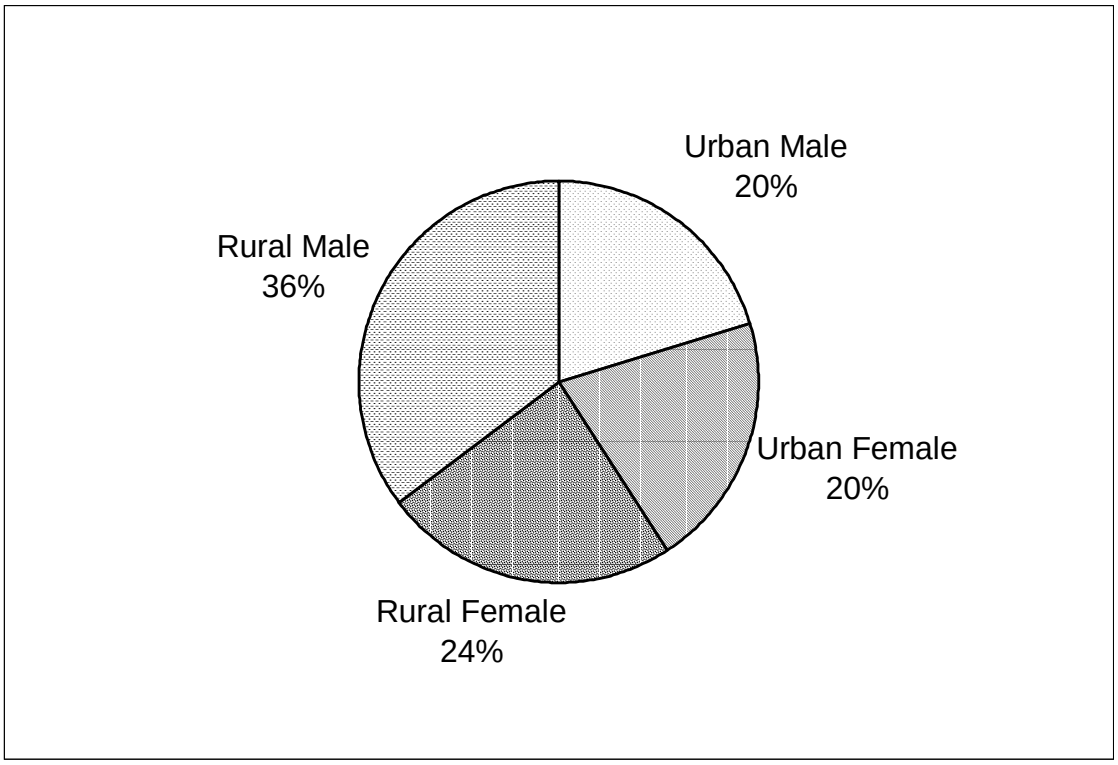


Figure 6.1 Composition of teachers who participated in the research.

These teachers were distributed in seven out of eight provinces of Kenya (Figure 2.1). The teachers came from 26 different administrative districts and from 43 divisions[11] as shown in Figure 6.2. The Rift Valley Province was represented by 20 teachers partly because of its expansive nature (Figure 2.1) and also the fact that two out of nine wetland workshops (section 1.3) were held in the province (Figure 2.1, Table 5.1). The workshop held at Kitale also drew participants from the Rift Valley province. Nairobi province is small in size (Figure 2.1) and is not divided into districts but only has divisions. North Eastern province was not represented even during the workshops (Table 5.1).

Figure 6.2 shows that there was considerable dispersion in contexts (section 5.3) from where views were sought in this study to ensure exploration of more or less broader picture of wetlands considerations among teachers. Wider consultation in research is important to provide a variety of data from different contextual, cultural, social, economic and political setups that enrich a

[11] In Kenya, the largest administrative area is the province, which are 8 in total (see Figure 2.1). Each province is subdivided into districts, then to divisions, locations and sub-locations.

study (Le Grange *et al*. 2000:7). Broader consultation is essential because wetlands are imbued with different meanings in different regional contexts (Sections 2.3). The exploration of the people's differential meanings for the various aspects of wetlands in different regions is important to understand wetland issues and risks from different regional contexts.

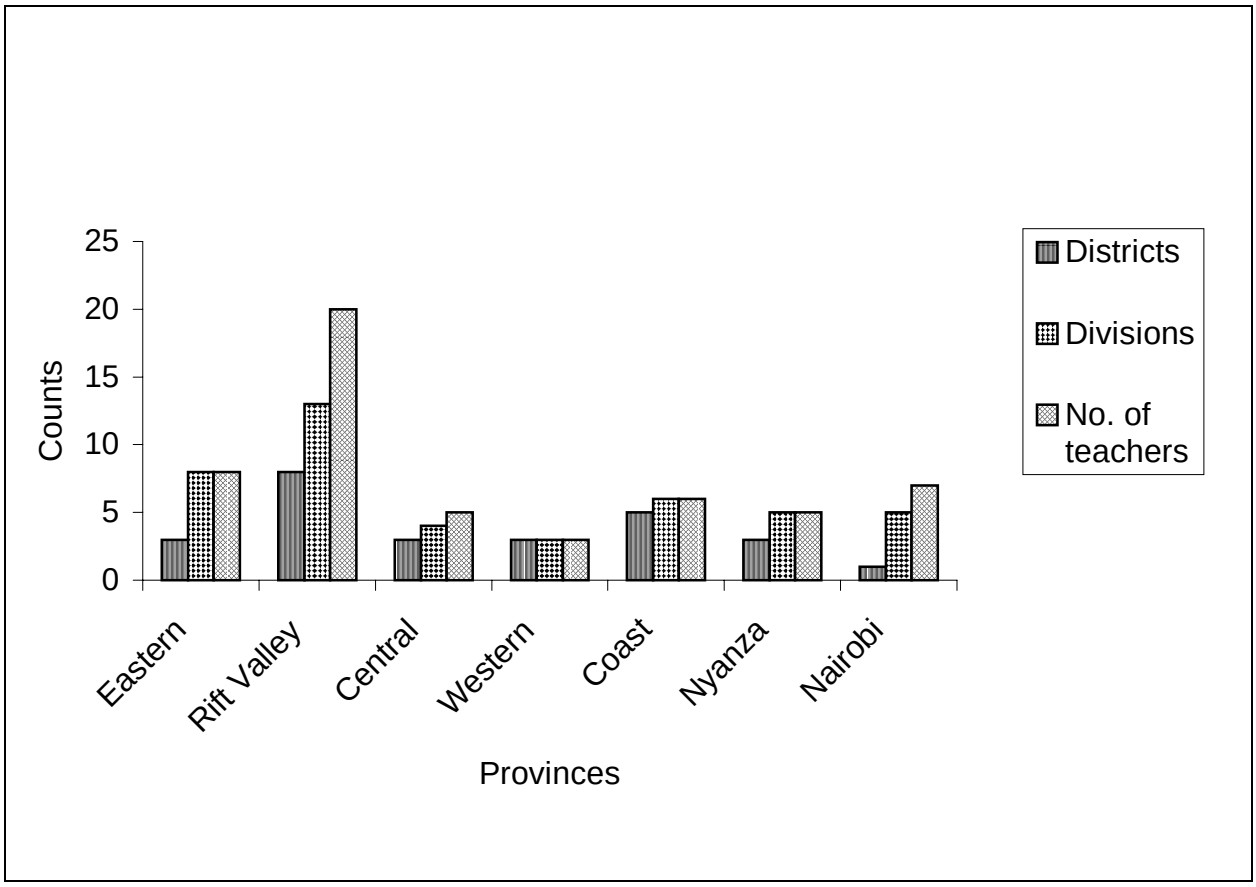


Figure 6.2 Distribution of the research respondents in Kenya

According to Le Grange *et al.* (2000), contextual issues are essential considerations in development of environmental education programmes. Contexts include the workplaces and workplace issues of the participants. Understanding of the local environmental and environmental education issues relevant to their own practice is important for environmental educators since it assists in development of programmes which address the immediate and urgent needs of the community. In this study, the context of the teacher is an important factor since urban and rural areas are endowed differently in terms of resources and experience different pressures. A high

population and pressure on resources characterize the urban areas. The wetlands available suffer greatly from pollution by solid wastes and sewage (Ndiritu, 2001; Ndaruga, 1998) and are normally not used for domestic water provision. Instead the residents are usually supplied with tapped water or they buy it from vendors. In contrast the rural areas have clean water and the community use this water for various purposes (ibid). The meanings attached to wetlands by the two groups from different contexts are likely to differ.

It is also important to consider gender roles in different communities. In Africa, gender roles are predefined and the teacher finds him/herself working within a system with some predetermined scope of action (Karembu, 2002). Since this study looks at teacher action, it is useful to consider whether gender plays a role in perception and actions for wetlands conservation.

Phase two of the study involved 39 teachers of whom ten (4 males and 6 females) had responded to the questionnaire used in phase one (section 5.6.2). The other 29 teachers (16 male and 13 females) were drawn from the ten schools which participated in phase two of the study but neither completed the questionnaire nor participated in the wetlands training in 1999 (section 5.6.2). They were distributed as shown below (also section 5.6.2 and 5.8.2).

Table 6.1: Composition of teachers who participated in phase two of the study.

Context	Status	Name of school	Province	Male	Female	Total
Urban schools	Active	Majengo	Coast	2 (+1)	1	4
		Central	Western	2	1(+1)	4
		Ruai	Nairobi	2	1(+1)	4
	Inactive	Victoria	Nyanza	1	2(+1)	4
		Kangaru	Eastern	2 (+1)	1	4
		Thingithu	Rift Valley	1	1(+1)	3
Rural schools	Active	Ngaimuranya	Rift Valley	1 (+1)	2	4
		Kaptumo	Rift Valley	2	1 (+1)	4
	Inactive	Rwathia	Central	2 (+1)	1	4
		Arap Moi	Rift Valley	1	2 (+1)	4
			Total	16 (+4)	13 (+6)	39

Note: The numbers in parenthesis represent teachers who participated in the wetlands training course in 1999.

Table 6.1 shows that phase two of the study involved teachers from seven provinces just like in phase one. However there was more emphasis on probing deeper into the contextual issues of the individual schools that participated in this study to understand wetland issues from other teachers, including those who did not attend the wetlands in-service training. This was considered necessary as a validation and triangulation tool to strengthen data from teachers who participated in the workshops as well as to get a clearer picture of the context.

6.3 Age and teaching experience of the teachers

This study is based on interactions between human beings and wetlands (section 5.4). It is possible that age factors may influence perceptions of people towards resources and situations in different contexts. Older people have interacted with natural resources, beliefs, norms and values as well as their associated meanings for a longer time. This may influence the way they interact and participate in exploitation and conservation of natural resources. The younger people are exposed to various forms of information sources in the course of their schooling, interaction with peers and the wider community. The environment that they experience currently may not be similar to that experienced by the older folk and this may lead to development of unique contextual meanings (Le Grange *et al.* 2000) regarding a resource (section 7.5). The meanings generated may have an influence on further actions towards exploitation and wise use of the resources.

In this study the age of the teachers varied from 20 years to over 50 years. The proportion of teachers in each category is shown in Figure 6.3. Figure 6.3 shows that the majority of the research respondents were of age bracket 31- 40 and 41-50 years. This suggests that the research participants in this study have interacted with wetlands for a long time (since birth) and could have diverse meanings about their resources.

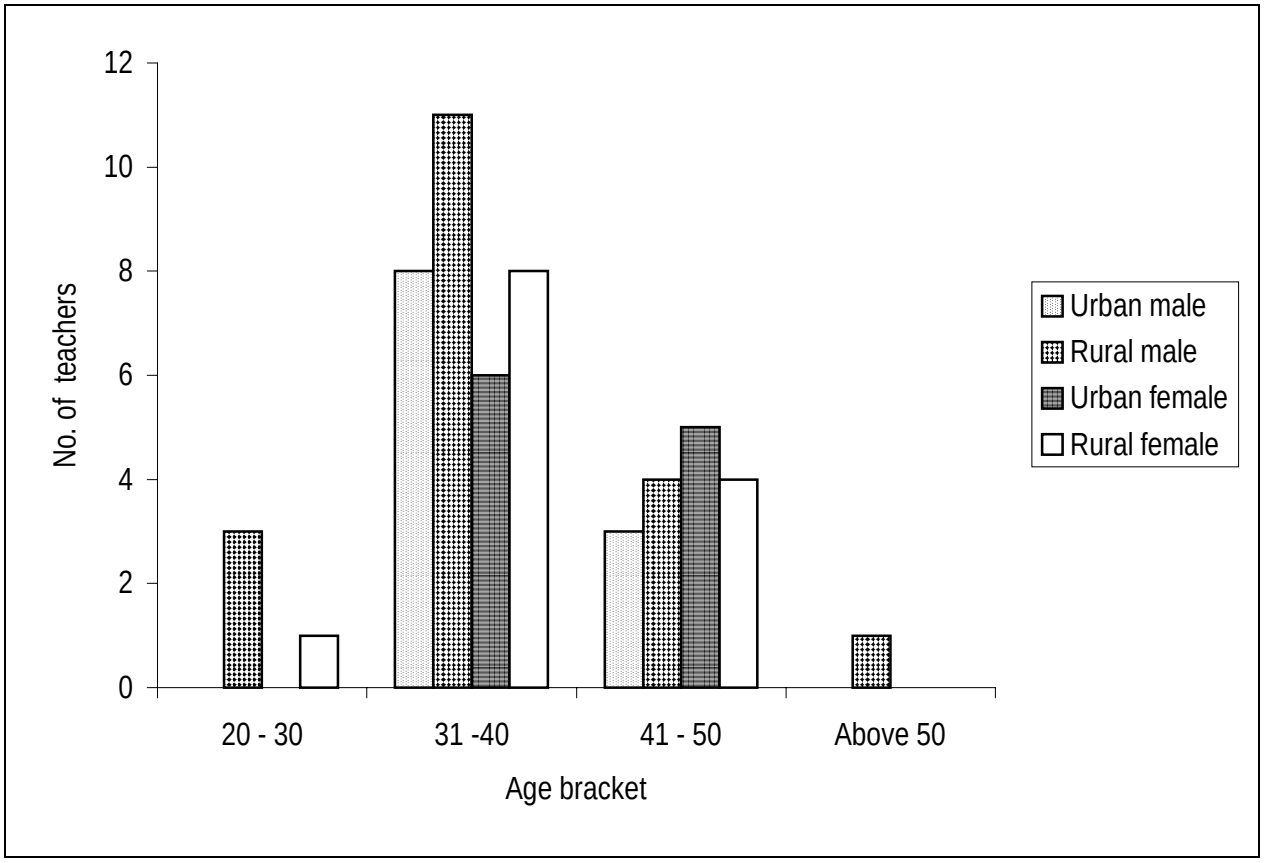


Figure 6.3: Age distribution among research respondents

Teachers were also asked in the questionnaire to report on their teaching experience and for how long they had been in their present stations (question 5 in Appendix 5.5). This question aimed at establishing the teachers' familiarity with Kenya's education issues and with local wetland issues. The teaching experiences reported range from three to thirty-one years while their stay at the present stations ranged from less than one to twenty years. This suggests that the teachers had considerable teaching experience and had also been within their working environment for some time. There is a possibility that the teachers are quite knowledgeable about local environmental (including wetland) issues as well as having tried several interventions to conserve the local environment. Details of teacher experience are given in Figure 6.4a and 6.4b.

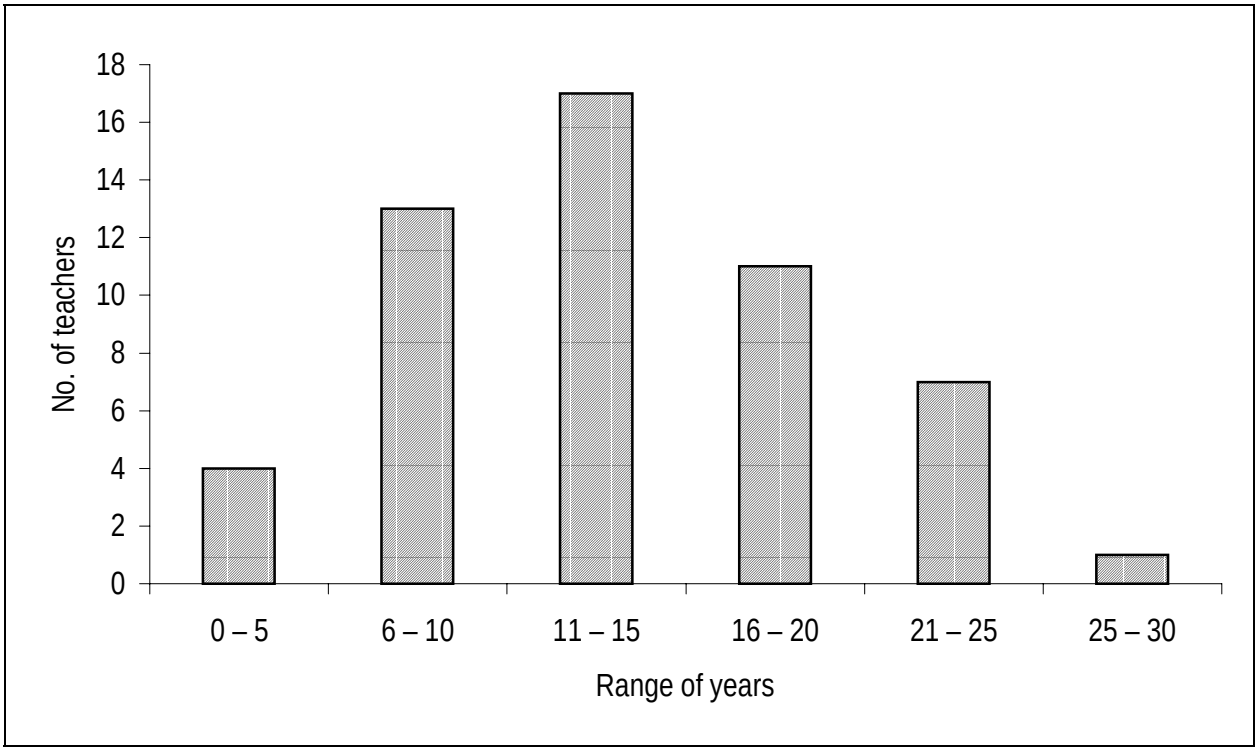


Figure 6.4a Teaching experience of the research respondents

Figure 6.4a shows that most of the teachers had substantial teaching experience and were therefore familiar with education issues in Kenya. The curriculum addresses many environmental issues including those touching on wetlands (Appendix 3.1 to 3.10). This study assumes that teachers consider the local environment as a valuable resource (section 1.4) and that they use it while teaching to add relevance (section 4.7.1). These assumptions are based on the view that through symbolic interactionism and constructivism (section 5.4), teachers are always actively constructing knowledge about local wetlands and methods of teaching. This knowledge integrates aspects of understanding the local status of wetlands and the process of mobilizing pupils and the community to address the perceived wetland problems (section 7.7 and 7.8). Having stayed at a place for a long time may mean that the teacher is adequately informed about the dynamics of local wetlands (section 2.3).

Figure 6.4b shows that some of the teachers had some lengthy experience in their present stations. This suggests the possibility of these teachers being acclimatized to their local contexts. Being acclimatized suggests that s/he is now a player in the process of local meaning making (section 5.4) and championing for change (section 4.7.6). Only seven teachers were in new stations after attending the wetlands workshop while the rest attended the workshop and went back to their working stations.

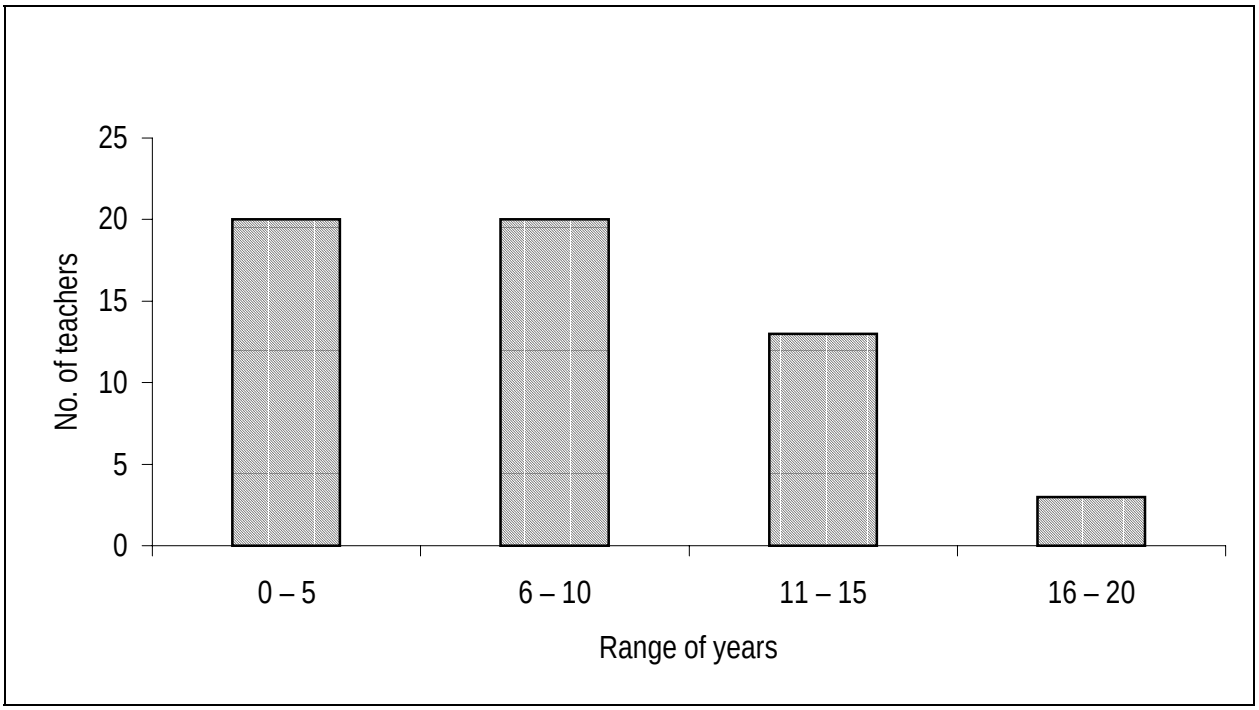


Figure 6.4b. Length of stay by teachers in their present stations.

When a teacher has stayed in a place for some time, s/he is likely to understand the local natural resource dynamics together with how people relate to it (chapter 7). This can help the teacher to easily locate areas of intervention and to justify action and vise versa in case of non-participation (section 5.4). The influence of experience and familiarity with the local context on local action will be assessed in the proceeding chapters.

6.4 Subject preferences by teachers

Teachers were asked in the questionnaire to report on the subjects they teach in their schools (question 6 in Appendix 5.5). The Kenyan primary curricula have sixteen subjects of which twelve are examinable at class eight (section 3.1). Environmental issues are integrated differently in these subjects (Appendix 3.1 –3.10). In some cases the integrated environmental issues are directly visible such as uses of water and soil erosion, while in other instances, the teacher is called upon to be innovative to identify environmental aspects that can assist him/her in realizing the lesson's objectives and at the same time enhance environmental education. Subjects such as Mathematics (Appendix 3.9) do not directly mention environmental education but an innovative teacher can achieve much by doing the activities suggested using an outdoor environment (section 3.9) and integrating the holistic aspects (section 2.3). In this study, teachers reported teaching various subjects in their schools. Details are given in Figure 6.5a.

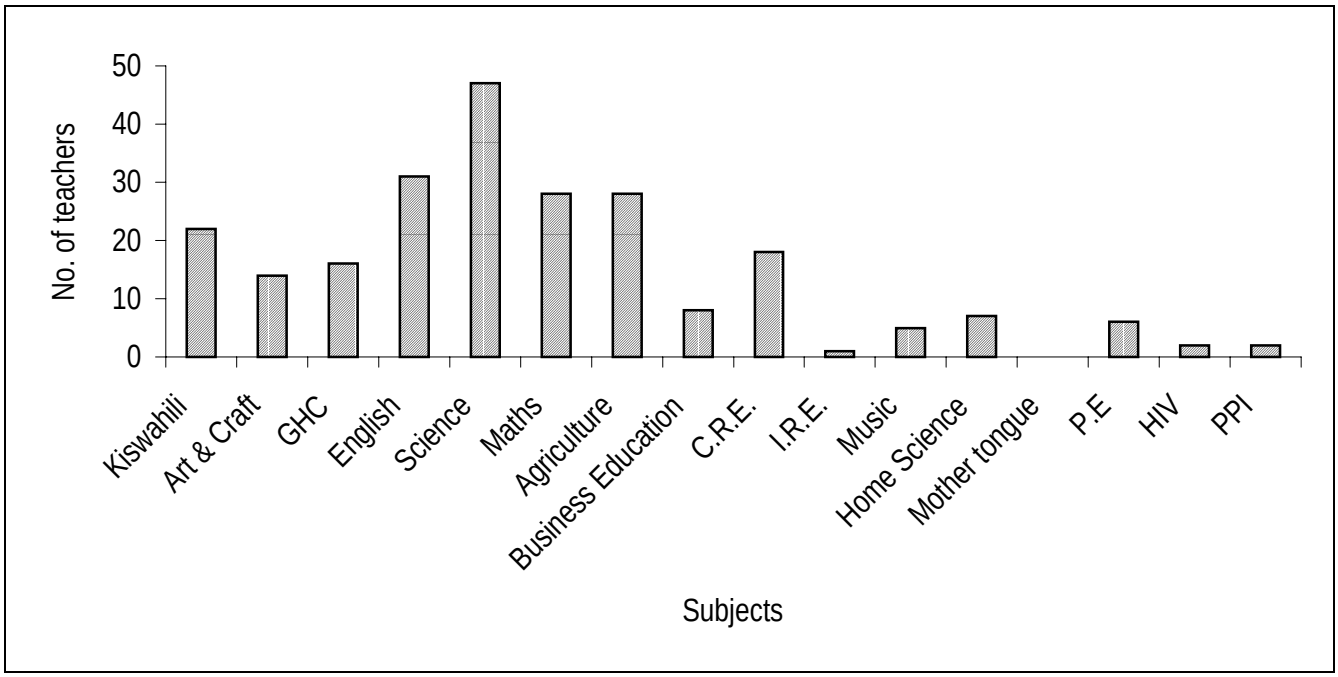


Figure 6.5a Subjects taught by the teachers

The five most popular subjects, according to the teachers, were Science, English, Mathematics, Agriculture and Kiswahili while the least popular were mother tongue, Islamic Religious

Education (IRE), Pastoral Programme of Instruction (PPI), HIV/AIDS and Physical Education (PE). Except for Islamic Religious Education, the other subjects incidentally are not examined at class eight. None of the research participants reported teaching mother tongue.

Teachers were also asked to state the subjects they most preferred and felt more comfortable teaching (question 7b in Appendix 5.5). This question was meant to establish the most popular subjects for teachers and relate this to the activities proposed towards wetlands conservation (section 8.6). The responses from teachers are summarized in Figure 6.5b and show that the most preferred subjects were Science, English, Mathematics, Geography, History and Civics (GHC), Kiswahili and Agriculture. The least preferred subjects were HIV, Home Science Christian Religious Education and Arts & Craft.

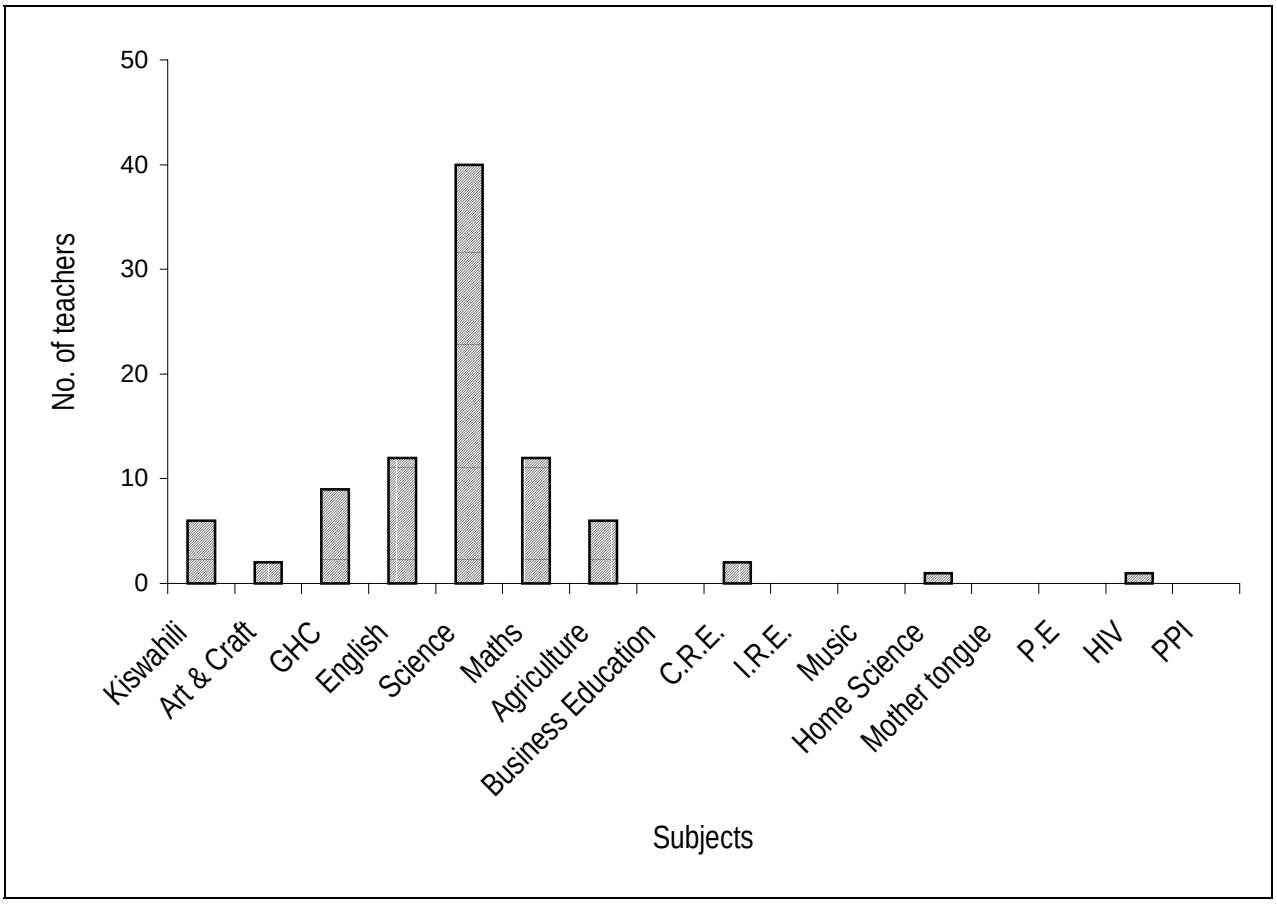


Figure 6.5b. Subjects most preferred by the teachers

Figure 6.5a and 6.5b portray some relationships. Teachers mentioned teaching many subjects in Figure 6.5a but not giving equal preference to all of them. This explains why there is a decline in frequency of mention of the subjects in Figure 6.5b. In all the subjects except Science the decline between teaching the subject and its preference was exponential. Some subjects such as Business Education, IRE, Music, PE and PPI were not selected at all by the teachers. The discrepancy in preferences may also apply to the content and activities identified within the subject as discussed in section 8.6. According to Martin (1993) and UNESCO (1978) all subject disciplines are relevant in teaching environmental education. This underscores the need for environmental educators to invest more effort in working with teachers to enhance relevance of addressing environmental issues in all subjects and boosting preference for all subjects since each subject approaches environmental issues in its unique way (Chapter 3). The use of these subjects by teachers in addressing wetland issues in this study is discussed at length in chapter 8.

6.5 Classes most preferred by the teachers

Teachers were asked to state the classes that they mostly preferred teaching at school (question 7a in Appendix 5.5). Environmental education varies within the subjects and between the classes (Appendix 3.1 – 3.10).

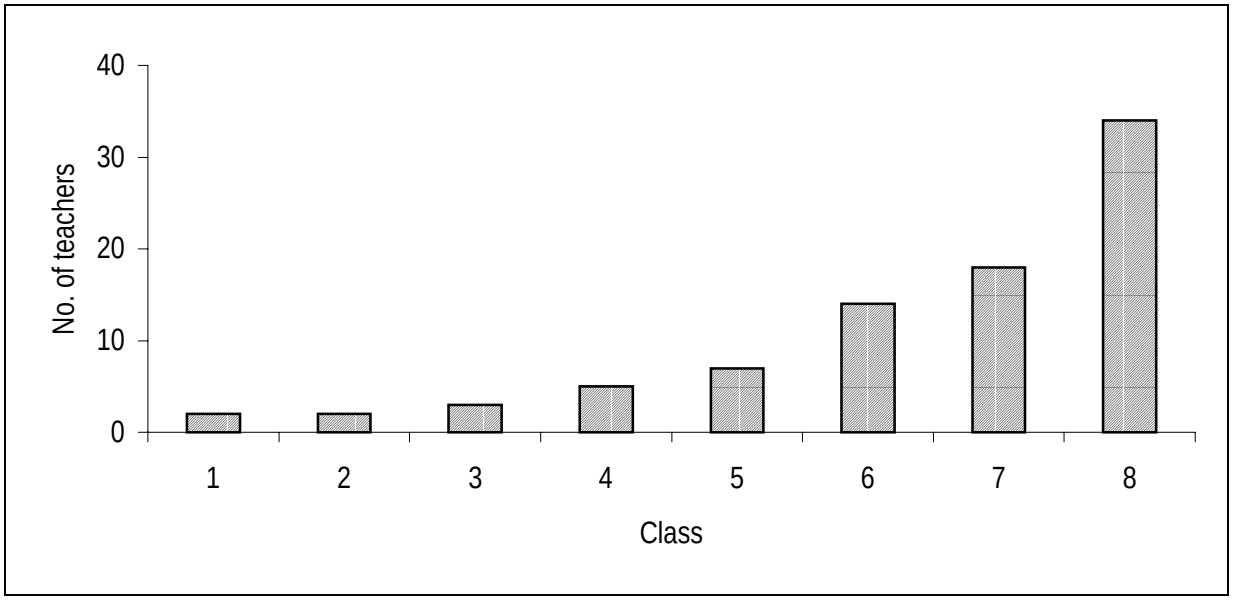


Figure 6.6 Classes most preferred by the teachers

The question intended to establish whether teachers had any class preferences and explore whether this could influence their campaign for wetlands using the subjects. A summary of the class preferences is presented in Figure 6.6. There appears to be a general liking for the upper classes by most of the teachers who participated in this research. Nevertheless, these teachers are trained to teach in primary schools but the head teacher has the discretion to assign the teacher lessons in both upper and lower classes. Most of the locally based environmental education topics that mention the use of the local environment are provided for in the lower classes (Chapter 3, Appendix 3.1-3.10). The curricular topics are spread across various classes and some classes have more environmentally related content than others (Appendix 3.1-3.10). For instance subjects such as GHC (Appendix 3.2), Science (Appendix 3.3) and Home Science (Appendix 3.8) have wetland issues directly mentioned in the lower classes while the upper classes have fewer or no mention of it. Subjects such as Art and Craft (Appendix 3.1), English (Appendix 3.5), CRE (Appendix 3.7) Mathematics (Appendix 3.9) and Music (Appendix 3.10) do not mention wetland issues directly although the activities mentioned can be more meaningful if they were performed in wetlands. In subjects such as Agriculture (Appendix 3.4) and Kiswahili (Appendix 3.6), wetland issues are mentioned directly and are relatively well spread in all classes (except for Class eight Agriculture). This disparity in integration of wetland issues may affect the teachers' actions to champion for wetlands conservation using the subjects. Teachers in upper classes may not recognize the need to use the local environment since they are not directly requested to do so. This may have implications especially on the integration of wetland issues at the curriculum level. These aspects are explored further in section 8.6.

6.6 Training status of the research respondents

Teachers were asked to state whether they had formal teacher training[1] (question 5b in Appendix 5.5). The purpose of this question was to establish whether the teachers were professionally trained. Data analysis revealed that 53 out of the 54 teachers had undergone formal teacher training and were therefore qualified to teach in primary schools. This suggests that the research

[1] Teacher training in Kenya is undertaken at four levels namely early childhood education (for kindergarten teachers), primary school teacher training leading to a P1 certificate (for primary school class 1-8 teachers), secondary school teacher diploma (for secondary school teachers) and Bachelor of Education degree holders (secondary school teachers) (RoK 1988; MENR, 1994:141).

respondents were homogenous in terms of basic teacher training. During their professional training environmental education is integrated in the courses taught (MENR, 1994; Karembu, 2002; KUC, 1980; Lindhe *et al*. 1993)

Teachers were also asked to give a detailed explanation of the other training opportunities they had received on environmental conservation in the course of their teaching practice at school after their formal training (question 12 in Appendix 5.5). This question was meant to establish whether in-service training programmes were popular and available to the teachers. The responses revealed that 36 (67%) teachers had not received further training and only 18 (33%) had undergone some kind of in-service training. Two of the 36 teachers who had not attended further in-service training however reported having participated in environmental activities such as 4K club (section 3.5, 9.2.1) activities in soil and water conservation, and local tree planting exercises. Participation in these environmental activities are likely to have raised their level of awareness and concern for environmental (including wetland) issues. Analysis of the details of the nature of training the teachers attended can be categorized into four areas as shown in Table 6.2.

Table 6.2: In-service training of teachers in environmental education

Training details	No. of teachers
Environmental conservation of biodiversity, catchment, soil, water, lakes, forests, energy, and development of education materials	12
Academic workshops such as PraSuPE, Science and Agriculture workshop.	4
Primary health care workshops	2
School management	1

The results suggest that natural resource or environmental conservation training sessions were the most popular followed by curriculum based academic workshops. It also suggests that teachers are popular targets of environmental conservation education by various institutions. This could be in line with recommendations by the Kenya National Environment Action Plan (MENR, 1994) on the need for environmental education institutions to be involved in more awareness and capacity building in natural resources conservation and environmental education. Teachers also

proposed some of the institutions that offered the in-service training on environmental conservation and these includes NGOs such as Wildlife Clubs of Kenya, Environment Trust of Kenya and Friends of Conservation. Others include government agencies such as the Kenya Wildlife Service. The PraSuPE (Practical Subjects in Primary Education) workshop was organized by the Ministry of Education.

This data from the teachers suggests little involvement by the Ministry of Education in teacher in-service training despite the fact that environmental education is integrated in the subjects (RoK, 1992; MENR, 1994:141). The data suggests that many teachers despite having stayed in their schools for a long time (section 6.3) have never been in-serviced. For those in-serviced, the training agencies are not specialized in education teaching approaches including involving teachers in exploration of environmental education processes (RU, 2002; Le Roux, 2000) and are only involved in giving facts about the status of the environment with a bias towards emphasizing what their legal mandates and strategic plans direct them to do. This training may not be in harmony with the needs of environmental education in schools as documented in the syllabus document (RoK, 1992). It may also not concur with the principles of education for sustainability (sections 4.7 and 4.8). According to Ramsar (2002), IGAD (1999) and MENR (1994), Kenya experiences a problem of lack of a holistic approach to environmental management and environmental education and there is lack of coordination. Various institutions undertake environmental management and environmental education and there is no coordination between each other. This means that many activities are replicated. This may also apply to these in-service sessions mentioned by the teachers. Each institution may have a bias towards a particular resource and this causes the environment to be presented in a more compartmentalized manner without addressing holistic aspects of the environment (Figure 2.2). The NMK based in-service programme on wetlands conservation shares similar characteristics to some of these other agencies that have trained teachers. This research is relevant in that it is an effort to use one case study to illuminate possible outcomes of activities of other environmental education training institutions.

6.7 Teacher perceptions about their pre-service training.

During an interview ten teachers (section 5.6.2) were asked whether they learnt environmental education in college (question 3 in Appendix 5.7). The purpose of this question was to establish whether teachers could recall learning environmental education during their training. This question was also expected to inform this research on whether teachers are aware that environmental education was integrated in their professional training. Eight teachers agreed that environmental education was there in the teacher pre-service curriculum but was integrated in subjects such as science, agriculture and GHC. These teachers comprised of five teachers from the active group and three from the inactive group (Table 6.1). In science some teachers identified topics such as environment, plants, animals, soil, foods and water. The topic on soil erosion was identified in agriculture. In GHC the topic identified was afforestation. These are subjects taught at colleges and also in primary schools. The teachers' recall of these topics suggests that they appreciate that the subjects taught in primary schools have opportunities for integrating environmental education.

Three teachers also complained about the nature of environmental education by putting across comments like 'very shallow', 'I can't say I learnt it in college', 'a little bit', 'not really' and 'I learnt a bit of it'. One teacher, however, complained that teaching was theoretical and not practical and was only geared towards enabling the student teachers to pass their exams. One teacher also said that environmental education was not taught in college. These responses suggest uncertainties about the clear conceptualization of environmental education by the teachers. The data suggest the likelihood that the teachers may not be aware of the appropriate teaching approach and content for environmental education.

The teachers were asked to comment on the methodology used by their college lecturers during teaching (question 5 in Appendix 5.7). This question aimed at getting views from teachers on their orientation to environmental education during college days. Nine teachers confirmed that their lecturers used to take the student teachers out of the classroom to do activities in the environment. The keywords symbolizing the general comments by the teachers are given in

Table 6.3 and are grouped into three categories depending on level of involvement of the learners in practical activities. One teacher complained that although they went out of the classroom, the main objective was not to cultivate those good ideas about the environment, but to pass exams. She felt that after passing exams, everything was forgotten and she criticized the method used as more of a lecture and not allowing for participation.

Table 6.3: Teacher perceptions of teaching methodologies used in various colleges.

Category	Key words	No. of teachers
Involved	'We were involved…', 'he used to take us to some sites…'	2
Somehow involved	'Teacher was practical sometimes', 'it depends upon subjects' '(yes but) the main objective was to pass exams', 'depends upon the subject', 'different lecturers did not behave the same way', 'it is real in some topics'.	7
Not involved	'It was a lecture all the time'	1

The responses suggest that some teachers were involved in some practical activities during their pre-service training. The teachers in this study were drawn from six colleges (Shanzu, Kericho, Kamwenja, Igonji, Meru and Asumbi) in Kenya. This suggests that the use of fieldwork activities is common in most colleges and that teachers in this study were aware of the importance of involving their learners in practical activities when teaching. These responses are important for wetlands since the teachers are expected to involve learners in environmental education processes that empower them to take action for conservation of the local wetlands. However, the methods reported by teachers appear as if they were used only a few times and the teachers did not appear to quote it in a way that showed strong ownership of the activity to conserve the environment. The activities reported by teachers do not show prolonged engagement with environmental problems. The activities were reported as one-off activities.

The teachers were asked to recall any outstanding activities they did at college during their practical sessions outside the classroom (question 6 in Appendix 5.7). The purpose of this question was to establish the aspects of the environment that were emphasized during teacher training. Some of the things they mentioned are given in Table 6.4.

Table 6.4: Outstanding activities during college days that teachers still remember

Activities	Details	No. of teachers
Visit and Observe	Ocean for pollution and fill some worksheet Sewage pond; observe trees, grass and types of flowers.	5
Practical interaction	Collect insects and frogs and draw. Do an experiment to show that oxygen is given off during photosynthesis and that water is given off during transpiration and then explain. Play with soil and construct things like rocks.	3
Eco-management	Planting trees during environmental day	1
Nothing done	Teacher never did anything outside the classroom	1

The results suggest that the teacher trainees were involved in some practical activities. However, even though fieldwork is applied in teaching, the corresponding practical activities do not involve learners in critical inquiry, engagement and environmental action. The methods are quoted in a way that does not portray the local problem as serious and as if the fieldwork was just an academic activity. The observation method used by the lecturers in this study only minimally involved the learner's critical cognitive skills and did not seem to query the real cause of the problem. It appears as if there was no challenging of the local *status quo* and issues of sustainable development were not considered. However, some observation was noted to elicit some critical inquiry in the learner as demonstrated by these two cases:

Teacher 1

> *One day, we were allowed to go to the college sewage ponds. After close observation, we realized that the water there was not even the colour we possibly thought. It was green, there were birds feeding on that water. It was generally interesting to observe and see what goes there though the main question was 'where does all this water go after remaining there for some time? What remains after that?' ...The old students had cheated us that the ponds were swimming pools and we were disappointed to learn the opposite.*

Another teacher said that after being taken out to observe trees, they developed an interest in knowing the local names of trees and later, through their own initiative, they would invite a local elderly man to tell them names of local trees. This helped them to teach the young children who wanted to know plants using local names and thus motivated them.

These two examples show the enthusiasm that can develop in learners when taken outside the classroom to study. The two cases demonstrate active learning taking place when learners go out for fieldwork (RU, 2002). This suggests that, if properly harnessed, observation in an outdoor environment can lead to informed action in learners. But in these two cases the teachers were not involved in any other activity by the lecturer and the critical reflection did not mature into an action. Both teachers did not have anything else to add about their enthusiasm.

There is a danger that if the way the teachers who participated in this study were taught is replicated in the classroom, they may initiate any meaningful environmental activities in their local areas including schools. The responses suggest the need for teachers to allow for maturity of the pupil constructions and to allow for undertaking of environmental action that can enhance environmental sustainability. The responses also suggest that learners have their own perceptions of the environment and appropriate environmental action. It is important to engage learners in matters that are of relevance to them and to the local environment instead of using instrumentalist, apolitical transmission approaches that are unrelated to the local environmental realities. Learners should be involved in environmental education processes that address local environmental problems practically to enhance sustainable use of resources.

6.8 Teachers additional responsibilities at school

Teachers were asked using a questionnaire to state whether they had any other responsibilities at school other that just being a classroom teacher (question 8 in Appendix 5.5). The question intended to explore the other opportunities at school through which teachers can champion for wetlands conservation. 51 out of 54 teachers confirmed that they performed other responsibilities at school. These responsibilities can be grouped into six major categories as shown in Table 6.5.

Table 6.5 suggests the existence of some potential opportunities to promote environmental concerns and action. The clubs such as wildlife, environmental, agroforestly and 4K clubs mostly deal with matters touching on the environment and 17 teachers are patrons of these clubs. Teachers reported using clubs to champion for wetlands conservation (section 9.2).

Table 6.5: Teacher responsibilities at school.

Theme	Responsibility	No. of teachers involved
School clubs/ extracurricular activities.	Clubs such as environment, wildlife, agroforestly, 4K, Rights of Child, Christian union, scouts, girl guides, debating, music, and drama club. Extracurricular activities such as games, entertainment, choir, school tours, and exhibitions.	34[1]
School administration	Being a head teacher, deputy head teacher or a senior teacher	22
Curriculum guidance	Being a member in charge of exams, academic issues, subject panels and book selection team for the school.	21
Assisting in school administration	Being the staff secretary, organizing operations of non teaching staff, making school duty rooster and timetable, class teacher, guidance and counseling, school discipline, in charge of prefects, school mosque, school librarian, store keeper, in charge of school flower gardens.	20
In charge of welfare	For teachers, pupils, first aid, anti HIV/AIDS campaigns,	6
Responsibilities outside school	Such as teacher trade union, head teachers association and teacher cooperative societies	3

The leadership positions held by the teachers can also play a role in influencing other teachers, pupils and the community to care and take action for the environment (section 9.3-9.4). Curriculum guidance implies that the teachers had an opportunity to play a role in ensuring the strengthening of environmental content and teaching issues at school. Teachers are also portrayed as networked even outside the school, although these networks are not inclined towards environmental conservation interventions.

The picture generated by this question is one of hope for potential intervention in environmental concerns and sustainability. The use of these opportunities is explored further in the proceeding chapters.

[1] Out of the 34 teachers, these comprised of 15 rural male and six of each of other groups

6.9 Teachers' responsibilities at community level

Teachers were asked using a questionnaire whether they had any responsibilities at the community level (question 11 in Appendix 5.5). The question was meant to establish how the teacher interacts with the community and the activities that they collectively engage in. As discussed in section 4.3.4, sustainable development for wetlands requires that people share resources with each other and take care of the earth. This needs peoples' change of attitudes and practices and adapting an ethic of living sustainably, that is caring for one another and for resources (IUCN *et al*. 1991). For the teacher to foster this, interaction with the wider community is needed. The older members of the community are the custodians of the wetland resources and have more control over them than the children. Involving the older folk on wetland issues is a greater contribution by the teacher in breaking the walls between the school and the community (Sinclair *et al*. 1997; Gough & Robottom, 1993) and is a significant step towards socially critical education orientation for the environment. Working with the community portrays the school and the community as working together to achieve the common goal of conserving and enhancing the local environment (section 4.6.3, Table 4.2). In this study, thirty-three teachers reported involvement with community activities. The involvement at community level falls under four key areas as shown in Table 6.6.

Table 6.6: Teacher responsibilities at community level

Theme	Responsibility	No. of teachers
Community development	Involved in local water projects	2
	Community groupings such as being an official or a member in a local NGO, local CBO, the district development committee, local welfare groups, local clan, women groups, youth organization, local agricultural group and being a parents representative in a local secondary school.	23
Local church	Serve as local church members or officials. Some are in charge of the mothers' union, teaching children on Sunday, and being the church treasurer.	16
Community education	Involved as education advisors at church or at community level.	3
Persuasion/ negotiation	Informal wetlands conservation lobbying	2

Table 6.6 shows that a reasonable number of teachers are involved in community work. Some are involved directly in water and wetland issues. Some of the teachers are involved in organized community groups and could easily lead the group to prioritize engagement in wetland issues. However, differences were noted, for instance, in the church where 14 out of 16 teachers involved were from the rural areas. This finding concurs with the observation by the National Environment Action Plan Report (MENR, 1994) that rural areas suffer from migration of young people especially the educated ones to urban areas in search of jobs and better amenities. The teachers left behind in the rural areas may be credited as well educated and are entrusted to coordinate some administrative aspects of the church and other social activities. This is a good opportunity that teachers can exploit to champion for wetland conservation (section 9.3 and 9.4). In urban areas, the situation is the opposite. The educated people migrate to urban areas and chances of the teacher being noted among the many well educated and employed people are lower. The chances of the teacher being incorporated in the church administration and other social responsibilities are lower for the urban group than for the rural group.

The other levels of involvement within the community did not seem to vary much. Involvement in community activities portrays the teacher as a member of the civil society locally able to initiate and participate in matters of wetlands conservation. These aspects are discussed further in sections 9.3 and 9.4.

6.10 Conclusion

This chapter presents an exploration of the profiles of teachers who participated in this study. The study involved teachers from both genders, urban and rural contexts and wider regional disparity - seven of the eight provinces of Kenya. The teachers had varying teaching experiences and taught different subjects of which they portrayed different preferences. There was greater preference for Science, English, Mathematics, Geography, History and Civics (GHC), Kiswahili and Agriculture than for HIV, Home Science, Christian Religious Education and Arts & Craft, mother tongue, Islamic Religious Education (IRE), Pastoral Programme of Instruction (PPI) and Physical Education (PE). Teachers preferred teaching these subjects at the higher classes than at

the lower ones. Some of the teachers had stayed at their present stations for a long period of time and were possibly familiar with local issues.

Teachers perform other responsibilities at school and within the community. Within the school most teachers were involved in extra-curricula activities and clubs. Other popular responsibilities were school administration, curriculum guidance and assisting the school administration. Some of the teachers were involved in clubs that can potentially deal with environmental issues. A great opportunity exists in using the clubs to improve the local environment and to conserve wetlands and this is followed up in section 9.2. At community level, community development and involvement in local church were the main responsibilities and these aspects are followed up in sections 9.3 and 9.4.

Some teachers perceived environmental education as integrated in the subjects taught at college. However some also felt that environmental education was not strongly emphasized in college. Nine out of ten teachers during the interviews agreed that their lecturers involved them in fieldwork activities during their pre-service training and were also able to recall some of the outstanding experiences they had during the fieldwork in college. This suggests that teachers were trained in environmental education in college and were exposed to some of the methods of involving learners in learning activities, especially use of outdoor fieldwork. However the fieldwork activities that were reported by the teachers portrayed a bias towards observation and exposition during the fieldwork as compared to practical interaction, exploration, dialogue, reflection and environmental action. There was lack of prolonged engagement with environmental issues as well as consideration of the holistic aspects of environmental issues (section 2.3). This trend, if replicated in schools, may lead to use of the environment and no local environmental improvement. The explanation by two teachers on the nature of the fieldwork activity suggested an emergence of some active critical inquiry and some self-construction of knowledge. It appeared that the teacher trainees did not take the environment as ‘given’ but rather tried to construct ideas on why it was like that. Nevertheless, though the insights by the teachers seemed good, no further action was evident.

53 out of 54 teachers were trained teachers and some had even benefited from in-service training opportunities especially on environmental conservation and academic improvement related courses. The data from teachers was suggestive of minimal government involvement in in-service training. The results from this study portray the non-formal institutions as major players in environmental in-service training.

This preliminary exploration suggests that the teachers have a crucial role to play in environmental education. There are opportunities that teachers can use to champion for wetlands conservation and there is a need to explore what teachers do within these frameworks. Exploration of these aspects forms the discussion of the proceeding sections of this thesis.

CHAPTER 7: TEACHER PERCEPTIONS OF THE LOCAL ENVIRONMENT AND WETLANDS

7.1 Introduction

Section 5.4 discussed how teachers actively generate meanings about wetlands within their locality through symbolic interactionism. Symbolic interactionism acknowledges that learning and meaning making result from an individual's own action to make sense of an experience. Knowledge is not a precise representation of the world as it is but a construction that an individual builds to fit within his or her experiences in the world (Haluza-Delay, 2001:44). For wetlands this would imply that teachers construct their own meanings on various aspects of wetlands (section 2.3) and act on the meanings generated. This constructed knowledge serves as a motivation to teachers' actions to conserve wetlands. There are relatively few studies done on people perceptions of nature and subsequent environmental concern (Hanna, 1995, Haluza-Delay, 2001). Research has however shown that periodic exposure to the natural environment during the early years of life provides enhanced awareness about the relationship among self, other people and the environment (Gillet *et al.* 1991; Newhouse, 1990).

Exploring people's perceptions towards natural resources is important to reveal what they know and understand and in the process to reveal any misconceptions held (Dove, 2000:32). Some studies on people's perceptions towards wetlands have been done before in Kenya (Masese, 1997; Thenya, 2001) but a focus on teachers has not been done. This study serves as a preliminary exploration whose findings are expected to shed some light on how teachers perceive wetlands. Perceptions have been recognised to play a major role in the success or failure of development projects. A study by Babikwa (2002: 53), for instance, revealed that Ugandan farmers valued only that training which addressed their perceived needs directly. They also valued being able to share existing knowledge in training sessions and to have it acknowledged as valuable. There is a possibility that teacher perceptions about the local wetlands in this study may have an influence on its frequency of mention in the classrooms and in the activities done with

members of the community. This could also influence teacher involvement in activities to safeguard the value of wetlands that he/she possibly perceives positively.

7.2 Teacher perceptions about wetlands

Thirty-nine teachers (section 5.6.2, 5.8.2, Table 6.1) were asked in an interview to define what wetlands were (question 8 and 44 in Appendix 5.7). The purpose of the question was to ascertain whether the teachers were familiar with wetlands and the local examples. All the ten teachers who had earlier attended the wetlands workshop (sections 1.3 and 5.8.2) defined wetlands as areas associated with water and are wet permanently or seasonally. Two teachers were able to link the wetland to the surrounding catchment. They gave examples of wetlands such as lakes, rivers, ocean, swamp, ponds and dams. They all agreed that there were wetlands around their schools although some were seasonal. The other 29 teachers (section 5.8.2, Table 6.1) who did not attend the wetlands in-service training programme were also able to tell what wetlands were and to give examples except for a few cases mentioned below.

One teacher was not able to define a wetland and defined it as

> *Areas where we take care of the trees, soils so that we take care of the land that we are going to use. Keeping the land properly so that we do not get soil erosion*

This teacher's definition portrays a great diversion from the appropriate conceptualization of wetlands (refer to section 2.1). This suggests that it is unfair to assume that everybody knows what wetlands are. I had to correct the teacher before going on with the rest of the interview.

Other misconceptions about wetlands were realised as given in the following quotes from five teachers.

> *I don't consider a sewage collection as a wetland because normally it is a dumping place for sewage wastes*
>
> *I don't think rivers are wetlands because the water is flowing* – suggested by two teachers
>
> *Wetlands are connected with wet places like rivers. Or when it is raining, the ground is wet*

> *I was not involved in the programme and it is difficult to answer that (*that is, to say what wetlands are)

These findings suggest that there was a difference in conception of wetlands between those who were trained and those who were not. Several teachers who were not trained did not understand the concept of wetlands properly. This is unfortunate because teachers are expected to be conversant with aspects of local environmental issues (Le Roux, 2000) so as to be able to propose and undertake appropriate remedial measures. According to Ballantyne and Parker (1996:26),

> Teaching strategies must be considered as interdependent with conceptual content rather than as general strategies that are universally acceptable. To focus on process issues (such as exploring and developing values) with little attention to teaching content (such as an integrated environmental knowledge base) diminishes the efficacy of the approach.

In this study, the narrow conceptualisation of the local wetland issues by those teachers who were not in-serviced may influence the process of involving learners in knowing and generating activities to conserve local wetlands. It is possible that these teachers are not familiar with the concept of wetlands sustainability processes (section 4.3 and 4.7). Education for sustainable development is goal oriented to improve the immediate environment as well as to educate for sustainability in the long term (Tilbury, 1995:197). The responses by some of these non in-serviced teachers portray a failure in understanding of their local environment. According to Jickling (1992:7), an educator cannot champion for sustainability of something that is inadequately understood and conceptualised. This suggests that environmental educators should not assume that teachers know everything and this underscores the importance of in-service training to involve teachers in developing more insights into aspects of the local environment as well as promoting their knowledge base on wetland issues.

7.3 Teachers special liking of wetlands

Ten teachers (section 5.8.2, Table 6.1) were asked during the interview schedule to mention what they specially liked about their local wetlands (question 11 in Appendix 5.7). This question aimed at understanding why teachers were attracted to the wetlands. They suggested the following attractions:

Aesthetics

- Wetlands are beautiful when you see them.
- The natural beauty. When you see water moving and the sound it produces, there is that beauty.
- The stones in the river provide beauty because these are not just stones you come across.
- Tourists come to see them
- Sometimes when I have time and need to relax, I always go to the sewage ponds.
- Wetlands vegetation is attractive and is not vegetation you see everywhere.
- It sooths the mind. It is a therapy.
- There are many things and I cannot explain what I like.
- The way the area is green.

Provide essential goods (economic)

- Provide herbal medicines.
- Sources of domestic water but they are really polluted and people suffer from typhoid.
- Arrowroots grow along the banks.
- I use the water to grow tomatoes.
- I like seeing people taking animals there for water.
- In agriculture one can use that wetland to fetch a lot of money
- Provide people with employment in fishing and the harbour.
- I get fodder from the wetlands
- The water is used for irrigation of vegetables.
- Wetlands water for cattle.
- The dams provide fish, which is food for some people.

Educational

- It’s an educational site.

The aesthetic, essential goods and educational use of wetlands are all direct use values (Table 2.1). Some uses are commercial while others are non-commercial. The use of wetlands for

recreation is associated with various meanings teachers have for them such as being beautiful, natural, attracting tourists, relaxing, having unique vegetation and soothing the mind. The economic aspects portray wetlands being exploited to serve various needs of the human beings. These responses suggest that teachers have strong meanings and attraction for wetlands and this implies that they are valuable to them locally.

Sustainable development entails recognition of interrelationships between man and the environment. The teachers' acknowledgement of human being interaction with and dependence on wetlands is a recognised starting point of teaching about sustainability (section 4.3 and 4.7). The various uses mentioned are the ones responsible for wetlands degradation (section 2.3) and the teacher is expected to foster development of concern for these aspects as well as how they could be addressed.

7.4 Personal use of wetlands by teachers

Teachers were asked in a questionnaire to explain the benefits they derive from wetlands around them (question 10 in Appendix 5.5). This question aimed at establishing whether teachers regard local wetlands as of benefit to them. The responses suggest that the teachers perceive themselves as deriving different benefits from wetlands. The valuation of each benefit was categorised following the classification system in Figure 2.3 and Table 2.2. These perceived personal benefits are summarised in Table 7.1.

Table 7.1 shows that direct-use value of wetlands dominated both in frequency and ranking indicating that teachers are aware of what wetlands are, perceive them as beneficial, and interact with them regularly. Some of the direct-use value of wetlands is directed towards exploiting them both for commercial and non-commercial gain. Biophysical aspects are the second most popular followed by social and then political aspects. A discussion on enhancing education for sustainability focusing on the aspects highlighted in Table 7.1 is explored in section 7.5.

The suggestions by teachers when compared with aspects of wetlands mentioned in section 2.3 and Figure 2.3 suggest inadequacy in consideration of the holistic aspects of wetlands. These

responses suggest the need for more teacher involvement in environmental education processes in order for enlightenment about the holistic aspects of wetlands to be achieved.

Table 7.1: Teachers' personal benefits from wetlands.

Benefits	**Frequency**	Rank	Valuation (Barbier *et al.* 1997:15; Emerton 1998:7)	Valuation (O'Donoghue & Janse Van Rensburg, 1995:8)
Domestic water	36	1	Direct use value	Economic
Farming water	20	2	Direct use value	Economic
Modify climate	17	3	Indirect use value	Biophysical
Water for animals	17	3	Direct use value	Economic
Building materials	15	5	Direct use value	Economic
Centre for recreation	13	6	Direct use value	Social
Grazing areas	8	7	Direct use value	Economic
Provide plant foods such as arrowroots	6	8	Direct use value	Economic
Habitat for plants and animals	5	9	Non-use value	Biophysical
Local crafts	4	10	Direct use value	Economic
Firewood	4	10	Direct use value	Economic
Centre for learning interrelationships	4	10	Direct use value	Political
Fish	3	13	Direct use value	Economic
Medicinal herbs and water	2	14	Direct use value	Economic
Control flooding	1	15	Indirect use value	Biophysical
Animal salt lick	1	15	Direct use value	Economic
Artefacts such as sea shells	1	15	Direct use value	Economic
Cultural and religious functions	1	15	Direct use value	Social

7.5 Teacher valuation of wetlands from a community perspective

Teachers were asked to express their local community perceptions about wetlands (question 14 in Appendix 5.5) by responding to a Likert scale in a questionnaire. This question was intended to establish whether teachers consider the community as important players in wetland issues. The Likert scale had response options for very important, important, neutral, less important and not important at all. These were coded as 5, 4, 3, 2 and 1 respectively. The overall rank was determined by totalling all responses per parameter and ranking them. The other ranks were determined by multiplying the frequency for responses to each parameter by the coding number

and the sum of all the products per parameter were used to calculate the ranks. The results are summarised in Table 7.2. The question was repeated in the interview to 39 teachers from ten schools (Table 6.1) and the results are shown in column 2. Results from responses to the questionnaire are given from column 3 onwards.

The questionnaire results indicate that the most important values of wetlands to teachers at community level are domestic water, water for animals, farming water and grazing areas. The values rated least were provision of transport, local crafts, attraction of tourists, recreation and purification of water. The trend for the most important values was repeated during the interviews although the wetland value as grazing areas lowered. The lower regard could be as a result of the teacher not being given a set of choices to choose from as was done with the questionnaire (question 14 in Appendix 5.5) and so possibly ended up forgetting it as an important value of wetlands. The interview phase also lost most of the ecological, social and political values identified earlier in the questionnaire while it also created two more categories, the industrial use and direct employment, which were not identified earlier using the questionnaire. However the trends in this question concur with the findings in Table 7.1 that involved individual teachers' benefits from wetlands.

Teachers derive many economic benefits from wetlands. Some uses are perceived to be more valuable than others. At a personal level (Table 7.1), domestic water, water for farming and for animals and building materials were ranked highly. However at community level, building materials were ranked low, while the other economic benefits remain high. This suggests that when compared to other wetland resources, water is of high value to the teacher and the community. 80% of Kenya's population live in 20% of the highly productive rural areas especially around water sources (MENR, 1994:117) and this could explain the high rating of use of water for agriculture and for animals as well as grazing areas. It also appears that the urban group in this study were quite conscious of their source of water and seem to understand that it does not simply come from the tap in their house, but from wetlands. This could be attributed to urban areas having a problem of solid and liquid waste leaching into wetlands that pollute the water making it unsuitable for human use (ibid, 118). The urban areas get their water from rural wetlands located far away and sometimes suffer persistent water shortage problems mainly

caused by population pressure and rapid development (ibid) as well as mechanical breakdowns, and this could explain why urban residents rank water and wetlands highly. In rural areas, most of the teachers could have some water harvesting from the roofs of their homes into tanks and this could explain why they are ignorant of wetlands as sources of domestic water.

Table 7.2: Summary of ranking of teacher valuation of wetlands

Parameters	Interview responses	Questionnaire responses – 54 teachers							
	Rank	Overall rank	Teacher categories						
							No. of years		
			Urban	Rural	Male	Female	21-30	31-40	41-50
Domestic water	2	1	1	2	2	1	3	1	3
Water for animals	3	2	2	1	1	2	11	2	1
Grazing areas	8	3	5	3	3	3	2	3	4
Farming water	1	4	3	4	4	4	4	4	7
Water cycle	-	5	6	5	5	7	1	5	8
Habitat for flora and fauna	5	6	4	6	6	6	8	6	5
Modify climate	-	7	7	8	10	5	5	8	2
Centre for learning interrelationships	6	8	9	7	7	8	10	9	9
Control flooding	-	9	10	9	9	9	6	7	12
Fish	4	10	8	12	12	10	12	10	6
Building materials	12	11	12	10	11	11	15	13	10
Filter silt	-	12	16	11	8	12	7	14	13
Culture and religious sites	-	13	15	14	14	16	16	12	14
Centre for research	-	14	17	13	13	14	9	15	18
Purify water	-	15	11	17	17	15	18	11	16
Centre for recreation	7	16	13	16	16	13	13	17	11
Attract tourists	13	17	14	18	15	18	14	18	17
Local crafts	14	18	18	15	18	17	19	16	15
Provide transport	11	19	19	19	19	19	17	19	19
Provide employment – fishing and the harbour	9	-	-	-	-	-	-	-	-
Water for industrial use	10	-	-	-	-	-	-	-	-

In this study, provision of fish was not rated highly by teachers especially in the rural areas. During the school visits the rural teachers and most urban teachers did not mention the use of wetlands as a source of fish. Only two teachers mentioned this value and these were from Kisumu (adjacent to Lake Victoria) and also in Mombasa (adjacent to the Indian Ocean) (Figure 2.1). Earlier research studies suggest that fish utilization as food is not popular within some communities because of cultural norms (Gichuki, 1999:104). However the urban areas in Kenya are more cosmopolitan and this could explain why the urban group rank it higher than the rural group.

The low ranking of water for animals, local crafts, building materials and fish by the 21-30 years age group could be a cultural issue. At this age, most of these teachers may not be married and may not be owners of property in the rural areas such as a house and animals. This age marks the age of finishing college and initial years of working. This is in contrast to the 41-50 years group, who ranked water for animals and building materials higher. This latter group is comprised mostly of married people with families and property who therefore use those wetland resources. These teachers have already been working for a long time and possibly have acquired some property.

The high ranking of farming water and attraction of tourists by the 21-30 years group could have its roots in their own schooling, or in what they teach after their professional training. The curriculum in Kenya covers these aspects in primary, secondary and at tertially levels of training (RoK, 1992; Lindhe *et al*. 1993)

Provision of transport was rated low by all the teacher categories. This is possibly because the teachers were reporting about their local wetlands, most of which are not used for this function. In Kenya most of the wetlands are small in size (Figure 2.1) and are not used for provision of transport. Transport provision was only reported for Lake Victoria and the Indian Ocean.

Education for sustainability is geared towards improvement of quality of human livelihood as well as sustaining the natural resource base (section 4.3). The discussion above suggests that teachers perceive the community as having differing meanings for wetlands based on economic

gains from them. Pursuit of economic development and its relationship with the other biophysical, social and political concerns and the resultant environmental degradation is partially responsible for the development of the process of sustainable development debate (section 4.3). Pursuit of economic gain has been noted to give rise to various problems (section 2.3.2) some of which include insensitivity to biophysical, social and political aspects and a blind accentuation on maximising profits (RU/SADC, 2000). The data from this study (section 7.3-7.6) portrays the wetland issues as serious since there are many economic interests represented. Wetlands are in this case regarded as emporiums or warehouses (Zerner, 2000) where people extract various resources. The role of environmental education is to promote appreciation of nature as important sources for various economic benefits and the fact that these resources are finite (also refer to section 2.4). This calls upon teachers to refocus the education programmes to recognise these economic aspects and address their potential implications for wetlands sustainability. These programmes should enhance exploration of human attraction to wetlands, the economic activities and people involved, the resources exploited, distribution of economic benefits among local people, the perceived threats and the required interventions. Active learning (section 4.7.7) could help in addressing these economic issues by accommodating a mix of methods such as lectures, doing research in books and other publications, visiting wetlands for research and taking action (section 4.7.6).

The ecological function of wetlands in the modification of climate was ranked high at personal level (Table 7.1) and moderately at community level (Table 7.2). The water cycle and habitats of wildlife were recognised at community level. This suggests that the teachers were able to regard wetlands as playing a role in sustaining life in their local areas. The age 21-30 yrs group ranked the water cycle highly while the age 41-50 years group ranked modification of climate highly. But during the interviews most of the ecological functions did not feature suggesting that they did not impact highly enough on the teacher so as to be recognised easily. However, the ecological function of wetlands as habitats was rated highly during the interview. This is possibly because they teach about it in the subjects (section 8.6) as well as interacting more with the fauna and flora of wetlands than with the other ecological attributes (section 7.3). However the number of ecological functions mentioned by the teachers was fewer compared to those appearing in Figure 2.3. This implies that their conceptualisation of ecological functions of wetlands was narrower.

Education for sustainability recognises the ecological roles of the environment as a life sustaining system as well as the base upon which the economic, social and political aspects hinge (Figure 2.2). The impacts of economic development have been blamed for interfering with the biophysical environment (Le Roux, 2000) as witnessed through pollution, ozone depletion and the greenhouse effect. Environmental education for sustainability strives to enhance exploration of these links and the complex natural cycles that sustain life (section 2.4). In this study these cycles are not adequately mentioned, implying the need for teachers to be more involved in activities that illuminate and prioritise these links.

Social use of wetlands for recreation was ranked high at teachers' personal level (Table 7.1). However, at community level (Table 7.2), this value was ranked low. Social issues such as cultural and religious functions were ranked low at both personal and community level. The urban group value recreation more than the rural group, which could possibly be due to the fact that buildings and other forms of infrastructure dominate urban areas (MENR, 1994). When these teachers visit wetlands they may find themselves immersed in a new context, which is more interesting than their usual concrete dominated one. It is possible that this helps to promote perceptions that wetlands can be good recreation areas and perhaps attract tourists. Recreation was also mentioned several times during the interviews (section 7.3) although the frequency of mention was lower than mention of economic and ecological attributes.

Cultural and religious functions were ranked more highly by the older teachers than by the younger ones (21-30 years). This suggests the likelihood that as one gets older, he/she gets more immersed into knowing and appreciating the cultural meanings of the natural resources. This could concur with symbolic interactionism (section 5.4) whereby increased interaction with wetland resources and other people for longer periods of time makes one understand and participate in development and modification of cultural aspects of the community.

Education for sustainability considers social issues as important aspects of the holistic aspect of the environment (section 4.3, 4.7). The social aspects mentioned by teachers show recognition of direct use values of wetlands for relaxation as well as religious and cultural functions. However,

Figure 2.3 suggests more social aspects that should have been explored. The goal of exploring the social aspects is to promote greater recognition of the influence of natural resources on relationships among people, meanings for various attributes, settlements, heritage, types of foods and resources exploited and cultural aspects supported by wetlands. The social aspects when considered from an ecosocialist perspective (section 4.2.2) aim at promotion of cohesion between human life and life supporting systems as complementary systems within the ecosphere (Salite, 2002:69). The recognition of only a few social attributes implies that the social aspect could be under conceptualised and may not be exploited to the maximum in the teachers' actions within both school and community contexts. This underscores the need for increased emphasis of social issues during training sessions for the teachers on wetlands.

Teachers also identified political aspects of wetlands such as using them for teaching about interrelationships and for research. All sub-groups in Table 7.2 share similar perceptions about their use for teaching about ecological interrelationships. Rural teachers, however, placed a higher value on wetlands as centres for research. This could possibly be as a result of these wetlands being familiar and accessible to the teacher since the ownership is local and known to the teachers. Rural teachers in this study expressed that they participate more actively in community activities (section 6.9). The teachers in the rural areas may find it easier to penetrate into wetlands for research and education purposes since the community regards them highly since they interact more closely. Section 6.9 portrayed urban teachers as not being actively involved in community issues. It is possible that in urban areas there may be more difficulties in negotiating access to wetlands for research purposes. The younger group ranked research higher than the older teachers and this could possibly be due to their being young and energetic, and possibly their having recently come from college where a research emphasis was encouraged. During the interviews the only political use of wetlands mentioned was use of it as a centre for learning and this was mentioned by six out of 39 teachers.

The political aspects mentioned by teachers mainly centre on direct use value of wetlands (Table 2.2). Education for sustainability aims at promoting harmony between people-people-nature relationships. There is emphasis on the need for people to share with each other and to care for the earth (IUCN *et al*. 1991:8). This addresses aspects of governance, access and use decisions

and ownership issues (Figure 2.3, section 2.3). It is not clear from the teachers' comments in this study whether these issues were addressed during the education and research activities. The data suggests the need to involve teachers in activities that enlighten them on political aspects of environmental issues (also refer to section 2.4).

In summary, the responses from teachers above represent various meanings teachers attach to local wetlands. The predominance of economic meanings compared to biophysical, social and politically based conceptions suggests the need for integrating the holistic aspects of wetlands during in-service training for teachers. The various meanings of wetlands for teachers in this study are expected to serve as motivators (section 8.3, 9.2.1, and 9.4.3) to conservation of wetlands. The education for sustainability aspects should emphasise the need to address the implications of these perceptions for sustainability of the local wetlands.

7.6 Special uses of wetlands to the local community

Teachers were asked in a questionnaire to list some of the very special uses of wetlands to the local community which, if absent, could have a major negative impact for the community (question 14b in Appendix 5.5). This question was aimed at allowing teachers to specifically suggest the very intimate value of wetlands to the community. The teachers' suggestions are summarised in Table 7.3.

The data suggests that the most valuable uses of wetlands are water for domestic use, for animals, for farming and grazing land during dry periods. The values differed between gender (male and female) and contextual (urban and rural) categories. Male teachers rated wetlands more highly than females with regard to provision of water for domestic use, for animals, grazing areas, water for farming and building materials. The gender disparity is a bit unexpected and hard to account for. However this could be as a result of gender roles whereby some roles such as grazing and building are men's roles in some communities. The males may rate these wetland values higher than their female counterparts since they are directly involved. Wetlands are traditionally known to be popular as grazing areas and for provision of building materials (section 2.3.2).

Table 7.3: Teacher perceptions of the special uses of wetlands to the community

Category	Special uses to community	No. of teachers in different categories				
		Overall count	Males	Females	Urban	Rural
Economic	Water for domestic use	37	24	13	12	25
	Water for animals	31	21	10	10	21
	Grazing areas in dry seasons	21	13	8	7	14
	Water for farming	27	17	10	8	19
	Provide building materials such as sand, gravel, water	8	8	0	3	5
	Fish	5	3	2	3	2
	Provide food such as arrow roots	1	1	0	0	1
	Provide clay for smearing local houses	1	1	0	0	1
	Provide herbal medicine	1	1	0	0	1
	Provide transport	1	1	0	0	1
	Provide water to a tea factory	1	1	0	1	0
	Tourism attraction	2	2	0	2	0
Ecological	Habitat for plants and animals	5	4	1	2	3
	Modify climate, cool breeze	3	2	1	3	0
	Assist water cycle	3	1	2	2	1
	Purification of water	2	2	0	0	2
	Purification of wastes	2	0	2	2	0
	Filter silt flowing downstream and make fertile soil for farming	1	1	0	0	1
	Control flooding	1	0	1	0	1
Political	Provide learning materials -centre	1	1	0	0	1
Social cultural	Cultural and religious practices done here	3	1	2	1	2

The rural group rated wetlands highly as compared to the urban group with regard to provision of domestic water, water for animals, grazing areas during dry periods and water for farming. This is expected because rural areas have cleaner water (Ndiritu, 2001; Ndaruga, 1998) and most grazing and farming activities are confined to the rural areas (MENR, 1994). The sequence of rating of the uses of wetlands concurs with the one in Tables 7.1 and 7.2 but differs in terms of context and gender considerations especially for economic aspects. The difference between the rural and urban economic value of wetlands is understandable because wetlands act as determinants of settlement distribution in rural areas (MENR, 1994:117). Compared to urban areas, wetlands are extensively used in rural areas.

The teachers seemed to have greater considerations for economic aspects of wetlands than for social, political and biophysical aspects. However, biophysical aspects registered some improvement compared to those mentioned in Table 7.2. The economic aspects mentioned were mainly geared towards direct use of wetlands (section 2.3). The responses by teachers suggest the possibility of wetlands degradation by community economic activities. A document analysis of the syllabus and the books used by the pupils (section 5.8.5) failed to locate mention of most of the aspects mentioned in Table 7.2 and 7.3. This implies that the responses by teachers were personal constructions by the teacher after interaction and reflection on local wetlands. This tallies well with constructivism as well as symbolic interactionism (section 5.4).

This discussion above (section 7.2-7.6) suggests the possibility of lack of enough knowledge in teachers about wetlands. This strongly suggests the need for more training on wetland issues to enhance understanding of values and functions of wetlands to enable teachers to involve pupils and members of the community in more holistic and innovative activities. Di Chiro (1987:25) reiterates the need for knowledgeable educators by asserting that "…environmental education is strongly oriented to environmental problem solving. Before an environmental problem can be solved, it must be adequately defined and understood so that an effective environmental education curriculum can be created and real solutions developed and applied." With the current perceptions of teachers inclined towards the exploitive aspects of wetlands, there is need for the teachers to be involved in environmental processes that empower them to facilitate activities that counteract adverse effects of perceived economic values of wetlands. The education activities need to consider wetlands holistically (Figure 2.3) as well as advocating promoting sustainable use of wetlands. This would involve exploration and application of the holistic meanings of wetlands (section 2.3) to promote broader conceptualisation of environmental issues and risks as well as responses.

7.7 Teachers' personal concerns (dislikes) about local wetlands

Ten teachers (section 5.6.2, Table 6.1) were asked in an interview to name any environmental problems that they experience locally (question 7 in Appendix 5.7). The purpose of this question was to establish whether there were any local environmental problems that teachers could easily

identify and prioritise as agendas during teaching at school as well as within the community context. Teachers cited local problems such as

- local industry
- densely populated streams where many people and animals converge for water
- pollution by solid waste, sewage
- no trees
- deforestation
- soil erosion

The data shows the presence of local environmental problems that teachers could identify with. The problems identified by the teachers seem to be centred on people's pursuit of economic development (refer also to Table 7.2 and 7.3). This strengthens the need to address the pursuit of economic benefits locally as well as its impact on wetlands. The problems mentioned also focus on people interaction with wetlands or with the environment in terms of people's activities in the catchment impacting negatively on wetlands, for instance through soil erosion and pollution. For the teacher to address these problems, it seems necessary to integrate the human aspect of the problem into the learning process. These issues are covered directly in GHC, Science and Agriculture (Appendix 3.2, 3.3 and 3.4).

The ten teachers (Table 6.1) were then asked to explain what they disliked about the local wetlands (question 12 in Appendix 5.7). This question was aimed at soliciting for a personalised view of the negative feelings held by teachers concerning wetlands. Their responses include both biophysically related and human induced aspects as shown below:

Biophysically related concerns

- Drowning of some people
- They make the place impassable. One cannot cross anywhere but has to go for long distances along the river and if you are in a hurry, you don't like that.
- Sometimes there are animals that are dangerous like crocodiles, hippos
- There are insects that can bite, the ants, mosquitoes.
- There is some vegetation that itch the skin

Human induced concerns

- Foul smell from the sewage
- Sometimes they are soggy
- Some people farm near wetlands and cause soil erosion.
- Some farmers use chemicals that may affect wetlands.
- Pollution by silt, farm chemicals, oil, sewage factories.
- Over utilisation
- Clearing of vegetation
- Some people make cattle roam everywhere making the water dirty.
- Grabbing of land around wetlands

The biophysically related factors show recognition of negative meanings associated with natural features of wetlands. These factors could lead to wetlands degradation which entail clearing of vegetation, draining, destruction to construct roads, killing of animals as well as spraying or adding oil to wetlands to get rid of insects such as mosquitoes. Sustainable development education could entail exploring these natural based negative meanings associated with wetlands.

The concerns about wetlands emanating from human interactions seem to be inclined towards issues of overuse, misuse and pollution which are all inclined towards the economic aspects of wetlands uses (section 2.3.2). Grabbing of land near wetlands is more inclined towards the political aspects (section 2.3.4). The list of dislikes by teachers acknowledges the importance of the holistic approach to wetlands conservation (section 2.3). To do this would require interplay of methods as discussed in section 4.7 and 4.8 as well as others appearing in later chapters of this thesis. This study also looked at how the problems were perceived by most other teachers using a questionnaire (section 7.8).

7.8 Teacher perception of the local wetland threats

Teachers were asked using a questionnaire to respond to a Likert scale question on what they perceived as threats to their local wetlands (question 15 in Appendix 5.5). The scale and coding used was similar to that of wetlands value (section 7.5). This question aimed at establishing

whether teachers were aware of threats to their local wetlands. Their responses, summarised in Table 7.4 suggest that the most important perceived threats were population pressure, agriculture, soil erosion, deforestation and overgrazing. The least important threats were seen to be pollution by industries, exotic species, destruction to get rid of mosquitoes, over-harvesting of wetland products and pollution by sewage.

Table 7.4: Perception of wetland threats by teachers

Threats	Overall rank	Teacher categories and ranks for wetland threats						
		Urban	Rural	Male	Female	21-30 yrs	31-40 yrs	41-50 yrs
Population pressure	1	1	2	2	1	1	1	1
Agriculture	2	5	1	3	2	2	2	3
Soil erosion	3	2	4	1	4	3	3	4
Deforestation	4	4	5	4	5	7	5	2
Overgrazing	5	11	3	5	3	5	4	7
Pollution by farm chemicals	6	7	7	6	9	6	7	5
Over-extraction of water	7	8	6	7	8	4	6	10
Pollution by solid wastes	8	6	10	10	7	10	8	8
Pollution by sewage	9	3	12	11	6	11	9	6
Over-harvesting of products	10	12	8	8	10	8	11	8
Destruction to kill mosquitoes	11	13	9	9	12	12	9	13
Exotic species	12	9	11	12	11	9	12	11
Pollution by industries	13	10	13	13	13	13	13	12

The major threats mentioned by teachers are a result of economic pursuits (section 2.3.2). Population pressure is a social aspect (Figure 2.3, section 2.3.3). The economic pursuit and the resultant problems also bring into focus issues of sustainable development and environmentalism (section 4.4) suggesting that in the teachers' locality, issues of unsustainable use of wetlands are rife and need to be addressed.

Urban and rural teachers of both gender held similar perceptions regarding population pressure. Kenya has witnessed a rapid growth of population over the years. The population has increased from 11 million in 1969 to 28.7 million in 1999 (RoK, 2001:xxvii). This has lead to increased demand for resources including wetlands (RoK, 2001b). Urban teachers high ranking of soil

erosion is unexpected, but this may be as a result of high urban population that tramples on the little vegetation and grass in open spaces leaving the ground bare, which is easily eroded when it rains. Among the age groups there was no difference in perceptions about soil erosion.

Deforestation was not a major issue with the 21- 30 years age group but was ranked highly by the other age groups. This could possibly be due to the fact that the older generation were born at a time when there were extensive forestlands that have now been taken up by farmland and other land uses (Manguriu, 1999; MENR, 1994; UNEP, 1987; RoK, 1972). They are therefore more likely to complain about deforestation. The younger group may not have witnessed this destruction and perceive the *status quo* as normal. Differences in perceptions about agriculture as a threat were witnessed among the rural and urban teachers with the former rating it highly. This could be expected because rural areas have more agricultural activities (MENR, 1994:117) and teachers work close to where these agricultural activities take place. There were no differences among the various age groups.

Overgrazing was ranked more highly by the rural teachers than the urban teachers. Females ranked it highly as a threat. The various age groups differed in perceptions about overgrazing with the age 41-50 years ranking it low. The high ranking for overgrazing, agriculture and over-harvesting of wetland products by rural teachers depicts what happens in rural areas where wetlands are exploited for domestic, agricultural and grazing purposes (section 2.3.2) including by teachers who could also be landowners. In urban areas the land use is dominated by buildings and non-agricultural enterprises (section 6.2) and hence agricultural activities are ranked lower.

The teachers expressed the view that pollution was not a major threat to wetlands compared to other threats. Pollution by industries, sewage and solid wastes were ranked low. However, comparisons between the urban and rural teachers revealed that pollution by sewage, solid wastes and by industries were major issues in urban areas and were ranked higher compared to rural areas. This is expected because urban areas have a high population, many settlements and economic activities that generate a lot of wastes. In Kenya different kinds of pollution have been reported in wetlands (Thenya, 2001; Kiithia & Musingi, 1995) but pollution by sewage is a major problem in urban areas compared to rural areas (Ndiritu, 2001; Ndaruga, 1998). Pollution by farm

chemicals and solid wastes were given low ranks. These responses suggest that pollution issues may not be well understood by the teachers. Both groups, however, held similar perceptions about pollution by industries. This response is expected because Kenya does not have many industries. Pollution by industries is localised to some areas and some rivers (Ndiritu, 2001; Ndaruga, 1998; Kiithia & Musingi, 1995) and teachers in some areas may not have witnessed industrial pollution.

The exotic species is a major issue in Kenya (Njuguna, 1992) and are introduced into wetlands either deliberately (for instance the Nile Perch in Lake Victoria), which gives the aspect a political dimension, or get into wetlands accidentally (for instance the water hyacinth) and this gives the problem a social dimension of negligence. The low ranking of exotic species suggests that teachers may not be familiar with them. This is an area that should be addressed. Mosquitoes are naturally occurring in wetlands but people's decision to destroy the wetlands is a political issue (Greenall, 1987) of lack of awareness of the ecological aspects of wetlands leading to poor decisions.

There seems to be a relationship between males and females in perception of wetland threats such as soil erosion and overgrazing. Female teachers rated soil erosion and pollution by farm chemicals low as a threat. Males rank soil erosion higher than females. In Kenya most agricultural activities are done by women (Karembu 2002; Ongile, 1999) and it appears that the way they understand pollution by farm chemicals and soil erosion is different from their male counterparts who rank them highly as threats. The females may think that they are doing their best to conserve the soil but men, who in this case may be observers, think otherwise. The same applies for overgrazing whereby grazing is usually a male dominated practice and women are observers, who in this case accuse the practice as responsible for causing soil erosion.

The above discussion portrays different meanings by teachers on threats to their local wetlands. The threats challenge both quantity and quality of wetlands. The causes of the threats traverse economic, social, biophysical and economic aspects of wetlands. This reiterates the need for ensuring a holistic approach to addressing local wetland threats. The threats identified in sections 7.7 and 7.8 are expected to be the focus of local interventions by teachers using both formal and

non-formal forums. Education for sustainable development underscores the need to address local issues as a goal while reflecting on sustainability of the environment in the longer term (section 4.7). Sustainable development at the local level entails shaping people's realities to project their way forward through critical reflection of their present and past situations (Pretty, 2002:166) and implementation of appropriate interventions. How teachers reflect on these local threats is discussed in several sections of Chapters 8 and 9.

7.9 Teacher perceptions of the local community's awareness about the wetland threats

Teachers were asked using a questionnaire whether they thought the community and the school were aware of threats to their wetlands (question 16 in Appendix 5.5). This question was aimed at exploring whether teachers recognise the need to sensitise the local community about wetlands. The focus on sustainable development entails people working together to promote better quality of human livelihoods as well as caring for the vitality and diversity of the earth (IUCN *et al*. 1991:8). Teachers cannot do this only at school because the wetlands are located and shared with the community and schools should work together with the community to resolve the local wetland problems (Gough & Robottom, 1993). After all, environmental education is not neutral, but outcome based, aiming at nurturing critical thinking and consciousness in learners to conceptualise and influence change in the local *status quo* towards development of sustainable processes and societies (section 4.3). This could be possible if schools embrace a tradition of working together with the society and reciprocating each other's efforts to ensure sustainable development (Table 4.2).

In this study, 31 teachers responded that the local community was aware of the threats to their wetlands. The following reasons given to support their argument can be divided into three categories. The number of teachers for each response is indicated in parenthesis.

The first category claimed that they thought the members of the community were aware about their local wetlands. They supported their arguments saying that

- Residents suffer - they fetch water far away (1), community sometimes complain of pollution by sewage and typhoid (1), pupils have learnt about and experienced sewage dumping (1), villagers buy wetland grown vegetables and if not present they suffer (1)

- Wetlands have disappeared - a grazing land in former wetland is no longer there (1), everybody can see that the wetland nearby has very little water now due to cutting down of trees at source (1)

- Residents use wetlands - villagers get water from wetlands and nearby shopping centre (1), school is aware since they are part of the community and use wetlands (1)

- Residents don't care sometimes - those who don't live near wetlands don't have concern and only rely on them during drought (1), complain whenever there is water shortage but they are ignorant of source (1), members cause a lot of pollution (1), they are aware but little has been done (1)

These statements seem like speculations by the teacher that the community interact with wetlands and hence are aware about them. This view augurs well with symbolic interactionism in the sense that teachers are of the opinion that the community have constructed various meanings for their local wetlands (section 5.4). However, the teacher seems not to have done anything to involve the local community in learning more about wetlands. There is no evidence of the teacher involving the community in a learning process to influence their meaning making towards those meanings that are consistent with the ideas of sustainable development (section 4.3). The picture presented here is that of teacher recognition of the *status quo* of wetlands that has developed within the community over time but which has not been challenged or enhanced.

The second category of teachers claimed that some awareness has been created and supported themselves with statements such as

- Teacher/school has told pupils - teacher had sensitised pupils during club days (1), teacher had sensitised pupils about dangers of planting exotic trees near wetlands such as Eucalyptus and hopes they inform their parents since its difficult to meet community members through chiefs baraza (1), teacher in serviced the school and the community after the workshop (1), school has posters (1)

- Teacher told the local community - teacher talked to chief who promised to organize a meeting for him (1), teacher was given an opportunity by the head teacher to address parents and teachers about wetlands (1), school has talked to farmers on good methods of farming (1), community sensitised through seminars, workshops where soil erosion controls and planting of trees are emphasized in school (3)

- Media and local administration - most people are informed through the media (1), community have been informed through barazas, demonstration plots by agricultural extension officers (1)

- Practical action visible - a special day set aside to remove water weed (1), government has employed forest guards to protect forest clearing around wetland (1), special areas created for animals to get drinking water (1), school once collected rubbish at wetland (1), community have started a project to control soil erosion and overgrazing (1), sometimes youth remove silt from wetland (1), community removed water weed from dam (1), people rejected city dumping site in the locality (1), people plant trees (1), community conserve soil in their farms (1), community use water from other areas (1), community worked with an NGO to build a reservoir and to protect a wetland (1).

These statements acknowledge some effort by the teacher and other stakeholders in raising awareness about wetlands. Nevertheless, only six teachers told the community about wetlands. The teachers' responses on involvement in sensitising the pupils and the community is commendable but it looks more like an information transfer to passive recipients. The use of

media and local administration appears to be use of a transmission approach that does not acknowledge people's local knowledge. The local people do not seem to be adequately consulted. Even where practical action is reported, the process seems narrowly conceived, short in time duration and as one off activities. The cycles of perfecting practice from exploration, reflection, dialogue and action (O'Donoghue & Janse Van Rensburg, 1995; Gough & Robottom, 1993) were not visible in these interventions. It is possible that the teachers have no reference point and may continue replicating mistakes of earlier interventions. There is also danger of not winning continued community support and motivation since the time duration is short and the community members are not given the opportunity to wrestle with ideas as well as to own the implementation of their conceptions.

Education for sustainability acknowledges the role of exploration of and reflection on local *status quo*, dialogue and generation of local action (Le Roux, 2000). This ensures that the problem being addressed is a priority for the local people and that everybody participates and has a chance in decision-making about the solution to the problem. In the case of this question, this seems to be lacking.

The third category of teachers claimed that the community were aware about the wetland threats but other factors intervene. They supported themselves with statements such as

- Aware but compelled - community is revenging against discrimination in land allocation and hence invade wetlands (1), poverty, ignorance and selfish motives pose threats (1), wetland allocated to desperate people who don't mind flooding and dumping (1), people concerned are not ready to stop this activity due to land pressure (1).

- Desperation - little can be done since wetland filled with hyacinth (1), nothing is being done even if they are aware (1).

These statements present some of the hardships teachers face in championing for environmental conservation. They portray the teachers as overwhelmed by the *status quo* on the ground, what

O'Donoghue and Janse Van Rensburg (1995) refers to as 'action paralysis'. This is a major challenge especially in developing countries (Hattingh, 2002) where issues of survival and lack of resources supersede innate desires for conservation. The responses suggest some political aspects of policy that are unable to check issues related to discrimination, land allocation, grabbing and dumping. Some of these issues extend beyond the teacher's control but impede on their action. Agenda 21 (UNESCO, 1992) emphasised many aspects of promoting environmental sustainability that include appropriate policies to check on abuse of the environment and resources as well as putting in place legal administrative structures that are sensitive to environmental issues. The teacher responses in this section call for localization and strengthening of these policies and legal structures to create a more enabling environment for promoting environmental education. Some awareness to foster development of these policies could be enhanced through the integration of the holistic aspects of wetlands (Figure 2.3, section 2.3).

In summary, the scenario presented by teachers about the community awareness of wetland threats does not demonstrate local environmental action towards promoting sustainability of wetlands. Sustainability entails people deliberately working together locally to improve their livelihood as well as to ensure that the local resource base is not depleted (section 4.3). This implies the local people being aware of their resources and taking responsibility of their conservation. The teacher responses to this question did not portray social cohesion and consensus to address local wetland issues. The teacher appears to be working individually while the local community seems to be poorly informed about their wetland resources and threats.

Some teachers claimed that the community was not aware and gave reasons such as

- Ownership - Wetland is treated as nobody's land (2)
- Community is illiterate and do not realize the dangers (3), community has never had these programmes and there is lack of general awareness (2)
- Corruption by local leaders who are quiet or collaborate in destruction (1)
- Personnel - lack of qualified personnel to create awareness (2), the few people who are aware don't enlighten others (1)

- Wetland degradation continues as a daily practice in the area (3), people construct houses along the slopes (1), washing clothes (1), reclamation and overgrazing (2)
- Community is ignorant (3).
- Wrong perceptions such as thinking that they are changing wetlands into productive land by growing crops (1), claim it is a way of controlling pests and diseases such as mosquitoes and tsetse flies (1).
- Teachers not aware in time and only view programmes on television after research has been conducted without them being invited. Sometimes teachers do not receive information from lead conservation agencies and the Ministry of Education on time (1).

The reasons given by the teachers are mainly inclined towards political aspects of environmental education. This includes issues of ownership, illiteracy, ignorance, corruption, misconceptions and lack of information which influences the community decision making on access and use of wetlands (Figure 2.3, section 2.3.4). These responses also touch on issues of policy that do not seem to recognise conservation of local wetlands and how this can be done. The local policies seem to have failed to inform the local people about their responsibilities in wetlands conservation. This calls for programmes that involve the participation of the community in making decisions on how to reverse wetland destruction. The policies should be in harmony with the principles of sustainable development (section 4.3) geared towards promotion of social justice, equity and fairness to one another and to the environment. These findings reiterate the need to seek ideas from teachers and the community early enough before programme implementation and to work with them to resolve local wetland problems.

The training programme on wetlands offered in 1999 could have been better if the trainers knew some of these issues earlier. This could have made the programme responsive to the people's current challenges. Education for sustainability is emphatic on the need for education to be relevant to the local needs, be it the curriculum or the audience participating in the training programme (section 4.7.1). Relevance could be enhanced by allowing teachers to participate in deliberating, reflecting, proposing and implementing remedial actions to their perceived wetland threats (section 7.7 and 7.8) as well as to the action constraints mentioned above.

7.10 Perceptions of teacher potentials locally

Ten teachers (section 5.6.2, Table 6.1) were asked in an interview to comment on the question whether they consider themselves capable of championing for wetlands conservation (question 14 in Appendix 5.7). This question aimed at gathering information about how the teachers were motivated to champion for wetlands conservation. Their responses fell into two categories - some teachers saying that it was possible, others that it was impossible.

Five of the active teachers (Table 6.1) reported that it was possible to champion for wetlands conservation and claimed that

- Being a teacher, you can pass this information in different ways such as through the pupil, doing it practically at school, and the pupil can pass it to the community.
- There is good relationship with the community. I can talk to them and they can listen to me
- We have participated in many cleanups and that is an achievement.
- I am involved with administration and I am a class teacher. I have a lot of work but I feel I should find time for the environment no matter how much I am involved.

These responses appear to be wishful statements by teachers or just rhetoric and no action. Although these views are commendable as attempts to recognise local environmental problems, the responses do not show any existing proactive, long-term programmes to address wetland issues. The methods mentioned are mainly transmission approaches (Table 4.2). There was no indication of teachers' personal involvement emanating from the lessons learnt from previous interventions. Even where eco-management activities (section 4.7.6) were reported such as cleanups, there was no linkage to show that the school proactively engaged with a local problem with an aim of enhancing learning and taking long term considerations for the environment. The interventions fail to qualify as an ongoing process of exploration, acting, reflecting, dialogue and re-planning to perfect subsequent action (O'Donoghue & Janse Van Rensburg, 1995; Stapp & Wals 1993). These views concur with what Woods (1992:358) refers to as theoretical definitions held by teachers but which are never implemented due to other intervening constraints such as lack of motivation, class size and curriculum and exams prescriptions. The teachers in this case

portray high optimism inclined towards wetlands conservation but propose neoclassical approaches to education as a way of achieving their motives. The neoclassical approaches are inclined towards education about the environment (section 4.8.1) which, though rated as a useful option within the complex web of environmental education process (Tilbury, 1995) have also been criticised for being behaviourist and for promoting social engineering (RU/SADC, 2000; O'Donoghue & McNaught, 1989; Robottom, 1987).

Other teachers who were selected on the basis of being inactive (Table 6.1) said that it was possible to champion for wetlands conservation, but cited problems experienced such as

- Resources - lack of finances and other resources such as a fishpond or a dam.
- Support - Teacher may not be able to interact with everybody, needs support of the head teacher and the local leaders (such as chief and member of parliament), the education office and members of the community. Other issues include jealousy where some people may think the teacher wants to shine more than them, discouragement from other corners and having no other person to work with.
- Training - need for initial empowerment.
- Curriculum - The curriculum is based on examinations and anything that is not examinable is not considered.
- Biophysical - trees can be planted but there is no water. Parents buy water for use at home and cannot allow children to carry water from home to the school.

The inactive teachers felt their potentials constrained by various problems. These problems are also cited and discussed in sections 8.15, 9.2.3, 9.3.4, and 9.4.8. These are some of the problems that need to be addressed to enhance wetlands education. The problems seem to anchor on economic, social biophysical and political aspects of wetlands (section 2.3) as well as education for sustainability aspects (section 4.7). The problems suggest the need to work closely with the teacher and to learn from one another to improve teaching practice as well as the local environment.

7.11 Teacher perception of the term "environmental education"

Ten teachers (section 5.6.2, Table 6.1) were asked in an interview to explain what they understood by the term "environmental education" (question 2 in Appendix 5.7). The aim of this question was to explore teacher perceptions of what they considered environmental education to entail.

Table 7.5 Teachers' perceptions about environmental education

Major orientation	Details
Knowledge	Environmental education is the person acquiring knowledge about our environment or about our surrounding. Surrounding refers to every aspect around us starting from the air we breath, the places we stay, soil and water, animals, buildings, its everything
	It is the acquisition and imparting of knowledge that involves everything that surrounds us. Surroundings mean what we come into contact with as we go through daily activities. We have like vegetation, water, human beings and animals.
	Environmental education is the knowledge about my surroundings. My surroundings comprise of other people, plants, water from time to time, animals, air etc.
	The study of what surrounds man. Surroundings mean man made features such as roads, houses and God made features such as animals, trees, birds, rivers, lakes, vegetation, mountains and people (2 teachers)
	Environmental education refers to what surrounds you as a human being. For example plants, water animals and other living things. It refers to whatever may affect you as a human being or a living thing
Practical skills	Environmental education is the teaching of practical skills about the environment and also people and the environment.
	The environment is a wide topic, in an urban area it may refer to the pollution of the environment, maybe things to do with the health, preventive measures and so on in the environment. But as far as I am concerned, I like beauty, you know with a beautiful environment, I think it's also important to keep the environment clean. Its part of what I usually do in terms of keeping flowers well managed, clean and so on.
Interdependence	Study about other animals. People depend on animals and animals depend on each other. They are interdependent. Environment means many things, plants, animals, water and outer space.
Understanding	Environmental education means to guide and assist people to understand their environment. Environment is the surrounding. This includes the surrounding industrial area and hospitals.

Their responses revealed that teachers have different predispositions about what they thought environmental education entailed. Environmental education was considered in terms of knowledge acquisition, acquiring practical skills, interdependence and creating understanding. The explanations in each case are given in Table 7.5.

Those whose focus is on the knowledge emphasise the importance of what surrounds man. But their suggestions about the surroundings are biased towards the natural environment with very little emphasis on processes and structures in the society such as social norms, culture and governance and their impact on people and the natural environment (section 2.3, Figure 2.3). This is a narrow approach to environmental education. The teachers with a bias towards practical skills tend to introduce the concept of people and the impact of human activities on the environment. However the interactive process does not feature.

One teacher emphasised interdependence but failed to problematise the process and was still confined to the natural environment. The teacher who emphasised understanding does address both natural and human environment but simply on understanding and not taking action.

All the definitions above seem inadequate since they fail to be holistic (Figure 2.2). They seem to be biased towards the natural environment and give little emphasis to the economic, social and political processes and structures that affect the natural environment as well as influence the human-human-environment relationships (section 4.3). They also fail to nurture critical thinking to generate actions geared towards challenging the present *status quo* of the environment. The environment according to the teacher descriptions appears external to the person, something to be attained and not to be nurtured. This is an inadequate way of looking at environmental education and has an impact in later actions to conserve wetlands in both formal and non-formal contexts (chapters 8 and 9).

7.12 Conclusion

The analysis of the teachers' responses suggest that teachers have a close and interactive relationship with wetlands. The results show that teachers are aware of their wetlands and have some well developed perceptions of their value and threats. All the teachers who were in-serviced were able to describe wetlands precisely while some of the teachers who were not in-serviced had problems in describing their wetlands (see section 7.2). These findings suggest that although meaning making through symbolic interactionism is acknowledged in this study (section 5.4), teachers make diverse meanings about wetlands some of which are incorrect. Wetland issues are not integrated in a straightforward manner in the Kenyan curriculum (Appendix 3.1-3.10). It is crucial that teachers are conversant with correct information about wetlands to enable them to develop appropriate innovations and interventions with their pupils and members of the community on how to promote their sustainability.

Teachers expressed various perceptions about wetland values (section 7.3-7.6). They cited the most important uses of wetlands to the community as provision of water for various uses such as domestic use, for animals and farming and as grazing areas. Teachers rated these uses as special to the community such that, if absent, the community would suffer. These results suggest that wetlands are very useful resources to the community. These direct use values of wetlands are either for commercial or non-commercial purposes. The pursuit of economic gain from wetlands suggests that people have a great attraction to wetlands and exploit them for various commercial and non-commercial gains. However at the personal level biophysical and social issues were ranked higher compared to at the community level (Table 7.2 and 7.3). The high rating of biophysical and social aspects of wetlands at personal level suggests that teachers have a personal affection for the ecological and social role of wetlands and these could be attributed to their professional training and practice. The low rating of wetland biophysical, social and political attributes at community level implies that these meanings of wetlands are not as prominent as the economic ones. These findings suggest the need for emphasis of the holistic aspects of wetlands during in-service training.

The questionnaire data suggests that the main threats to wetlands were based on pursuit of economic activities to improve the livelihood for the increasing population. There were differences in emphasis between the urban and rural and also between male and female teachers on their perceptions of wetland values and threats. The threats could be attributed to the farming based economy of Kenya (MENR, 1994). The interview data suggested that wetland threats were broader in scope. The several biophysically based threats that were mentioned during the interview could also lead to wetlands destruction. These threats suggest that teachers are able to identify with their local wetlands and have diverse ideas of what goes on there. These are locally based issues that teachers were expected to address through various education for sustainability based approaches (section 4.7 and 4.8) to ensure the conservation of the local wetlands. The responses by teachers support Jensen and Schnack's (1997:164) view that environmental problems are located within the society and our ways of living and the need to seek for solutions to these problems exist at both societal and individual level. In this case the values and threats cited by teachers are local and need locally constructed solutions.

Teachers had various perceptions about community awareness about threats to wetlands. Some teachers felt that the community members were aware of the threats to their wetlands (section 7.9). Some of the arguments to support their views were assumptions that the community interact with them, they suffer from their unavailability, and that they use them. Other teachers felt that even if they know about wetlands, they do not care about them. While these arguments support the notion of meaning making through interaction with wetlands and between people (section 5.4), data from the teachers revealed that sometimes the conceptions held could be wrong (section 7.2). The community could also be holding wrong perceptions about their local wetlands. These misconceptions could be corrected through engagement in environmental education and teachers could be instrumental in fostering this aspect.

Some teachers felt the community was aware about the local wetland threats since they had been engaged in some kind of awareness by the teacher, the school, the media and through practical action at local level (section 7.9). However, only six out of fifty-four teachers reported having made an effort to inform the pupils and members of the community about wetlands using a transmission approach (section 7.9). The community in most areas covered by this study may not

be enlightened on wetland value and threats and their contributions towards their destruction and conservation. This strongly suggests that the teachers were not instrumental locally in involving the community in addressing local wetlands issues. The training they received seems not to have benefited the local community.

While the teachers suggested how the community came to know about wetlands, they failed to show a continuous proactively conceived locally based engagement with local issues and risks. It was not clear that the community members and the teachers were deliberately responding to local environmental problems that were posing threats to local wetlands. There is a possibility that the community might not be aware about wetlands as the teachers claimed because there were no signs of real involvement in problem identification, deliberation, strategy development and implementation as well as reflection to improve subsequent interventions.

Some teachers felt that the community was aware but were compelled to degrade wetlands due to factors such as discrimination, poverty, ignorance, ownership problems, and land pressure (section 7.9). These aspects again portray the need for addressing holistic aspects of wetland issues and to involve the community since they are familiar with the local contextual issues and how to solve them.

Some teachers claimed in an interview that they had the potential to champion for wetlands conservation in their local areas (section 7.10). However their perceptions had many features of neoclassical transmission approaches (section 4.6.1). There was no indication of the teachers' personal involvement emanating from the lessons learnt from previous interventions. The responses seemed like a wish list of what teachers thought they could do. The predominance of neoclassical approaches in this study suggest that the teachers' conceptualisation of environmental education is narrow since it fails to show recognition of progression in intervention perfection with continued interaction between education about, in and for the environment as a process (refer to section 4.8).

Teachers suggested various constraints that were a hindrance to local action. These include lack of resources, support, training, curriculum and natural climate. The first four constraints suggest

the need for teachers to be enlightened on how to engage pupils and the community in environmental education processes that could enable them to make their own local resources, mobilise their colleagues and the administration as well as integrate a broader approach to the curriculum and not 'as given' to pass examinations.

Ten teachers in an interview gave various definitions about their conceptualisation of environmental education (section 7.11). The definitions, however, were inclined towards understanding of the environmental attributes. None of the teachers mentioned relationships between people and nature. Most teachers held a general view about the environment as 'everything' that surrounds people which did not seem to entail the holistic view of the environment The teacher conceptions seem to be more inclined towards the physical, observable and tangible aspects of the environment. The lack of mention of environmental decision-making and action is suggestive of lack of awareness about the vital need of involving others in taking action. This outlook to environmental education seems to be responsible for the findings in this research whereby teachers suggested that their anticipated outcomes after teaching pupils about wetlands were mostly to promote knowledge and understanding (section 8.14).

This study demonstrates the need for teacher in-service training programmes to seek teachers' views first in order to understand them fully before the training programme implementation. There are indications that in Kenya differences in perceptions among the sub-groups studied are often not taken into account in such training programmes for teachers. The contextual and age difference issues should also be given consideration in order to focus the training programmes properly. The training programme in this case should be developed with and not for teachers.

The curriculum used in Kenyan primary schools has many possibilities for integrating issues about wetlands into day-to-day teaching (chapter 3, Appendix 3.1-3.10). Wetland issues are integrated into the syllabus content of Geography, Science, English, Mathematics, Kiswahili, Music, Art and Craft, Agriculture and Religious education. This chapter has demonstrated that the teacher, besides being directed by the curriculum to teach about wetlands, also has a reserve of knowledge and perceptions about local wetlands, which he/she can utilise to enrich teaching and learning in school. This, if harnessed by the teachers, could assist in enhancing wetlands

appreciation by pupils, and is a challenge to environmental education trainers. This aspect is explored further in section 8.6.

At the community level, the teacher is also often a person endowed with both social and intellectual leadership roles (section 6.9). Often, being one of the educated people in the community, he/she can play a potentially leading role in promoting concern and care of the resource he/she benefits from. The teacher's activities within the community context are explored in sections 9.3 and 9.4.

CHAPTER 8: INTEGRATION OF WETLAND ISSUES WITHIN THE FORMAL CURRICULUM

8.1 Introduction

Chapter three of this thesis explored the potential existing in several subjects of the Kenyan education curriculum for addressing wetlands issues and risks. The exploration was based on the teacher responses to the questionnaire and this forms the basis for analysis of data presented in this chapter (section 3.1). This chapter is an exploration of whether teachers considered the wetlands training (section 1.3), their meanings about wetlands (section 7.3-7.8) as well as the provisions within the formal curriculum (chapter 3) as important in fostering conservation of local wetlands. The discussion commences with an exploration of the wetland workshop held in 1999 (section 1.3, Appendix 1.1) and proceeds to what teachers do within the school.

8.2 Teachers' reflections on the wetlands training

81 teachers were asked using a questionnaire (question 18a, Appendix 5.5) to reflect and evaluate the different aspects of the wetlands workshop they attended in 1999 (section 1.3) with regard to the use of the training in their practice of teaching. They were asked to comment on five aspects of the workshop using a Likert scale. The Likert scale had response options for good, above average, average, below average and poor. The purpose of this question was to establish how they perceived the wetland conservation workshop proceedings in terms of knowledge, skills learnt, resources provided and interaction during the workshop. The summary of the workshop ratings by 54 teachers is given in Table 8.1.

Table 8.1: Post training rating of the wetlands workshop by teachers

Wetland training aspects	No. of teachers choosing each category				
	Good	Above average	Average	Below average	Poor
Quality of workshop sessions	44	3	4	0	0
Take away notes and brochures	34	7	6	3	0
Wetlands poster	32	7	8	5	1
Outdoor activity in the local wetlands at the workshop site	30	10	11	1	1
Interaction among workshop participants and facilitators	38	11	3	1	1

The results show a general tendency that the teachers still appreciated the wetlands training one year after it was offered. The majority of teachers rated the workshop sessions as above average. However the responses also showed teachers' reservations with the outdoor activity as it scored lower than all the other aspects. This aspect is reflected in the teachers' comments in other sections of this thesis (Table 8.8, sections 9.2.3, 9.3.4, 9.4.8) .

The teachers were asked to comment further on their ratings of the wetlands workshop presented in Table 8.1 (question 18b, Appendix 5.5). This was a probing question with the intention of gathering more information from teachers regarding the wetlands workshop as well as their choice of rating on the Likert scale above. Teachers gave various explanations and these are summarised in Table 8.2. The responses are organised into major themes, key supporting statements and the frequency of mention of each comment.

Table 8.2: Teachers' additional comments about the wetlands training programme

Main theme	Supporting statements	No. of teachers
Teacher applied the training	Teacher formed an environmental club, uses notes and brochures to teach, cares for the wetlands, uses the methods taught during the workshop.	4
Praise for the workshop	Reference materials, practical activities, socialization, interaction, knowledge and skills learnt, logistics, facilitators.	25
Complaints	No follow up; lack of time, outdoor activity and learning materials inadequate, implementation difficult, venue for workshop was not good (in a pub)	10
Suggestions	Use various wetlands, more training, use more and various resource materials, follow up, invite members of the community, improve teacher's welfare, train on other areas such as forestry	25

The responses suggest that teachers appreciated the in-service training and perceived it positively. However, the additional comments by teachers also revealed that the 35 teachers experienced some difficulties with the integration of wetland issues in the local contexts and either complained or offered suggestions to the programme. 24 teachers complained about the training in terms of inadequate training time, need to use more and varied wetlands, use of more practical than theory, need for more training and lack of follow-up. Seven teachers complained that there were not enough learning materials and that they should be of many varieties showing different

pictures to arouse pupils' curiosity. One teacher recommended that the brochures should be compiled into a booklet with many detailed illustrations.

This probing question enabled teachers to express their views that they were facing problems with the programme implementation. Their complaints could be valid because the wetland training was done for only two days (section 1.3, Appendix 1.1) and some issues could have been rushed over with just few practical activities. The posters (Plate A) were few (section 1.3) and teachers were also expected to distribute them to other schools. It was not possible to have a poster for every class in schools. Formal visits to the schools by the National Museums of Kenya project coordinators were not possible because the project was donor driven (Ndaruga, 1999) and funds had been exhausted. The wetlands in-service training was a one-off activity and may not have addressed all the needs of the teachers adequately. The workshop had other shortcomings that surfaced after extensive reading of environmental education literature during this study. These are indicated in Appendix 1.1. These shortcomings could be responsible for making teachers feel inadequately prepared at local level. However, the teachers in this study were trained teachers (section 6.6) and had socially constructed meanings about their local wetlands (chapter 7). The teachers also claimed to be motivated to champion conservation of the local wetlands (section 8.3). They were expected to use these endowments to initiate and champion social change in their locality through environmental education. Although shortcomings were notable regarding the wetlands in-service workshop as discussed above, they cannot be regarded as the ones entirely responsible for teachers' inactivity. Rather, it implies the possibility of the existence of constraints within the environmental education system in the schools that participated in this study. These issues are explored further in sections 8.5 and 8.15.

8.3 Teacher motivation for integrating wetlands issues within the curriculum

54 teachers (who participated in phase one of the study) were asked using a questionnaire to state what motivated them to integrate wetlands issues within their curricular teaching (question 28, Appendix 5.5). This question wished to explore what drives teachers to champion for wetland conservation using the formal context. The reasons given are presented in Table 8.3.

The responses suggest that teachers' motivation is derived from various perceptions, the dominating one being the educational motivation. Teachers have high regard for the curriculum requirements to make learning interesting and learner centred, the presence of wetlands in many topics and also creation of awareness about dangers of wetlands. This suggests that the teachers have already identified areas dealing with wetland issues and where to involve learners (Appendix 3.1-3.10). The educational motivation concurs with education for sustainability perspective of integrating environmental issues in all subjects (section 4.7.3). The responses suggest that teachers recognise subjects in schools as carriers of environmental issues and that these opportunities are valuable. This aspect tallies well with constructivism (section 5.4) whereby teachers actively recognise wetlands as relevant in the subjects taught at school. However, the teachers' comments lack emphasis on allowing learners to develop critical skills. There seems to be a greater influence by the teacher instead of active learning by pupils (section 4.7.7) to generate informed action. Education for sustainability emphasises changes in value and ethics in pupils towards those of caring for one another and the environment (section 4.7.4). To achieve this requires development in critical faculties in pupils so that they are in a position to make decisions as well as to defend them.

The biophysical aspects of motivation portray teachers' agreement on wetlands being of value, being available locally and being homes of threatened biodiversity. The economic aspects also suggest wetlands being of value but being threatened due to ignorance and greed. Social aspects portray recognition of interactions with wetlands and their influence on people as well as the need for intergenerational equity in distribution of wetland resources. Training was also mentioned as being responsible for initiating teachers' action locally. The responses suggest the existence of meanings of wetlands at local level (section 5.4) as well as regard for local wetlands as being of value (section 2.3, 7.3-7.6), which trigger teachers to action. Working for sustainability is a deliberate undertaking based on one's meanings for resource quantity, quality, threats as well as the implications. According to Babikwa (2002) and Le Grange *et al*. (2000: 3) it is important for environmental issues and processes to be of interest to the participants so that problem identification and solution remains their initiative. It is expected that the value attached to wetlands above serves as the driving force to teachers' actions mentioned below.

Table 8.3 Teacher motivations to integrate wetland issues within the curriculum.

Theme	Details of the motivation	No. of teachers
Biophysical	Environment is part of us, without it life is not complete	6
	There are so many wetland areas near the school	1
	I know the dangers ahead if I don't safeguard wetlands	1
	Unfairness of people towards animals living in wetlands	1
Economic	We need water and wetland in our day to day undertakings	4
	Water is a basic commodity and should be conserved for future use	5
	Not utilizing wetlands in the right way	1
	W&W training vital in today's economy because people have started self reliance activities which need W&W	1
	Ignorance and greed makes us innocently destroy wetlands leading to desertification	1
Social	Children have interacted with wetlands since birth	1
	Wetlands is part of our community and decides fate of the next generation	1
	Wetlands influence the life of everybody in society	2
Educational	There are many benefits from wetland which pupils should know	4
	Wetland topic found in various subjects	6
	Need for people to understand environment and stop misusing it	1
	Teacher involved pupils in soil conservation – they won the first position nationally, will be touring Tanzania	2
	Pupils are future inherent of the environment and should be taught about it early enough	4
	Need to enlighten pupils so as to enlighten community	4
	Make learning interesting, child centred	13
	Subject creates awareness about our surroundings, know dangers of destroying wetlands	6
	Use local environment and its materials, pictures	4
	Wetlands are natural and available as teaching materials	1
Training	Training sensitised me on their importance	4

8.4 Involvement of other teachers in local wetland issues

Teachers were asked in the questionnaire (question 21 in Appendix 5.5) and the interviews (question 39 and 40 of Appendix 5.7) to explain how they involved other teachers in local wetland issues. The results are presented in the proceeding sections.

8.4.1 Involving other teachers in knowing about wetlands

Teachers were asked in a questionnaire to explain how they informed other teachers in their working stations about the local wetlands (question 21 of Appendix 5.5). 52 teachers reported having informed their colleagues about the training they attended. One of the teachers who did not inform the other teachers complained of having been transferred while another teacher complained of not having been given an opportunity by the head teacher.

The responses from 52 teachers above revealed that 46 (85%) teachers informed their colleagues by word of mouth during staff meetings, lectures, national day celebrations or on an individual level. This is characterised by key words used by the teachers such as 'I told them', 'reported', 'briefed', informed', 'explained' and 'discussed'. 3 teachers reported showing their colleagues the wetlands poster. One teacher expressed despair that he explained it in detail though some teachers viewed it as a waste of time. Only two (3.7%) teachers reported involving their colleagues in some environmental eco-management action (section 4.7.6) in the form of planting trees, starting a nursery bed, and use of papyrus to make articles. These activities do not display any engagement with local wetland issues and seem to deal with only peripheral issues instead of the key issues. The key wetland issues mentioned in section 7.7 and 7.8 include drowning, being impassable, harbouring dangerous plants, insects and animals, being soggy, overuse, misuse, pollution, and land grabbing. Other threats to wetlands include population pressure, agriculture, soil erosion, deforestation and overgrazing. These problems require a more holistic approach than the transmission approaches proposed by the teachers in this question.

The questionnaire responses also concur with data obtained through the interview (question 39 in Appendix 5.7) of ten teachers (Table 6.1) whereby two teachers said they conducted a seminar and four teachers informed their colleagues through individual interaction. Three teachers complained of not being given an opportunity by the head teachers to inform the other teachers. Two teachers argued that if they could have convened a meeting privately, it could have been treated as an illegal assembly. One teacher claimed that he did not involve his colleagues because he assumed that having been residents of the local area, they were familiar with the local wetlands.

In both the interview and questionnaire cases above, nobody mentioned doing any visits to the wetlands during the meeting with the other teachers. The responses suggest that the approach used by the teachers was show and tell geared towards creating awareness about their attendance to a wetlands workshop and perhaps some key highlights about the workshop. The teacher informed his/her colleagues about having some expert knowledge about wetlands. This method could have been a convenient approach to create awareness about wetlands at that moment (bearing in mind that some teachers claim this was done during staff meetings or tea break times). However, in this study, what followed after that is amazing since teachers did not report further concerns for local wetlands. The wetland issues were quickly forgotten. This suggests that the teachers did not involve their colleagues in the learning cycles they underwent through during the in-service training and the programme was very diluted by the time it reached the other teachers. It also suggests that the teachers did not initiate local activism to conserve wetlands or involve fellow teachers to develop environmental action competence (Jensen & Schnack, 1997). This is despite the teachers' comments about their motivation to address wetland issues locally (section 8.3). These views were also supported by the findings of the review visits (Appendix 3.12) where no comprehensive local action plan to conserve wetlands was noted. These findings suggest lack of prioritisation of addressing wetland threats identified in section 7.7 and 7.8. At the teacher and administrative level, there were no plans in place to conserve the local wetlands as a school.

The lack of concern for the local environment indicates that education for sustainability for local wetlands is absent in schools that participated in this study. Education for sustainability involves consideration of local environmental issues and sustainability of the environment in the longer term (section 4.7). This involves the use of diverse approaches geared towards empowering people to take charge of their local environmental management. In this study the methods used were of the top-down neoclassical type (Table 4.2) and this is blamed for not promoting participation in taking action (RU, 2002).

8.4.2 Working as a team in school

Ten teachers (section 5.8.2, Table 6.1) were asked during the interview schedule whether they work hand in hand with each other at school to conserve local wetlands (question 40 of Appendix 5.7). The purpose of this question was to establish whether the teachers had any shared vision to address environmental and wetland problems at the local level. A summary of their responses is given as follows:

The five active teachers (Table 6.1) admitted working together with their colleagues and supported themselves with the following statements

- But the local landscape is rocky and has no soil
- Most of them take part in the clean up and other school activities
- Majority of the teachers come from the local area and so we work together
- Several of them accompany me to the wetland.
- The teachers individually take their children there

The five inactive teachers (Table 6.1) reported not working with their colleagues and supported themselves with the following sentences

- It's a personal endeavour.
- I have never told them and they never saw the poster
- Urban people have little interest in conservation
- I have never done it – 2 teachers

The responses by the active group suggest a positive outlook on working together as well as some activities done jointly in wetlands. The responses by the inactive group suggest lack of an attempt to work together as well as pessimism about the whole process of working together to conserve local wetlands. The responses from both cases also fail to show evidence of any collaborative effort at school to come up with comprehensive local programmes to address the plight of wetlands. Even the active teachers failed to enthusiastically present the programmes they had initiated and only portend that they can work together with the other teachers if there was need

but not on a proactively agreed locally initiated programme. These findings suggest that the knowledge by the teachers who attended the wetland workshops was treated as a personal affair and was not shared with the other teachers. Their responses do not show working together locally for sustainability of wetlands (section 4.7). Sustainability requires that people share with each other (IUCN *et al*. 1991:8). The sharing could be of information or resources.

This question was extended to 29 other teachers who did not attend the wetland in-service training (section 5.8.2, Table 6.1). The teachers were asked to explain whether they ever sought guidance from the teacher who participated in the wetlands training (question 51 in Appendix 5.7). The question aimed at establishing whether there was any strong emphasis made on addressing local wetland issues at school level. Their responses are shown below with the number of teachers for each response indicated in parenthesis.

Some teachers said they do consult and supported themselves using the following points:

- School encourages teamwork (4)
- We are close (2)
- I talk to him whenever I need clarifications (2)
- We work together in planting trees (2)
- Supports fieldwork to the river (1)
- Teachers give views and I support them (1)
- We talk freely (1)
- Those trained also train others (1)
- We consult but there are no wetlands here so we do nothing (1)
- Teacher saw the wetlands book (1)

Some teachers claimed they do not consult and claimed that: -

- I did not know the teacher went for training (4)
- But I know they should be conserved (1)
- I thought they were science issues (1)

- But I think school can give all the support needed (1)
- I am new to the school (1)
- But curriculum ties us up (1)
- We give support when they request it (3)

The distribution of teachers in these responses failed to follow a pattern like the other ten teachers shown above. For the 29 teachers, 19 teachers from both active and inactive groups (Table 6.1) said that they consult the teacher who attended the in-service training. Those who reported having not consulted included three teachers from the active group. This question gathered narrowly conceptualised ideas of teachers on the kind of consultations they have for wetlands. The teachers' comments do not show consultations with an aim to conserve wetlands but just for normal teaching chores. The kind of activities they involve learners in also seem narrowly conceptualised and they do not appear to be geared towards conservation of the local wetlands.

The responses suggest a narrow conceptualisation of the role of the school in addressing wetland and other environmental issues including an understanding of the process involved (Table 4.2). For the schools participating in this study, the data suggests that schools do not understand the complexity of local environmental issues and the required responses. There is no evidence of a process of engagement with the local wetland issues mentioned in sections 7.3 and 7.8. The schools did not identify themselves with the local wetland problems and seem to be busy only fulfilling the requirements of the formal curriculum. This suggests that the teachers do not have environmental action competence (Jensen & Schnack, 1997) and do not understand the process involved in achieving this (Stapp & Wals, 1993; Gough & Robottom, 1993; Sinclair *et al*. 1997). This also implies that the concept of sustainability education (section 4.7) could be alien to these teachers. This suggests the need for teacher involvement in environmental education processes as an empowerment process to assist in identification of local environmental issues and how to mobilise local concerns and action.

However the responses by these teachers also revealed some administrative constraints that could have played a role in wetlands education. For instance, one head teacher said that

We give them support when they request it. For teachers to be effective in schools, we administrators should be aware of what training they went for and how useful it is for us. If this is not done, it will be hard for us to give them an audience. The organisers should produce a training manual and give a copy to the teachers and explain what is expected of them and how they can help.

The proposal by the head teacher suggests that the administration can be a constraint to teachers' actions at school. The response by the head teacher suggests that teamwork in this school is earned and not readily available. It seems to be at the discretion of the head teacher. This is unfortunate since concern for the environment is expected to be a priority for all at school since they teach about it (section 3.1-3.10) and possibly would like to participate in improving it (section 8.3). The absence of this portrays a constraint to the teacher. In this case it appears that the teacher has to initiate local support first before engaging with environmental activities. These teachers' comments suggest that the head teacher at the formative step can discourage the teacher. Nevertheless, the proposal by the head teacher for the school to be aware of what the teacher was involved in is useful in that it supports involvement of the school administration in the process of mobilising participation of the school in wetland conservation.

8.5 Involvement of children in knowing about wetlands

Teachers were asked using a questionnaire to explain how they involved the children in knowing about local wetlands after attending the wetlands training (question 23 in Appendix 5.5). This was a more generalised question aimed at gathering views from teachers about the forums s/he uses to address local wetland issues with the pupils and how s/he goes about doing this. This question shares similarities with the one presented in section 8.6 but this section looks at the activities with children across the disciplines in school without much emphasis on particular subjects. 48 teachers reported having involved the children while three teachers had not. Three other teachers did not respond to this question. For those who involved the children, this involvement can be categorised into three areas as shown in Table 8.4.

Some suggestions did not fit into any of the three categories since they looked a bit unclear. These are 'involved pupils in an environmental activity' (1) and 'celebrate World Wetlands day every year' (2). It was not clear what sort of activities the children were involved in.

Table 8.4 shows that theoretical approaches of wetland awareness were the most popular to the teachers who participated in this study. The teachers in this case seem to only transmit wetland knowledge to pupils and the learners are passive recipients. The teacher hopes that by transmitting the facts about wetlands, the learners would perceive them holistically. This is a linear conception of knowledge and has been criticised as inappropriate (O'Donoghue & Janse Van Rensburg, 1995; O'Donoghue & McNaught, 1989).

Table 8.4: Involvement of children in knowing about wetlands

Category	Key features	No. of teachers
Theoretical approaches	Told them, discussed, informed, talk about, taught, theoretically, shown various types of wetlands, teacher composed a poem which was recited in school, enrolled pupils in a club, use local wetlands as examples.	26
	Pupils involved in plays and songs…, pupils wrote poems for competition	4
Visits to wetlands	Visit nearby wetland, …to see, ...to collect palms, …and discuss, nature walk, study tour.	23
Eco-management activities	Clean up the wetland, plant trees, practice mulching in farms, building gabions, participate in practical activities, start a wetland at school	7

Some theoretical approaches such as use of plays, songs and writing poems can enable learners to actively generate knowledge about local wetlands (sections 3.2, 3.6, 3.10 and 4.7.7). However, if they do not lead to practical action (section 4.7.6), they would still retain features of the theoretical approaches.

The other approach used is the visits to wetlands. However, the activities that learners are involved in do not show a high level of engagement with wetland issues and seem to be more leisure based with some academic features but not problem solving oriented. The wetland visits do not portray exploration of wetland problems, causes, effects and mapping out of an intervention plan, a process proposed by Stapp & Wals (1993).

Only a few teachers involved learners in practical eco-management activities (section 4.7.6). However, the activities do not relate to the real cause of wetland problems documented in section

7.3-7.8. The wetland problems call for more dialogue, reflection and planning together with pupils and members of the community so as to challenge the *status quo* responsible for wetland degradation presented in section 7.3-7.8. The eco-management activities presented in this question seem inadequate and do not intervene to challenge the *status quo*. According to Jensen & Schnack (1997: 169)

> …an action must be targeted towards solution of the problem that is being focussed upon. The focus must be change perspective. ...the fact that a class, for example cleans dirt and waste from a beach could not be characterised as an action if the problem in question is pollution of the marine environment. Even though cleaning of the beach leads to the immediate disappearance of certain of the polluting elements that originate in the sea, the activity will not have any effect on the problem because the activity does not address the causes of the problem, but on the contrary, is focussed sorely on its symptoms. It cannot therefore be characterised as an action against the environmental action in question.

In this case, the actions by the teachers do not seem to address the causes of the real problems (section 7.3-7.8) but only address peripheral issues. They do not lead people to identifying of their local problems, their causes or making informed choices to stop wetland degradation.

Four teachers gave reasons in the questionnaire why they had not involved children in knowing about wetlands. Their explanations touch on issues of misconceptions, ownership, time, availability of wetlands, and curriculum. Under misconceptions are comments such as

> *Being rural, I thought they knew much about rivers and streams since they fetch water and swim there*

This statement shows recognition of active generation of knowledge through interaction with wetlands. Nevertheless, it also displays lack of proactive attempts to address wetland threats. The teacher had done nothing and does not even seem to know what children know about the local wetlands. The statement does not indicate that the teacher harnesses what learners know.

> *I thought it was just another workshop which we attend and forget about it*

The statement suggests that the teacher did not view this workshop to be of value. The teacher appears to have attended other workshops but had done nothing to apply the workshop knowledge and skills. The statement by this teacher suggests that lack of utilization of workshop

knowledge and skills was the order of the day at this school. The wetland training could also have been taken for granted.

On ownership, one teacher complained that wetlands are found in private farms and going there may be considered as trespassing. This points out that political issues (section 2.3.4) are of vital importance in wetland education. One teacher complained that the local wetland was located a distance away from the school and this causes him not to intervene. This is a biophysical issue (section 2.3.1). This suggests the need for teachers to understand the dynamics of wetlands in terms of the wetland cycles and catchment issues of which every school, regardless of its location from the wetland body, impacts on. On curriculum, two teachers complained that there was no specific programme allocated to actively involve the children, together with pressure of work to raise the school position in local examinations. Document analysis of the syllabus, however, revealed that wetland issues are integrated in the curriculum (Appendix 3.1-3.10). However, the examination pressure in schools has been criticised by various authors as responsible for the neglect of addressing local environmental issues (IGAD, 1999; MENR, 1998; Karembu, 2002). This is likely to be responsible for making teachers blind to the use of the local environment and wetlands as they fear they may not know how to realise the requirements of their subjects using the local environment which is not as neatly packaged together as it is done in books they use at school.

This issue was followed in an interview whereby ten teachers (section 5.8.2, Table 6.1) were asked to explain how they taught about wetlands in their subjects (questions 15, 16 and 17 in Appendix 5.7). These questions were intended to shed some light on teaching approaches for wetlands from a practitioner's perspective. The issues raised by the teachers underscore some pertinent issues about wetlands education at schools. The emerging issues from this question are that

- the curriculum does not allow teachers to teach about wetlands
- wetlands are only used as teaching aids
- sometimes the teachers teach about wetlands
- teachers visit wetlands with pupils
- teachers try to link wetland issues to human activities, and

- there is misconception about children is prior knowledge.

There was no specific pattern of responses between the active and inactive categories (refer to Table 6.1). On the curriculum issue, six out of ten teachers openly declared that they don't teach about wetlands. They commented that the teacher is guided by the syllabus and that there is no need to teach something that is not in the syllabus. If the syllabus does not indicate the use of a practical activity and if it is not relevant, teachers do not do it. One teacher said that teachers use wetlands as teaching aids whereby pupils visit and explore the river and later write a composition or discuss it in class. He suggested that the pupils mention wetlands when writing a composition about 'water is life' or 'floods' or 'El nino' but had never written a composition specifically on local wetlands. One teacher also complained that he could not plan a visit to the wetland during other times such as the evening or weekends because of additional work at school such as additional tuition. Others complained that wetlands are just mentioned in topics in science like pollution and it was taught as outlined in the syllabus. This means the teacher does not tell pupils that they are learning about wetlands. Some of the relevant quotations are

> *…we don't tell them (pupils) that we are teaching them about wetlands. Only the teacher knows.*
>
> *There is no need of teaching something that is not in the syllabus.*
>
> *I don't involve them (pupils) in any practical activity. If it is not indicated in the syllabus and if it is not relevant, we don't do it.*

These views show lack of linkage between what goes on in school and the local wetlands and the teacher just focuses on the syllabus. This is a neoclassical approach to knowledge (Table 4.2) that values facts and concepts that only have meaning in occupational and disciplinary contexts (section 4.6.1). The orientation does not involve searching for opportunities that can boost learning as well as improve the environment. The goal of education in this case is to pass the exam and get other occupational rewards but learning about the environment and taking care of it is expected to come later (Fien, 1993:22). The absence of wetland issues in the curriculum also implies that it may not be a main feature in the examinations (see section 8.12). This approach does not portray attributes of education for sustainability of wetlands which include recognition of curriculum potential in environmental education (section 4.7.3), need to develop values and

ethics (section 4.7.4) and the use of methods that promote active learning through involvement of learners in constructing their own knowledge (section 4.7.7).

Sometimes teachers do teach about wetlands. Two teachers said they do this during clubs time, mentioning a factory when discussing pollution, how to purify and recycle water, guided questions about how the lake is important, what activities go on in the lake, animals found in the lake, taking some water and asking pupils to talk about the uses of water, demonstrating to pupils about uses of water and irrigation, germinating seeds, using pictures and charts. Again these issues mentioned by the teacher suggest that the process of learning is teacher dominated and has no linkage with the local context. The suggestions by teachers do not tally well with the search for remedies to the implications of wetlands' perceived value and threats (section 7.3-7.8).

Two teachers reported that sometimes pupils visit wetlands on their own. One teacher said that

> *The pupils are sent there to look at the gullies, soil erosion and grass. We do this because the place is far away and pupils cannot afford to pay bus fare and this idea of going there is treated as homework and so they go there and come and report back. I don't accompany them because the administration is against pupils and teachers going out of the school. When giving their results after the visit, most pupils agree that the grass is greener, the soil is wet, the place has shade, and the place is cool. I cannot accompany them after classes because we are also involved in tuition at the evening and even weekends and we cannot afford to go there.*

The teacher's response shows lack of serious concerns for local wetlands especially about threats to wetlands (section 7.7-7.8). The pupils' reports about wetlands also show the narrow conception of wetland issues that do not consider the holistic aspects of local wetlands (Figure 2.3, section 7.3-7.8). The wetland aspects mentioned appear very simplistic to this teacher and there was no mention of the human aspects of interaction with wetlands. Another teacher said that pupils could also visit wetlands with teachers and then write a composition or discuss later in class, or expert guides are used to tell pupils more about sites such as a sewage pond or Lake Victoria. The teacher also complained about time being inadequate to go to the wetland. The purposes of visiting wetlands presented in this case are just academic and not for investigative activities that can generate environmental knowledge as well as action competence (Jensen & Schnack, 1997: 170).

One teacher's response demonstrated development of linkages with human activities. The teacher said the following

> *I have mentioned about the factory when discussing pollution. The local river is polluted by a coffee factory. I talk about how they can purify and recycle that water. We also went to the factory and we were shown around and even how they recycle coffee husks. We also visited municipal sewage and we found that it was not well taken care of.*

These visits are important as they provide learners with an opportunity to appreciate firsthand experiences of environmental problems. The visit to the factory suggests the importance of meaning making on factories as sources of environmental pollutants. After the meaning making process no activities followed. The visit failed to trigger an active learning process to address the local wetland problem and come up with a long-term plan of action to conserve it as required by education for sustainability process (section 4.7.7). According to Murdoch (1993:154),

> An effective action component in an environmental education program shows children that they can do something for the environment. In this case it is positive and empowering and provides children with constructive and immediate ways in which they can care for their planet rather than being overwhelmed by the picture of 'doom' and 'gloom' offered by some.

For this study, the school did not go further to encourage children to do something but the visit to the factory and sewage pond were just treated as a one-off activity that was later forgotten. From the teacher's comments, it appears that the teacher's visit did not have a clear agenda to address local pollution. After the visit, nothing about wetlands was mentioned and this implies that the visit was treated as an end in itself. The same weakness was noted from one teacher who admitted taking children to Lake Victoria, but the only activity that learners were involved in was touching water with their hands. This shows detachment with the local reality and no concern for sustainability of wetlands (sections 4.7 and 4.8).

There was also a problem of assumption by the teacher that the child is familiar with wetlands and so the teacher did not need to teach anything more. One teacher claimed that

They pass there every morning and evening. They get water there and take animals to drink. The pupils have been to the wetlands. One just needs to find out what they don't know and teach it. Before you explain, they already have a rough idea of what you are talking about

The misconception that pupils are familiar with local wetlands could be good as it treats them as persons with knowledge about the locality. This concurs with constructivist and symbolic interactionist approaches to learning and meaning making (section 5.4). However, this perception could only be valuable if it contributes to development of active learning processes geared towards identification and isolation of a problem, exploring it, looking at alternative solutions and laying down action strategies to solve the problem (Stapp & Wals, 1993). However, in this study the teacher seems to have used it as an excuse not to involve learners in addressing local wetland issues and thus a justification for inactivity. There was no evidence to show that this prior knowledge was harnessed to enhance learners' appropriate actions to take care for the wetlands. There seems to be no effort to establish whether what pupils know was right and to dispel false consciousness.

One teacher complained that the administration does not allow teachers to go out of the school and this does not motivate the teacher to teach about wetlands. This could be attributed to the head teacher having not understood the concept of wetlands as was evidenced from the teachers who were not in-serviced in this study (section 7.2). It could also be due to the examination problem where the education system is geared towards passing exams and not improving the local environment (IGAD, 1999; Karembu, 2002).

The overall picture presented in this study is that the schools recognise meanings for local wetlands and threats. Some teachers also assume that pupils know about local wetlands. However, the activities presented show that schools do not play any active practical role in wetlands conservation. They only create awareness and this is not augmented by practical action. There is lack of critically thought initiatives to address wetland issues. Those proposed here are just general, one-off, depoliticised activities that do not seem translatable into positive contribution to sustainable use of wetlands (section 4.7). There is no school that demonstrated a proactive engagement with real wetland issues identified earlier in section 7.3-7.8. These problems need long term programmes that address wetland issues consistently showing features

of exploration, dialogue, encounter and reflection (O'Donoghue & Janse Van Rensburg, 1995). There is also lack of consideration of the holistic aspects of wetlands (section 2.3, Figure 2.3). There was an overall lack of processes inclined towards education for sustainability for wetlands (sections 4.7 and 4.8).

8.6 Integration of wetland issues in the subjects

Primary school syllabuses for Kenya were analysed (section 5.8.5) and the data showed that there were provisions for integrating wetland issues (Appendix 3.1 – 3.10). Using a questionnaire, this study asked teachers to identify the subjects, topics and practical activities that they do in schools that also integrate wetland issues (question 25 in Appendix 5.5). The subjects identified by the teachers were Art and Craft, GHC, Science, Agriculture, English, CRE, Home Science, Mathematics, Kiswahili and Music. The summary of the various approaches used in all the subjects is presented in Table 8.5. The popular subjects for wetlands education were Science, Agriculture and GHC in that order. The mention and use of these subjects concur with the teachers' preference for these subjects as shown in Figure 6.5b.

Table 8.5: Methods used by teachers within various subjects.

Approaches	Frequency of mention for each audience based on questionnaire data									
	Art & Craft (section 8.6.1) N=9/11	GHC Section 8.6.2) N=20/29	Science (section 8.6.3) N=33/45	Agriculture (section 8.6.4) N=19/24	English (section 8.6.5.1) N=1/6	Kiswahili (section 8.6.5.2) N=2	CRE (section 8.6.6) N=5/10	Home Science (section 8.6.7) N=2/5	Maths (section 8.6.8) N=1	Music (section 8.6.9) N=1
Theoretical	4	3	11	0	1	2	2	1	0	0
Use of wetland resources	7	2	3	2	0	0	0	2	0	1
Visits to wetlands	3	16	26	15	1	0	1	2	0	0
Eco-management	0	4	17	12	0	0	4	0	0	0

Theoretical approaches seem to have been more prevalent in Science. Visits to wetlands were common with the pupils studying in subjects such as Science, GHC and Agriculture. Eco-management activities were also more popular in subjects such as Science and Agriculture. These

subjects are the ones usually associated with environmental education by teachers (Karembu, 2002; Lindhe *et al.* 1993). This scenario suggests that teachers utilise a narrow approach in advocating wetlands conservation within the subjects (section 8.6.1-8.6.9). The topics identified and activities that learners engage in are discussed in the proceeding sections.

8.6.1 Art and Craft.

Section 3.2 presents a discussion on how Art and Craft discipline can promote learning of environmental education. In this study eleven teachers identified topics that can integrate wetland issues. Only 9 teachers gave the corresponding wetland activities that learners are engaged in. The topics selected in Art and Craft are weaving, modelling, drawing, plaiting, collage, mosaic, paper mache, painting, basketry, building and construction. The teachers failed to give activities for topics such as principles of art, uses of colour, lettering posters and traditional houses. The corresponding wetland activities suggested for the other topics above could be grouped into two categories, that is visits to wetlands and theoretical approaches away from wetlands. The number of teachers who proposed each activity are indicated in parenthesis.

Visit to wetlands

The visits to wetlands are of two kinds. These include

- Academic visits characterised by visiting local wetlands to identify uses of plants e.g. papyrus (1), pupils draw small animals in wetlands; a landscape (2)
- visiting local wetlands to harvest wetland resources for instance exploiting wetlands for various items such as getting weeds from wetlands and weaving with them (2) collecting and preparation of papyrus reeds to make items (1) extracting mud, clay from wetlands and modelling with them (1) making baskets, ribbons (from various sample soils) (2) and looking at mangrove forests for poles and other materials (1)

Activities done away from wetlands

Some teachers did activities in their schools away from wetlands such as

- Observation of actual scene and compare it to the poster (Plate A) to give foreground, middle and background of a picture (1)

- Painting (1)
- Modelling various articles, ponds and rivers (2)

The responses suggest that the teachers do not seem to do anything to transform or improve the environment using this subject. However the wetland use activities portray meaning making for wetlands as being of value both for learning and for economic activities (section 7.3-7.6). However it remains unknown whether the teacher uses this opportunity to tell learners about the value of wetlands.

These activities fail to meet the criteria presented in section 3.2 by Martin (1993) and Wenham (1994) - that art is an activity of deconstructing and re-constructing reality according to the perception of the individual involved in order to depict the past, present as well as the anticipated future *status quo*. Art and craft could have enabled learners to explore wetlands and their associated beauty as well as the complex interrelationships represented. This could have enabled learners to get personally involved in communication visually, orally or through simulation games and role-play of their appreciative meanings about wetlands (sections 2.3, 7.2-7.6) and perhaps to generate a locally based action to conserve wetlands. However, the activities presented by teachers in this study do not portray this exploration of *status quo*, dialogue, encounter and reflection on wetland issues that is geared towards expression of the learners' perceptions about the local wetlands both to portray the present and future projections. One teacher tried to do this through painting and modelling but this happens away from the wetland environment and does not seem to be related to the reality on the ground (section 7.3-7.8). The approaches used cannot be regarded as being potentially able to address the real issues since they do not even explore use of the various media such as visual, oral and simulation games. The subject as presented by teachers in this study cannot be relied upon in promoting sustainable use of wetlands since it fails to promote relevance of local wetlands, looking at wetlands issues in a holistic way (Figure 2.3), promoting pupils' values and ethics, initiating local environmental action, promoting active generation of knowledge by pupils and allowing them to project their expected future for wetlands (section 4.7). The use of Art and Craft discipline in this study shows a potential but under-utilised opportunity for teaching about wetlands.

8.6.2 Geography, History and Civics (GHC)

GHC is a combined course comprising of geography, history and civics. The role of each subject in environmental education is discussed in section 3.3 and Appendix 3.2. In this study 29 teachers proposed various topics where wetland activities can be integrated. However only 20 teachers gave corresponding activities that they involve learners in to enhance learning. The topics selected in GHC are physical features (8), drainage (6), natural resources (4), sources of water (3), vegetation (4), wildlife and tourism (3), rivers (1), lakes (2), environmental conservation (1), soil conservation (2), fishing (2), industries (2), land reclaiming (2), agriculture (2), climate (2) weather (2), population (1), swampy areas (1), animal and plant habitats (1) and communication (1). The data shows that teachers are able to relate wetlands to particular topics that were linked to the biophysical aspects of the environment (Figure 2.3). The corresponding activities that teachers engage in can be divided into four categories as shown below together with the corresponding number of teachers who selected each option.

Visits to wetlands

Visits to wetlands served twofold function. These are

a. Academic visits which include

- Visiting nearby wetlands and observing their uses, sources of water (6)
- Visit sites and observe them and list what they see (2)
- Identifying animals living in water and how they help us (2)
- Observing wetland to see its importance as a natural resource (1)
- Watching hippos, ducks, flamingos (1)
- Visiting catchment areas (1)
- Study changes caused by the wetland (micro climate) (1)
- Identify wildlife that attracts tourists (1)

b. Sports and leisure

- Sporting, swimming, rowing of dhows and boats (1)

Using wetlands and their resources

- Making mats, brooms, baskets (1)
- Bring wetland plants and small animals to school (1)

Activities done away from wetlands

- Observing maps about lakes and rivers (1)
- Drawing fish species in our wetlands (1)
- Modelling and drawing drainage system (1)

Eco-management activities

- Planting trees around the wetland (2)
- Building gabions, terraces (1)
- Uprooting types of vegetation in wetland areas (1)

The data suggests that wetland visits dominated. Some teachers used theoretical approaches such as using wetland resources and other activities away from wetlands. Only a few teachers were involved in practical ecomanagement activities. The data suggests that in GHC, teachers and pupils interact with wetlands with a view to use it for learning and rarely participate in taking action to conserve it. The practical eco-management activities are not adequate to address the wetland problems identified in sections 7.7 and 7.8. The History and Civics aspects of GHC are conspicuously missing in the activities presented by teachers. In this study, GHC failed to create opportunities for development of inquisitive critical skills about the relationships between the local environment and human activities (section 4.3). It also failed to encourage discussion of local problems, their history and interventions needed including how to influence local decision making to act ethically. There is no evidence of an integrated exploration of various political, economic, cultural and social forces influencing the local environment (section 2.3) and their relationships to global trends (Martin, 1993:25; Bailey, 1994:67). This deficiency in the use of GHC to address environmental issues practically and holistically could be related to the subject's objectives that also fall short of encouraging critical engagement with local environmental issues

(section 3.3.3). This was also evidenced during the school visits where one teacher failed to use the outdoor as well as teaching aids to teach about communication (Appendix 3.11). The document analysis of the schemes of work also failed to show any mention of improvement to the local environment (Appendix 3.12). The responses to this question present a potential but under-utilised opportunity to address local wetland issues.

8.6.3 Science

Science is a popular discipline in Kenya and is offered from class 1-8 (RoK, 1992). Kenyan teachers consider Science as a key subject in environmental education (Karembu, 2002:142). A review of the potential of using Science to teach environmental education is presented in section 3.4 and Appendix 3.3. In this study 45 teachers suggested various topics that integrate wetland issues but only 33 teachers were able to propose accompanying practical activities for pupils (Table 8.5). The high number of teachers who identified themselves with the Science discipline corresponds to the number of teachers who teach the subject and who selected it as their favourite preference (section 6.4). The topics identified include environment (19), living things (14), adaptations (7), soil (7), classification of animals (6), pollution (5), weather (5), interdependence (4), energy (2), conservation (2), water sources and uses (2), ecosystem (1), buoyancy (3), health education (2), water cycle (2), food chains (2), water conservation (1), diffusion (1), turbidity (1), modelling (1), acids and bases (1), nutrition (1), rain (1), the sky (1), water borne diseases (1), fish farming (1), irrigation (1) and properties of matter (1). The responses show that the most commonly perceived environmental education topics in science were all inclined towards the biophysical aspects of the environment (Figure 2.3). The corresponding activities can be categorised into four categories shown below together with the number of teachers involved in each case.

Activities done away from wetlands

Demonstration on pollution of water, recycling of dirty water (4), composing poems about water and wetlands (1), suggest by discussion importance of these animals to tourism (1), where these animals are found as exhibits (1), assessing how dangerous the animals are (1), naming the habitat of different animals (1), making weather instrument (1), modelling – making ribbons (1).

Visiting wetlands

Identifying plants and animals found near or in wetlands (8), collecting animals, observing and classifying them (7), visiting wetland/nature walk (4), identifying water pollutants (3) discuss uses of water (2), pupils identify food webs and food chains and draw them (2), identifying relationship of living things in the environment (2), observe living things such as water plants e.g. algae (2), drawing animals, plants seen in the ecosystem (2), make observations, experiments, records, classify and look for solutions (1), identify threats to a local wetland (1), identification, observation by visiting water sources within the village (1), identifying wading birds (1), sinking and floating objects (1), observe signs of pollution in a wetland (1), observe causes, effects of pollution (1), visit wetland as bilharzia zone (1), visit wetland and see erosion (1), visit sewage plant (1), demonstrating land breeze and river breeze comparisons (1), measuring drainage (1), soil drainage/capillarity of various soils (1) and study stream passing through an area e.g. uses (1).

Using wetlands and their resources

Washing (1), fishing (1), collecting of clay from a wetland (1)

Eco-management activities

Planting trees near wetland (5), cleaning the compound, environment, beaches (3), weeding and caring for school trees (1), washing and cleaning latrines (1), collecting and discarding litter and other wastes (1), recycling of materials (1), use of cow dung instead of wood (1), terracing (1), avoiding pollution (1), water seedbeds/seeds of various plants (1) and removing rubbish around the wetland (1).

These responses show that visits to wetlands were common. The activities done during visits to the wetlands concur with Martin's (1993:23) proposal that the science discipline is involved with exploration of the variety of life and their functions (section 3.4). However in this study, there were only a few teachers who looked at interrelationships among living things and their abiotic environment. The teachers commonly confined their pupils to identifying various aspects of wetlands and their resources instead of exploring their relationships. Common threats to wetlands

mentioned in section 7.7 and 7.8 were not explored. The eco-management activities did not adequately address the threats to wetlands mentioned in section 7.7 and 7.8 or those in section 2.3. There was no mention of people and wetland interaction intervention activities. The teachers failed to demonstrate action competence that integrates exploration of local wetland aspects, identification of wetland problems, discussion of alternative approaches to solve the problem, implementation of the agreed actions and subsequent reflection (Jensen & Schnack 1997; O'Donoghue & Janse Van Rensburg 1995; Fien, 1993). This inadequacy by teachers could be attributed to the objectives of science subject (section 3.4) and education (section 3.1) that insist on awareness, understanding, skills and attitudes but not participation. The methods applied in this case seem inadequate in the promotion of development of action competence in pupils that lead to promoting sustainability (refer to section 4.7). During the school visits, these weaknesses were also observed whereby teachers used theoretical approaches and failed to involve pupils in critically oriented activities during teaching (Appendix 3.11). The document analysis of the schemes of work did not show any attempt to engage in local wetland issues (Appendix 3.12).

These findings suggest that teachers fail to use the Science subject to promote sustainable use of wetlands. Issues of relevance, holism, values and ethics, environment and development issues, active learning and locally based environmental action were ignored (refer to section 4.7). The subject portrays a potential but under-utilised opportunity to champion for sustainability of wetlands in Kenya.

8.6.4 Agriculture

A discussion of the use of agriculture to teach environmental education is presented in section 3.5 and Appendix 3.4. In this study 24 teachers suggested topics where wetlands can be integrated but only 19 were able to propose corresponding pupils' activities. The topics proposed are soil conservation (17), fish farming (5), water conservation methods (4), land reclamation (2), crop husbandly (2), uses of water in the farm (4), types of irrigation (1), land use in Kenya (1) plants and animals (1), animal husbandly (1), afforestation (1), and bee keeping (1). The teachers also proposed various activities corresponding with the topics mentioned and these include:

Visiting wetlands

Visiting fish farms e.g. ponds, swamps, lakes (2), identify activities leading to erosion (2), watering of animals (2), identifying water plants (1), identifying water conservation measures (1), identifying soil conservation (1), identifying areas where soil erosion had taken place (1), visiting eroded sites (1), visit wetland to observe silt carried to the river by erosion (1), collecting various types of soils and adding equal amounts of water to soil samples (1), identifying ways in which a wetland has been reclaimed into other uses (1), visit wetland and see how they irrigate vegetables, onions etc (1)

Using wetlands and their resources

Pupils spray some crops in school farm (1) and pupils use water in various ways (1)

Eco-management activities

Planting trees (3), building of a fish pond (2), planting crops and nurseries in the school (1), making terraces (1), removing weeds (1), train young farmers club members how to conserve soil (1), control e.g. gully, soil erosion (1), control of drainage (1) and building of a dam (1).

The responses suggest that wetland visits were the most common. In section 7.7 and 7.8, teachers identified wetland threats emanating from agricultural practices such as deforestation, farming near wetlands causing soil erosion, pollution by farm chemicals and silt, over-utilization, overgrazing and land grabbing. Some of these threats are partially addressed in the teachers' activities mentioned above but most of them are not. The teachers seem to have failed to involve the learners in confronting the wetland issues and failed to facilitate practical activities during the wetland visits. Use of wetland resources did not show engagement with wetland issues. Only a few teachers engaged in practical eco-management activities. The eco-management activities, however, failed to integrate aspects of human-human and human-environment relationships. The activities were more inclined towards the biophysical aspects of the environment (section 2.3.1) and were silent about addressing the real issues of wetland degradation that lie within the social, economic and political aspects of the society (section 7.7-7.8). The teachers also ignored involving pupils in community projects as required by the syllabus (RoK, 1991:161). The practice of water conservation methods discussed in section 3.5 also failed to feature in the

activities proposed by the teachers. During the school visits, this weakness was evidenced whereby theoretical teaching approaches dominated (Appendix 3.11). There was also lack of critical engagement with local issues in the schemes of work developed by the teachers (Appendix 3.12). The activities by teachers do not seem to concur with the prescriptions for education for sustainability since they fail to integrate holism, relationship between development and environment, addressing environmental issues, developing agricultural related values and ethics as well as promoting appropriate learning approaches and environmental action (refer to section 4.7).

8.6.5 Languages (English and Kiswahili)

In Kenya, English and Kiswahili are the two major languages taught in all public schools. The languages present an opportunity to integrate environmental education into teaching and learning as discussed in section 3.6 and Appendix 3.5 and 3.6. The integration of wetland issues in both subjects by teachers in this study is discussed below.

8.6.5.1 English

An exploration of integration of environmental aspects in the English subject is explored in section 3.6.1 and Appendix 3.5. In this study six teachers identified some topics in English where wetland issues can be integrated but only one teacher gave some corresponding practical activity to address the topic. The topics suggested were composition (6), public speech (1), poetry (1), vocabulary (1) and debates (1). One teacher mentioned a wetland visit as one of the activities pupils engaged in. Other theoretical approaches include writing a composition (1), competitions in public speaking (1) and learning names of items on the poster such as ‘hippo’, and ‘crocodile’ (1). The theoretical approaches show some emphasis on active learning (section 4.7.7) through cultivating pupil creativity in developing compositions and public speaking possibly about wetlands. The teachers did not mention having allowed the pupils to visit wetlands to explore the pertinent local wetland issues in order to address them practically. The approaches could not have promoted pupil engagement with real wetland issues (section 7.3-7.8). During my visit to schools, I attended one of the classrooms where pupils were being prepared to write a composition (Appendix 3.11) and everything was done in class without the exploration of the real

issues surrounding tree-planting activities. I assume the same thing happened for the compositions on wetlands mentioned in this question. The activities by the teachers in this study failed to allow the pupils to engage with real local wetland issues and the pupils' expressions through composition, public speaking, poetry and debates may not have been focussed on local issues affecting wetlands. Teachers during the interviews confirmed having never told pupils to write compositions on local wetlands. One teacher claimed that if pupils were asked to write about local wetlands, the topic would be shallowly covered. He argued that pupils write composition based on broad topics and wetland issues are considered as minor issues and are not given special consideration.

The teachers in this study are bound to fail in the promotion of sustainable use of wetlands because they do not engage pupils in brainstorming and addressing local issues (section 3.6.1). They fail to cultivate relevance and active learning strategies in pupils to enable them to speak out about the environment and also to chart the way forward to conserve local wetlands (section 4.7). The subject presents a potential but an under-utilised potential to champion for sustainable use of wetlands.

8.6.5.2 Kiswahili

Integration of environmental issues using Kiswahili language was discussed in section 3.6.2 and Appendix 3.6. In this study, two teachers identified topics such as vocabulary (1), public speaking (1) and composition (1) as the ones where they can integrate wetland issues. But the suggested activities did not involve practical interaction with wetlands. They include use of the poster to identify and name plants in Kiswahili (1) and to form competitions on public speaking about wetlands (1).

These responses suggest that teachers use a narrow range of approaches in dealing with environmental issues using Kiswahili language subject just like for the English language subject (section 8.6.5.1). There is lack of use of fieldwork and pupil centred creativity to enhance learning. The pupils are confined to the classroom when learning and are not involved in exploring the local environment to enable them to write on real issues. There is no evidence of

critical engagement with the local issues including those affecting wetlands (section 7.3-7.8). The activities appear very neutral to wetland issues and there is no major evidence of exploration, dialogue, encounter, reflection, action and then reporting about local issues (O'Donoghue & Janse Van Rensburg, 1995). This phenomena was also evidenced during the visits to schools (Appendix 3.11) where a Kiswahili teacher taught about HIV/AIDS using a lecture, guided questioning and group work discussions only inside the classroom. When I probed further using non-formal interviews (section 5.8.2) why the outdoor environment was not used, the teacher said that the syllabus does not say so. This suggests great disregard for the use of outdoors and exploration of local issues and their relevance to the curriculum. The learners are not likely to develop action competence (Jensen & Schnark, 1997) to be able to address local environmental issues. These responses are unfortunate because the potential of addressing environmental issue using Kiswahili are spread through all classes (Appendix 3.6). Like in the English subject, the responses depict a great opportunity for enhancing meaning making (section 7.3-7.8) and sustainability of wetlands that is not adequately utilised.

8.6.6 Christian Religious Education (CRE)

Integration and relevance of wetland issues in CRE are discussed in section 3.7 and Appendix 3.7. In this study, ten teachers identified the topics where wetland issues could be integrated but only five teachers identified corresponding practical activities. The topics mentioned were care of the environment (4), creation (5) and service to others (1). The corresponding activities can be grouped into various categories as shown below.

Activities done away from wetlands

- Displaying poster and identifying various things created by God (1)
- Demonstrate use of water in washing feet of disciples (1)

Visiting wetlands

- Nature walk around the wetland (1)

Eco-management activities

- Preparing seedbeds (1)
- Weeding (1)
- Cleaning water sources (1)
- Planting grass on sloppy areas (1)

The data suggests that CRE teaching can integrate components of environmental action. However the activities proposed do not display emphasis on development of critical creativity in pupils. The activities are very neutral to the local *status quo* and do not tally with teacher perceptions of wetland threats as given in section 7.7 and 7.8. Wetlands in Kenya serve some spiritual roles (section 2.3.3) that could have been explored to promote learning about wetlands. Section 3.7 presents an argument in support of exploring various beliefs and doctrines held by people about wetlands. However in this study, this aspect of exploring and reflecting on the community's closeness to wetlands was not mentioned. During the school visits, teachers were observed to be using theoretical approaches (Appendix 3.11, 3.12). The evidence presented in this section does not show that CRE was used to champion for wetlands sustainability. The responses to this question present a potential but under-utilised opportunity to promote wetland conservation.

8.6.7 Home Science

Section 3.8 and Appendix 3.8 presents the potentials for integrating environmental issues in the Home Science subject. In this study, five teachers identified the topics relevant to wetlands but only two teachers proposed corresponding wetland activities. The topics identified are cleanliness or health education (1), nutrition (1), laundry work (1), sources of water (1) and diseases (1). The corresponding activities are given below.

Activities done away from wetlands

- Softening water by boiling (1)

Visiting wetlands

- Visiting wetlands (1)
- Identifying various sources of food from the river, drawing and labeling them (1)

Using wetlands and their resources

- Using water from wetlands (1)
- Visiting wetland near school to get water for laundry (1)

Section 3.8 portrays Home Science as a subject where issues of cleanliness and good hygiene are emphasised. Water is essential in this subject and the wetlands are valuable. Availability of clean water is an important requirement in realization of cleanliness and good health. Prevention of contamination of the environment and wetlands is highlighted in the syllabus (section 3.8), especially the issue of proper refuse disposal (RoK, 1992b:72). However, the data presented by teachers shows that they failed to undertake practical environmental action to address cleanliness of the environment and wetlands even though they benefited from them. Wetlands are also recognised as sources of food although learners were only involved passively. The activities presented in this question failed to show any critical engagement with local wetland issues and possibly inadequately address sustainability of local wetlands (section 4.7).

8.6.8 Mathematics

The potentials of using the Mathematics subject to address environmental issues are discussed in section 3.9 and Appendix 3.9. The environment is referred to as having a higher potential for learning various skills useful in environmental problem solving (refer to section 3.9). In this study only one teacher identified counting as a topic that can be learnt using wetlands but no practical activities were reported. This suggests the possibility that teachers do not use the outdoor environment to promote learning of mathematical skills and mostly study the subject indoors. This aspect is strengthened by the observation made during the observation of the teacher in class during the school visits (Appendix 3.11). The two teachers observed were teaching topics that could have used the local environment to generate mathematical skills and

data to use in further analysis. The data generated by pupils could have enhanced active learning of the concepts prescribed in the syllabus (Appendix 3.9) and in the textbooks they used as well as learning more about the environment (section 3.9). However the teachers dominated the lesson and relied heavily on the textbooks. I suspect the same aspects are responsible for the non-use of wetlands to teach mathematical skills. The responses by teachers show no consideration of wetlands sustainability using Mathematics. The scenario presented in this subject is that of a potential but inadequately utilised subject to promote environmental and wetlands conservation.

8.6.9 Music

Section 3.10 and Appendix 3.10 presents the potentials available in the Music subject to promote environmental conservation. Music is regarded as having a high potential to enable learners to express their views about the environment. It is also considered to be a consumer of environmental resources (section 3.10). In this study, one teacher identified the topic of musical instruments as relevant to wetlands. She identified making musical instruments using materials from wetlands as the activity she involved learners in. This activity shows the usefulness of wetlands in providing resources to support music. However, the activity fails to encourage critical thinking about wetland problems identified in sections 2.3, 7.7 and 7.8. This activity does not show any link with the local wetland problems or their conservation. The responses also do not show pupil engagement with local wetland issues in a way that can generate self-expression through composition of songs on various issues. The pupils also failed to explore the wealth of environmental knowledge in songs. This could have encouraged active learning as a process that integrates dialogue, encounters and reflection geared towards addressing local environmental issues. The responses to this subject show a potential but an under-utilised opportunity to champion for wetlands conservation.

8.7 How teachers who were not in-serviced teach about wetland issues.

29 teachers who did not attend the wetland in-service training (section 5.8.2, Table 6.1) were asked to explain how they taught their classes about the local wetlands (question 46 in Appendix 5.7). The purpose of this question was to gain more insights into the teaching of wetland issues

from other teachers and not necessarily those who had undergone the wetland in-service training. Their responses are as follows with the number of teachers in each case indicated in parenthesis.

a) Theoretical approaches (24 teachers)

- Teach theoretically (13) and give local wetlands as examples
- Observe environment (2), see trees that pupils have planted at school
- Demonstration (4) – draw water using a bucket and make a pupil to bath, ask pupils to wash parts of their body and demonstrations on soil erosion, fishing
- Academic based approaches (5) such as guided questions, write a composition, essay after the visit use maps, make models, illustrations

b) Wetland visits – 14 teachers

- Wetland visits to learn irrigation, look at rivers' beauty, see small animals like frogs and tadpoles, see drainage, speed of river, touching the water and plants, play with water, collect clay, throw some leaves into the river and observe how they move, identify vegetation, birds and other animals and connect this to interdependence and food chains, visit river and teach while there, capacity – measure water amounts, go out and look at what God has created, swim and enjoy themselves, capture tadpoles

c) Taking action - 3 teachers

- Eco-management activities such as Wildlife Club beach cleaning, uproot some of the weeds, plant and water vegetables

There were no differences between the inactive and the active school categories (Table 6.1). There were also no major differences in the activities reported between those in-serviced and those who were not (also refer to Table 8.5). The responses suggest that theoretical approaches dominated followed by wetland visits and only a few teachers took practical action. The frequency of mention was 24:14:3 respectively. The data suggests that the approaches used in schools in this study are more inclined towards show and tell or awareness orientation where the

teacher posits as the expert and the learners as passive receivers of knowledge (section 4.6.1 and Table 4.2). There is also evidence of some encounter incidents with wetlands for various reasons of which none are inclined towards identification of local wetland problems or their solution (refer to section 7.7 and 7.8). Most of the visits to wetlands were more leisure based to see the wetlands and to discuss but not to do anything about any threats to it. Only a few teachers did some eco-management activities and these seemed to have little relationship with the real wetland problems mentioned in section 7.7 and 7.8. The data suggests failure of those teachers who were not in-serviced to promote conservation of local wetlands. This could be attributed to lack of adequate knowledge about wetlands (section 7.2) or the rigid school systems that do not encourage taking action to address local wetland problems.

Three teachers commented that they do not involve learners in knowing about wetlands because going to the wetlands can only be done during a tree planting activity (1), pupils are familiar with wetlands (1), due to shortage of time since the wetland is located far away (1) and also because parents cannot allow children to do activities in the lake (1). These reasons demonstrate the teachers' narrow conceptualisation of the wetland issues and lack of active engagement with wetland issues as well as mobilisation of the school administration and parents and other community members for support. The data from these teachers who are not in-serviced concurs with that from the in-serviced teachers (section 8.6). This suggests that the in-service training may not have had an impact on the teachers' practice of teaching. Their teaching methods did not seem to differ in both groups of teachers considered in this study. This suggests that education for sustainability of wetlands could be non-existent in these schools. This also suggests the need for greater involvement of teachers in environmental education processes that can empower teachers to identify issues of local wetlands that are relevant to the curriculum and to the community as well as appropriate ways of dealing with them.

8.8 Source of instructions for teachers' practice

Ten teachers (section 5.6.2) were asked during the interview to explain who told them what to teach and how to do it in school (question 18 in Appendix 5.7). All the ten teachers agreed that the syllabus acts as a guide but its interpretation is the personal role of the teacher. There was a

complaint that the syllabus does not talk about wetlands and only talks of other related aspects such as uses of water.

About the method of teaching, eight interviewees said that this is a teacher's initiative and they are not told by anybody. The teacher is supposed to make the lesson enjoyable and usually there is no book that talks about how to do that. The syllabus can prescribe some teaching aids but if they are not available, the teacher should improvise.

These responses portray the teacher as a constructor of knowledge at school. The teacher is expected to interpret the curriculum in his/her own way to enhance learning. This expectation concurs with the constructivist view of knowledge generation and meaning making where the teacher is regarded as being able to internally construct knowledge (Fien & Hilcoat, 1996:27). The knowledge constructed by the teachers could be expected to reflect individual perceptions on local issues (Chapter 7) since it is a "product of individual thinking and consciousness"(Mcfarlane, 2000:27). This suggests that the teachers had a major role to play in the success or failure of the wetlands education programme and wetlands conservation in their local areas. These responses implicate the teachers as the ones responsible for selecting or not selecting wetland aspects in schools. Any weakness identified in this study could imply a teacher's deficiency in some aspect of environmental education professionalism especially on promotion of environmental sustainability (sections 4.7 and 4.8). Several weaknesses are identified in various sections of this thesis. The areas of deficiency identified could be the priority area of training on wetlands education in future (refer to section 10.8).

8.9 Teachers' benefits from the water and wetlands training

Ten teachers (section 5.6.2, Table 6.1) were asked to explain how they benefited from the water and wetlands training (Appendix 5.7, Question 37). The purpose of this question was to gather more comments about their perceptions about the wetlands training. The benefits fall into various categories as shown below.

Knowledge/Cognitive

- Got knowledge such as on importance of water, magnitude of the wetland problem, wetlands and their uses, identification of wetlands and their organisms learnt international bodies dealing with wetlands (7).
- Got resources such as posters (1)

Skills/Psychomotor,

- Got skills such as in identification of birds, plants (1) and to disseminate information (1)

Attitudes/Affective

- Changed attitudes (1)

Participation

- Met different peoples of same profession and shared ideas with each other (1)
- Apply the training for instance assisting a local catchment group (1)
- Started a water project at school (1)

The results suggest that most teachers' benefits centred on cognitive development that was more focused on individual gains. All the benefits look more personal and short-term and do not address contextual wetland related challenges for the teacher at the local level (section 7.7 and 7.8). This suggests lack of linkage between what happens at school and at the community (refer to section 4.6.4). The benefits mentioned by the teachers portray features of the liberal progressive orientation with regard to knowledge and action (section 4.6.2) that is more inclined towards the individual than the society. In this case, the teacher benefited and little if any of these benefits drain off to the community. The responses by teachers fail to adequately address the goals of environmental education (section 3.1) and the expectations of the training programme that teachers be more active at a local level (section 1.4). The responses presented by the teachers in this question do not tally with considerations for education for sustainability of local wetlands with regard to exploring the local environmental issues and risks and prioritising their relevance

both now and in the future. They also fail to consider issues of cooperation and collaboration in addressing local wetland issues with members of the community (sections 4.7 and 4.8).

The ten teachers (section 5.6.2, Table 6.1) were then asked in the interview to explain the insights they developed about themselves after teaching their learners about wetlands (question 41 in Appendix 5.7). This question was meant to elicit views from teachers on how they sustained practical action to take care for wetlands. It was meant to explore the vigour with which teachers teach and champion for wetlands conservation at the local level. Their comments are as follows.

- Teaching methodology has changed from lecture to going out (1)
- It is easy to conduct a lesson because it is something they see (1)
- It is easy to join community such as the catchment group in planting trees (1)
- Teacher has knowledge for instance that water is very important (1)
- Improvement in exam. For instance a topic where pupils went out was performed well (1)
- It promotes enjoyment by pupils because they discover things by themselves (1)

Four teachers complained of several limitations such as time since other teachers may complain, one must seek permission to go to the wetland even on a weekend and she is obliged to teach first and go for fieldwork later. This portrays weaknesses in lesson planning for the teacher whereby the practical and theoretical sessions of learning are treated as separate. This is a neoclassical approach to education (Table 4.2). In education for sustainability, theoretical and practical activities are integrated whereby pupils learn while doing activities.

While the teachers portray enthusiasm about their changed perceptions and practice, the findings of this study reveal that the opposite is true on conversion of these perceptions to appropriate action for sustainability of wetlands (refer to section 8.6). My visit to schools (Appendix 3.11 and 3.12) and the teacher responses using other research tools (section 5.8) failed to demonstrate engagement with local wetland issues. The teacher did not report any ongoing projects to conserve local wetlands through a process of dialogue, encounter and reflection to improve later interventions. The responses given treat wetland education as a simplistic process and teachers appear not to be aware of the wetland threats mentioned in section 7.7 and 7.8. The responses do

not portray the teacher actions as informed by the local reality about wetlands. The teachers could not remember any challenging activity they have done in wetlands. The responses do not show considerations for education for sustainability of wetlands (sections 4.7 and 4.8). This suggests the need for promotion of teacher training to enable them to treat environmental problem identification and solutions as a process (Stapp & Wals, 1993) and to integrate the local community in the solution of environmental problems (Gough & Robottom, 1993).

8.10 Teachers' reflections on teaching approaches after wetlands training

Teachers were asked using a questionnaire to comment on the quality of their teaching after attending the wetlands training (question 26 in Appendix 5.5). This question was meant to enable teachers to gauge their practice of teaching wetland issues after attending the in-service course. Forty-five teachers felt that their performance had improved. Eleven teachers cited the posters as being especially useful in class. Three teachers complained that the posters were insufficient and that learning could have been made more real by use of some videotapes. One teacher felt that teaching had not improved since wetlands were not a topic in the syllabus but was only integrated. These responses suggest that most of the teachers considered wetlands training to be of value and had enhanced their teaching.

The participants were then asked to describe and explain their feelings about the integration of water and wetland issues in the entire environmental education context as required in the school curriculum using a Likert scale (question 27 in Appendix 5.5). The Likert scale had options for very difficult, difficult, neutral, easy and very easy. One teacher felt it was very difficult to integrate the wetland issues but did not explain further. Seven teachers felt integration was difficult and five of them gave the reasons why. Five teachers were neutral about integration of wetlands issues in the curriculum and four of them gave reasons. Twenty-eight teachers said integration was easy and twenty-four of them explained why. Eleven teachers said that integration was very easy and eight of them explained why they felt so. There were no major differences between male and female categories or urban and rural contexts (section 6.2). The responses by teachers are summarised in Table 8.6.

Table 8.6 Teacher reflections of teaching approaches for wetlands after the wetlands training

Theme	Difficult/very difficult	Neutral	Easy/Very easy
Syllabus	Wetland issues not mentioned in the syllabus		
Personnel	Teacher alone at school		
Knowledge	Little knowledge of wetlands and threats	Wetland knowledge useful in other subjects, easy to apply	Topics in EE look very easy, I know about wetlands and uses to the community, I can discuss with pupils
Support	Start at grassroots, sensitise everybody including head teacher, involve all stakeholders		Head teachers should be made aware so as to support teachers,
Time		Teacher to find time for outings	
Interrelation ships			Most subjects have topics related to wetlands, pupils can easily interpret using the local, can enhance awareness on culture, science, art etc.
Our environment			Wetlands are part of the environment, important to man's everyday life, learning easy as pupils see things practically.
Exposure, teaching			Pupils grew interacting with wetlands, teacher teaches something real, EE participatory, from known to unknown.
Resource materials	Lack of materials to disseminate information		Posters and notes make approach easy, coloured pictures make learners attentive.
Constraints	Powerful people, limited land, ignorance, conflicts between school and community,	Requires support of community and the government	Lack of resource materials Time

These responses portray a continuum of wetland perceptions that could be considered during wetlands training. Teachers who view wetland issues as easy highlighted aspects of relevance (section 4.7.1) to human beings and the curriculum, existence of interrelationships, human dependence on wetlands, importance of resource materials, relationship between the school subjects and local knowledge about wetlands (refer to Table 8.6). This portrays this group as having owned up to the fact that the environment is theirs and seeing their interrelationships to it.

These perceptions highlight aspects of sustainability (section 4.3 and 4.7). These features were not felt by the teachers who were neutral or felt it to be difficult. The group that remained neutral recognised the usefulness of wetlands in the subjects but insisted that more support by the community and government as well as time availability was needed. The group that considered integrating wetland issues in the curriculum to be difficult raised many complaints as shown in Table 8.6. It could be useful to address these constraints by the teachers during training programmes.

These responses concur with the results obtained in an interview whereby ten teachers (section 5.8.2, Table 6.1) were asked to respond to the question: *What can you say about the application of what you learnt into your local context in school and at the community?* (question 38 in Appendix 5.7). The aim of the question was to gather views on teacher perceptions of the challenges of teaching about wetlands. Their responses show that some teachers felt it was simple while the majority considered it to be difficult as explained below.

Difficult

- Needs time, devotion and resources (2)
- Lack of resources locally such as wetlands (1), trees for planting and the municipal council have no lorries or fuel to transport the garbage collected (1)
- The few trees planted at school were done by coercion of the children and not by self-driven initiative and are therefore easily destroyed (1)
- Local administration that does not support going out of school (1)
- Training had very few experiments (1)
- It is hard to deal with the community (4)
- Its hard to tell somebody not to pollute the water unless during wetlands day (1)
- Nothing done (1)

Simple

- I am working with the local community as the workshop told us (1)
- We plant vegetables, maize trees and we mulch and drip them (1)

These responses again suggest that majority of the teachers felt that application of their training locally was difficult. The difficulties have a political dimension (section 2.3.4) in terms of lack of time and local support by the administration and the community. Lack of resources implies some financial and professional constraints. Training aspects were also challenged and one teacher felt the need for it to be practical. However those who felt that integrating the wetland issues was easy also spoke in praise of what they do locally. But there is lack of evidence of a sustained programme that addresses local wetland issues that has been initiated by the teachers. This implies that even though some teachers regard integration of wetland issues as easy, there is much that is not happening locally especially considering that they identified many threats to the local wetlands (section 7.7 and 7.8). There was no evidence of a proactively locally developed programme to address wetland issues. These values and threats traverse biophysical, economic, social, and political aspects of wetlands (Figure 2.3) and hence need a holistic approach that enhances prioritisation of local relevance (Tilbury, 1995). These features are missing in the teachers' comments to this question. More discussion on this issue is provided in section 8.15.

8.11 Teachers' views about pupils after learning about wetlands

Ten teachers (section 5.6.2, Table 6.1) were asked to explain the insights they developed about their pupils after teaching them about wetlands (question 20 in Appendix 5.7). This question was meant to find out about the emergence of any special conservation related activities after an experience in teaching about wetlands. The issues discussed by the teachers are as follows.

- The children understand faster when seeing concrete things than when it is theoretical (2)
- A lot of observation developed (1)
- Pupils able to think and reason critically (1)
- Children develop questioning skills (1)
- Opens up the pupils mind than in class (1)
- Able to compare local wetlands with others in the district and also to compare and differentiate fish (1)
- Language use improved especially use of proverbs and similes (1)
- Pupils appreciate good wetlands (1)

- Attitude change for instance pupils swore never to eat vegetables from a polluted river (1), teacher overheard some boys saying that they wanted to construct a fishpond at home (1).
- I don't think we are doing anything because we are not doing things practically (1)

Some of the teacher responses suggest development of active learning (section 4.7.7) making learners think critically, be inquisitive, compare wetlands, differentiate fish and appreciate wetlands. Teachers were in praise of using wetlands while teaching and described many personal benefits to learners but few returns for the wetlands. The response to this question concurs with the liberal progressive education orientation (section 4.6.2, Table 4.2) that has a high regard for individual experiences and constructions in nature (Fien, 1993:22). This helps in meaning making by pupils using the local environment. However, the responses do not portray exploration of environmental issues from a social perspective. The response to this question again showed lack of engagement with local wetland issues. It suggests lack of reflection on local wetland problems (section 7.7- 7.8) and lack of a proactive preconceived plan in these schools to set up a long-term plan for the local wetlands. The responses suggest that teaching is geared towards making the learners understand so as to be able to interact with wetlands (Grundy, 1987:13). There seems to be no effort to cultivate processes that can lead to emancipatory-oriented actions to conserve wetlands (section 4.6.3, Table 4.2). These results concur with the weaknesses of Kenyan education objectives discussed in section 3.1, which fail to engage learners in critical thinking and participation. The teachers' responses do not show the presence of features of environmental education for sustainability in schools (sections 4.7 and 4.8)

8.12 Integration of wetland issues in exams

Examinations have been cited as a major constraint to environmental education. Education systems have been criticised for putting a lot of emphasis on determining success and entry into various professions on performance in exams at the expense of judging through performance of a task. Teachers are coerced to ensure good grades by pupils in exams instead of making pupils apply the knowledge learnt to solve immediate environmental problems (Stevenson, 1987). In this study ten teachers (section 5.6.2, Table 6.1) were asked to explain whether the exams done in

schools were set locally or got from elsewhere (question 21 in Appendix 5.7). The purpose of this question was to find out whether the teacher had any influence in integrating local wetland issues in the exams done in school. Their comments are given as follows

- Exams bought from other Kenyan districts with a reputation of doing well (4)
- Exam prepared at a central point by experts such as at zonal and divisional levels (5)
- Sometimes mid term exams set at school and written on chalkboard (1)
- Teacher sets the exam (2)
- Teacher gives pupils assignments (1)

The responses show that most exams are not set in the school but come from outside the school. The exams may fail to address the local contextual issues affecting the wetlands around the school (section 7.3-7.8). The teachers were then asked about their perceptions about integration of local wetland issues in these exams (question 22 in Appendix 5.7). Their responses are given as follows.

- Exam not seen at local level but as a countrywide exam focussing on the Kenya Certificate of Primary Education (KCPE). This was reported by 5 teachers who said that
    - local wetlands are included in a generalised way
    - local rivers are mentioned if they are also mentioned in the syllabus
    - aim is to pass national exams
    - the syllabus only talk about the big rivers

- For class 1-3, local issues and wetlands are covered but only in subjects such as GHC (2)
- Some exams cover local issues such as the Indian ocean, local cash crops, local rivers (3)
- In multiple-choice questions, most of the local rivers are mentioned as choices (1)

The responses suggest that exams taken at schools are not standardised. Most schools get their exams from other regions endowed with different wetland values and problems (section 7.3-7.8). These exams may fail to explore local wetland issues in a way that prioritises relevance and holism (section 4.7). By failing to emphasise local issues, the teachers may not consider the local

experience in wetlands necessary and may not be motivated to address it. This scenario portrays the teacher as having failed to understand the importance of teaching learners to develop life long action competence (Jensen & Schnack, 1997) in local wetlands conservation as opposed to teaching to pass exams. The responses also suggest that the exams may be responsible for the absence of considerations of education for sustainability in schools since the local environment issues are not prioritised. Teachers do not feel obliged to address local wetland issues since they may not be credited in the exams.

8.13 Use of the wetlands poster

Section 4.6.4 discusses posters as one of the resource materials used by teachers to enhance environmental education. During the wetlands training in 1999, each teacher was given seven posters (plate A) to use and distribute to the neighbouring schools (section 1.3). In this study, teachers were asked in the interview to explain how they used the wetlands poster in their schools (question 50 in Appendix 5.7). Out of 39 teachers, eleven reported that they use the wetlands poster while 28 teachers did not use it. Those who use it mentioned its usefulness in subjects such as Science, GHC, Agriculture, and Art and Craft. One teacher claimed that parents enquire about the poster and the teacher explains. One teacher referred to the poster as a store of knowledge for future generations. One teacher praised the poster saying that *'I use it regularly for knowledge to stick in pupils mind and for those currently enrolling in class one'*. This may imply taking the information in the poster 'as is' without adapting it to the local context. One teacher complained that the use of the poster was below average as most topics in curriculum ignore water topics and that teachers seem not to realise the importance of the poster. The teachers' responses are summarised below.

I use it to teach

- Fishing because the local rivers have no fish (1)
- Water catchment and soil conservation (1)
- Environment (3)
- Forestry and mountains, animals and tourism (1)
- Conservation of animals (1)

- Adaptation of animals to the environment (1)
- Birds found in wetland, beaks, legs, feet (1)
- I go with it to class (2)

I don't use it

- Poster cannot be traced, has disappeared (4)
- I don't use it nowadays - subjects that I teach are not relevant to the poster i.e. Maths and Kiswahili (3)
- I thought it could be more useful in science (2)
- I cant explain why (6)
- It is fixed in the staff room (2)
- I teach GHC and I don't teach something like wetlands as such although I mention something on mangrove forests (1)
- Gave posters to individuals (1)
- I gave all posters to the head teacher and never saw them again (1)
- They were in some classes but the teachers do not use it (1)
- Never seen it (8)
- Teacher not given a poster (1)

Out of the ten schools that participated in this interview schedule, nine had received a copy of the poster through the teachers who participated in the in-service training workshop (section 1.3). The uses of the poster reported above are more inclined towards promotion of understanding and appreciation of the environment. This is a feature of the liberal progressive orientation in education (section 4.6.2). There are also features of the neoclassical orientation whereby teachers use a transmission approach (section 4.6.1) where the teacher dominates while the pupils remain passive. The responses do not show any critical engagement with the poster to adapt views in the poster to the real life situation in the local wetlands. The teachers seem to take the issues prescribed in the poster 'as given' without reflecting on their relevance as well as the local *status quo*. This is unfortunate since the poster was a generalised teaching aid and the teachers were expected to use it to explore local contextual issues on wetlands. The context in which the poster was developed is more generalised and different from the one presented by teachers in section

7.3-7.8. This study expected the teacher to deconstruct the poster and then adapt it to the local context. This would entail getting more diverse ideas of use of the wetland poster that focus on its adaptation to addressing local issues.

Some teachers did not use the poster and the reasons given are suggestive of ignorance on the part of those teachers who attended the in-service course and refusal to avail it to their colleagues. Some teachers also had misconceptions about the poster that it was not relevant to their subjects. The responses were baffling since some of the teachers who said that the poster was not relevant to their subjects were geography teachers, a subject that has many issues dealing with wetlands (Appendix 3.2). These responses suggest that some teachers did not consider the poster to be of worth to them. This makes one question the approaches most suitable when working with teachers to make learning materials such as posters more useful. An idea held by Lotz (1995) and O'Donoghue and McNaught (1989) is that there should be more teacher involvement in designing and production of learning resource materials. Most probably, this poster failed in its use because teachers felt it was being imposed on them and did not address the wetland issues as they would have wished it to. Possibly, with the focus of some teachers on passing exams (section 8.12), the poster failed to satisfy their needs. It is likely that if these teachers were involved, they could have integrated their local reality within the poster development and this could have increased its relevance within the school and community contexts. This issue needs to be researched further.

8.14: Teacher expected outcomes from pupils

The questionnaire data revealed in general that teachers engaged their pupils in learning about wetlands and some teachers took them out to the wetlands to study (section 8.6). During the interview, the researcher asked the 39 teachers (Table 6.1) to explain the kind of outcomes they anticipated achieving by teaching learners about wetlands (question 19 and 47 in Appendix 5.7). The purpose of this question was to explore the outcomes teachers wanted to achieve as well as to gather information on teacher perception of the value of teaching pupils about wetlands. Section 4.6.4 explores the importance of having preconceived outcomes before and during programme progress to enable learners and facilitators to have a clear sense of what they are working towards

(Le Roux, 2000:13). The outcomes as perceived by teachers could tell more about their perceptions on the outcomes of the learning process. The environmental education outcomes classified according to the Tbilisi conference (UNESCO, 1978) centre on promoting awareness, knowledge, skills, attitudes, and participation (section 3.1). It was necessary to explore the outcomes guiding teaching of wetlands by teachers in this study to establish how the teachers work within these international guidelines. The emergent issues in this study are summarised as follows:

Table 8.7 Teachers' expected outcomes from pupils in learning about wetlands.

Category of outcome	Details and number of teachers
Awareness	See the gravity of the issue so that as the children grow up, they should not pollute the river (1) to see what is found inside the lake and around it, the animals and their importance (1), see small animals such as frogs and weeds that are dangerous in the river (4), see, feel and work with wetlands (1), see river's beauty (1), see how river is being conserved (1), when children exposed, they will tell their parents and thus pass environmental message (1), children learn many things (1)
Knowledge	Understand importance of water to human beings (3), have this knowledge as it can help them even when out of school (2), appreciate wetlands (1), get a wider view for their own use in future (1) learn uses of water (1), learn how fish ponds are constructed and how fish are harvested (1), study features of a river (1), learn about the status of the environment and how they can help (1)
Skills	Conserve wetlands (2), creative writing (1), practice what I learnt (1), pupils to be able to keep environment clean without polluting it (1)
Attitudes	Appreciation of wetlands (2), mental development (1)
Participation	Ensure availability of clean water in the local wetland (1), to save money that could have been used if we used tap water since it is metered (1)

The teachers seem to emphasise developing pupils' awareness about particular issues of wetlands. The awareness seems to be grounded on observation of wetlands. There was no mention of discussion and reflection on the problem. The aspect concerning knowledge touch on both natural and human aspects of wetlands. However some teachers stress the use of knowledge learnt in future conservation of the environment instead of immediate action informed by the fluid *status quo*. This is a major handicap to environmental education (Styles, 1995; Stevenson, 1987). There is no mention of using active learning (section 4.7.7) to enhance understanding or

promotion of learner based activities to generate new ideas about wetlands as well as locally based environmental action.

Concerning skills, there is an emphasis on involvement of the learner in generating ideas about wetlands. Emphasis is on attitudes and expression related to the interactive processes of wetlands that involve human-human-environment interactions. With regard to participation, teachers did not show proactive engagement with local wetland issues. They failed to provide the process that would ensure pupil and school participation in local wetland conservation.

The overall picture generated is that the main outcomes are based on promoting awareness and understanding. This concurs with the Habermas practical knowledge interest, which is interpreted by Grundy (1987:13) as having "an interest in understanding the environment so that one is able to interact with it." This interest, as presented by the teachers, seems individualistic and selfish with no attachment to the social perspective of wetland conflicts and the role of education in conflict resolution. The teachers seem to take a neutral, apolitical, academic oriented position and seem to be blind to the wetland value and threats mentioned earlier (sections 7.3-7.8).

The results suggest that the teachers are not critical about the local wetland issues and do not facilitate learners' participation in engaging with the real wetland issues critically. This partly explains why the teachers' activities are dominated by theoretical approaches, wetland visits and apolitical eco-management practices (section 8.6). Their view of the expected outcomes is not on critically based participatory engagement to bring about change. Education for sustainability emphasises improvement of the immediate environment as a goal as well as educating for sustainability in the long term (Tilbury, 1995:197). The expected outcomes by the ten teachers failed to portray the need for local environmental improvement. The lack of critically based outcomes and actions suggests that teaching for environmental sustainability was not evident in the schools that participated in this research.

8.15 Teacher perception of constraints within the school context.

Teachers were asked using the questionnaire (question 35a in Appendix 5.5) and interviews (question 24 in Appendix 5.7) to highlight the problems that constrain them from applying the water and wetlands training within their schools. The purpose of this question was to document issues that hinder realisation of sustainable use of wetlands by teachers using the schools and the formal curriculum. Their responses are given in Table 8.8. Table 8.8 suggests that the constraints for teachers have a fivefold dimension that comprises of the holistic aspects of environment as well as an educational component. These problems affect teachers at different magnitudes that seem to follow a trend in order of severity from educational, political, social, economic and then biophysical problems.

The educational problems suggest that teachers are constrained by lack of adequate training on wetlands as well as those trained being few in number. The training is also considered to be dogmatically technical. These are valid observations by teachers as reflected in Appendix 1.1. Being the first training of its kind in Kenya, the trainers were not conversant with environmental education processes and how to apply them in wetlands education. The training was mainly done by scientists and wetland managers and not by environmental educators. Aspects of how the teacher can unpack the training to suit the local needs were not addressed (Appendix 1.1). The lack of training of environmental educators has been highlighted as a major constraint to environmental education in Kenya (IGAD, 1999; Karembu & Kinyanjui, 1997; MENR, 1998; MENR, 1994). The recurrence of this issue in this study suggests that the problems are still in existence and are serious. Lack of resources is not an unusual problem in Kenya because wetland issues have been tackled at scientific studies and research level with little emphasis of communicating the findings to the teachers, pupils and members of the public (Maina, 1996). There are very few resource materials on wetlands for the educators. One of the first deliberate attempts to produce materials for teachers was done in 1999 with the publishing of a wetlands poster (Plate A) and a wetlands booklet (NMK, 1999). The posters and the books were distributed to teachers who participated in the wetlands workshops only (section 1.3). There are still many teachers with no access to wetland resource materials.

Table 8.8: Constraints to teacher practical actions for wetlands at school level

Theme	Problems	Number of teachers	
		Questionnaire	Interview
Economic	Lack of funds to buy materials e.g. seedlings, put up projects on wetlands, for outdoor activities, learning materials, for conservation, garbage collection, no facilities to tackle the problem	10	1
	There's need for more land for agriculture, people earn their living from wetlands	2	
Political	Ownership conflicts - Landowners claim land is theirs and should use it as they wish, community rivalry against information on extraction of water, what happens to wetland is seen to be owners problem and not communal problem, wetlands protected by government, school and county council are fighting over land ownership and school is helpless – cannot stop degradation at the moment.	9	1
	Problem magnitude - Little can be done, powerful people grab and dump in wetlands, every threat blamed on Municipal Council,	3	
	Frequent teacher transfers interfere with teachers output and morale	2	1
	Lack of time	21	2
	Lack of support among stakeholders, technical support from NMK – ideas, activities, members of staff, headmaster, lack of follow-up	6	4
Biophysical	Wetlands are far from the school	5	
	Lack of a permanent wetland to be used as an example, sometimes dry up	2	2
Social	Lack of interest from teachers, considered waste of time and energy, poor attitude towards work	6	1
	Negative attitude in pupils – view it as punishment e.g. planting of trees, consider wetland activities as dirty work	7	
	Discouragements from local teachers		
	Failure to turn up (few people turn up for an activity)	2	
	Tiresome	1	
	Ignorance, lack of interest from curriculum developers, prioritisation, ridicule from people	2	3
	Trees planted not well protected and are destroyed by grazing animals	2	1
	Children come from all over the country	1	
	School is urban and pupils don't want to soil their hands	2	
	Teacher not familiar with the local area		1
	Community unfriendly		1
	School doesn't have a tradition of involvement in fieldwork		1
Educational	Few teachers teaching the subject, teacher doesn't teach all subjects, all classes	3	3

	Lack of training for teachers on wetland issues, subject is difficult if there is no practical approach	5	1
	Workshop taught technical aspects of wetlands – methodology aspect not tackled well and teacher may not know where to start	1	1
	Lack of enough books/resource materials /posters, tools and equipment, materials based on various ages (classes)	11	2
	Lack of interest by curriculum developers	1	
	Pupils only concentrate on what is in the curriculum, school curriculum very tight, Teachers and pupils believe in examinable subjects, programme not included in the school curriculum, too much class work and very little time for co-curriculum	12	6
	Wetland content – to be a subject by itself or a topic	1	3

The curricular-based problems also seem to be a major constraint to the teachers. The main concerns are on illumination of the wetland aspects in the subjects and topics as well as change of teacher, pupil and curricular emphasis in exams. These concerns also seem valid and are supported by the document analysis (Appendix 3.1-3.10, 3.12) and the data from this study whereby local wetland issues are not given priority since the aim of the curriculum seems to be geared towards fostering achievement within a centralised system of exams which are blind to local contextual issues (section 8.12). This is a major problem because it makes teachers lay emphasis on the passing of exams as the goal of education instead of teaching learners to think critically (Jickling, 1999; Stevenson, 1987) in order to influence change of local *status quo*. There has also not been any proactive collaboration between the institutions dealing with wetlands research and management to involve the Ministry of Education and the curriculum development centre (Kenya Institute of Education) in prioritising wetland issues in schools (Ramsar, 2002). Selection of the wetlands conservation options instead of substitution of wetlands for survival (section 4.4) by the community members may be a major challenge for teachers to engage in through environmental education.

The politically related concerns provide a new dimension to wetlands education in addition to those mentioned in section 2.3.4. From the point of view of the teachers, the political issues relevant to the local context were dominated by time, provision of support, accessibility of wetlands and teacher transfers. These concerns suggest that wetland education in schools is a collective responsibility at school that needs various considerations - some which are out of the

control of the individual teacher. The teaching activities need support in terms of providing time and local acceptance by the school and the community without interfering with the teacher. This implies that wetland issues and education could benefit much if the role of the teacher is considered while considering the political aspects of wetlands (section 2.3.4) in wetland management strategies and plans.

For the political attributes, ownership conflicts were a major issue that hindered teachers from accessing the wetland or taking action to conserve them. Section 2.3.4 presented the political aspects of wetlands and highlighted ownership as a major constraint to access and use of wetlands. The data from this study shows that teachers also experience this problem. The curriculum used in Kenya is created at a central point, the Kenya Institute of Education (section 1.2). The exams done by students are guided by this curriculum and teachers often find themselves teaching in order to make pupils pass exams (IGAD, 1999) and not to be critical about what happens to the environment (section 8.12). This portrays a weakness in the education system in the sense that it fails to strengthen the link between the school, schooling and the local environment. However, although the teachers complained that wetland issues were not included in the syllabus (section 8.12), document analysis showed that wetland issues are integrated in the curriculum (chapter 3, Appendix 3.1-3.10) and this suggests that the teachers do not make use of this available opportunity. This is a major threat to education for sustainability for wetlands. More research is needed in this area.

Teachers also complained that nothing can be done and that powerful people are responsible for wetland degradation. This shows ‘action paralysis’ (O’Donoghue & Janse Van Rensburg, 1995) and suggests that teachers do not engage in active learning about the problem to identify its constituent causes, which can be used as opportunities for various learning projects. This suggests the need for empowerment of teachers to be able to define the problem in its constituent parts and generate strategies for each (Stapp & Wals, 1993) instead of being overwhelmed by the problem’s magnitude. This can assist also in addressing the administrative and time constraints identified by the teachers. These political issues are also closely related to social issues and depict the local community as having very little interest and attachment to local wetlands or to the work done by the teacher.

The social aspects that act as a constraint to the teachers includes ignorance, negative attitude, lack of enough awareness and community hostility towards the teacher. These problems suggest that the local context where the teacher works may be ignorant about wetlands and their resources. During the interview one teacher lamented that

> *Sometimes when you take children out for a nature walk to see these areas, you are usually seen as if you are wasting time. The community feel that you should be in school and not wasting time out travelling to other areas.*

This gives an impression that the community does not consider fieldwork to be learning but more a leisure activity. This suggests that the school has not worked together with the community to make them understand how the school links with the community and the surrounding environment. This is a gap that causes the community and the schools' perceptions about schooling to differ. This suggests the need to work with the other members of the community to address local environmental problems as well as to enrich the academic curriculum. This can help to address the other problems of selfishness and local ownership of environmental interventions. This also implies that there is a major role to be played by all stakeholders in the wetlands education programme in making the local people and the school interested in local wetland issues. My assumption is that these problems emanate from a lack of emphasis on the relevance of wetlands education to the local context such that the former appears detached from the latter. According to Gough and Robottom (1993) an education programme can win greater local support if it addresses issues that are relevant to the local people. Sustainable development underscores the need for all people in a locality to work together to address local environmental issues (section 4.3). This is a major challenge to wetlands education that requires the teachers to play a more proactive role.

The economic constraints emphasise that wetland education has some financial implications that teachers and schools have to contend with. Some of the problems such as financing outdoor activities and wetland projects suggest likelihood of misconceptions by teachers that environmental education is located far from the local area or that it involves complicated projects that could be abstract to the learner. According to Murdoch (1993) and Stapp and Wals (1993),

environmental education projects and outdoor learning for schools should be responsive to local threats to the environment. These should be conceptualised as an ongoing process of active learning (section 4.7.7) and action taking involving dialogue and reflection (O'Donoghue and Janse Van Rensburg, 1995).

The responses from teachers also suggested that economic problems are related to the values identified for wetlands in section 7.3-7.6. This suggests that the problem facing teachers in this study is rooted in addressing issues of sustaining livelihoods of people in terms of provision of food and other daily necessities. This is a major challenge in developing countries (RU, 2002) where many people are poor (section 2.3). The economic constraints depict how the community relies on wetlands and that it is difficult to tell them not to use wetlands since it is their livelihood. This is a problem in Kenya because of the high level of poverty (RoK, 2001b; MENR, 1994). Sustainable development requires that people understand that they need to sustain the resources they depend on across generations. For this to happen a change in attitude and ethics is needed to one that makes people enjoy fewer rights to the use of wetlands (Lee, 1999). This may entail foregoing some economic aspirations. Teachers have a role to play in promoting realisation of this ethic.

The biophysical aspects mainly focus on lack of wetlands in the local areas. The local contexts in Kenya differ with some areas more endowed with wetlands than others (Figure 2.1). But this should not be a major complaint leading to lack of action because each locality must have a water source even though it may be a distance away. Many seasonal wetlands appear during the rainy season (Ng'weno, 1992) and these can be used in teaching. The teacher should also think globally in terms of considering that every place falls within a wetland catchment. Improvement of catchment through planting of trees, avoiding soil erosion or improving the water cycle can go a long way in alleviating wetland problems and is a good step in wetlands sustainability.

8.16 Conclusion

This chapter is an exploration of teacher perceptions and actions within the formal curriculum to address local wetland issues. Teachers acknowledged the wetlands training as being of value to

them (sections 8.2 and 8.9) although they also expressed the need for improvements in some aspects of the programme such as the practical teaching activities (section 8.2). The in-service training was also seen to be a motivator to the teachers' action (Table 8.3). Other motivation for teachers traversed educational, biophysical, social and economic aspects of wetlands. However, despite claiming being motivated to conserve local wetlands, their actions did not reflect locally constructed actions geared towards alleviating the implications of the perceived value of and threats to wetlands. This aspect makes the researcher sceptical about whether a relationship exists between motivation and subsequent responses or actions. This is an area that needs further research.

The chapter explored the teachers' activities within the school and formal curriculum and anomalies were noted. In the formal context various methods were used in different subjects (Table 8.5). Subjects such as Science, Agriculture and GHC used a mix of theoretical, visits to wetlands as well as eco-management activities. The Art and Craft subject was popular with the use of wetland resources. Science dominated in use of visits to wetlands and eco-management activities. Review of relevant literature, however, shows a great potential in all subjects for championing for wetlands conservation (chapter 3, Appendix 3.1-3.10). The use of only a few subjects in this study suggests the existence of problems in teacher perceptions of relevance of wetland resources to the various subjects. This is an area that needs intervention by teacher trainers.

Teachers claimed that they proactively and constructively decide on how to teach as well as what activities to select and involve learners in their subjects (section 8.8). However, in this study the activities reported by teachers seemed to be one-off incidents and not proactive engagement with wetland issues as a process of dialogue, encounter and reflection (O'Donoghue & Janse Van Rensburg, 1995; Stapp & Wals, 1993). This problem was common to both in-serviced teachers and those not in-serviced (sections 8.6 and 8.7). This problem was also noted in the classroom observation where transmission approaches were very popular (Appendix 3.11). Document analysis of the schemes of work and lesson plans showed that the lack of emphasis on environmental education processes was deeply entrenched and absent in the planning for teaching (Appendix 3.12). The planning for the lessons had many features of the neoclassical orientation

characterised by a general lack of outdoor fieldwork encounters and participation by learners. The teachers' anticipated outcomes from pupils were also narrow in scope and capitalised on promoting understanding in learners and not developing a critical and active individual (section 8.14).

Also noted was lack of collaboration among teachers to address local environmental issues. The teachers appeared as if they work alone and did not involve colleagues (section 8.4). The wetland poster was also not appreciated and was not used by most teachers (section 8.13). This could suggest its not being relevant to the local realities and teacher expectations within his/her subjects. The examinations also did not integrate local wetland issues and the teachers did not seem to feel obliged to put emphasis on local issues since they were not examined (section 8.12).

Teachers also cited a number of constraints that hinder them from working comfortably within the formal curriculum (section 8.15). The problems traverse economic, social, political, biophysical and educational related constraints. This again reflects the relevance of holistic aspects of wetlands as well as the need for environmental education for sustainability.

The overall judgement of the status of wetland education within the formal curriculum suggests a potential but under-utilised opportunity. Teachers demonstrated having some meanings within the subjects of what would constitute plausible environmental activities to address wetland issues. However there was a great discrepancy in addressing the holistic aspects of wetlands (section 2.3) as well as considering teaching within the general framework of education for sustainability. This suggests the need for addressing wetland education in a holistic way that integrates the holistic aspects of wetlands as well as how to promote teaching of the same in schools to ensure sustainability of wetlands. These findings support the need for pre-service and in-service training of teachers, especially on wetland issues and methods of teaching. The training should be in line with education for sustainable development (sections 4.7 and 4.8).

CHAPTER NINE: NON-FORMAL WETLAND EDUCATION.

9.1 The non-formal context

According to Tyson (1994:10), non-formal environmental education consists among others of adult and out of school youth continuing education programmes and extra-curricular programmes for students in schools. These education programmes seek changes in knowledge and skills in broad audiences, and rarely advocate specific solutions to issues. These programmes are generally responsive to perceived needs (ibid). Similarly, UNESCO (1997:15) reiterates that the emphasis on addressing local issues and risks makes non-formal community education and local environmental communication successful. In Kenya non-formal environmental education entails a continuous learning process, most of which is not institutionalised and varies from region to region (MENR, 1994:140). Various institutions, including schools, the government, NGOs, and other bodies, are involved and mainly target those within and outside the formal system.

The non-formal context in this study refers to those optional activities facilitated by teachers in and outside schools that may or may not be formalised. The opportunities are additional responsibilities for the teacher and the pupils whose success depends on their volunteerism, motivation and innovation. In some cases schools may fail to take them seriously arguing that they do not directly relate to the examinable curriculum. For this study the non-formal context involves use of clubs, special (environmental) days and the general interaction with members of the community. The activities may or may not be within the regular school timetable. However there could be ample time to carry out activities within this framework as compared to within a normal classroom situation since the non-formal context is not constrained by formal curriculum restrictions. The teachers, pupils and community members can decide on the activities to undertake as well as the timing. There is also minimum external pressure and the programme can be confined to a single theme, usually from the participants' interests.

9.2 Use of clubs in schools

The popularity of development and use of school clubs could be attributed to the constraints experienced in formal education contexts in terms of lack of time, resources, funding, syllabus constraints, lack of knowledge about the environment and little experience in suitable fieldwork techniques for environmental education (Wagiet, 1997; Styles, 1995; O'Donoghue & McNaught, 1989:118; Opie, 1986). Club movement provides an appropriate opportunity to address certain pertinent issues without experiencing the aforementioned constraints. Nature-based clubs serve an important role in cultivating and shaping environmental interests and action in students. Some of the clubs are national movements of the youth co-ordinated by non-formal institutions outside the formal school set up. For instance, the Wildlife clubs of Kenya (WCK) was formed in 1968 and has a membership of over one million students (McDuff, 2000:384). In other countries such as Uganda, the Uganda Wildlife Clubs had a membership of over 784 institutions both formal and non-formal by 1995 (Mucunguzi, 1995:338). In 1997 there were wildlife clubs in at least seventeen Anglophone countries and ten Francophone countries in Africa (Boulton & Eddershaw, 1997). Today wildlife and environmental clubs exist in many countries of Africa, Asia, Latin America, Australia and Europe (McDuff, 2000:384). The clubs have proved to be effective links in some countries between the school and the community by virtue of club sponsored community-oriented projects (Tyson, 1994:13).

Clubs are instrumental in raising environmental awareness and taking environmental action. Clubs serve a crucial role in addressing the interests of the members who subscribe to it. They usually address local contemporary environmental issues. For instance, between 1973 and 1977 WCK held successful student demonstrations to criticise elephant poaching and game hunting and this culminated in a hunting ban that was imposed in Kenya in 1977 (McDuff, 2000:386). In 1998 WCK initiated a campaign on 'Use Baskets, not Plastics' to curb the problem of pollution by plastics (ibid:389). In this way they led students in challenging the social, economic and political tenets of the contemporary plastic pollution menace in Kenya. These activities involved students from many schools throughout the republic. Besides awareness, WCK network also coordinates school involvement in a coastal cleanup during the Marine Environment day that attracts over 1000 students every year (ibid). These activities assist in enlightening students on

the value of conservation as well as allowing them to participate in environmental improvement. These activities portray children as participating in activities that address immediate local environmental problems, which concurs with the emphasis of education for sustainability (Tilbury, 1995, Stevenson, 1987).

Besides the wildlife clubs, other clubs are also active in schools. The 4K clubs are agricultural based and are even provided for in the formal curriculum (RoK, 1992). 4K clubs mainly aim at the promotion of farming skills to pupils and the Ministry of Agriculture co-ordinates these activities in schools (section 3.5). Schools also have a variety of other clubs depending on local needs but literature is not readily available because of lack of proper records on their history and activities (McDuff, 2000:395).

In an effort to understand how the clubs that exist in schools could be used to address environmental education, teachers were asked using a questionnaire to document the environmental extracurricular movements (school clubs) and activities present in their schools in which wetland issues could be tackled appropriately (question 29 in Appendix 5.5). Forty-eight teachers reported having clubs in their schools and these are shown in Table 9.1. The club's thematic area of interest is indicated in parenthesis.

The data suggests the existence of diverse extracurricular movements or clubs in schools that teachers could use to champion for wetlands conservation. The clubs are engaged in agricultural, environmental and natural resources, communication, disciplinary (subject) based, health, social and religious activities. The frequency of mention of the clubs differ and for this study the most frequently mentioned were 4K clubs, Wildlife club, Environmental club and the Scouts movement. These clubs can be used to champion for wetlands conservation. For instance, Agriculture club can integrate an aspect of impact of farming, agrochemicals and other implements on the environment (section 3.5).

Response to the questionnaire question concurred with those in an interview schedule whereby ten teachers (section 5.6.2, Table 6.1) reported having special interests in certain clubs (question 26 in Appendix 5.7). Teachers selected their choices such as 4K club (3 teachers), environmental

club (2 teachers), wildlife club (1 teacher) and debating club (1 teacher). These responses closely concur with the questionnaire findings in Table 9.1. Teachers' exploitation of the clubs' provisions to champion for local environmental considerations as well as sustainability is discussed in section 9.2.2.

Table 9.1 Clubs that could be used in schools to foster wetland conservation.

Club	No. of schools	Club	No. of schools
4K club (Agricultural)	24	Agriculture club (Agricultural)	1
Wildlife club (Environmental)	18	Historical club (Disciplinary)	1
Environmental club (Environmental)	12	Tree planting club (Environmental)	1
Scouts movement (Environmental, social)	11	AIDS awareness group (Social, health)	1
Girl Guide movement (Environmental, social)	6	Art & craft (Disciplinary)	1
Debating club (Communication)	5	Choir (social)	1
Drama club (Communication)	4	Boys and girls brigade (Religious)	1
Science club (Disciplinary)	3	Music club (Disciplinary, social)	1
Young farmers club (Agricultural)	3	Poetry (Communication)	1
Agro forestry (Environmental)	2	No clubs at all	4
Christian union (Religious)	2		

9.2.1 Personal motivation towards use of clubs for wetlands conservation

Motivation as a qualitative variable represents different value or goal orientations, different ways of processing or attending to information and different cognitions of one's performance (Ames & Ames, 1984:535). In the case of wetlands education, this entails the way teachers think, their perceptions, interpretations and patterns of self-direction and regulation of action. Motivation influences how they approach a task, how they attend to salient features of the wetland issues and risks and how they interpret their performance. In this study, teachers were asked in a questionnaire to state what motivated them to apply their wetland training in the extracurricular context (question 31 in Appendix 5.5). This question aimed at establishing teachers' responsiveness to local wetland issues using the clubs. The responses from the teachers are given in Table 9.2. The number of teachers for each type of motivation is indicated in parenthesis.

The teacher responses in Table 9.2 suggest that they had diverse sources of motivation to promote wetlands conservation. It appears that the educational role was the major motivator. This suggests that the teachers acknowledge that extra curricular context is useful in realisation of the goals of education (refer to section 3.1). However, unlike in the curricular context where motivation is related to the subjects and the teaching process (Table 8.3), the extracurricular context seems to lay emphasis on the pupil constructing his/her own knowledge as well as becoming autonomous in thoughts and deeds. The environment as a learning resource is given greater credit within the extracurricular context as compared to the curricular context (sections 8.6 and 8.7). These views recognise the need for learner engagement with wetlands to generate and express their perceptions and responsibility towards their conservation, that is, to make meaning of their engagement, a position supported by the theory of symbolic interactionism (section 5.4). Education for sustainability emphasises the role of meaning making and giving learners the freedom to generate their own relevant local knowledge during the learning process (sections 4.7 and 4.8). The teachers' response regarding educational based motivation has features of allowing pupils to explore, reflect and experience as well as to decide on their future environmental issues. The responses concur with Le Roux's (2000:90) observation that club activities can become part of the learning programme in school. This aspect is explored further in section 9.2.2.

Motivation based on recognition of the biophysical aspects of the environment shows recognition of the catchment, biodiversity, wetland threats and the need for a green and clean environment. These features suggest teachers' attachment to features of the natural environment. The results seem to point to the realisation that all life is dependent on the biophysical environment (Ekins, 1993) onto which the human being has symbolic relationships socially, economically, and politically (section 2.3). These suggestions portray recognition of the vital roles played by the biophysical aspects as well as the need for promoting ecological sustainability (Orr, 1992) to enhance life. Education for sustainability stresses the biophysical environment as the life support systems from which people generate meanings that are geared towards conservation or degradation (section 2.3).

Table 9.2 Teacher motivation in use of clubs to champion for wetlands conservation

Motivation	Details
Economic (10)	Sources of various needs such as water for domestic and irrigation of vegetables to make money and general community upkeep
Socially (13)	Promoting pupils appreciation of wetlands, realisation that wetlands affects everybody including children and society directly, ensure the next generation does not suffer due to our mistakes, people neglect for wetlands, few rubbish pits at school, teacher finds joy, achievement, act voluntarily, feel good when doing anything worthy to community, need to maintain cleanliness, role served by wetlands such as their aesthetic value and also helping to restore cultures that pass away fast.
Political (3)	Days set aside for clubs and societies, support from fellow staff, this is the only ample time at school to conduct such activities
Biophysical (19)	Recognition of the need for conservation, maintain water catchment, love for sea animals such as turtles, maintain green and clean environment, realisation of shortage of trees at school, threats to wetlands such as soil erosion, degradation, desertification.
Educational (34)	Wetlands being ideal for sampling, providing physical teaching materials, extracurricular activities enable self expression among pupils, need to teach learners to become responsible adults, to appreciate the environment, fulfil national goals of education, to involve learners in doing since they gain more, interest of pupils in the subject and for fieldwork.
Wetlands in-service training (6)	Sharing of what was learnt, knowledge and skills acquired, good posters, notes, brochure and poster obtained

The socially based motivation suggests that teachers also recognise the close relationship between people and nature. The teachers noted that people did not seem to relate well to the environment and if this were not changed the next generation would suffer. Some teachers highlighted the importance of intergenerational availability of these resources through nurturing environmental responsibility at an early age. These motivation aspects portray the teacher having closer concerns for nature and other people. Education for sustainability emphasises the need to recognise people and to foster good relationships with each other and with the environment (section 4.3). Some teachers also reported the motivation being intrinsic to such an extent that it was regarded as joyful moments. This is essential as it suggests that the teachers were not being coerced into action.

The economic concerns portray the teachers' recognition of the direct use value of wetlands to the people. This motivation has a relationship to their perceptions about wetlands (section 7.2-7.6) where economic considerations dominated. Section 2.3.2 presents a discussion about wetlands in Kenya serving crucial economic value and the threats posed by these values. As a source of livelihoods, people are expected to be motivated to maintain wetlands for posterity. Sustainable development emphasises the need for ensuring that people continue to draw economic benefits while also paying closer attention to sustainability of the resources (section 4.3). The teachers' motivation suggests the relevance for sustainable development concerns in Kenya.

The wetland in-service training was also credited as a motivator for several teachers. Teachers credited the knowledge and skills acquired as well as the resource materials distributed. This suggests that training and availability of teaching materials is a strong motivator that can steer people to action based on the insights gained. Sustainable development emphasises the need for sharing resources including information. It is important that teachers share these endowments with the other teachers at school and within the community. However, section 8.4 suggests that sharing of information at school does not take place. This leads to scepticism about whether this motivation really translates into action. This aspect needs further research. These aspects are explored further in various sections of this study.

The politically based motivation pertains to aspects of availability of opportunities as well as local support to champion for wetlands conservation. However, only a few teachers mention these aspects. The political aspects portray wetlands education using the extracurricular context as an activity where various individuals and policy structures have to be in place for the success of the awareness campaign. When these are available, teachers are motivated to act. This study reported that the political aspects could be a constraint to teachers' actions (section 2.3.4). Sustainable development emphasises the need for all people to interact and discuss local issues (Gough & Robottom, 1993). This entails diffusing any political tensions such as power relations, access and use issues, policy, cooperation and collaboration that could constrain teacher actions locally. These issues are discussed at length in other sections of this thesis.

The overall scenario generated by the teachers in this question is that the utilitarian value of local wetlands, wetlands in-service training, the school system, local policies as well as the resources such as posters, notes and brochures motivate teachers to champion for wetlands conservation. The motivation is driven by the desire to ensure social continuity in terms of availability, access, quantity and quality of wetlands across generations. The motivation presented is both intrinsic and extrinsic. Some aspects involve the teacher only while others point out the need for involving other people and existing policies. The motivation by teachers suggests that wetlands conservation involves both personal and collaborative (involving both people and policies) ventures. The proceeding sections explore how teachers use the extra-curricular context to realise these motivations.

9.2.2 Use of clubs to address wetland issues in schools

Teachers were asked using a questionnaire to explain whether they had used the school-based clubs to address wetland issues (question 29b and c in Appendix 5.5). Only thirty-one teachers reported having used them. The question was repeated to ten teachers (section 5.6.2, Table 6.1) during the interview schedule (question 28 in Appendix 5.7). Teachers gave various explanations that are summarised in Table 9.3.

Table 9.3 Use of clubs by teachers to address wetland issues

Main theme	Examples of the teacher responses	No. of teachers	
		Questionnaire	Interview
Theoretical approaches	Transmission approaches characterised by words such as 'taught', 'address', 'educate', 'sensitise', 'talk' and 'explain'.	23	3
	Drama, debates, poems, and discussions	5	1
Wetland visits	Visit wetlands near the school and others located far away such as Lake Nakuru.	4	1
Eco-management activities	Planting grass, trees, watering seedlings, rearing fish, constructing a fishpond, collecting polythene bags, constructing terraces, gardening, flowerbeds and cleaning of wetland.	8	2
Others	Involving children in addressing issues e.g. soil erosion, and wind breaking, planting vegetables	1	

The data suggests dominance of theoretical approaches of knowledge transmission. The transmission approaches usually involve one-way transfer of information from the teacher to the pupil with only little involvement of the pupil. The knowledge from learners is usually neglected. This approach assumes a linear relationship between knowledge and change in attitude and behaviour that in practice may not be the case (O'Donoghue & Janse Van Rensburg, 1995). This approach is inclined towards the neo-classical education orientation (section 4.6.1, Table 4.2).

However, some theoretical approaches suggested also integrate pupil involvement. These were mentioned by five teachers and include drama, poems, debates and discussions. These approaches have the potential to promote active learning (section 4.7.7) and can enable the learner to be engaged in exploring an issue as well as giving individual suggestions. For instance, debate usually involves students' role-play and arguments between each other over an issue and this involves some active learning where learners can generate and defend their own ideas. However, these approaches could still be regarded as theoretical since there is some likelihood that the poems and drama were not developed by the pupils but by teachers such that the pupils' role was only to recite them. This was witnessed in two schools during the interview (section 5.8.2, section 8 in Appendix 5.7) when pupils claimed that their teachers wrote the poems. Nevertheless, although this poem recitation, drama and debate may generate attitude and affective change in pupils, its value should be directed towards taking practical action within the social context by way of engaging with the root causes of environmental degradation (sections 4.3, 7.3-7.8). If these activities do not engage pupils in challenging the real issues, they may retain features of the transmission aspects of the neoclassical behaviourist approaches (section 4.6.1, Table 4.2). In terms of sustainable development, theoretical approaches may not be appropriate because, besides individual change in values and attitudes, there is a need to influence others to do so and to undertake physical improvement of the environment (section 4.7.6). According to UNESCO (1997:26), enhancing sustainable living requires collective action and responsibility. These require approaches that go beyond theoretical concepts.

The visits to wetlands were very few. In all the schools I visited for interviews (Table 6.1), the wetlands were located a walking distance away (Plate C and D) and teachers, if willing, could

take pupils there for activities. The absence of wetland visits and activities suggests that the schools do not feel obliged to address local wetland issues or even to promote the pupils' awareness of their need for conservation. This suggests that teachers are only involved in teaching and are not informed by the local environmental context. The teachers may therefore not be teaching for sustainability (section 4.3 and 4.7) and may also not be aware of how to do this (also refer to section 8.6).

A number of teachers suggested having done some practical activities, most of which can be categorised under eco-management activities (section 4.7.6). However, most activities just address the physical environmental problems and do not target the social, political and economic environment, especially for wetlands (section 2.3). They also do not adequately address the wetland threats identified in sections 7.7 and 7.8. According to Gough and Robottom (1993:306), learning experiences should strive to give students a historical and critical perspective on society, as well as to provide opportunities to engage in activities consistent with building a responsive democratic society. They see learning as a cooperative process where students are regarded as agents for producing working knowledge through interaction with the environment and with others in socially significant tasks. In this study addressing local context issues could have enabled learners to generate a diversity of ideas and actions to tackle local wetland problems that are inclined towards the holistic aspects of wetlands (Figure 2.3) as well as promotion of better human-human-environment relationships (section 4.3). These environmental sustainability aspects are conspicuously missing in this study.

During the interviews the way these activities were conducted also failed to manifest prior conceptualised linkage with the local environment and wetlands. This is highlighted in these quotations.

Teacher 1

> *When we talk of the environment, we talk about many issues like forests, rivers and others. We visited the river. Pupils have been involved in gardening, flowerbeds and cleaning.*

This teacher's response appears broad based, general and not targeted to specific issues of the environmental resources mentioned. The activities mentioned were not presented as a process of

engagement with the underpinning causes to integrate exploration, dialogue, encounter and reflection (O'Donoghue & Janse Van Rensburg, 1995). The activities appear to be one off activities with no relevance to local reality (refer to sections 7.3-7.8). Aspects of sustainability are missing (sections 4.3, 4.7 and 4.8).

Teacher 2

> *I have been using pupils in planting trees in the compound*

Although planting trees is a commendable activity, the teacher fails to portray efforts to address the local wetland problems. The problems stretch outside the school compound to the society. It is likely that planting trees in the school has no link to a conception of environmental and wetlands sustainability. This response also failed to underscore that tree planting is a process. In this study, the response looks like a pupil-engineering aspect and not a process of collaborative negotiation involving identification of priority local needs as well as taking necessary relevant action.

Teacher 3

> *4K club is involved in farming activities in the school. Last year we planted some vegetables. There are no other clubs since most of the teachers are ladies and are a bit relaxed.*

The response by this teacher does not portray the club as having any environmental conservation agenda especially for wetlands. The response seems to accentuate doing farming without making the farming activity an environmental learning opportunity.

The quotations above suggest lack of emphasis on the local environmental concerns that were responsible for wetlands degradation (sections 7.3-7.8). The proposed environmental activities do not seem to be critically conceptualised and informed by local reality. According to Gough & Robottom (1993:308), what schools consider as environmental education puts more emphasis on environment and not education, especially that which is geared towards being critical of the local *status quo*. Very little seems to be done to empower the students to address and resolve the local problems. For this study it is likely that the practical actions mentioned did not have any relationship with the environment and wetlands at the formative stage and possibly were just

haphazardly conceived environmental activities. They were quoted as one-off activities done by individuals in particular seasons and not as a process with a clear focus on alleviating local environmental problems. This negates the view that environmental problems are complex and rooted within human-human -environment interactions (UNESCO, 1997; O'Donoghue & Janse van Rensburg, 1995) and thus require diverse interventions that are context specific and require time, observation and reflection as people initiate, adapt and sustain change.

The responses by teachers make it doubtful whether teachers use clubs to involve learners in addressing real issues and risks affecting the environment. They seem to negate the proposal by Tyson (1994:10) that extracurricular programmes are responsive to perceived needs. This data does not show exploration of local needs, especially of wetlands. This has an implication for environmental education suggesting the need for teacher empowerment to understand the value of school clubs and how to use them in environmental interventions. This also applies to the Wildlife clubs of Kenya whose network of over 1,800 schools (McDuff, 2000) can help to steer this process by involving schools in projects with a focus on sustainability of the local environment. Some of the areas that such programmes should address are explored in the following section on constraints to teachers in the use of clubs.

9.2.3 Reasons for not using clubs to address wetlands issues

Nine teachers explained in the questionnaire why they had not used the clubs to address wetland issues (question 29c in Appendix 5.5). Ten teachers (Section 5.6.2, Table 6.1) during the interview schedule gave more complaints on the same issues (question 31 in Appendix 5.7). These questions aimed at making teachers to reflect personal and contextual limitations that hinder them from using school clubs. The suggestions by teachers traverse through biophysical, economic, social, educational and political aspects of wetlands education (section 2.3).

The biophysical aspects mentioned include natural disaster such as drought that led to drying up of trees and thus discouraged the school's tree planting activity. The other one included the few number and types of wetlands in an area. Nevertheless, these are lame excuses because a motivated teacher can do many activities when the season is favourable. After all, planting trees

is only one response among many to addressing wetland threats mentioned in sections 7.7 and 7.8. The teachers should diversify their approaches as discussed in sections 4.6-4.8.

The educational aspects mentioned include inadequate training about clubs, lack of posters, lack of follow up to encourage and advise the teachers, training did not teach about the value of clubs and how to start them and work with them and the curriculum being overloaded to an extent that it cannot accept anything extra. This suggests that the teachers may not have been adequately prepared by the wetlands in-service training (section 1.3) on how to use opportunities existent in clubs. Education for sustainability requires maximisation of use of all available opportunities to champion for conservation (section 4.7). The suggestions by teachers show non-use of an important opportunity. This points to the need for working closely with teachers to address some of these training and resource material issues (section 8.15).

Teachers also seem to suffer from lack of knowledge in working within clubs as this quotation suggests.

> *Teachers do not have knowledge of clubs. The environmental and wildlife clubs are considered to belong to secondary schools.*

This teacher seems to consider the concept of clubs as complex and does not seem to know what the club concept was all about. This response suggests the need to popularise clubs as important avenues for championing environmental education.

Some teachers also portrayed signs of desperation and of being overwhelmed by the magnitude of the environmental degradation problem. They opted not to act even if environmental problems were clearly visible. This is illustrated by this comment from one active urban teacher (Table 6.1).

> *One thing like the Dandora sewage* [main sewage treatment ponds for Nairobi city], *there isn't much you can do about it. And even river Rwaka, it is hard to tell them to stop polluting. At Cheremi* [a local swamp], *the people grabbed it a long time ago and subdivided it into small plots.*

This teacher seems to be in a state of 'action paralysis' (O'Donoghue & Janse Van Rensburg, 1995). This teacher seems to assume that one could only use clubs to solve local problems. While solving local problems could be an important consideration, the environment is also there to be appreciated as well as to be used for various purposes and educators should harness these multiple realities (sections 2.3, 7.3-7.8). This is supported by the principles from the Tbilisi conference, which are broad in scope and include awareness, knowledge, skills, attitudes and participation (section 3.1). Within this broad scope, the teacher could involve pupils in many activities even if not necessarily undertaking physical action to improve the environment. For instance in a sewage pond, there are many valuable things that members of a club can do such as bird watching as well as using it as a training ground to initiate other conservation activities elsewhere, possibly in places with 'lesser problems'. The sewer can also be used to conduct water quality or biodiversity studies (Clacherty,1986; Gough & Robottom, 1993) and these studies can heighten pupils' awareness about the environment. This could be a better option than just doing nothing. After all, a broader problem like the one perceived by the teacher could be approached through a process that involves many small steps (Sinclair *et al.* 1997; Gough & Robottom, 1993), each step integrating certain types of learning outcomes for learners (sections 4.6.4, 8.14).

Another teacher perceived clubs as a reserve for those with special talents and as requiring a lot of volunteerism. He lamented that he did not have the necessary raw materials to start and maintain a club as shown below.

> *This is a talented area and it is only for those with interest. The teacher has freedom to do what he likes.*

This response again portrays clubs in school as voluntary. The teacher does not seem to feel properly endowed to act although the school has opportunities for teachers to initiate such activities. This misconception could be responsible for the inactivity and absence of clubs in schools. This suggests the need for demystifying clubs and club activities in order to regard them as potential avenues for championing environmental education.

The social aspects comprise of teachers being new to the present school, lack of interest by the individual teachers and the school, gender bias whereby some male administrators fail to listen

and to act on suggestions by female teachers, misinterpretation and gossip by colleagues. One female teacher reported the following about misinterpretation during the interview schedule.

> *Sometimes you also hear people expressing different opinions on what you want to do and mostly in a discouraging way. So there is all kind of internal conflicts of why does she want to do this, what is the intention? This leads to lack of motivation.*

These suggest the existence of power relation tensions as well as internal conflicts at schools that act as a constraint to teachers. This is depicted as a cause of discouragement to volunteerism to champion for environmental conservation. This suggests the need for expansion of training as well as involvement of the other teachers to create stronger partnerships at school to address local wetland problems. In the case of this study it appears as if the other teachers were not aware of what was happening and this breeds gossip and lack of cooperation with the in-serviced teacher. According to Posch (1988) quoted by Gough & Robottom, 1993:313), it is necessary for environmental educators to work towards "the improvement of teacher-teacher communication and the integration of a greater number of teachers/schools into this exchange of experiences, (and) production of knowledge on environmental project instruction by the teachers themselves." This could help teachers to appreciate what others are doing since they have also been initiated into the process. Sustainability also entails participation by all people to address their local environmental issues (UNESCO, 1997). The responses on social constraints suggest the need for training programmes for teachers to emphasise the need for cultivating better relationships at school so as to promote dialogue, encounter and reflection as a process towards addressing local environmental problems (O'Donoghue & Janse Van Rensburg, 1995).

The political aspects mentioned are numerous. They challenge the deterministic curriculum, autocratic administration that does not allocate time for clubs as it thinks it is wasting pupil's time, lack of recognition of the clubs, lack of wetland professionalism in potential activities such as debates and lack of technical support from NMK. Others include clubs being inactive and only being used to visit well conserved attractive wetlands. These aspects suggest that the structures at school and within the community are problematic to teachers. These constraints also challenge the existing school policies that in this study appear not to recognise clubs and their potentials in addressing local environmental issues as well as enhancing learning. These issues call for

teachers' change of attitude to develop critical initiatives at local level. This suggests the need for training programmes for teachers to involve them in addressing these political underpinnings of their actions in order to secure support for the wetlands awareness, especially from the school administrators. The political aspects portray wetlands education as a collaborative activity requiring many informed and interacting players as well as appropriate policy structures that allow for integration of wetland issues including appropriate timetabling. This suggests the need for a holistic approach to addressing wetland issues (section 2.3).

The foregoing debate suggests a low prioritisation of club activities in schools despite teachers having mentioned the existence of many clubs (Table 9.1). The responses also suggest the existence of a policy problem that seems to fail in encouraging the schools to integrate clubs as part of the school learning activities. This is also indicated in the quotation below from the interview schedule.

> *They (clubs) only exist by name but are practically absent. These inactive clubs are science, mathematics, 4K and drama. They are inactive because whoever is supposed to head them is reluctant. Also because we are ever thinking of how to teach for exams. Times for clubs are seen as a waste of time. …I cannot revive them (clubs) because any revival must come from the top. Administration is the one that sets time for the clubs. Teacher has no say because he may be seen as an intruder of other activities allocated that time. The head teacher and the parents are only interested in passing exams.*

This teacher raises the issue of a top-down approach at school, lack of personal commitment to constructively initiate and maintain change and some fear of the administrators by the junior teachers. This suggests the existence of a power inequalities problem at school. The teacher, even after being trained on wetlands continually suppressed the training because of the perceived hostile social environment. This suggests the need for teacher training that integrates activities to address these perceived constraints. The teacher also talks about the curriculum, which she considered a constraint since the school has to ensure good grades. This concurs with a critique by Stevenson (1987:76) and Vulliamy (1987:14) that the present education system is designed for mass processing and credentials awarded to children and adolescents. This is criticised for defining teachers' work by the demands of an assessment system which tests student mastery of a broad range of standardised content which can be compared nationally (for primary, secondary and some colleges in Kenya). This nationally credited content may not be sensitive to local

context and insists on understanding it rather than challenging the *status quo* that plays a part in shaping the contextual issues (Grundy, 1987). In this case an effective teacher is expected to ensure that students get good grades through whichever means possible. Teachers may be compelled to concentrate on maintaining order and control in their classrooms through dominance of teacher talk (Schrag quoted by Stevenson, 1987:76). In this study many schools seem to have suspended club activities in favour of teaching for exams (sections 8.12 and 8.15). The quotation above seems to imply that the head teacher, teachers and the parents have fallen victims of the exam trap and ignore other school outcomes at the expense of getting good exam grades.

The school's role of mass processing of students and credentials awards makes teachers and students regard the real purpose of schooling as pursuit of individual academic achievements. These perspectives convey norms of individualism, competition, achievement and independence (Stevenson, 1987). Environmental education, however, strives to improve quality of life for all humankind. It prescribes interdependence among communities (at local, national and global level) and has a revolutionary purpose of transforming values that guide our decision making to those that promote sustainable development (Huckle, 1991) (also section 4.3). The function of knowledge in environmental education is immediate use for the social value of a sustainable and emancipated quality of life. This conflicts with a narrow view of school knowledge, which emphasizes storage for future use, enhancement of individual status and economic well being (Stevenson, 1987:75). In schooling knowledge precedes application. Environmental education knowledge and skills are demonstrated by students' actions in real situations such as negotiation, persuasion, consumerism, political action, legal action and eco-management (section 4.7.6) activities for the environment. This change in students' behaviour is supposed to be cultivated within the school context, which seems to place major emphasis on passing exams, classroom order and future use of knowledge and skills. This calls for changes in teachers' attitudes and activities to teaching as well as views of learning. Three more teachers lamented about this curriculum constraint saying that: -

I guess there were very many subjects and there was no time.

The day set for clubs is Thursday but there is a lot of curriculum work and there is no time.

Nobody has ever had interest in clubs

These quotations suggest that in these schools the clubs are optional and the teachers had not recognised their role in aspects such as supporting the curriculum or environmental conservation.

Another teacher brings in the aspect of treating learners as novices, as people who do not know about Lake Victoria (Figure 2.1) although it is found within a walking distance from the school, lamenting that

> *Even if you introduce pupils to wetlands, they may not know you are talking about wetland issues they know. Most of the time we are involved in class work and not clubs. I have never told pupils to debate about the lake or to write a composition about it.*

This teacher seems to ignore the worldview of the pupils and appears to follow the curriculum 'as given' to an extent that external reality has no meaning to her practice of teaching. This suggests that the teacher just teaches what is prescribed in the curriculum but does not seek to be informed by the local context.

These quotations appear to point an accusing finger at the school culture where time is only considered as wisely utilised if pupils are involved in academic work. It suggests that some schools have no time set aside for non-academic work such as school clubs. This is unfortunate considering the discretion given to schools to allocate time to various activities including non-academic work. (RoK, 1992, 1988, 1984). The responses also suggest that the activities teachers involve learners in are conceptualised by the teacher and not through collaborative discussions to deliberate on urgent local issues that are relevant to the curriculum. The curriculum seems to be regarded as an end in itself and any other issue as irrelevant. This is contrary to the conception of education for sustainability where the relevance of every activity undertaken in the local context is given priority (section 4.7.1). According to UNESCO (1997:15), sustainable development emphasises local issues rather than global ones. The quotations above portray problems at the local level and this implies that sustainable development in schools involved in this study could not be an agenda being pursued in the activities proposed.

In summary, the teachers' responses above point at various problems that need attention. The teachers do not seem to understand the freedom existent in clubs to carry out programmes informed by perceived needs (Sinclair *et al*. 1997; Tyson, 1994; Gough & Robottom, 1993). They do not appear to be innovative and seem to wait for direction from the school administration. They do not seem to realise the potential existent in engaging learners in extracurricular activities and developing learning activities in a way that cuts across the academic disciplines as well as addressing the local social needs. In this way teachers seem to fail to maximise use of the clubs as well as to evade the curriculum and examination trap mentioned above. They seem to be trapped in the tendencies to recite (and not to be guided) by the curriculum and to teach for exams (and not for emancipation of the pupil). The teachers in this study seem to have failed to differentiate between disciplinary teaching in the subjects (section 8.6) and club activities that are supposed to give learners more freedom to do activities based on local social challenges and needs (RoK, 1988, 2001b; Sinclair *et al*. 1997; Tyson, 1994; Gough & Robottom, 1993). There also seems to be lack of knowledge of what clubs are and what they can do. Also noted was the tendency to treat the club as abstract and that it should provide remedies to most community problems instead of being used to promote appreciation of the environment, empowerment and critical thinking to take environmental action. For instance the sewage incident seems to have failed to acknowledge the multiple roles played by a resource and only appears to have been viewed from one area, the provision of a remedy to the problems. This could be a reductionist view as it falls short of understanding the diverse environmental education processes (Le Roux, 2000; Stapp & Wals, 1993) where an array of approaches are available for use depending on contextual challenges (sections 4.6-4.8). The same case applies to treatment of clubs as a talented area whereby the teacher fails to acknowledge that s/he is potentially able to stimulate change locally, albeit in a small way. This could be attributed to lack of confidence, innovativeness and concern for the environment. The whole scenario suggests that the clubs are not adequately used to champion environmental (and wetlands) sustainability.

9.2.4 Summary: some major issues within the clubs.

The teacher responses suggest that many schools have different types of clubs. The motivation behind club establishment varies from agriculture, wildlife and environment, religious or academic concerns (Table 9.1). The use of clubs to address environmental issues was reported. Nevertheless, most teachers failed to differentiate between formal academic sessions (section 8.6) with pupils to the non-formal context of the clubs and the associated variation in methodologies of involving children. There was dominance of top-down transmission approaches (section 4.6.1). Some teachers involved learners in experiential encounters and practical eco-management activities. Nevertheless, there was no evidence of a prolonged deliberate engagement with environmental issues. It appears that the encounters and practical activities were just one-off activities and not prolonged process of action with integrated learning to improve future interventions. These approaches look simplistic and seem to fail to acknowledge that change occurs through complex processes of exploration, critical reflection and dialogue of everyday action and social interaction (O'Donoghue & McNaught, 1989:21; Gough & Robottom, 1993; UNESCO, 1997).

Teachers reported being motivated to champion for wetlands conservation using clubs. The educational based motivation dominated and this suggested that teachers treated the activities within clubs as learning opportunities for the pupils. Their other sources of motivation traversed the biophysical, social, economic and political aspects of wetlands. Nevertheless, the proportion of teachers for each aspect of motivation varied considerably, suggesting the need for greater illumination of the holistic aspects of wetlands to the teachers. Likewise, their actions did not match their motivation. There was lack of enthusiasm in the actions that could counterbalance that portrayed in the motivation. The motivation appeared to be locally based while the teachers' actions did not seem to be informed by the local context. The study failed to establish the role played by motivation on the actions reported by the teachers. This area needs further research.

Teachers identified various constraints that hinder them from using clubs to champion for wetlands sustainability. These constraints traversed biophysical, economic, social, political, economic, and educational aspects of wetlands. These constraints depict wetlands education as a

collaborative activity that is dependent on appropriate policy structures on politics, economics, culture and social relationships. The constraints suggest the need for refocusing the use of clubs for promoting wetlands sustainability especially with regard to illumination of holistic aspects of wetlands as well as responses that are inclined towards involving people in environmental education for sustainability processes (Grundy, 1987; Carr & Kemmis, 1986). The overall picture suggested in this section is that clubs present an excellent opportunity to champion for wetlands sustainability but the teachers do not use it adequately.

9.3 Use of special (environmental) days in wetlands conservation

This section of the chapter discusses how teachers use special days to carry out environmental activities in Kenya. The training on water and wetlands conservation (section 1.3) encouraged teachers to use special days to foster environmental conservation within their localities. In this thesis a special day is used synonymously with an environmental day and is considered to be a day loaded with special meaning(s) referring to occasions when people meet to reflect on an (environmental) issue in an effort towards promoting or addressing it. The annual calendar has many special days addressing various themes (Ndaruga, 2002; Share-net, 2000). Some themes may not directly refer to the environment and it requires a holistic outlook to identify and magnify the environmental aspects. The special days, when assessed holistically, address the four aspects of the environment proposed by O'Donoghue and Janse Van Rensburg (1995), that is, the biophysical, economic, socio-cultural and political aspects (Figure 2.2). However, each special day may have a bias towards one or more of the four aspects. For instance, the World Human Rights Day may be more biased towards the political dimension.

Special days are set aside as a reaction to realization of the need to reflect on the various issues and challenges that have confronted humanity over the years (section 4.3). The thematic emphases of the special days are on human-human-environment interactions. Some of the global special days' themes include wetlands, water resources, weather, health, environment, family, fair wages and decent working conditions, heritage, refugees, drought and desertification, human population, illiteracy, ozone layer, peace, tourism, habitats, food, disarmament, children, HIV/AIDS, disabled people, and human rights (Ndaruga, 2002; Share-Net, 2000).

Only a few special days are highlighted on most ordinary calendars used in Kenyan schools, offices and homes and these include New Year's eve, religious days such as Easter, Christmas and Boxing Day, Labour day and political days such as Madaraka, Kenyatta and Jamhuri day. It is hard to notice any call for integrating environmental activities in celebrating these days. Numerous international environmental days are celebrated throughout the year (Ndaruga, 2002) but are not indicated on the normal calendar. They are usually announced through the electronic and print media (radio, TV and newspapers), but sometimes the announcements are made after the days have already passed, or they merely report on those small-scale celebrations held by the lead agencies (institutions mandated to coordinate the celebrations).

Schools are often not aware of these days unless some institutions decide to involve them in celebrating the day. For instance, the Wildlife Clubs of Kenya (WCK) is an active youth movement in most Kenyan schools. Since 1968 it has popularised environmental issues such as anti-poaching, non-use of plastics and other conservation issues (McDuff, 2000). WCK hosts the largest public education gathering with more than 1000 students participating each year in Marine Environment Day (ibid, 389). Other organizations such as the National Museums of Kenya, National Aids Control Council and Kenya Human Rights Commission advertise their special days in newspapers and sometimes invite schools to participate. The primary school curriculum does not emphasize celebration of special days (RoK, 1992). The books used by teachers (section 5.8.5) also do not talk about environmental days. The celebrations of environmental days in schools form the discussion of the next section of this thesis.

9.3.1 Celebrating environmental days in schools and the community

Teachers were asked in a questionnaire whether they celebrate environmental days at school and the community contexts (question 30a and 33a in Appendix 5.5). Their responses are as shown in Figure 9.1 a & b. Figure 9.1a shows that 32 (59%) teachers celebrated environment days while 22 (41%) did not. Of those who celebrated, 21 (65.6%) were males while 11 (34.4%) were females. Of those who did not celebrate, 9 (39)%) were males while 13 (59%) were females. In terms of context, 20 (62.5%) of the rural and 12 (37.5%) of the urban teachers celebrated environmental

days. At community level (Figure 9.1b), only 16 (29.6%) teachers marked environmental days while 38 (70.4%) did not. Only seven rural teachers and nine urban teachers celebrated the day and these comprised of six women and ten males.

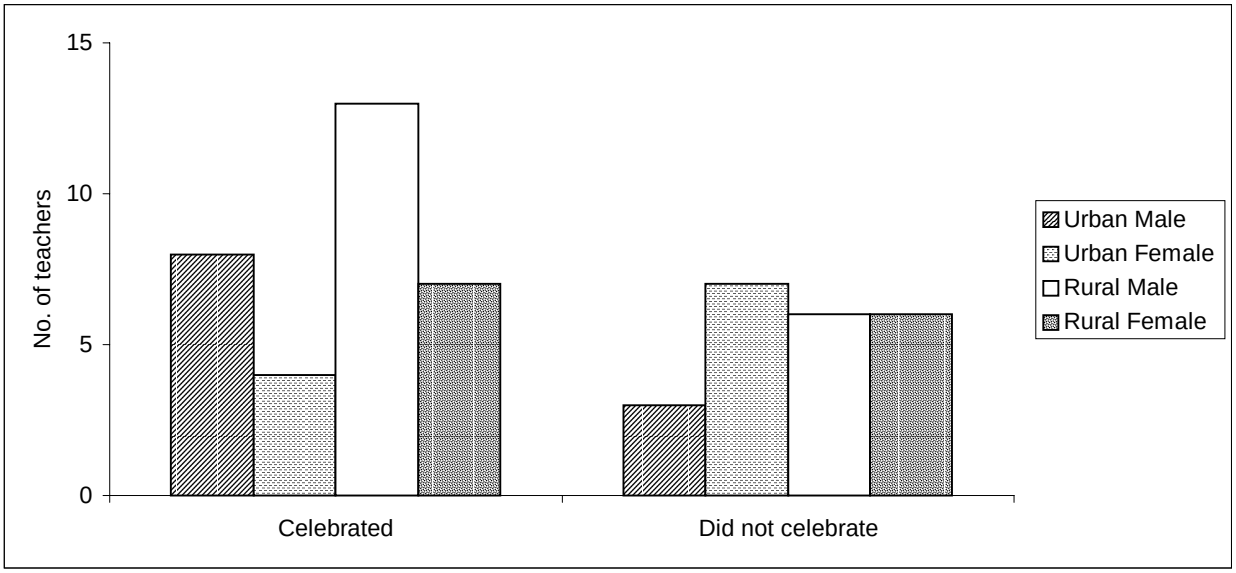


Figure 9.1a Celebration of environmental days at schools.

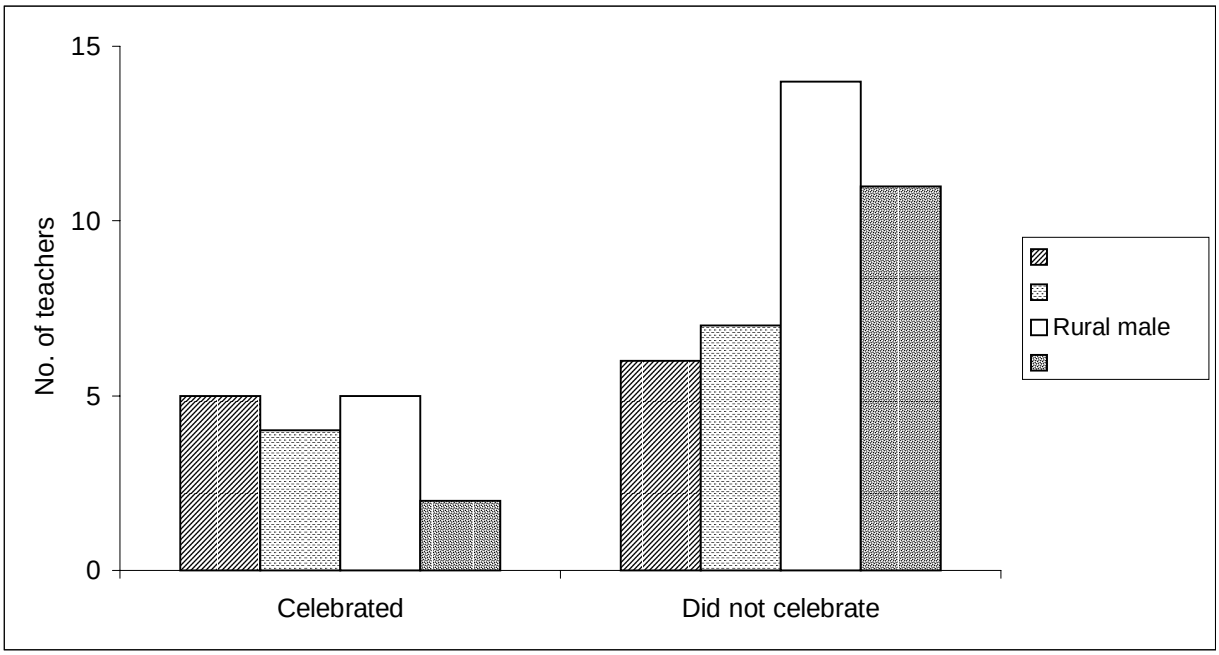


Figure 9.1b Celebrating environmental days with members of the community

The data suggests that schools celebrated more environmental days than the community did. This is possibly because the lead agencies involved the schools (section 9.3). Men seem to be more active in marking environmental days than females. Similarly, rural teachers are more involved in the celebrations than the urban teachers. In both cases this is possibly because rural teachers, especially males, hold more responsibilities at school and at community level which they can easily use as platforms to mobilise pupils and community members to mark the environmental day (section 6.8 and 6.9).

9.3.2 Special days celebrated in schools and the community contexts

Teachers were asked in a questionnaire to name the environment days they celebrated (question 30b and 33b in Appendix 5.5). Days mentioned include local, national and international environment days and their frequency of mention is shown in Table 9.4a.

Table 9.4a Frequency of mention of environmental days celebration among teachers.

Environmental day	Number of teachers per context	
	School	Community
Local	18	9
National	9	1
International	14	4

Table 9.4b gives the details of the days mentioned and the number of teachers per response. These findings acknowledge interaction with and recognition of environmental problems at the local level and attempts to address them. The recognition and addressing of local environmental problems is a significant step in working for sustainability (UNESCO, 1997; Tilbury, 1995). The local environmental days mentioned by teachers were numerous. These days portray local constructivism (section 5.4) and collaboration whereby teachers and schools have come up with their own days and labelled them as environmental days. In other cases, schools have joined hands with other local stakeholders to mark locally based days such as zone environmental day, memorial days and district tree planting day.

Table 9.4b Details of environmental days celebrated by teachers.

Category	Environment day	Number of teachers per environment day and context	
		School	Community
Local days	Tree planting day	9	4
	Some days of the week	4	2
	Local environmental clean up day	2	0
	Parent's day, soil conservation day, youth week, memorial days such as jubilees, zone environment day, district tree planting day,	One teacher for each	0
	Water conservation day, Clean up day, school environment day	0	One teacher for each
National days	National tree-planting day	6	1
	National environmental day	1	0
	National water day	2	0
International days	World Environment Day	4	1
	World Wetlands Day	2	0
	World Water Day	0	1
	International coastal clean up, Volunteers Day, Founders Day, World Food Day, Earth Day, Labour Day	One teacher for each	1

It is interesting to note that although these teachers were participants in the wetlands conservation training course where the World Wetlands Day celebrations were emphasised, only two teachers reported celebrating it. This suggests that the day was not taken seriously. The tree-planting day dominated at school and community contexts possibly because it is emphasised in the subjects (Appendix 3.1 – 3.10) or because it is a popular activity undertaken by the lead agencies. It could also be attributed to the fact that it is an easy and cheap activity that can be undertaken since seedlings may be readily available. The national days were not popular, possibly because the teachers were not informed. International days were relatively popular, possibly because they are numerous in the annual international calendar and because of better publicity given by the electronic and print media. A document analysis of the popular Kenyan newspaper (Daily Nation) revealed that most international days were well publicised and they were usually presided over by senior government officials. The data suggests that teachers may not be aware of the relevance to their work of celebrating environmental days.

9.3.3 Activities during environmental days

Teachers reported involving pupils and the community in various activities. These activities involve talking about the environment, visits to wetlands and practical action to improve the environment or the people's well being. Following Tilbury's (1995) discussion on environmental action (section 4.7.6), the activities by teachers in this study can be categorized as shown in Table 9.5.

Table 9.5 Activities during environmental days at school and community contexts

Category	Details	Number of teachers per activity and context	
		School	Community
Eco-management	Planting trees	20	7
	Cleaning the environment	16	2
	Digging terraces, gabions	5	0
	Clearing the bush, grass	5	0
	Planting flowers	4	0
	Weeding	6	0
	Cleaning wetlands and drainage	3	2
	Watering trees, flowers	2	0
	Planting grass	2	0
	Building a water tank	0	1
	Giving prizes to cleanest classes and well preserved wetland, making tree nurseries, manuring the flowerbeds, making compost manure, closing running taps, collecting seedlings, water purification, clearing and spraying stagnant water, fencing a local stadium, digging to plant crops	One teacher for each	0
Experiential activities	Visiting the local wetlands to identify plants, animals and threats, warning those washing clothes in the swamp to stop it	3	1
	Visit a water treatment plant	1	0
Theoretical approaches	Drama, concerts, poems, dancing,	9	0
	Developing posters, attending a lecture at the site of tree planting, drawing, discussions, explaining to parents and pupils,	One teacher for each	0
	Hiring people to clean the environment, setting aside days for the environmental cleanup, listening to songs and poems	0	One teacher for each
Political action	Participating in an environmental procession	1	1

The data suggests that teachers use various approaches to address local environmental issues. However there is a predominance of eco-management activities, which are defined by Tilbury (1995:203) as maintaining and improving the landscape through physical action. Planting of trees and environmental clean-up dominated especially at school context. Eco-management activities are dominated by activities that mainly addressed improvement of the biophysical aspects of the local environment.

A few teachers did the visits to wetlands for learners to participate in experiential encounters. However there was no sign of engagement in the wetland threats identified in sections 7.7 and 7.8. The activities also failed to give an impression of active learning (section 4.7.7) to explore the root causes of the problems and to formulate appropriate solutions geared towards environmental sustainability. Even warning those washing clothes in the river does not seem to be an educational activity but rather some coercive intervention. These visits do not show features of education for sustainability (sections 4.3, 4.7 and 4.8).

The theoretical activities were of various kinds. Some involved a transmission approach of explaining, lecture and listening. Hiring of people to clean the environment is commendable but in this study it portrays detachment of teachers from the activity and failure to use the opportunity to promote learning about waste management. Sustainable development activities could have addressed issues of deliberate individual attention to reducing, reusing and recycling of wastes. The use of drama, concerts, poems, dancing, drawing, developing posters and discussions shows opportunities that could be used to engage learners in deeper exploration of wetland issues geared towards active learning and undertaking activities to promote sustainability. However the teachers failed to state them as activities that address local wetland issues. This section treats these activities as theoretical but acknowledges that if properly utilized, they could have promoted active learning (section 4.7.7) that could have had better outcomes than transmission approaches (RU, 2002). Only one teacher mentioned the use of political action (section 4.7.6) in this question. This political activity concurs with the radical ethical approach to sustainability (section 4.3.5). The teacher, however, did not state the local wetland issue they were addressing in the demonstration.

The activities mentioned in Table 9.5 portray teachers being able to make diverse meanings about their local context and appropriate actions necessary to address environmental issues. However the teachers failed to show a holistic outlook of addressing local wetland issues mentioned in sections 7.3 and 7.8. The activities fail to address the social, economic and political underpinnings (Figure 2.3) responsible for wetland degradation (sections 7.7 and 7.8). According to Jensen & Schnack (1997:164), "environmental problems are structurally anchored in society and our ways of living. For this reason, it is necessary to find solutions to these problems at both the societal and individual level." Although the activities in Table 9.5 were commendable, they do not appear to be properly conceived since the local reality was not addressed holistically (Figure 2.3). The activities can be criticized for not being focused on sustainability of the local wetlands. This approach by teachers is criticized by Stapp & Wals (1993:57) who contend that "…the surest way for a group to fail in solving a community problem is to accept a palliative – an action that is not a real solution and address only the surface problem and not the underlying causes." Although eco-management activities show an attempt to address the local wetland problems practically, they fail to address the real problems (section 7.7 and 7.8) and hence are inadequate in discouraging the recurrence of further wetlands degradation. These problems need a holistic outlook of wetlands (section 2.3) as well as approaches that concur with environmental education for sustainability approaches (sections 4.3, 4.7 and 4.8). These approaches are lacking in this study.

9.3.4 Reasons for not celebrating environmental days

Teachers (numbers of which indicated in parenthesis) gave various reasons in the questionnaire (Question 30, 33 in Appendix 5.5) and during interviews (Question 31 in Appendix 5.7) why they do not celebrate environmental days in their schools and within the community. The main constraints at school level were curriculum emphasis on exams and not mentioning the environmental days (10), not knowing when these days are marked (8), ignorance by the school (3), the school is not fenced hence trees destroyed by livestock (3) and lack of motivation and interest by teachers (2). Other problems mentioned singly include lack of adequate knowledge about school issues, school administration not being environmentally friendly, lack of time, water shortage due to drought, teacher doesn't know why, lack of qualified people to handle these

activities and lack of funds to transport pupils to the venues where the environmental day is marked.

The problems highlighted are either internal to the school or externally based. Ignorance by the school, lack of a fence, teacher's interests, lack of time and funds are issues that are internal to the school. Some of these issues suggest lack of prioritisation of relevance of wetlands to the school and the community. The issues also show a low deal given to the role of the school in local wetlands conservation. These responses portray the school as an institution that has no sustainability agenda for the local wetlands. Issues of exams, knowledge about environmental days, drought and lack of qualified personnel suggest the need for collaboration and cooperation with other stakeholders to work together for the prioritisation of the local wetland issues. This suggests the need for the school to focus beyond its physical boundaries for support of its ventures in promoting environmental sustainability. This implies the need for development and harmonisation of school and community policies regarding their (its) role in addressing local environmental issues (Le Roux, 2000). This could enhance addressing issues of holistic aspects of wetlands (section 2.3) and how this is influenced by and challenges the local contextual structures and roles of different people including teachers, pupils and members of the community.

At community level, the main constraints were

- Local support and motivation (10) which entails lack of forum to address local issues, teacher not given opportunity, no encouragement at school and teachers not being recognized beyond the school level;
- Lack of knowledge (9) when day is marked and lack of confidence to penetrate the community;
- Community's lack of interests (6) caused by ignorance, wetland owners get money from them and cannot stop cultivating and some people being preoccupied with other activities.
- Time (4) since the teacher is at school most of the time and community meetings being organized during school days;
- The urban context (4) that is prohibitive to reaching out the community, boarding school attracts pupils from all over the country who do not relate to local issues, urban people are preoccupied most times and teacher not in contact with community members.

- Lack of resource materials such as posters to use during such days (2)
- Lack of funds (1) to organize such days.

Seven women compared to three men complained about the curriculum as a barrier to celebrating environmental days. Other pertinent issues mentioned by women include their low regard by males, not being recognized outside the school and the community being hostile (section 9.4.8). These complaints suggest the need for recognition and working closer with teachers to address some of these gender related constraints.

At community level, the problems by teachers cited above highlight many contextual issues of support, proper training, community mobilization, time and urban-rural status. These problems suggest that there is a big challenge in establishing good working relationships between the teacher and the community. The responses by teachers suggest lack of reciprocity between the school and the community regarding environmental issues and risks. This is contrary to the socially critical view of the school (Table 4.2) that considers the society and the school as reflecting and assisting each other (Gough & Robottom, 1993). Sustainable development reiterates the need for everybody to change attitudes and ethics to embrace those of sustainability (sections 4.3, 4.7). This entails both the school and the community alike (UNESCO, 1997). The teachers in this study seem to be fighting their own war while the community is not bothered. This suggests that a gap exists between the teacher and the community that needs to be diffused to access and be acceptable by the community.

The data suggest that teachers are not familiar with environmental days. Karembu (1999:10) criticized the Kenyan electronic and print media for presenting inadequate news and stories on the environment and being selective and sensational to maximize audience. My document analysis review of the Kenyan Daily Nation newspaper for the year 2000 showed that many environmental days passed unnoticed or were only minimally reported. This is possibly because some special days' coverage failed to qualify as good news. Teachers were therefore not aware early enough when the days are marked.

These responses suggest that celebration of environmental days, as presented in this study, is not easy and teachers are confronted with a number of problems. The environmental days celebrations at school and at community level represent a collaborative venture and require good knowledge of contemporary issues, innovativeness, resources and goodwill from local administration including the school. These aspects do not seem to be available to most teachers. Promotion of wetlands sustainability does not seem to be adequately addressed. This could be attributed to the fact that the teachers were trained using the colonial legacy of disciplinary curricula (Mucunguzi, 1995:339). The curriculum they use does not address environmental days' issues (RoK, 1992) and it is likely that their pre-service training also failed to address such issues. The teachers may fail to work within the community context where the search for democratic ideals demands a more integrated people centered and participatory approach to environmental concerns. The lack of this type of orientation may disempower teachers at community level. This suggests the need for teacher involvement in social democratic processes in environmental education that empower them to work within the non-formal contexts.

9.3.5 Emerging issues on celebration of special (environmental) days

Teachers reported celebrating several environmental days, suggesting that environmental days are meaningful to teachers (Table 9.4a). The special days address themes that cut across all the four interacting dimensions of environment (Figure 2.2). The participation of schools in environmental days highlights teacher recognition of their role in addressing local environmental issues. It portrays schools and the society as being in pursuit of a similar agenda, to promote a healthy local environment. The local initiatives are unique and bear both elements of schools' internal constructivism and external collaboration between the schools and local stakeholders. This suggests that the schools harness the link with the community in matters of environmental improvement.

However, their response to environmental degradation seems inadequate. The holistic aspects of the environment (Figure 2.2) and wetlands (Figure 2.3) require schools to be involved in activities that stress socially, morally and politically justifiable conflict resolution (Fien, 1993). Engagement with the holistic environmental issues is a process involving exploration, dialogue,

encounter and reflection (O'Donoghue & Janse Van Rensburg, 1995; Gough & Robottom, 1993). This cyclic process (including praxis) enables participants to learn more about the problem, the action and the process of problem solving and to feed the lessons learnt back in the process to resolve an environmental problem. These cyclic processes of engaging with local wetland issues are missing in the celebration of environmental days in this study.

The data suggested that teachers are not familiar with environmental days which can be attributed to lack of popularity of these days. This study suggests environmental days present an under utilized opportunity that can be harnessed to enhance environmental meaning making and sustainability. It is essential that teachers devise ways to popularize these days. This calls for working proactively with all stakeholders to develop suitable materials for use by all levels of learning, including the community members. These materials include special calendars, books, posters etc. These materials should be open ended so as to accommodate reality from different contexts (Lotz, 1995). Teachers could also be involved in processes that involve use of the process approach to solving environmental problems, which entails use of diverse environmental education methodologies to enhance addressing the underlying ideological causes of environmental degradation and social problems. This could also entail increased use of the electronic and print media to popularize these days.

The policy issues also came up whereby there does not seem to be harmony between what happens at school and in the community. The school and the community lack reciprocation when dealing with local environmental issues. This suggests the need for prioritizing and harmonizing local policies to recognize the school as a player in local environmental issues and to accord it the time, resources and support needed. This could entail winning public support and consensus to make the fight against environmental degradation and promotion of sustainability a collective responsibility (UNESCO, 1997).

9.4 Reaching out to the community

This section of the chapter is an extension of teacher interaction with members of the community whom s/he lives with (also refer to section 9.3). It looks at how the teacher uses this interaction to

champion for the conservation of local wetlands. It also looks at the forums in which teachers meet with members of the community, the kind of activities they engage in and the constraints that teachers face while executing their duties. This view perceives the curriculum and the agents effecting and affected by it (teachers and students and cooperating community agencies) undertaking initiatives in the community for community. The changes undertaken could be perceived as being as much on behalf of the community as on behalf of the schools (Gough & Robottom, 1993:310). The teacher and the school are perceived to initiate and sustain community endeavour to resolve local wetland problems and this integrates interactive and mutually supportive liaison and communication. This has features of what Fien (1993) regards as education for the environment whereby teachers do not perceive the environment in terms of individual fulfilment and concerns but as socially constructed resulting from generation of and reactions to meanings emanating from interaction with one another and with the environment (section 4.6.3, Table 4.2). Education in this respect aims at emancipation of perceptions of the members of the society to reconstruct their meanings for and interactions with the environment to create sustainable environments and societies. These interactions and actions by teachers at community level are discussed in the proceeding sections of this thesis.

9.4.1 Teacher interaction with members of the community

Ten teachers (section 5.6.2, Table 6.1) in an interview described their interactions with members of the community (question 32 in Appendix 5.7). This question intended to find out whether teachers consider themselves as part of the community and are able to interact freely. Interaction is important because it enhances meaning making and exchange on various aspects of wetlands. The meanings held by teachers for wetlands in this study are perceived to represent shared knowledge with the community (section 5.4). However, the teacher's professional training and practice as well as the wetlands in-service training is assumed to make him/her more conversant with wetlands (IUCN, 1971:17) and this is expected to put him/her in an elevated position to champion for wetlands conservation locally at school and community levels.

Seven teachers reported that they interacted well with the members of the community, women groups and the local leaders. Three teachers from the inactive group (Table 6.1) claimed they did not interact well with community members. Among the three one teacher said that:-

> *The community is hostile and does not welcome the teacher. The parents are allergic to anything that might result into demanding for funds. When you want to start anything, the community fear they will be required to contribute some money and they refuse this in advance.*

This quotation suggests that the financial issue can be a barrier and this teacher feels handicapped especially when this issue comes up. The teacher seems to have already developed some stereotype about the community as hostile and this emergent meaning may affect his involvement with the community. Environmental education tries to involve society to become responsible for their actions in the environment (O'Donoghue & McNaught, 1989; Tyson, 1994). It entails a process of emancipation of the society to appreciate and adapt the efforts to promote a healthy living environment and to sustain it. The teacher, being the facilitator of the emancipation process, is expected to employ strategies to break this hostility to promote better interaction and communication for environmental sustainability. This may entail being more innovative in approaches so as not to fall victim to the social constraints that the community may present forward. This could entail involving the community to explore their environment and to make locally based decisions on what they want for their environment. This area needs to be addressed in training programmes for teachers.

Another teacher commented that

> *In school we don't interact very well. The teacher cannot call a parent meeting. Only the head teacher can do this and if he does not value what you learnt, he cannot give you an opportunity to address the parents.*

In both cases, the teachers appear to be in a dilemma of opposition at community level and at school. It is apparent that the teachers in this case unmask the bureaucratic red tapes in a school and view the head teacher as a crucial entry point to access the community. This particular teacher seems enslaved within a system that does not appear to be aware about wetlands. The head teacher is portrayed as a pacesetter of what is done at school. This underscores the need for a teacher to foster local goodwill with the head teacher. The system prescribed in this school is a

neoclassical, top-down, authoritative system (section 4.6.1, Table 4.2). The teachers need to be conversant on how to break this barrier through engaging in environmental processes that make the school realise the relevance of local wetlands and their responsibility in their conservation (section 4.7)

This also underscores the need for teacher trainers to realise that training for teachers to foster environmental sustainability requires being conversant with local contextual issues. The cases presented by teachers here point to the need to work with teachers more closely as well as to allow them to share their experiences of how to seek remedies to overcome social contextual blockades. The sustainable development process seeks for this consensus (UNESCO, 1997; O'Donoghue & McNaught, 1989; Gough & Robottom, 1993) since it is only when most people participate actively that the goal of sustainability can be realised (sections 4.3- 4.8, Table 4.2).

9.4.2 Perceptions about community interactions with wetlands.

The same ten teachers (section 5.6.2) were asked in the interview to comment on what they admired about the community interaction with local wetlands (question 33 in Appendix 5.7). This question aimed at exploring whether the teacher understood what happened in the local wetlands. The teachers suggested that some interaction with wetlands was unavoidable whereby the community gets water for domestic use and for livestock (4). The wetlands also attract people for fishing, employment and relaxation (1). This concurs with the responses on teacher perceptions on wetlands given in section 7.2-7.8 where direct use values (section 2.3) dominated in mention suggesting the recognition of the intimate dependence of human beings on the natural environment. Sustainable development recognizes the importance of wetlands to continue providing these benefits but underscores the need to address sustainability of these resources as well as ensuring that the benefits drain to all people across generations without any injustices in access and use of the resources (section 4.4). Teachers should address these issues with the community.

Teachers also suggested that the community had come up with strategies to take care of wetlands. These include fencing to keep cattle away (1), vehicle owners washing their cars in car wash and

not in the river (1), teacher considered using sewage for farming as good practice (1), some people get water from taps and so do not go to the wetlands (1), and an observation that a wetland sandwiched between privately owned farms was well taken care of (1). One teacher reported that people who wash clothes do it a distance away from wetlands (1). However, during the observation phase, the last response was challenged through triangulation and found to be possibly wrong (Plate F). This answer demonstrates the importance of triangulation in research (section 5.10).

The results suggest that teachers acknowledge why people go to wetlands, the potential threats and the activities that the people do to conserve them. The responses to this question suggest use of different methods some of which are geared towards physical blockage, use of alternatives, change of attitude against sewage as well as noticing of well-managed wetlands. The responses do not show proactive engagement with local wetlands problems mentioned in sections 7.7 and 7.8. There seems to be no effort to address issues of sustainable use of wetlands within the locality (refer to sections 4.3, 4.7 and 4.8).

The same ten teachers were asked to comment on their concerns or what they disliked about community interaction with the local wetlands (question 34 in Appendix 5.7). Some of the their concerns include the following:

- Cultivating close to the wetland causing soil erosion (2)
- Cutting down trees in catchment areas(1)
- Plastic bags from other places can get to the ocean and can be eaten by sea animals and kill them (1)
- Over-harvesting of water (2)
- Bringing many animals into the river to drink water which trample the banks (1)
- Pollution by industries, solid wastes and by washing clothes (3)
- Some species have disappeared from a wetland e.g. papyrus (1)
- They infringe the law by not leaving the 20 feet from the river to the farmed area (1)
- Misuse of the little water available (1)

This demonstrates that teachers are not novices about environmental (wetland) problems in their local areas. They already have some preconceived meanings and ideas on what is not right in wetlands. These responses concur with those on perceptions of wetland threats in sections 7.7 and 7.8 and are the ones teachers are expected to respond to at community level (Tilbury, 1995:197; Gayford, 1991:77).

The activities by the community in wetlands mentioned earlier by teachers in this sub-section suggest that most local wetland problems are not addressed and sustainability could not be an issue considered by the teacher perceptions. This study assumed that teachers proactively respond to local wetland problems since they are knowledgeable at community level and are resource users just like the other members of the community (section 1.4). The next section of this thesis looks at what motivates teachers to involve community members in wetland conservation activities as well as the diversity of approaches used by teachers to address local wetland problems at community level.

9.4.3 Teacher motivation to apply wetlands training at community level.

Teachers were asked in a questionnaire to explain what motivated them to apply wetlands training (section 1.3, Appendix 1.1) at community level (question 34 in Appendix 5.5). This question aimed at exploring the roots of the teachers' actions to conserve local wetlands. Twenty-three teachers gave various reasons to support their actions. These reasons are shown in Table 9.6.

The responses by the teachers suggest that teacher motivation for wetlands conservation was derived from multi-dimensional considerations, the most prominent one being the in-service training. The prominence of this motivation in the community context as compared to the school context can be attributed to the fact that teachers argued that there were provisions such as subjects and clubs that provided opportunities for addressing wetland issues (Tables 8.5, 9.1). This possibly obscured the in-service training aspects at school whereas the stronger curricular and club provisions took the lead as motivators. At community level the opportunities for integrating wetland issues are not well defined (section 9.4.8) and the teacher is expected to

innovatively create such opportunities. The teachers in this case felt that since they had been in-serviced, they had to champion for engagement of other people to address local wetland issues. Features of in-service training that were praised by the teachers include the knowledge acquired and the need to disseminate it.

Table 9.6 Motivation for teachers to apply water and wetlands training at community level.

	Motivation	No. of teachers
Biophysical	Realization of increasing deforestation and desertification may result	1
	Rate at which wetlands are being destroyed	1
	Community members have planted trees, made baskets, mats and conserved environment by not polluting wetlands	1
	Need to protect our resources	1
	Drying up of water, people should be made aware	1
	The locality and dangers caused by humans	1
Economic	Importance of wetlands e.g. for domestic use	3
Social	Concern for the community since they lack knowledge on soil conservation	2
	Local wetland polluted and people exposed to typhoid, minimize water borne diseases	2
Political	Office promised to give seedlings	1
	Cooperation by local leaders, community in digging boreholes, soil erosion control, bought water tanks, protect their local water and wetlands	4
	Interest created by wildlife club members	1
In-service training	Pass knowledge acquired to local community	8
	Teacher acquired sufficient knowledge and is confident	5

These teacher responses demonstrate that in-service training can serve as a strong motivator for teachers to promote action at local level and that training should be taken seriously. As indicated earlier (section 4.9) this study did not consider the wetlands in-service training as a very new phenomenon to the teachers. Instead, the in-service training aimed at making local wetlands more relevant to the teacher (section 4.7.1) so that s/he can foster their conservation using the opportunities available within the school and community contexts (section 1.4). The response to this question suggests that some teachers perceived this training as the one responsible for their actions to conserve wetlands locally. This observation tallies well with the aims of in-service training in other literature where it is regarded as an important tool for enabling teachers to

become efficient in their practice of teaching (MENR, 1994; KUC, 1980; UNESCO, 1992). The response of teachers in this study demonstrates that, besides helping teachers to become efficient in their practice, in-service training also motivates teachers to initiate conservation activities locally.

The political aspect of motivation mainly focuses on issues of cooperation and collaboration within the school and the community level. The teacher seems to appreciate the good working relations with the community. This stresses the need for recognition of promotion of better relationships between the school and the community. This tallies well with the views on sustainability that underscore the need for promotion of better human-human-environment relationships (section 4.3.4). This enhanced relationship serves to promote dialogue, encounters, reflection as well as collective responsibility to sustain the environment.

The social aspect of motivation entails concern for the community, especially because their activities are responsible for wetland degradation and ill health. The teacher suspects this is due to lack of knowledge. This suggests the need to improve dialogue between people as well as reflection to improve the nature of encounter between people and resources. In this context, the social role of the school would therefore be to facilitate this process and thus to act as a critical forum for engaged cultural reconstruction (O'Donoghue & McNaught, 1989:22; Freire & Shor, 1987). Cultural reconstruction would entail people working together guided by the wetland meanings generated through exploration of the *status quo*. The people work together to improve their environment and livelihoods to promote concern for one another and the environment (section 4.3).

The economic motivation entails using wetlands directly for provision of water. This could lead to degradation of wetlands if sustainability issues are not addressed (section 2.3.2). Environmental sustainability acknowledges the role of wetlands in provision of this economic gain but underscores the need to address the quantity and quality aspects in relation to demand for the resource. This is an aspect that teachers are expected to integrate in their activities with community members.

Biophysically based motivation is inclined towards realisation of the ecological functions of wetlands (Orr, 1992). The biophysical aspects of wetlands include realisation of the quality and quantity issues of the wetland resources. It also addresses the role of human beings in influencing the equilibrium through deforestation and exploitation as well as the efforts done by human beings to enhance the biophysical aspects of wetlands. The data suggests that teachers are able to feel ownership of the local wetland in terms of their role in promoting the ecological processes.

In summary, the picture presented by the teachers is that they recognise wetlands to be of value and imbued with biophysical, economic, social and political aspects that lead to their conservation or degradation. The teachers perceived the in-service training as a major incentive in enhancing championing for wetlands conservation.

9.4.4 Involving the community in knowing about wise use of wetlands

Teachers were asked using a questionnaire to explain how they have tried to enlighten the community members on the wise use of their wetlands since the wetland workshop (question 32a in Appendix 5.5). The responses showed that twenty teachers had involved the community while thirty-four teachers had not. Of those who did, thirteen were males and seven were females. For those who did not, seventeen were males and a similar number were females. In terms of context, eleven of those who informed the community were rural and nine were urban while for those who did not, twenty-one were rural and thirteen were urban. The responses did not suggest differences between the genders and urban and rural groups (section 6.2). This is illustrated in Figure 9.2.

The graph suggests that many urban compared to rural teachers failed to involve the community in knowing about the wise use of wetlands. This could be attributed to the teachers' minimal involvement in additional responsibilities at school and at community level (sections 6.8 and 6.9). This could make them unable to mobilise the community to participate in community activities. In terms of sustainable development this suggests lack of interest in addressing local wetland problems (refer to section 7.2-7.8) and portrays that wetlands sustainability is not being pursued by these teachers (refer to section 4.3).

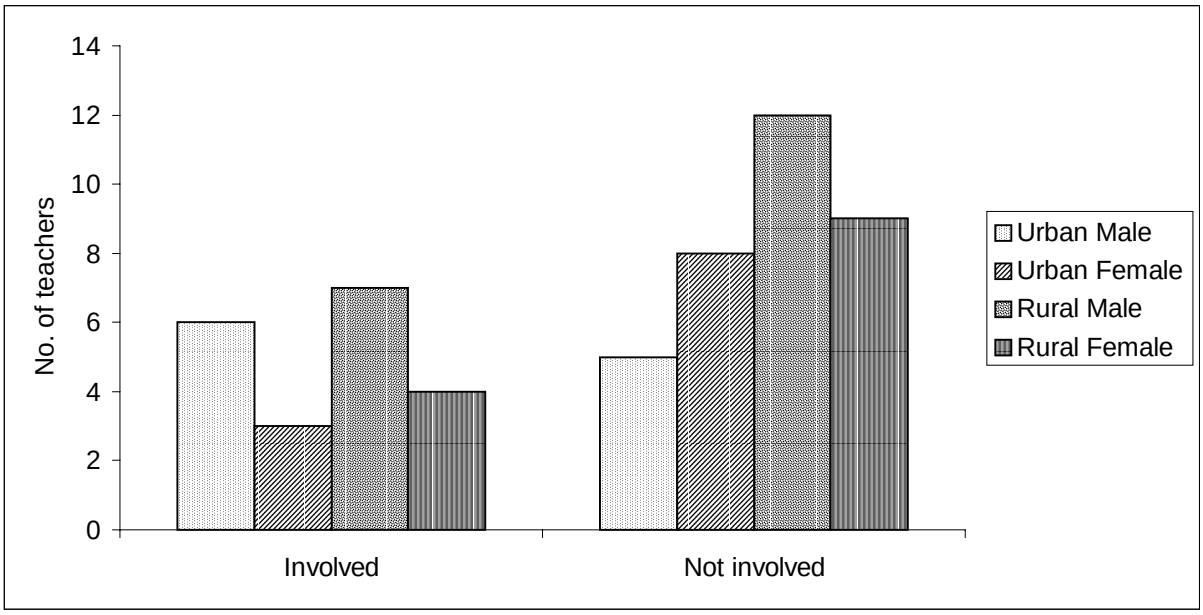


Figure 9.2 Teacher involvement of the community in knowing about wetlands

The teachers were then asked to outline the strategies they employed and activities they involved the community in. The aim of this question was to explore the strategies popular to teachers when involving members of the community. Teachers reported using strategies such as *baraza* (public meetings), women groups, church, youth groups, local community and parent meetings. The frequency of mention of these strategies is summarised in Figure 9.3.

Figure 9.3 suggests that the most popular forums were the *baraza*, women groups and youth groups. The baraza were common to men in both rural and urban contexts. Only one female teacher used the *baraza* to champion for wetlands conservation as compared to eight males. This could be attributed to the few number of female teachers who reported involving the community (Figure 9.2) as well as due to discouragements from men (section 9.3.3). Youth groups were mostly popular with men. Some men also used women groups. Differences are also evident among the teachers in use of various forums especially the use of the church, local community and the parent meetings. The non-use of parent meetings is worrying because this is one of the easiest ways to reach the community since they are frequently invited to the school to decide on education issues of their children. The data suggests that the community context is a great opportunity for promoting wetlands sustainability but is not adequately utilised by the teachers. With few teachers being involved in the community context, this implies that realisation of

sustainable development may not be possible since it requires social support, collective action and responsibility (sections 4.6, 4.7, 4.8, Table 4.2).

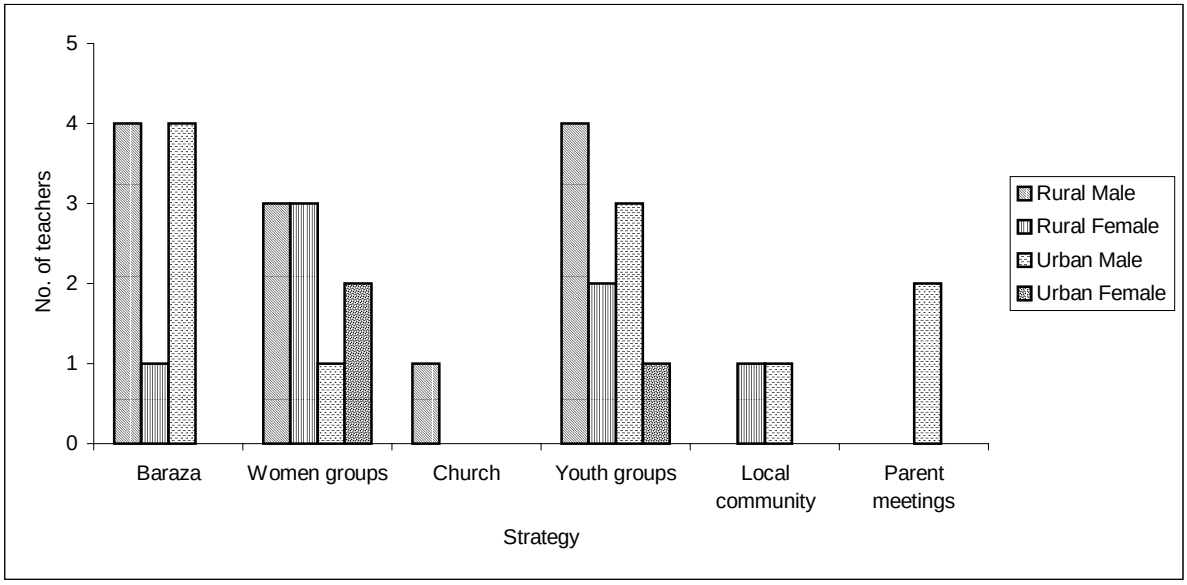


Figure 9.3 Strategies used by teachers in reaching out to the members of the community.

9.4.5 Activities with members of the community

Teachers were asked to give the details of the activities they involve the local community in (question 32b in Appendix 5.5). This question aimed at establishing the strategies used by the teachers in involving the community members. From the questionnaire responses, the activities can be grouped into theoretical, visits to wetlands, use of wetland resources and eco-management activities. The number of teachers for each activity is indicated in parenthesis. Theoretical activities done away from wetlands include demonstration of wise use of water and keeping it clean (1), passing information through chief for community to farm 20-30 meters away from wetland (1), teaching the community members, encouraged community to dig local dams to trap water during rainy season (1), pupils recite poems, songs on environment and wetlands (1) and also a wetland football tournament (1).

During the interview six teachers out of ten reported more activities such as addressing parents during a parents day (2), talking to a few people during a meeting of the catchment group (1),

informing members of a women group (1), telling people not to wash in the river (1) and encouraging people to plant trees (1).

Activities involving visits to wetlands include a visit to the nearest wetland to demonstrate its importance (1), using the school fishpond to inform visitors about wetlands (1) or when explaining about fishpond (1), opening road leading to a wetland (1).

Activities involving use of wetland resources include making bricks (1), weaving baskets (1), planting vegetables and pineapples using water from a wetland (2), preparing mud for moulding (1) and making pots, mats and improved *jikos* (1). Some of these activities involve extracting the wetland resources and may lead to their degradation.

Activities involving undertaking some practical eco-management action (section 4.7.6) include planting trees and cover crops (9), cleaning up the environment and a local dispensary and town (5), establishing a nursery for trees, passion fruits and pyrethrum whereby people sell and plant some (3), terracing of sloppy areas (3), building gabions (3), fencing off to protect water points (2), carrying stone and digging trenches to protect water (2), removing of eucalyptus trees from water sources (1), participating in protection of catchments (1), collecting garbage (1), people coming from near wetland cared for it (1), collecting stones to build channel for a borehole (1), removing water weeds and silt from a dam (1), conserving environment (1), dramatization on environmental conservation (1), constructing of water tanks for conservation of water (1).

During the interview three teachers reported having done activities such as planting trees with women group members in a public park but these were later destroyed by cattle (1), women groups organise clean-ups for the estate and the wetland (1), teachers have planted trees in their private farms and teamed up with community members during environmental cleanups (1).

These responses suggested that most teachers just spoke about wetlands but did not deliberately engage the community in activities to make them understand wetlands and conserve them. More discussions on the use of these education approaches is presented in sections 9.2.2, 8.6, 8.7 and 10.4.

The interviews seem to have provided better data than the questionnaire in the sense that the teachers could have completed the questionnaire with information about what usually happens within their community but not what they had initiated themselves. However the questionnaire data is also very valuable since it gives the perceptions of teachers on the kind of environmental activities they deem appropriate with members of the community. Their responses provide a checklist of their perceptions of best environmental practice for wetlands sustainability at community level. The interview also provided the researcher with an opportunity to explore deeper into those activities which were initiated by the teachers and not imposed from outside by other local leaders. This was not possible with the questionnaire (section 5.8.1). This data was supported through further interviews with twenty-nine teachers from the ten schools (section 5.8.2).

The twenty-nine teachers (not trained about wetlands) were asked this question, "*As a member of the community, have you done anything to address the local wetlands?"* (Question 48 in Appendix 5.7). The aim of this question was to explore the activities done jointly with members of the community as custodians of a common resource. Only seven teachers reported having done something with the members of the community while the other twenty-two teachers had never involved the community. The seven teachers involved the community in the following activities:

Activities involving theoretical approaches include

- Teacher talks about cleanliness of homes, building toilets, planting trees, how to keep rivers clean, and how to use water properly (5)
- Teacher assume that once the pupil knows, the information reaches the parents (1)
- School has many posters hanging outside for everybody to see including parents (1)
- Teacher has explained in a parents meeting about the need to fence the school and to plant trees, their uses and the need to plant them in their residences, boil water (2)
- Teacher talked to the chief (1)

Activities with some practical eco-management (section 4.7.6) activities include

- Community go to rivers and try to conserve the soil (1)
- Draining out dirty water and cleaning dams used by cattle (1)
- In a women group, use the river water to irrigate trees and vegetable nurseries (1)
- Using sewage water to irrigate vegetables and teacher explains to those who inquire (1)

The results suggest that there is very little involvement of the community by teachers in wetland conservation issues practically. This is despite the fact that the teachers and the parents meet many times in meetings organised by the school. This suggests that the schools in this study have not taken up the responsibility of being responsive to local wetland sustainability issues as suggested in section 9.4.2. The school does not seem to treat the society meaning making and activities in wetlands as problematic even though they had declared so in their perceptions of wetland value and threats (sections 7.3 and 7.8).

The activities presented by the teachers above seem to be very apolitical and seem not to challenge the *status quo* in the community. The theoretical approaches mainly use the transmission approaches (section 4.6.1, Table 4.2). This approach is prescriptive to the members of the community without giving them an opportunity to contribute their reality in the process of learning. The teacher may not have sought community meanings of wetlands and this does not concur with the provisions of education for sustainability (sections 4.3, 4.7 and 4.8).

The visits to wetlands were few and the teacher is still seen to dominate in transmitting knowledge to the community members. The teacher did not seem to allow the community members to generate and express their knowledge. This approach may fail in securing interest from members of the community to work for wetland sustainability since the knowledge transmitted may fail to be relevant to them or due to its failure to recognise the community members' perceptions as important (Babikwa, 2002)

Use of wetland resources did not portray any attempts to address conservation of the resource being extracted to ensure its continued availability and sustainability. There seem to have been no environmental education consideration in these activities. Some of the activities such as getting bricks, making mats and pots can lead to wetlands degradation.

Most of the teachers reported involving members of the community in eco-management activities of various kinds. Most of these activities do not challenge the economic, social and political underpinnings of the wetland problems (section 7.3-7.8). They do not portray engagement with the wetland as a process of dialogue, reflection and encounter (O'Donoghue & Janse van Rensburg, 1995; Gough & Robottom, 1993). They do not concur adequately with activities geared towards sustainability (sections 4.7, 4.8). These findings concur with those obtained in the use of eco-management activities in clubs and in the formal education set-up and are discussed in earlier sections of this thesis.

In this study the teachers failed to portray use of methods that enhance learning about the holistic aspects of wetlands (section 2.3). The narrow range of methods used are appreciable as an attempt by teachers to engage in wetland awareness, but unfortunately seem greatly inadequate in ensuring sustainability of wetlands. According to UNESCO (1997:13),

> …education in its broadest sense must be a vital part of all efforts to imagine and create new relations among people and to foster greater respect for the needs of the environment.

The methods mentioned by teachers above are not adequate in generation of outcomes commensurate to the goals of education highlighted by UNESCO above.

9.4.6 Constraints to teachers at community level

Teachers were asked using a questionnaire to document the problems they face at the community level that hinder them from actively engaging the community in wetlands conservation (question 32c in Appendix 5.5). This question aimed at allowing teachers to speak out about their constraints and experiences within the community context. The problems identified by teachers can be categorised into five categories - that is economic, political, social, biophysical and educational related constraints. These problems interact with each other and should not be seen as discreet although they are discussed separately in this study. The number of teachers in each case is indicated in parenthesis.

Economic constraints

- People cannot support something that does not generate money (3).
- Compulsion to invade wetlands due to population pressure, shortage of land for agriculture and grazing. Poverty makes people think on monetary terms (7)
- People make money from wetlands and it is difficult to convince them otherwise (2)
- Lack of funds to buy seedlings, materials and tools and to organise workshops. These include for instance transport and demarcation of the wetland into sections for people and animal use (7)

These responses suggest that the economic base of the people makes them insensitive to conservation aspects. The people seem to invade wetlands for various economic benefits and this could be attributed to rampant poverty in Kenya (RoK, 2001b; MENR, 1994). These constraints concur with the observation by Iozzi (1989) who argued that children might not be able to relate to the concept of natural resources when they do not have access to resources such as food and do not enjoy a reasonably decent standard of living. This may also apply to members of the community in this study. It may be hard to teach or to convince people that the wetlands should be conserved when they are burdened with social problems. Iozzi recommends the need for the teacher to make the people aware that environmental problems are indeed social problems as well and that they need to understand that they too are part of the world community, that we are talking about our world and that we have an important role to play in striving toward a quality environment for all. He says that to convince people of this is not easy (Iozzi, 1989).

The responses also suggest the need for consumer education that can help the wetland users to make informed choices about their consumption patterns and their implications (UNESCO, 1997:26). This can help in making people wiser in their exploitation of wetlands. Consumer education acknowledges community members' attachment to and use of wetlands as well and the need to adapt lifestyles compatible with sustainable living (section 4.3).

The teacher responses also suggest existence of an economic implication to wetland intervention in terms of funds for various activities. These implications suggest the need for training on aspects of fundraising for wetland activities.

Political constraints

- The community meetings either not there, are organised on weekdays and the teacher is busy at school or teacher not allowed to address it (10)
- Time not available to attend other schedules outside the school, teacher in school most of the time (8)
- Lack of cooperation and support from the teachers, community and the government (7)
- Ownership of wetland by private people and one can be accused of trespass. Some wetlands belong to powerful individuals (3)
- Talking about wetlands to the community is the work of the chief. The teacher may be seen as if he is doing the chief's work or stepping on another person's toes. Teacher thus lacks a penetration point (2)
- Teacher has no proof to local authority that he is conversant with wetlands so that he can be supported (1)
- Teacher cannot appear in community meetings not to be accused of being away from school always (1)
- Policies only allow the chief to convene a community meeting but not the teacher (1)
- In school, only the head teacher can convene a parents meeting (1)
- Conflicting sectoral acts. No department in the Ministry of Education or Office of the President dealing with wetlands activities (1)
- Teacher's role is not recognised beyond the school (1)
- Teacher should be introduced to the community so as to be able to start working (1)
- Teacher assumes since the community were involved during the marine environment day, there was no need of involving them again in knowing about wetlands (1)

The political aspects were the most frequently mentioned constraints by teachers. These constraints seem to be mainly centred on contextual challenges in terms of ignorance,

misconceptions and policies that fail to give adequate time, facilitate support and collaboration as well as recognition of the teacher as a potential local resource person on wetland issues. These responses suggest the need to address the political aspects at a greater depth since the teacher is only a facilitator while the community that s/he interacts closely with (section 9.4.1) are expected to initiate, support and adapt change for promoting wetland sustainability. Community education approaches involve participation that entails informing and consulting the people in the planning and management of environmental activities. Community education in light of the contextual challenges mentioned above calls for generation and provision of accurate, understandable, pertinent and timely information on environmental issues, alternative solutions to problems and diversity of possible approaches to the implementation of solutions (Mucunguzi, 1995:342). The political aspects suggest that the teacher needs the support of the community in order to succeed in wetlands sustainability promotion endeavours. They demonstrate that besides having knowledge, skills and attitudes (UNESCO, 1978), there is need for an appropriate political environment that encourages and supports participation in local initiatives to conserve wetlands. This calls for development and harmonisation of local policies (for the school and community contexts) to recognise all people and institutions as stakeholders in resource needs, use and conservation. According to UNESCO (1997:26), the move towards sustainable living requires collective action and responsibility. This policy aspect touches on the issue of prioritising relevance (Tilbury, 1995: 199) to encourage people to identify themselves with the environmental degradation, rehabilitation and sustainability.

Social constraints

- Community ignorant, consider wetlands as undesirable, not interested in conservation, negative attitudes (33)
- Illiteracy within the community (9)
- Barriers such as language (vernacular), tribal mistrusts, cultural setbacks, traditional beliefs and customs (6)
- Lack of motivation from the community, poor turn up for meetings, working with community is tiresome (3)

- Urban set up is prohibitive to reaching out the community, boarding school has parents from all over the country, urban people are preoccupied most times, teacher not in contact with community members (3)
- Assumption that when the child is taught, the message will reach the community (2)
- Parents only think that the school should talk about the academics, parents only want to hear children excelling in exams (2)
- People do not want to interact (2)
- Community especially men do not respect ideas from women (1)
- Misconception of teacher's activities – teacher viewed by the community if he wanted to grab the wetland (1)
- Some community members feel that wetland conservation is meant for the farmers and the uneducated people (1)
- Administrators do not see threats to wetlands and encourage wetlands degradation (1)
- Local people have water taps in their homes (1)
- Those expected to support the teachers are land grabbers (1)
- Teacher assumes the community can ignore (1)
- The local wetlands are not threatened as people have dug dams or get water from elsewhere (1)
- Teacher was new to the area (1)

The social aspects portray strained teachers-teacher and teacher-community relations. The community members are also portrayed as being in conflict with each other and with wetlands in terms of being insensitive to wetland issues as well as harbouring various misconceptions. This suggests existence of contests at the social level of meanings of wetlands and people's (including the teachers) activities. This concurs with Fien's (1993) and Di Chiro's (1987) observation that the environment is socially constructed. The social constructions comprise of the values and norms held by the society which in this case appear ambivalent and conflicting. The social aspect in this study presents diverse social constructions about wetlands and wetland action that hinders teachers' action. According to UNESCO (1997:30), the social aspect is a practical determinant of sustainable development since the kind of change required implicates each community, household and individual. Successful solutions to problems at this level of society will need to be

rooted in cultural specificity of the town or region if the people are to be supportive of and involved in such change (ibid). This suggests the need to address issues of interactions and meaning making (and change) in the social context and how to mobilise the community to generate and implement actions that are concurrent with wetlands sustainability endeavours (section 4.3).

Biophysical constraints

- There are no wetlands in the local area (2)
- Climate makes the wetlands to dry up (1)

These biophysical issues were addressed in greater depth in section 8.15.

Educational constraints

- Teacher lacks confidence to approach the community. It is not easy to do this alone and needs other stakeholders (4)
- Lack of resource materials such as posters to use during such days (4)
- Curriculum does not allow the teacher to reach out to the community. Absent in the school timetable and all days are taken up by the syllabus (3)
- Lack of knowledge and skilled personnel (3)
- More training, frequent follow up needed that takes a longer time (3)
- Training should be more practical than theoretical – teach methodology, interaction and imparting knowledge to community especially the illiterate members of the community (3)
- Teacher not trained to approach the community, teacher never thought of facing the community (2)
- Train the chief, elders and local community leaders – they are with the people all the time (2)
- Water and wetland issues are full of terminology and teachers cannot translate some into vernacular (1)

- Head teacher should be made to recognise the training so as to support the teacher to reach out the community using the school (1)
- Give teachers information on environmental days (1)
- Wetlands is a new phenomena (1)

The data presented above suggests that educationally based constraints confronting teachers were numerous. They traverse aspects of teachers being few in number, not being trained adequately, inappropriate training, lack of resources, a deterministic curriculum and lack of local support. The curriculum was also noted to address other abstract issues quite removed from the local reality. This is supported by the following two quotations from the teachers:

Teacher 1

> *Since wetland is privately owned, it is difficult to interfere. I can only interfere to put sense in that person. I cannot quote the law because this is the work of the administration. If I do that, I will be taken as if I am doing the chief's work. Some will even say they have many children and must farm to get more harvest. So, the teacher may be seen as if he is interfering.*

Teacher 2

> *I think my voice is so little that it cannot be heard. I can only create awareness in school, but the moment we leave the boundary, we go elsewhere. The community can be hostile. The best thing is to give information at school. The moment they carry this information, I think the problem can be addressed. But if you approach parents you'll be an enemy.*

The quotations above suggest that teachers do not want to interfere with what happens at the community level. There seem to be power relations' problems whereby tensions seem prevalent between the teachers and the community. The teacher claims there are clear boundaries to which their interventions should be confined. This suggests existence of a policy problem where the teacher and the community do not work in harmony with each other. The responses reiterate the need for development of local environmental school policies that are in harmony with the other local policies. The school and members of the community should be involved in the development of local environmental policies (Le Roux, 2000) to make them relevant for sustainability of the local environment.

Training of teachers on various aspects of wetlands as well as on how to teach seems to be a major concern. Various documents in Kenya (MENR, 1994; MENR, 1998; KUC, 1980; Lindhe *et al*. 1993; IGAD, 1999) have expressed concern over the few number of trained teachers who can be regarded as competent in teaching environmental education. These documents propose in-service training as one of the approaches that can assist in increasing the number of teachers who can competently handle environmental education. Nevertheless, the responses by teachers in this study demonstrated that the proportion of teachers who have never had a chance to attend in-service training was exceptionally high (section 6.6). The training aspects were also in the environmental science field and were conducted mainly by non-governmental organisations that possibly had no professional competence in aspects of environmental education for sustainability (sections 4.7, 4.8 and 6.6). The teachers are not likely to have been involved in processes of exploring aspects of educational practices that are compatible with sustainable use of resources (refer to Appendix 1.1). This could be responsible for their relatively poor performance in the activities used to engage learners and the community in wetlands conservation (section 9.3, 9.4). The teacher complaints about inappropriate training in this study could also be a result of lack of trained environmental education trainers who designed the water and wetlands education programme that formed the basis of this study (refer to section 1.3). This programme does not seem to have been compatible with principles of sustainable use of wetlands (refer to Appendix 1.1).

The teachers in this study were expected to train their colleagues on aspects of conservation of local wetlands (section 1.4) just as they were taught during the workshop. Use of teachers as trainers for other teachers is regarded as a convenient means of overcoming the high cost of logistical and training issues, especially where large number of teachers are involved and budgetary allocation for training is low (Wanaswa, 1993). In this study the trained teachers did not train their colleagues appropriately (section 8.4.1). This scenario suggests the need to refocus the issue of teacher training especially for wetlands. Training should enable teachers to conceptualise the holistic aspects of wetlands, teach environmental education to pupils, involve members of the community, train and work with other teachers at school and initiate locally based sustainable livelihood activities.

The teachers also raised the issue of resource materials and their development. This aspect was also noted by IGAD (1999) as a serious issue in Kenya and there was a suggestion that teachers be provided with more and diverse resource materials for various audiences. However this study showed that while the teachers asked for more resources, the posters provided were not used by many teachers at schools (section 8.13) and sometimes were only used 'as given' without initiating critical engagement with the local reality (section 7.2-7.8). The same applies for the curriculum which teachers claimed to be deterministic, not allowing the teacher to be flexible. This suggests the need to involve teachers in material development so that any material produced is relevant to them (Lotz, 1995). This implies that there could be other issues of more relevance to the teachers in this study such that wetland issues were of lesser urgency. The study suggests that it could be important to establish the needs of the teachers early and to integrate this in the training programmes in order to promote relevance of the programme to what the teacher is currently doing (section 4.7.1). This could involve working more closely with teachers in different contexts to assist them in addressing their local needs and not imposing solutions on them (Lotz, 1995). This implies making learning resources with teachers and not for teachers.

Teachers also complained about the terminologies used and the need to tone them down, especially for the illiterate members of the community. This is a challenge to the teacher trainers to consider the context in which they conduct their educational programmes. People interact with the context through symbolic interactionism and make their own meanings relevant to their context (section 5.4). Educators should also make their training and terminologies relevant to the meanings held by members of the community within particular contexts.

Teachers also complained about lack of support by the local administration, head teacher and fellow teachers. This contextual problem should be treated as problematic during training programmes. This suggests the need for the teacher trainers to address the issues of cultivating local collaboration, cooperation and joint meaning making as well as taking action. This implies involving teachers in learning about the socially critical aspects of the environment (sections 4.6.3, 4.8.3 and Table 4.2). The socially critical tradition addresses issues of power relations, traditions and habits that inhibit local action. This aspect of training advocates promotion of teachers' self-knowledge to emancipate them from any irrational practices beliefs and

misunderstandings (Higgs, 1998). This orientation in training programmes could enable teachers to query the role of the school in the promotion of sustainable use of wetlands and to act on the insights gained. Some of the insights may require confronting issues of securing support from the community, head teacher and the other teachers.

The data portrays education as major constraint and teachers propose further training for themselves, the school administrators and the local administration. The areas mentioned are on methodology or approaches in community education especially because they deal with illiterate people. Mucunguzi (1995:339) contends that teachers were trained using disciplinary curricula that cannot work in a community context that needs a more integrated, people centred and participatory approach to environmental concerns. The lack of this type of orientation is possibly responsible for making teachers feel disempowered at community level. This area needs to be addressed by training programmes for teachers. This issue has also been addressed by O'Donoghue & McNaught (1989) who critiqued the deterministic model of development and implementation of curriculum for environmental education. They argued for the need for collaborative action research process of contextual critical dialogue, a process they refer to as local reconstructive action (p, 16). In this study the teachers came from different communities, contexts and languages and to address their needs may require this process of local reconstructive action. This could also help to address local contextual, curricular and resource problems mentioned by teachers due to the orientation's emphasis on feeling ownership of the wetlands conservation process and its implementation without external coercion. Vulliamy (1987) also warned against transposition of ideas between contexts, arguing instead for nurturing a process of development of locally based knowledge.

In summary, the educational system is regarded as a vital tool in enhancing realisation of environmental sustainability (IUCN *et al*. 1991; UNESCO, 1978, 1992, 1997). Section 4.7 provides a detailed exploration of some of the expected changes in education to enhance realisation of environmental sustainability. The discussion above suggests the need to link the holistic aspects of wetlands (section 2.3, Figure 2.3) to what the teacher does in school and the community. These responses also suggest that in wetlands education, it is not just a matter of training teachers about the holistic aspects of wetlands (section 2.3) but also how to teach about,

in and for wetlands as well as for sustainability (section 4.8). It seems essential to develop with teachers appropriate teaching approaches to address the various emergent constraints mentioned in this section. This training could be prolonged for more than the three days that characterised the wetlands workshop held at NMK in 1999.

This could involve a praxis process approach that allows for exploration, dialogue, reflection and taking informed action and its cyclic nature allows for improving performance in each successive intervention as well as addressing new challenges as they emerge (McNiff, 1988; McKernan, 1996). According to Janse Van Rensburg and Le Roux (1998:104), praxis implies a conscious recognition of the relationship that exists between practice and its rationale. This involves asking questions on why we do things the way we do and this questioning informs the next course of action. Carr extends this view and contends that praxis should not be viewed in terms of practice and theory as a means to an end but as "…a form of reflexive action which can itself transform the 'theory' that guides it" (Carr, 1995:73). Fien (1997) recommends the need for education to consider local reconstruction of the curriculum to cultivate learning from the local and for the local environment. Iozzi (1989) reiterates the need for use of the local environment since children develop environmental values right from the kindergarten stage to adulthood. If this local knowledge is not harnessed, then it is possible that education prepares learners for conservation of an 'imaginary environment' and not the real one that they know. In this case, sustainability of the local resources may not act as the guiding motivation.

9.4.7 Summary: Emerging issues within the community context

Teachers admitted that they interact with local resources and with members of the community. Some teachers, however, seemed to have a strained relationship with the community members. Teachers seemed to be aware of how the local community interact with wetlands and how some interactions were harmful. Teachers cited the locally based perceptions as responsible for motivating them to undertake local action to conserve wetlands. However, only a few teachers reported involving the community members in wetlands conservation. The majority of the teachers appeared to shy away from the community. The commonly cited forums to reach the

community were the baraza, women groups and youth groups. Other sparingly used opportunities were the church, local community and parent meetings.

The teachers reported involving the members of the community in diverse activities, but which lacked local relevance. There seemed to be no sign of prolonged engagement with environmental problems that can promote dialogue, reflection and encounter (O'Donoghue & Janse van Rensburg, 1995). The activities undertaken by the teachers with the community had features more inclined towards the neoclassical educational orientation (Section 4.6.1, Table 4.2). The activities were characterised by transmission approaches by the teachers and did not seem to incorporate reality from members of the community which traverse social, economic and political relationships in society (section 2.3). These activities may not be adequate in promoting sustainability of wetlands (section 4.3).

Teachers complained of various problems that traverse personal, contextual and community level. The problems also traverse educational, biophysical, economic and political constraints (section 9.4.8). These responses suggest the need for a better conceptualized wetlands education orientated towards exploration, dialogue, encounter and reflection of the holistic aspects of local wetlands. There is also a need to improve approaches for teaching to integrate those inclined towards education for sustainability (section 4.7), which were found to be missing in this study.

9.5 Seeking support to enhance wetlands conservation

Using the questionnaire, teachers were asked to explain whether they sought assistance (from within and outside the school) to solve the problems they experienced while applying the water and wetlands programme (question 36 in Appendix 5.5) (section 1.3). This question aimed at finding out the people and institutions that act as partners with the teacher in wetlands conservation. Twenty-six teachers comprising of 19 (63%) males and 7 (29%) females reported seeking various kinds of assistance from various places. The various types of places where teachers sought assistance and the kind of assistance availed are as follows:

1. Local administration was of assistance to seven teachers. One teacher told the chief about washing clothes and vehicles in the river and the chief warned culprits. Another teacher talked to the sub-chief and he always talks about it in *barazas*. In another area, the chief and area councillor mobilized community to work hand in hand with an NGO. Other teachers sought assistance from the local leaders, chief and sub-chief but did not give details.

2. Government ministries such as Ministry of Agriculture, Water, Public Works and Education. Eight teachers did this. Some of the officers approached are the local agricultural extension officer who assisted in a *baraza* meeting, agricultural mechanization service and farmer Training Centre. Assistance from the Ministry of Education was for reference materials.

3. Within the school, the teacher got assistance from the head teacher and fellow teachers. Assistance was in the form of allowing the teacher and pupils to do environmental study in wetlands and cleaning it, head teacher talked to teachers, pupils and parents and allowed the teacher to attend local environmental demonstration. Others include the head teacher allowing teacher to use pupils to make nurseries, head teacher agreed to fence the school to keep cattle away and one teacher said the school has bought a bus and transport was not a problem. Teachers also agreed to help one teacher to coordinate environmental activities.

4. A non-governmental organisation in Kitale promised to give one school some seedlings, while in another school, it helped to construct a water reservoir and fence a wetland. One school worked closely with Kisumu museum who assist with posters and notes.

5. Parents assisted the teacher by allowing pupils to do some of the activities during weekends. Parents also contribute towards school trips.

6. At community level, a community water project helped to plant trees at a spring source, one teacher approached the community but their response in clearing up the environment

> was not encouraging. One teacher lamented that he sought assistance from leaders informally but they turned a deaf ear.

The data suggests the wide range of consultancy by teachers in wetlands conservation locally. According to Gough & Robottom (1993:306), when outsiders are called in for consultancy tasks, they are seen as contributors to a collaborative school and community based meaning making and action process and therefore are seen as resources. In this study, most of the people consulted did not seem to act as consultants. The teachers seem to have only consulted in order to be able to reach out but not to bring in new experiences to his/her process of involving pupils and the community in wetlands conservation. It appears that only in the case of the use of the Ministry of Agriculture to assist in a *baraza* meeting was there some aspect of consultancy and teaming up of resources expressed. Gough & Robottom (1993:313) contend that

> …it seems important to allow these communication structures to develop practically in response to the range of technical, pedagogical, curricular, political and social issues encountered by teachers as they attempt socially critical forms of environmental education. These issues are idiosyncratic and cannot be foreseen, and can only be fully understood by practitioners in whose professional lives they are expressed.

In this study, despite the problems cited by teachers (section 9.4.8), there does not seem to have been any focused and relevant consultation done to address real wetland issues (sections 7.7, 7.8 and 9.4.2). The teachers appear to have failed to show collaborative endeavours that involve several different constituencies within their school-community set-up where participants in a social critique exercise a range of forms of channels of communication. The struggle for conservation of wetlands was portrayed as an individual affair involving the teacher only and consultation seem to have been only for logistical issues and not the professional technical aspects of wetlands sustainability (sections 2.3, 4.3) and education (section 4.7).

Ten teachers explained in the questionnaires (question 36b in Appendix 5.5) and the interviews (question 40 in Appendix 5.7) why they did not seek assistance. Some of their complaints include

- Asking for cash handouts whereby teachers were not willing to volunteer for something they will not be paid for. Chief cannot work unless the teacher gives him some money (bribe).
- The curriculum problem whereby these activities are not seen as part of the curriculum and are considered waste of time. Head teacher can only assist what can boost school mean score (in exams) and this makes clubs dormant while pupils have no breathing time.
- No staff members around – on environment
- Lack of interest among teachers
- It's a sensitive issue and political

The responses point to the need to cultivate teamwork at school towards responding to the local environmental problems. It also suggests the lack of knowledge and attachment to the local environment by teachers and community members to an extent that they do not see the problem as theirs but have to be paid to conserve their environment. This could be attributed to ignorance and poverty that makes people insensitive to environmental issues (Iozzi, 1989). This problem could be addressed through use of a school environmental policy discussed in section 9.4.8. The curriculum problem and lack of interest has been addressed in other sections (section 9.2.3). The lack of competent staff on environmental issues is a major concern in Kenya (MENR, 1994) and suggests the need for more teacher empowerment. This study has documented that many teachers have never been in-serviced on environmental education (section 6.6) and this had an influence on their conceptions about the environment (section, 7.11) and wetlands (section 7.2). These findings justify the need for more investments in teacher in-service training on environmental education and sustainability.

9.6 Conclusion: Emerging issues within the entire non-formal context

The teacher responses suggest that many schools have different types of clubs. The clubs are involved in activities that promote agriculture, wildlife and environment, religious or academic concerns (Table 9.1). Teachers also reported celebrating several environmental days whose themes cut across different aspects of the four interacting dimensions of environment (Figure 2.2). Teachers admitted that they interact with local resources and with members of the

community. The commonly cited forums to reach the community were the *baraza,* women groups and youth groups. Other sparingly used opportunities were the church, local community and parent meetings (section 9.4.4). These responses show that there is great opportunity for using the non-formal context to champion for wetlands conservation. However, the number of teachers who made use of the non-formal context, especially the community context were few. The data suggests the need to encourage teachers to maximise use of all these non-formal opportunities.

Teachers were involved in diverse activities within the non-formal context. Nevertheless, in both school and community non-formal contexts, there was no indication of prolonged engagement with environmental issues and the activities were quoted as one-off events. Most teachers seemed to have failed to differentiate between formal academic sessions with pupils (section 8.6) and the non-formal context of the clubs and community contexts which were more non-restricted in terms of time and content as well as bureaucratic protocols to be followed. There was a dominance of theoretical approaches with greater use of top-down transmission approaches (section 4.6.1). Some teachers involved learners in experiential encounters and practical eco-management activities. The activities did not seem to be relevant to the local *status quo* of wetlands. These activities seemed inadequate since the underpinning causes of environmental degradation, which entail the socio-cultural, political and economic attributes (section 2.3), remained unchallenged. Teachers also failed to address their perceived local threats to wetlands (sections 7.7, 7.8, 9.4.2). Engagement with the holistic environmental issues is a process involving exploration, dialogue, encounter and reflection (O'Donoghue & Janse Van Rensburg, 1995; Gough & Robottom, 1993). This cyclic process (including praxis) enables participants to learn more about the problem, the action and the process of problem solving and to feed the lessons learnt back in the process to resolve an environmental problem. These cyclic processes of engaging with local wetland issues are missing in the use of non-formal contexts in this study. The activities given in this study cannot guarantee sustainability of wetlands. This is an area that needs attention in future wetland education programmes for teachers.

Teachers reported being motivated to champion for wetlands conservation. They cited locally based perceptions as responsible for motivating them to undertake local action to conserve

wetlands. The motivation traversed the biophysical, social, economic and political aspects of wetlands (Table 9.2). The proportion of teachers for each aspect of motivation varied considerably, suggesting the need for greater illumination of the holistic aspects of wetlands to the teachers. Curricular-based motivation dominated in the clubs while in-service training dominated at the community level. However, this research failed to establish the relationship between motivation and the activities for promoting wetland sustainability reported by the teachers. There was a lack of counterbalance between the actions presented and the enthusiasm portrayed in the motivation. Although the motivation appeared to be locally based, the teachers' actions did not seem to be informed by the local context and hence the study failed to establish the role played by motivation on the actions reported by the teachers. This area needs further research.

Teachers cited various problems that hinder them from being effective within the non-formal context. These constraints traversed biophysical, economic, social, political, economic, and educational aspects for wetlands. The constraints depict the need for cooperation and collaboration in wetlands education. This seems to be dependent on appropriate local policy structures on politics, economics, culture and social relationships. The constraints suggest the need for refocusing the use of non-formal context for promoting wetlands sustainability. The results seem to stress the need for more illumination of holistic aspects of wetlands as well as responses that are inclined towards involving people in environmental education for sustainability processes as praxis (Grundy, 1987; Carr & Kemmis, 1986). The policy issues that came up suggest lack of harmony between what happens at school and at the community. The school and the community seem to lack reciprocation when dealing with local environmental issues. This suggests the need for development, prioritizing and harmonizing of local environmental policies and to recognize the school as a player in local environmental issues and to accord it the time, resources and support needed. This could entail winning public support and consensus that the fight against environmental degradation and promotion of sustainability is a collective responsibility (UNESCO, 1997). The overall picture suggested in this section is that the non-formal context presents an excellent opportunity to champion for wetlands sustainability but the teachers did not use it adequately.

Teachers reported having sought assistance locally to solve their perceived problems. Their responses, however, suggest that they sought logistical support than professional and technical support to promote wetlands sustainability. The consultation undertaken could not bring forth meaningful cooperation and collaborative teamwork that brings forth new relevant experiences to address the local wetlands sustainability problems. The training programmes for teachers should involve teachers in activities that empower them to exploit the wealth of consultancy on various wetland issues that exist locally.

The proceeding discussion points to the need for a more elaborate wetland education programme that can address the teachers' problems above. This suggests the need for involving teachers in the process approach to meaning making and change on the environmental values and threats. This entails use of diverse environmental education methodologies to enhance addressing the underlying ideological causes of the wetland value as well as the associated degradation and social problems. The process approach integrates exploration, dialogue, reflection, and action cycles that are context specific. This calls for working proactively with all stakeholders to develop suitable methods and materials for use by all levels of learning, including the community members. These materials include special calendars, books, posters etc. There is also a need to increase the use of electronic and print media to popularize the available opportunities such as clubs and environmental days as well as the activities done by teachers as a form of networking and motivation.

CHAPTER 10: CONCLUSION

10.1 Introduction

This study aimed at establishing the perceptions of teachers on various aspects of wetlands as well as their actions to champion for wetlands conservation (section 1.4). This chapter presents a summary of the earlier nine chapters and focuses on key findings and emerging issues. The implication of these findings to wetlands sustainability education is explored. The chapter also proposes tentative recommendations especially to other teacher training programmes, on wetlands that could be reflected upon. The chapter is divided into seven main areas as follows:

- Perceptions of teachers about their local contexts and wetlands
- Opportunities available to teachers for integrating wetland issues
- Use of various opportunities to champion for wetlands conservation
- Motivation for teachers to use various contexts in wetlands education
- Constraints to teachers at the local context
- Seeking assistance at local level
- Reflection on the research process

Some of these aspects concur with the objectives of this research (section 1.4). In the discussion of these aspects, the teacher responses are reflected upon the debate on sustainable development (section 4.3) and environmental education for sustainability (section 4.7). Education for sustainable development in this study is conceived to entail integration of aspects such as ecological sustainability (Orr, 1992; IUCN *et al.* 1991), social justice (Fien, 1993), critical inquiry skills (Le Roux, 2000), critical environmental consciousness (Fien, 1993) and political literacy (Tilbury, 1995). This study explored how these aspects apply to Kenya using a case study involving primary school teachers.

Since this is a case study involving a small sample, the recommendations proposed only apply to the teachers who participated in this study and cannot be generalized for the whole country (refer to section 5.5.4). However, since the recommendations are reflections of the lessons learnt from

the study, they are considered valuable, especially to the planning of future workshops on water and wetlands sustainability for teachers. It is believed that teacher trainers in Kenya can benefit from the insights generated by the findings of this study.

Some teachers' recommendations are also integrated as insights. In the questionnaire (question 37 in Appendix 5.5), teachers gave suggestions on what changes they deemed necessary for the wetlands education programme to encourage them to be more active in their local contexts. Section 10.6 revisits some of these teachers' comments and reflects upon them to arrive at tentative recommendations based on both the teachers' comments as well as insights from the research findings.

10.2 Perceptions of teachers about their local contexts and wetlands

The analysis of teacher perceptions of wetlands revealed that the meaning making process through symbolic interactionism (section 5.4) was relevant to them. The responses demonstrated that teachers had a dynamic and interactive relationship with wetlands. This applied to both in-serviced teachers and those who were not. Nevertheless, the teachers who were not in-serviced did not appear to be conversant with wetland aspects and some could not define them well (section 7.2). This implies the need not to assume that symbolic interactionism and meaning making process produces particular perceptions. Some misconceptions were noted with the non in-serviced teachers and this revelation strengthens the relevance of continuous training in environmental education. It is likely that the teachers with wrong conceptions may not be able to initiate appropriate programmes for promoting sustainability of local wetlands. The need for proper conceptualisation of issues is reiterated by Jickling (1992) and Ballantyne and Parker (1996:26) who argue that effective response to environmental degradation issues is strongly related to the level of conceptualisation of the underlying issues. The failure of teachers in this study to define and describe wetlands (section 7.2) suggests that their response to wetland issues and risks may not be adequate. In-service training for teachers on wetlands as well as other awareness programmes are necessary to enhance better conceptualisation of wetland issues. Since wetland issues are not integrated in a straightforward manner in the Kenyan curriculum (Appendix 3.1-3.10), it is crucial that teachers are conversant with correct information about

wetlands to enhance development of more appropriate innovations with their pupils and members of the community on how to promote their sustainability.

Teachers expressed various meanings for local wetland values (section 7.3-7.6). They cited the most important uses of wetlands to the community as provision of water for various uses such as domestic use, for animals and farming and as grazing areas. These uses were rated as special to the community sustenance of livelihood and employment such that, if absent, the community would suffer. Most of the wetland values mentioned were based on economic aspects of wetlands while social, political and biophysical aspects (section 2.3, Figure 2.3) were only sparingly mentioned. Some differences were noted between males and females and also between urban and rural teachers. The high ranking of economic values portrays economic pursuit as a major aspect that attracts people to wetlands. These aspects could be responsible for wetlands degradation. The pursuit of economic aspects degrades the social, economic and biophysical aspects of wetlands (section 2.3). The lack of awareness of the holistic aspects of wetlands (Figure 2.3) is of major concern since it implies that pursuit of sustainability may not be an activity that teachers are currently engaging in. Wetlands sustainability entails recognising the holistic aspects of wetlands and putting in place appropriate environmental actions (section 4.7). The skew in meanings held by teachers towards the economic aspects implies that there could be lack of exploration of the holistic aspects of wetlands during teaching. This is likely to have an impact on the environmental education process that may not enable pupils and the community members to be conversant with real wetland issues and risks.

The teachers suggested various threats to their local wetlands. The main threats were population pressure, agriculture, soil erosion, deforestation and overgrazing (section 7.7-7.8). These threats mainly hinged on economic pursuits although some like population pressure and overgrazing could be regarded as social problems (section 2.3). Some biophysically related threats were also cited such as drowning of people, dangerous plants and animals, and being soggy. Some differences in perceptions to wetland threats were noted between urban and rural teachers as well as between males and females. These threats portray the wide scope of meaning making about wetland threats by teachers. It portrays teachers as being able to define the contextual nature of wetland issues. This suggests the need for training of teachers to recognise and address these pre-

conceived issues that are of relevance to them instead of imposing alien ideas on them. These responses are relevant to wetland training in that they propose the need for training teachers to think critically (Jickling, 1992) on ways to explore their contextual issues and risks and to generate appropriate responses (section 4.7). This suggests the need to acknowledge that there cannot be universal environmental education programmes for teachers that can be adopted and replicated for different contexts. Each context is unique. According to Jensen and Schnack (1997:164), the social interaction and pursuit of livelihood characterises the local environmental problems in an area and solutions to these problems must be sought at both social and individual levels within that context. Teachers need to be involved in environmental processes that enable them to identify their local contextual environmental issues and risks and address them in ways that promote sustainability (sections 4.6, 4.7 and 4.8).

Teachers differed in perceptions about community awareness about threats to wetlands. Some teachers considered the community members as aware of the threats to their wetlands (section 7.9). This group argued that the community interact and use wetlands and they suffer from their unavailability. Some teachers argued that the community do not care even if they know about their wetlands. The community awareness by teachers above tends to suggest their recognition of meaning making through symbolic interactionism (section 5.4). However, as mentioned earlier in this section, teachers who did not attend the in-service training had misconceptions about wetlands. The community could also be holding wrong perceptions about their local wetlands. On the strength of this finding, it is possible that the community members are not aware of the local wetlands, as these teachers may tend to assume. This strongly suggests the need for involving the community in environmental education to enable them to appreciate their holistic values, threats and their role in sustaining them.

Some teachers felt the community members were aware about the local wetland threats since they had been engaged in some kind of awareness by the teacher, the school, the media and through practical action at local level (section 7.9). However, only six out of fifty-four teachers reported having made an effort to inform the pupils and members of the community about wetlands using a transmission approach (section 7.9). This suggests that the community in most areas covered by this study may not be enlightened on wetland value and threats and their contributions towards

their destruction and conservation. The teachers' responses on how the community came to know about wetlands also failed to show a continuous proactively conceived locally based engagement with local issues and risks. This aspect is explored further in section 10.4.

Some teachers felt that the community was aware but were compelled to degrade wetlands due to factors such as discrimination, poverty, ignorance, ownership problems, and land pressure (section 7.9). These are contextual issues (section 5.3) that vary from place to place. This again strongly suggests the need to train teachers to think critically about the holistic aspects of wetlands (section 2.3) and their role in promoting their sustainable use (sections 4.3, 4.7 and 4.8). It also involves generation and promotion of locally based responses to environmental issues and risks (Jickling, 1992; Ballantyne & Parker, 1996:26)

Some teachers claimed having the potential to champion for wetlands conservation in their local areas (section 7.10). However, analysis of their perceptions revealed that their claims appeared to be a wish list with many features of neoclassical transmission approaches (section 4.6.1, Table 4.2). None of the teachers indicated personal engagement with local wetland issues as well as lessons learnt from previous interventions. The findings concur with the observation by Woods (1992:358) that teachers have theoretical perceptions of what ought to be done but these never translate into practical action. The findings suggest that these teachers' actions were not informed by the local context and did not reflect on education for sustainability principles (sections 4.7, 4.8).

Ten teachers in an interview gave various definitions about their conceptualisation of environmental education (section 7.11). Although there is no universal definition of environmental education (Le Roux, 2000), it is conceptualised within a general accepted framework as discussed in section 3.1 (UNESCO, 1978, 1997; Tilbury, 1995). In this study, none of the teachers mentioned relationships between people and nature. Most teachers held a general view about the environment as 'everything' that surrounds people, which did not seem to entail the holistic view of the environment. The definition proposed by the teachers seems to be more inclined towards the physical, observable and tangible aspects of the environment. The teachers seem to have conspicuously missed mentioning environmental decision-making and action

taking. This outlook on environmental education seems narrow in scope and may not lead to environmental improvement that entails addressing the holistic aspects (Figure 2.2). This aspect was also noted from those teachers who reported that their anticipated outcomes after teaching pupils about wetlands was mostly to promote knowledge and understanding (section 8.14). These findings suggest the need to refocus environmental education for teachers to enhance their conceptualisation of what it entails, especially in holistic terms. The misconception of environmental education in this study is suspected to be responsible for the inadequate performance of teachers in championing for wetlands sustainability in this study (sections 8.6, 9.2.2, 9.3.3, 9.4.4).

In summary, the teacher perceptions of different aspects of wetlands and the local context demonstrates the need for teacher in-service training programmes to seek their views first in order to understand them fully before the training programme implementation. The teachers' perceptions in this study tend to differ depending on context (urban/rural), gender (male/female) and age (section 7.3-7.8). It is highly likely that these aspects are not considered in Kenya, as was the case with the water and wetlands training programme (section 1.3, Appendix 1.1). Consideration of these aspects is important, as it would help to tailor the programme to the needs of the programme recipients. The training programme in this case should be developed with and not for teachers.

Teachers in this study reported that they play a major role in the selection and interpretation of the content and activities done by pupils (section 8.8). In the Kenyan primary school curriculum, wetland issues are integrated in the content of many subjects (sections 3.2-3.9, 8.6, Appendix 3.1-3.10). The teachers' perceptions of various aspects of wetlands discussed above shows that besides being directed by the curriculum to teach about wetlands, they also have a reserve of individually constructed knowledge about local wetlands, which he/she can utilise to enrich teaching and learning in school. This, if harnessed by the teachers, could assist in enhancing wetlands appreciation by pupils. Unfortunately, in this study teachers seemed to be lacking emphasis on perception of the holistic aspects of wetlands (section 2.3). The curriculum and the books used in schools did not seem to emphasise the holistic aspects either. This deficiency is likely to influence their local emphasis on wetlands sustainability. The same applies at the

community level, where the teacher is also often a person bestowed with both social and intellectual leadership roles (section 6.9). Often, being one of the educated people in the community, he/she can play a potentially leading role in promoting concern and care of the resource he/she benefits from. But the lack of emphasis on holistic aspects of wetlands as well as lack of use of appropriate approaches (sections 4.6, 4.7 and 4.8) is likely to impact negatively on promotion of wetlands sustainability. This is a major challenge in future teacher training programmes on wetlands sustainability.

10.3 Opportunities available to teachers for integrating wetland issues

At the formal context, teachers reported using many subjects to champion for wetlands conservation (Table 8.5). The major subjects were Science, GHC and Agriculture. Other sparingly mentioned subjects include Art and Craft, CRE, Home Science, English, Kiswahili and Music. The use of these subjects concur with their popularity with the teachers (section 6.4). Review of relevant literature suggests the existence of great potential in all subjects for championing for wetlands conservation (chapter 3, Appendix 3.1-3.10). The use of only a few subjects in this study suggests the existence of problems in teacher perceptions of the relevance of wetland resources to the various subjects. It suggests that teachers associate wetland issues with particular subjects (Karembu, 2002).

The teacher responses also suggest existence of clubs in many schools. These clubs are involved in different activities with themes ranging from agriculture, wildlife and environment, religious or academic concerns (Table 9.1). The frequency of mention and use of different clubs varied, although environmentally based clubs dominated. The clubs have a great potential for championing for environmental education (McDuff, 2000). Teachers also reported celebrating several environmental days whose themes cut across different aspects of the four interacting dimensions of environment (section 9.3.1). The environmental days celebrated by teachers demonstrated that teachers are able to maximise use of these opportunities. Some of the days considered as environmental days were unique constructions by teachers. They were only known to teachers and at the local context as environmental days but are not indicated in the normal national calendar (section 9.3.2, Ndaruga, 2002). Some of the days were marked collaboratively

with members of the community. However, it was noted that only a few teachers made use of this opportunity and only a few environmental days were celebrated (section 9.3.2). This suggests the need to popularise these days to the teachers.

At the school level, involvement of fellow teachers also presented an opportunity for championing wetland issues to the teachers (section 8.4). The majority of the teachers (50/54) used this opportunity. However, this opportunity was not used adequately in that the in-serviced teachers just told their colleagues about wetlands and the training briefly. They failed to take them through the whole process of learning that they went through. This suggests the need to refocus on the aspect of teacher-teacher in-service training to enable many teachers to reach out to other teachers in their working stations.

Teachers also declared that they interact with local resources and with members of the community. The commonly cited forums used by teachers in involving the local community were the *baraza*, women groups and youth groups. Other sparingly used opportunities were the church, local community and parent meetings (section 9.4.4). However, the use of this opportunity was seen to be inadequate.

The responses above show that there is a great opportunity for using the formal and non-formal context to champion for wetlands conservation. The formal context was more popular with the teachers than the non-formal context. The number of teachers who made use of the non-formal context especially the community context was few. The data suggests the need to encourage teachers to recognise the relevance and to maximise use of all these opportunities. In the questionnaire (Question 37 in Appendix 5.5), 13 out of 54 teachers proposed some issues be addressed in the curriculum. These include infusing wetland topics in the curriculum, making water and wetlands issues a subject on its own, integrating more wetland issues in exams and the need for trainers to identify topics in the syllabus related to water and wetlands to be used during the training sessions. These views seem to emphasise making wetland issues more relevant to the curriculum and examinations.

The responses by teachers above suggests the need for their greater involvement in processes that enhance their enlightenment about the importance of both formal and non-formal contexts and about how to make use of them. This may entail working more closely with teachers to identify locally available opportunities and also development of locally conceptualised responses suitable and relevant for particular contexts.

10.4 Use of various opportunities to champion for wetlands conservation

Teachers reported using a variety of methods to involve the various categories of audiences identified in section 10.3. The activities are categorised following descriptions by O'Donoghue and Janse Van Rensburg (1995), Tilbury (1995) and Fien (1993). The teacher responses suggest that teachers employed a narrow range of approaches to champion for wetlands conservation in both formal and non-formal contexts (section 8.4, 8.6, 8.7, 8.14, 9.2.2, 9.3.3 and 9.4.5). The methods used are in four major categories with their order of preference ranging from theoretical, eco-management, wetland visits and political action approaches, in that order. In the formal context, the popular subjects in wetlands education were science, Agriculture and GHC, in that order (Table 8.5).

10.4.1 Theoretical approaches

Theoretical approaches seem to have dominated in the school context suggesting that the teachers failed to provide opportunities for pupils to learn on their own and continued to dominate the learning sessions. The theoretical (transmission) approaches were mentioned in several sections of the thesis (sections 8.4, 8.4, 8.5, 8.6, 9.2.2, 9.3.3 and 9.4.5). Most of the theoretical approaches were characterised by transmission methods of teaching that have features of the neoclassical approach and education about the environment (section 4.6.1, Table 4.2). The phrases used by teachers in the sections mentioned above seem to be based on the show and tell and guided questioning methods of instruction (O'Donoghue & Janse Van Rensburg, 1995:4; Fien, 1993; Gough & Robottom 1993). These aspects were also noted in the classroom observation where transmission approaches were evident (Appendix 3.11). Document analysis of the schemes of work and lesson plans showed that the lack of emphasis on environmental education processes

was deeply entrenched and absent in the planning for teaching (Appendix 3.12). The planning for the lessons had many features of the neoclassical orientation characterised by a general lack of outdoor fieldwork encounters and participation by learners. The teacher anticipated outcomes from pupils were also narrow in scope and capitalised on promoting understanding in learners and not developing a critical and active individual (section 8.14). The teachers were noted to dominate in class, they failed to engage the pupils in a way that encourage active development of knowledge, they failed to link what was taught in class with what was happening in the real world, they followed the curriculum as given and depended heavily on the text books (sections 8.6 and 8.7, Appendix 3.11 and 3.12).

Also noted was lack of collaboration among teachers to address local environmental issues. The teachers appeared to work alone and did not involve colleagues (section 8.4). The examinations also did not integrate local wetland issues and the teachers did not seem to feel obliged to put emphasis on local issues since they were not examined (section 8.12).

Although Tilbury (1995) acknowledges the approaches based on education about the environment as valuable, these approaches may create dependency in learners by making them rely entirely on the teacher. For instance, the wetland poster was also not appreciated and was not used by most teachers (section 8.13). Those who used it failed to indicate a process of active exploration, dialogue and engagement with the local issues (sections 8.6, 8.7, 8.14 and 9.3.3) to adapt the prescriptions provided in the poster (section 8.13) to the local context. This could suggest that the poster was not considered relevant to the local context and teacher expectations. It also suggests that the poster was only used ‘as given’ possibly with an assumption that the information therein had a higher status than any locally constructed knowledge to address wetland issues. This is unfortunate because the environment in which the poster was developed was different from the one where it was used. It was essential for teachers to seek and promote relevance of the poster to the local context (Lotz, 1995:8; Otiende, 1997:30). This could have entailed using the poster as a guide to enhance exploration of local issues but not to adopt it without locating it locally. This study failed to identify diversity of local ideas that could be regarded as having emanated from contextualising the poster. The aspect of teacher use of posters for educational purposes needs further research.

Some other theoretical approaches reported by the teachers had a provision to allow learners to engage albeit at a shallow level, with local wetland issues. Some of the phrases used to describe these approaches include ‘discuss’, ‘involved in plays and songs’, ‘writing poems for competition’, ‘drama’, ‘debates’, ‘dancing’, ‘drawing’, ‘developing posters’, ‘modelling’, ‘competitions in public speech’, and ‘painting’ (sections 8.4, 8.5, 8.6, 9.2.2 and 9.3.3). These portray engagement of learners in a higher level of thinking to express their views about wetlands orally, visually or through simulation games (refer to section 8.6.1, 8.6.5 and 8.6.9). These approaches have features of active learning (section 4.7.7) where learners are allowed to become autonomous and not to rely entirely on teachers for ideas. The approaches can lead to generation of more diverse ideas about local wetlands representing views of diverse people experiencing different contexts (section 5.3). However, constructing local knowledge is not enough. Environmental action is important in influencing issues responsible for environmental degradation as well as to physically improve the environment (Tilbury, 1995). There are several approaches to environmental action as documented in section 4.7.6. If generation of knowledge does not lead to action on the insights gained, the active learning process retains features of the theoretical approaches that are not adequate in responding to environmental issues. In this study these theoretical activities did not portray aspects of acting on the insights gained and are considered theoretical and inadequate in promoting sustainable use of wetlands (refer to section 4.7).

10.4.2 Visits to wetlands

Only a few teachers reported using this approach at the community level. Visits to wetlands were common with the pupils especially in subjects such as Science, GHC and Agriculture. These subjects are the ones usually associated with environmental education by teachers (Karembu, 2002; Lindhe *et al.* 1993). The visits to wetlands by teachers and learners were for various purposes and are documented in section 8.4, 8.5, 8.6, 9.2.2, 9.3.3 and 9.4.5. This approach had features of liberal progressive education orientation (section 4.6.2, Table 4.2) and education in the environment (section 4.8.2).

These approaches can enable the learner to explore diverse environmental aspects in order to develop higher faculties such as critical thinking, self-expression and suggestion of solutions to environmental problems. The teacher facilitates the outdoor activity and acts as the group leader (Table 4.2). The data suggests the occurrence of development of manual skills of collecting and using materials from wetlands. These visits can enhance development of environmental concern in pupils (O'Donoghue & Ashwell, 1994:16). Identification of plants, animals and conservation measures for soil and water suggest development of respect for personal constructions outside the ones given in the textbooks or by the teacher. These personal constructions add relevance and are adaptations of what is prescribed by the teacher and the textbooks to the real life of the person concerned in the engagement. Knowledge generation seems more subjective, private and individual (Gough & Robottom, 1993) depending on one's interaction and prior knowledge about the local wetlands and its resources. Nevertheless, learning in this case seems to be geared towards changing the learner's life in future but not to taking immediate action (Fien, 1993). Although the learner is allowed to create his/her own knowledge with little control from the teacher, the approach prescribed in this study lays more emphasis on individuals and fails to address social structures that underpin the environmental problems (refer to Table 4.2). The approach seems to address the problems only at a face level. The learners were taken to wetlands to make them interact with them (Grundy, 1987) but were not encouraged to engage critically in exploring and evaluating the *status quo* as well as taking action. The approach seems inadequate in the promotion of sustainable use of wetlands (refer to sections 4.3, 4.7 and 4.8).

Other teachers described the wetland visits as geared towards collecting materials such as weeds for weaving, papyrus reeds for making baskets, mats, making musical instruments and brooms, mud and clay for modelling, making ribbons, mangroves for poles and other materials, collect wetland plants and animals, fishing, water for washing, spraying and laundry (sections 8.4, 8.5, 8.6, 9.2.2, 9.3.3 and 9.4.5). These extraction visits could give learners good opportunities to acquire first hand information about the value of wetlands. However, some of these activities, if done without caution, can lead to degradation of wetlands and the teacher could have used this opportunity to address issues of sustainable use of wetlands. The visits to wetland could have provided the teacher with an opportunity to clarify with learners that wetland resources are finite and that continued extraction of resources is responsible for their degradation. Sustainable use of

wetlands implies that the extraction of wetland resources also considers and addresses the negative impacts on the holistic aspects of wetlands and enhances these holistic aspects. This implies addressing economic, social, cultural and ecological sustainability issues (Reid, 1996:170). The role of education in this case would be to promote economic sustainability, which entails promoting efficiency in terms of extraction and use of the resource to ensure that the ecological systems on which our economies depend are resilient (remain unchanged) and are available to all people across generations. Economic efficiency implies that the processes and projects undertaken (in wetlands) give the greatest output per unit of input (Reid, 1996:170). This suggests the need to explore with teachers aspects of who trades with wetland products, how wetlands affect trade locally, how the incomes from wetlands are shared, how the incomes from wetland trade influence harvesting of wetland resources and whether the current and projected future harvesting influences availability of the wetland resources to future generations. These visits could have been better conceived if learners addressed these sustainability issues. In this study, there was no evidence of advocating these sustainable use aspects of wetland resources by the teachers. The wetlands seem to have just been treated as emporiums or warehouses that provide various resources (Zerner 2000).

One teacher visited wetlands for sporting, swimming, rowing dhows and boats (section 8.5.2). There was no evidence from the data to show that the teacher involved learners in learning about sustainability of the local wetlands. It is possible that issues of sustainability of wetland resources did not feature during the visit.

The three aspects of visits to wetlands mentioned above seem inadequate in addressing local wetland sustainability issues. They failed to show engagement with local wetland issues and the learners seem to have gone there just to understand, harvest or to aesthetically appreciate the wetland. Sustainable development entails acting on the insights gained to initiate change for the environment (sections 4.7 and 4.8). The meaning making process on the features of wetlands and the anticipated action is also expected to integrate the holistic aspects of wetlands (Figure 2.3, section 4.7.2). In this study, this holistic aspect was not integrated during the visits to wetlands. There was more exploration of biophysical and economic aspects compared to social and political

issues. This causes the wetland visits to be regarded as inadequate in addressing the sustainable use of wetlands in this study.

10.4.3 Eco-management activities

Eco-management activities are defined as maintaining or improving the landscape through physical action (section 4.7.6). In this study, they are reported in sections 8.4, 8.5, 8.6, 9.2.2, 9.3.3 and 9.4.5. The eco-management activities were more common within the non-formal contexts and some subjects such as Science, GHC and Agriculture (Table 8.5). These eco-management activities provide learners with opportunities to practice skills of inquiry, values analysis and clarification and problem solving in everyday situations. The activities depict recognition of the need to promote participation of the pupils and the community in addressing local environmental problems (UNESCO, 1978).

According to Agenda 21 (UNESCO, 1992), the road to sustainability entails encouraging people to consciously plan and work for sustainable development at all levels from local to global, the need for all people including the poor and the disadvantaged groups to participate in making decisions about the environment and development and also the need for all stakeholders to work in partnership. This aspect is also supported by Boardman and Ranger (1996:163) who contend that sustainable development is a process of encouraging local people to participate in planning for environmental change and identifying environmental priority areas. In this study, teachers identified several threats to their wetlands (sections 7.7, 7.8 and 9.3.2). This study would have expected the teachers' activities to be geared towards addressing these problems and to involving everybody as a process. However, the data from the teachers did not show the process leading to consensus of agreement on the eco-management activity and reflection of the insights gained in the process as ingredients to be fed into successive interventions (O'Donoghue & Janse Van Rensburg, 1995; O,Donoghue & McNaught, 1989; Gough & Robottom, 1993). The teachers presented these activities as one-off activities and not as a proactive engagement with the local environmental problems. There seem to be little reference to the local problems identified above in the eco-management activities undertaken and many problems were not addressed. The teachers' activities in this study failed to show features of engagement with the social reality in

terms of reflecting on multiple interactions of local environmental aspects (section 2.3). Many of the activities mentioned in this study focused on addressing the biophysical aspects of the environment while the economic, social and political underpinnings of the wetland problems (section 2.3) were ignored. This suggests that the eco-management activities mentioned in this study were inadequate in addressing sustainable use of wetlands (refer to sections 4.6, 4.7 and 4.8).

10.4.4 Politically based activities

The political aspects were only mentioned by one teacher for both school and community contexts. The only activity mentioned was participation in an environmental procession. This suggests lack of knowledge or interest in teachers on political issues of the environment and how to address them. The political based approach mentioned is inclined towards the radical, political and ethical approach to sustainable development (section 4.3.5). This aspect portrays the teacher responding to current local environmental issues radically. This approach can be useful in gaining community support as well as allowing people to express their original views about their *status quo* after interaction with an environmental issue.

Dryzek (1998:584) argues that political aspects mainly address issues of democracy which are more inclined towards 'procedures' that should be in place to enhance environmental sustainability. In this study it appears that teachers did not view local democratic structures, especially those inhibiting decentralisation and self-control as problematic. However these issues featured prominently as constraints to teachers. Some teachers argued that the local administrators are the ones bestowed with the responsibility of dealing with local issues and not the teacher (section 9.4.6). Most teachers do not seem to feel obliged to address the local *status quo* issues. Teachers also mentioned other problems (sections 8.15, 9.2.3, 9.3.4 and 9.4.8) that may hinder them from addressing political issues. This implies the need for a refocus on political issues and their impacts on the quest for environmental sustainability. Teachers could have addressed issues like who decides on aspects of wetlands utilization, who influences the decisions, are people consulted and what do people say about the present *status quo*? (also refer to Boardman & Ranger, 1996). These are some of the issues that are missing in the teacher

responses presented in this study. According to Robottom (1987:296) teachers fail to engage in political issues because they fear involving themselves in controversial issues. Some teachers in this study openly declared political issues to be sensitive and 'political' (section 9.4). The presence of these problems suggests the need to involve teachers in environmental education processes to empower them on what political issues are and how to address them.

10.4.5 A synthesis

In summary, the entire scenario of the approaches used by teachers in this thesis seem inadequate in ensuring sustainable use of wetlands because they ignore addressing the holistic wetland aspects (section 2.3, Figure 2.3) and do not promote critical engagement with real wetland issues (refer to sections 7.3-7.8 and 9.3.2). The teacher approaches presented in this study appear to be narrowly conceptualised and aspects of education for sustainability are conspicuously missing (refer to sections 4.3, 4.7 and 4.8). The activities mentioned to be one-off activities and not sustained. This strongly suggests the existence of a major problem in teacher conceptualisation of the environment and formulation of appropriate action. This problem was also traced in the syllabus that emphasises understanding and not critical engagement with environmental issues (section 3.1). It is possible that the inadequacies in the syllabus could be responsible for making teachers develop learning objectives that were not geared towards critical engagement with issues as observed during the document analysis of their schemes of work (Appendix 3.12) and during the classroom observations (Appendix 3.11). Some of the teachers acknowledged the need for more training and follow-up to make them competent in addressing local wetland issues and risks (section 8.15). The pursuit of sustainable use of wetlands using the different opportunities (section 10.2) does not seem to be taking place. This suggests the need for rethinking of teacher pre-service and in-service training especially on aspects of promoting sustainable use of wetlands.

The need for more training and follow up was also a strong recommendation by 36 out of 54 teachers in the questionnaire (Question 37 in Appendix 5.5). Some of the teacher proposals include making training and follow up more frequent, using different wetlands during training, making training more practically oriented, involving more teachers, giving teachers special

assignments to carry out activities and publishing reports from teachers on local interventions. These responses are considered valuable in this study since they are supportive of the principles of education for sustainability on the need for trainers to work more closely with teachers to improve each other's conceptions and practice.

The foregoing responses from teachers suggest the need for teachers to be involved in environmental education processes that contribute towards their being more enlightened on the holistic aspects of the environment and how to develop education responses that are compatible with its sustainability (sections 4.7 and 4.8). These education responses should be based on a process approach and praxis (section 9.4.8) in solving environmental problems instead of using one-off activities (Stapp & Wals, 1993; O'Donoghue & Janse Van Rensburg, 1995; O'Donoghue & McNaught, 1989; Janse Van Rensburg, 1995; Gough & Robottom, 1993). Since the curriculum seems to be deficient in promoting critical environmental consciousness (Fien, 1993), it could be crucial to review it so as to integrate aspects that encourage active learning (section 4.7.7) and critical inquiry through critical reflection of the local contextual issues and also to promote local action taking.

10.5 Motivation for teachers to use various contexts in wetlands education

Teachers reported being motivated to champion for wetlands conservation (sections 8.3, 9.2.1, 9.4.3). They cited locally based perceptions as responsible for motivating them to undertake local action to conserve wetlands. The motivation traversed the biophysical, social, economic and political aspects of wetlands. The proportion of teachers for each aspect of motivation varied considerably. Curricular-based motivation dominated in the subjects and clubs while the in-service training dominated at the community level. The biophysical, economic and social concerns were greater sources of motivation at club level. The political aspects motivated teachers at community level as well as clubs but not at subjects level. The curricular concerns were not a motivator at community level. The results suggest that the teachers' meaning making process as well as motivation is directed by various contextual issues that include the holistic aspects of wetlands, local interactions with each other and with wetlands, the in-service training as well as curricular directives. These are context specific and differ among the teachers. This

suggests the need for teacher trainers to pay closer attention to these discrepancies in contexts, meaning making and teacher motivation. It would be useful to identify the motivators and to address them so as to maximise the value of the training programme for the teacher. The training should in particular aim at enhancing greater illumination of the holistic aspects of wetlands (section 2.3) as well as its relevance to the contextual challenges to the teacher in terms of what s/he does within the curriculum, clubs, environmental days, at school and at the community level.

In this study, although the motivation appeared locally based, the teachers' actions seemed not to be informed by the local context. The research also failed to establish the interaction and relationships between teacher motivation and the activities cited. There seemed to be no relationship between motivation and enthusiasm to address local wetland problems. This area needs further research.

Using the questionnaire (Question 37 in Appendix 5.5), teachers also recommended the need for promotion of motivation using incentives such as rewards for excellent performance, involving pupils in competitions and awarding prizes, involving teachers and encouraging them and giving financial benefits. These findings reiterate the need for trainers to establish needs of their trainees to be aware of their contextual and motivational discrepancies towards various aspects of the environment (Figure 2.2). This analysis could be done before the programme implementation to improve the relevance of the interventions to the trainees (section 4.7.1). The teachers could also be motivated through provision for various incentives such as certificates and recognition awards to acknowledge their commitment in working innovatively for conservation of wetlands.

10.6 Constraints to teachers at the local context

Teachers cited a number of problems that hinder them from working comfortably within the formal curriculum (section 8.15) and the non-formal context (sections 9.2.3, 9.3.4 and 9.4.6). These constraints traverse economic, social, political, biophysical and educational related problems. The main biophysical constraints were related to lack of wetlands that lead schools to not view wetland threats as relevant locally (section 8.15, 9.2.3 and 9.3.4). Other biophysical problems were related to drought (sections 8.15, 9.3.4). These constraints suggest the need for

teachers to be encouraged to understand these complex biophysical relationships in wetlands (section 2.3.1) and their influence at every water point. This would help in boosting relevance (section 4.7.1) of wetlands to every geographical context regardless of whether wetland features are externally conspicuously present or not. This aspect also brings into focus the need for consideration of the issue of the local context in terms of the natural environment where the programme is being implemented. Training programmes should acknowledge the fact that some areas are better endowed with resources than others. In the case of this study, those areas without wetlands form catchments of other wetlands downstream. The relationship between the catchment, wetlands and the water cycle can assist in promoting high regard for wetlands even for those situated far away. This aspect would also help in addressing the boosting of the complex aspects of the water cycle through afforestation programmes that can help in increasing moisture in the atmosphere as well as retention of water on the ground to recharge underground aquifers (section 2.3.1).

Economic constraints are mainly anchored on population pressure as well as invasion of wetlands for livelihoods such as agriculture and grazing (sections 8.15, 9.2.3, 9.3.4 and 9.4.6). These problems cut across both formal and non-formal contexts. In the global context, the issue of sustenance of livelihood and its impact on the natural resources was partly responsible for sparking off the sustainable development debate in the 1960's (Greenall, 1987) and the debate is ongoing (section 4.3). The responses by the teachers in this study suggest that this ongoing debate about sustainable development is relevant to Kenya where wetlands sustain livelihoods of people (section 2.3). Environmental education programmes for wetlands cannot afford to ignore addressing economic aspects especially the issues of promotion of sustainable use of wetland resources.

Other economic aspects are related to lack of facilities to tackle the problem (section 8.4.2, 8.15) as well as funds for various purposes (sections 8.15, 9.3.4, 9.4.6) such as for seedlings, to put up projects on wetlands, for outdoor activities, for learning materials, for conservation, for demarcating wetlands into sections for people and animal use, for garbage collection, for organizing environmental days and to fence the school. Using the questionnaire (Question 37 in Appendix 5.5), 24 out of 54 teachers also recommended provision of more resources such as

books, posters and videos. They also cited need for support from the local people and administration as well as financial support. These responses suggest the need for recognition of financial implications of teacher interventions for wetlands conservation. This implies the need for integrating an aspect of fundraising in the training programmes to raise funds to support wetland conservation campaigns.

In section 2.3 and Figure 2.3, the social aspects of wetlands were considered as comprising of issues of culture, heritage, spiritual rites and beliefs, transhumance, indigenous knowledge and settlements of people. The findings of this study suggest that the teacher could be experiencing some social problems with respect to the nature of relationships prevalent within the local context. The responses suggest the existence of constraints in local relationships making the teachers regard the community as unfriendly, ignorant and discouraging. Other aspects of these relationships include barriers due to language and culture, having alternative sources of water that make people ignorant and cause them to disregard the local wetlands. The social constraints were more prevalent within the curricular and community context and only a few were noted at the club and environmental days level.

Teaching is a process of creating relationships for people to explore, discuss, reflect and respond to issues. These relationships are dynamic and meanings are assumed to emerge on a daily basis based on interactions with things, objects and contexts (refer to section 5.3). The social aspects of conflicts in local relationships affect teachers' meaning making process as well as the perceptions of involving the pupils and the community in wetlands conservation. This observation reiterates the need for wetlands education to consider issues of local social relationships as well as meaning making as crucial issues that enhance local conservation action.

In section 2.3.4, political aspects for wetlands that were identified include issues of ownership, governance and access and use decisions. The findings of this study broaden the scope of political aspects of wetlands education to integrate issues of collaboration and cooperation, ownership, time and predetermined directives of the curriculum (sections 8.15, 9.2.3, 9.3.4 and 9.4.6). Some teachers viewed the problem as enormous suggesting some 'action paralysis' after being overwhelmed by the problems. Other teachers complained of lack of confidence and

existence of misconceptions. Section 2.4 discusses the implications of political aspects to conservation of wetlands that involve enabling learners to explore the local contextual issues to understand the stakeholders in wetland ownership as well as decision making issues. Sustainability entails the consideration of living in harmony with one another and in sharing and equitable distribution of resources among all people (IUCN *et al.* 1991; Fien, 1993; UNESCO, 1997). This implies recognition and respect for each other's role at the local level as well as working together to promote sustainability. The teacher responses on political issues also suggest the need for focusing on local environmental and other policy issues for the school and the community. The non-recognition of the teacher outside the school as well as lack of support from the local administration suggests the need for a review of the local policies to harmonise them with those of the school. The community does not seem to recognise the teacher as a resource person for the various local environmental problems. The local policies should recognise the variety of skills available locally including those from the teachers. The responses in this study suggest that besides addressing political issues of wetlands (Figure 2.3, section 2.3.4), there is a need to address the personal and contextual limitations listed above as problematic.

The data from teachers also suggested that educationally based constraints confronting teachers were numerous. They traverse aspects of having few environmental education competent personnel at school, clarity of issues, inadequate training, lack of resources, a deterministic curriculum and lack of local support (section 8.15, 9.2.3, 9.3.4, and 9.4.6). These issues have been discussed in greater detail in section 9.4.8. The educational constraints mentioned underscore the importance of consideration of other developments in the concept of education when involving teachers in training programmes. Jickling (1992:5) considers environmental education as a concept related to an *a priori* conception of education and the need for practitioners to reconcile both conceptions. This is relevant to wetlands education and suggests the need to rethink the relationship between wetland issues and education so that each enhances relevance of the other. The responses by teachers suggest that wetland training for teachers is not just a matter of involving them in exploring wetland issues but also integration of educational relevance of each aspect of wetlands with respect to promotion of wetland sustainability.

10.7 Seeking assistance

Some teachers reported having sought assistance locally to solve their various perceived problems. Education for sustainability stresses the need for all people to work together to address their local environmental issues in order to enhance a sustainable future (refer to section 4.3, 4.7). Working together involves recognition and utilization of local expertise who are familiar with the local context (Pretty, 2002). The expertise sought ought to inject relevant input that is commensurate with the local environmental issues, risks and constraints. In the case of this study, the teachers' suggestions of consultancy were based on the need for logistical support rather than for professional and technical aspects highlighted in earlier sections of this chapter. This consultation cannot be considered as relevant to the problems identified in this study and seems to be unrelated to the quest for sustainability of local wetlands. This suggests the need for training programmes for teachers to put more emphasis on aspects of maximising cooperation, collaboration as well as recognition, respect and use of local resources, including human expertise.

10.8 Summary of tentative recommendations

This section summarises the tentative recommendations advanced in section 10.2- 10.7. The summary provides a list of insights that wetland training for teachers could consider. These include

- Strengthen the emphasis on holistic aspects of wetlands (Figure 2.3) to promote appropriate meaning making process.
- Understand the local context (geographical, social, economic, historical, political, language, gender and age).
- Generate knowledge with teachers on how to maximise action within the local context.
- Learning should be informed by and relevant to the local context.
- Explore teachers' pre-conceived meanings for wetlands and help them to address issues and risks from that level.
- Explore with teachers the relevance of wetland issues in different subjects, clubs, environmental days, the school fraternity as well as the local community.

- Working closely with teachers to develop and avail more resource materials
- Develop training programme with and not for teachers.
- Train teachers on aspects of fundraising
- Explore with teachers on how to influence local policies to mobilise support for wetlands conservation projects.
- Explore teaching aspects that are compatible with education for wetland sustainability. This entails issues on how to address local problems, that is, how to teach or involve pupils, teachers and the community in activities that can enhance wetland sustainability.

- The response to environmental issues and risks should be based on the process approach that integrates exploration, dialogue, encounter and reflection. The insights from each cycle should be fed into the proceeding cycles in an effort to perfect response and should integrate praxis (section 9.4.8).

- Train teachers on the use of local consultancy. This includes sourcing appropriate professional and technical inputs commensurate with the sustainability needs of the local context.

10.9 Reflections on the research

This section of the thesis takes a critical look at the research process of this study: the research formulation, implementation and data analysis. Some of the issues discussed include the research aim, objectives, assumptions as well as the theoretical framework and methodology. Others include the data collection techniques and tools and the research findings.

10.9.1 Research aim

This research aimed at exploring teacher perceptions about wetlands and how they champion for wetlands conservation locally (section 1.4). In my view, this aim has been realised. Teachers gave various perceptions about wetlands (sections 7.2-7.8 and 9.4.2), environmental education (section 7.11), local community awareness about wetlands (section 7.9) and about their potentials locally (section 7.10). The teachers in this study also reported how they engaged the other

teachers from their schools who did not participate in the wetlands workshop (section 8.4), pupils (sections 8.5, 8.6, 9.2.2, 9.3.3 and Appendix 3.11 and 3.12) and the community (section 9.3.3, 9.4.5) in knowing about wetlands. Nevertheless, as the study progressed several weaknesses emerged as discussed below.

The teachers' practice is informed by several policies such as the curriculum that reflects the government's position on the kind of knowledge, skills and attitudes to be pursued by citizens (RoK, 1992, 1998). Although this study looked at the curriculum and how it informs the teaching practice in schools, the study could have shed more light on teachers' awareness of other relevant policies that inform wetlands conservation. For instance the study could have established how much the teachers know about wetland and local administrative policies and how relevant these are to their practice. The political constraints in this study strongly implicate the unfriendly local policies (or their absence) as responsible for the teachers' inadequate responses to local wetland issues (sections 8.15, 9.2.3, 9.3.4 and 9.4.6). Since these were emergent issues from the data obtained, the study could have looked at how wetland and local policies consider the teacher and the process of schooling as tools for enhancing environmental sustainability at the local level. The views from wetlands and local policy issues could have added more insights to this study. These are issues that could be considered in further studies on wetlands.

10.9.2 Objectives

This study was guided by various objectives from which several research questions were formulated (section 1.4). These objectives assisted in the development of a grounded theory about wetlands according to the viewpoint of 83 teachers who participated in this study. This study managed to realise these objectives as outlined in chapters 6-10. Reflection on realisation of each of these objectives is discussed below.

10.9.2.1 Teacher perception of wetlands

Realisation of this objective is documented in section 7.3-7.8. The key aspects highlighted from teachers suggested inadequacy in employing a holistic outlook of wetlands. This question had

given teachers options from which to give a rating using a Likert scale (questions 14 and 15 in Appendix 5.5). The weakness realised in this section was that, although the Likert scale had some open-ended sections for teachers to fill in, they failed to provide additional aspects to the list other than the ones suggested earlier by the researcher. The Likert scale therefore gave the researcher more data than when teachers were asked to speak by themselves. During the interviews (section 5.8.2, Appendix 5.7), the teachers also gave few suggestions on the valuable wetland aspects in their localities. This suggests that in some instances, closed-ended questions could be more appropriate than open-ended questions since the researcher is able to give the teachers a wider range of choices to respond to. The data from this study showed that most teachers responded to most of the issues presented to them using the Likert scale (Table 7.1-7.4). However if care is not taken, use of the Likert scale could disenfranchise the respondents by not giving them an opportunity to express their subjective context-specific views. Leaving some options for open-ended questions could be desirable.

Reflection also led to identification of some weaknesses in the questionnaire design. This could be attributed to the fact that the questionnaire was designed early in the research process (section 5.7). The holistic aspect of wetlands (Figure 2.3) was a later development in this research after extensive reading about sustainability issues. The questionnaire questions do not seem to have struck a balance between the different aspects of wetlands. Although this research considered teachers to know much about wetlands, the options given in the Likert scale for wetland aspects (questions 14 and 15 in Appendix 5.5) should have considered the holistic aspects of the environment (Figure 2.2 and 2.3). This could have made the teacher responses less biased towards some aspects of wetlands. Nevertheless, since the questionnaire and interviews had open-ended questions, the teachers still had the opportunity to propose issues that were compatible with the holistic aspects of wetlands.

10.9.2.2 Integration of wetland issues within the formal and non-formal contexts.

Realisation of this objective is documented in various sections of chapters 8 and 9 and summarised in section 10.3. Teachers suggested that they had various forums where they integrate wetland issues in different contexts (section 10.3). The use of many questions

addressing the same aspects was an important validation tool (Appendix 5.5 and 5.7). Some weaknesses of this aspect was that at community level, it was not easy to differentiate between opportunities initiated by the teacher him/herself and those initiated by other players such as the local administration where the teacher just participated like any other person. This problem was more prevalent in the questionnaire. This issue was addressed in the school visits where further probing was done to establish teachers' passion for conservation of local wetlands. This supports the need for use of multiple methods so that the researcher through triangulation could confirm or reject the data and hence enhance validity and reliability of the research (sections 5.10.2 and 5.10.3).

The data presented by teachers on integration of wetland issues in both formal and non-formal contexts was valuable since it represented the teachers' perceptions of expected environmental best practice. The responses represent a broader picture of meaning making (section 5.4) by teachers on how to address local environmental issues and risks.

10.9.2.3 Teacher actions in addressing local wetland issues

The realisation of this objective is also documented in various sections in chapters 8 and 9 and summarised in section 10.4. Teachers' responses suggested application of a narrow range of approaches to wetlands conservation. The possible weakness of addressing this objective was that it was not possible to strongly illuminate the relationships between teacher actions and their motivation (section 10.5) as well as the contextual constraints that teachers experience (section 10.6). Nevertheless, this is commonly acknowledged as difficult to establish in this qualitative non-positivistic research (Cohen *et al.* 2000).

The observation of teachers in class was also inadequate since some of the teachers were not teaching wetland related topics. It is possible that the researcher misrepresented what they did in class in the sense that it could differ from what they could have done if they were handling a wetland related topic. The document analysis of the schemes of work as a yardstick for teachers' activities (Appendix 3.12) was also inadequate because what was documented on paper may not

be a reflection of what teachers actually do in class. It may be written as a formality but not followed by the teacher. There was no way of knowing this.

10.9.2.4 Teacher motivation in championing for wetlands conservation

Realisation of this objective is documented in sections 8.3, 9.2.1, and 9.4.3 and summarised in section 10.5. Although many teachers claimed to be motivated, their responses (section 10.4) were to the contrary. There seemed to be a mismatch between motivation and the corresponding actions to conserve local wetlands. However, it was not easy to match motivation with the teachers' environmental action. The data just provided a pool of information on different orientations of teacher motivation that appeared diverse in terms of aspects prescribed. These teacher responses again suggested the need for consideration of the holistic aspects of wetlands (section 2.3). More research is needed in this area.

10.9.2.5 Constraints influencing teacher action at local level

Sections 8.15, 9.2.3, 9.3.4 and 9.4.6 present the responses associated with the realisation of this objective. The teacher responses strongly suggested the emergence of the holistic approach for wetlands conservation (section 2.3). Their responses also acknowledged the need for teachers to treat their contextual and personal problems as issues to be addressed in order to champion for wetlands conservation. Some of the constraints suggested require the teacher to rethink his/her commitment to wetlands conservation. Teachers just complained but failed to give comments on their enthusiasm in engagement with local wetland issues. More research is needed in this area.

10.9.2.6 Implications of teacher perceptions and actions to conservation of wetlands

This objective is addressed in various sections of the thesis from chapter 6 to chapter 10 and summarised in section 10.8. The general observation is that much needs to be done towards empowerment of teachers to champion for wetlands conservation. The weakness of these implications is that they are theorised from a small case study and may not be generalisable for a bigger sample (section 5.5.4). There is need for more research on this area.

10.9.3 Assumptions of this study

This study was guided by several assumptions (refer to section 1.4). Some were viable while others were proved wrong. For instance, teachers' consideration of wetlands as valuable resources suggests that the assumption was viable (section 7.3-7.6). The teachers were able to associate themselves with wetlands as being of personal value (section 7.4) and also valuable to the community (section 7.5 and 7.6). This supported the research's theoretical base that teachers make meanings about their wetland resources (section 5.4).

Teachers reported the existence of opportunities within the formal and non-formal contexts where wetland issues could be integrated (section 10.3). This finding further supported that meaning making is extended to the application phase with teachers being able to identify forums for addressing the wetland issues.

Many teachers claimed that they were motivated to champion for wetlands conservation in both formal and non-formal contexts (section 10.5). Their responses seemed to suggest that the teachers had both intrinsic and extrinsic interest in conserving local wetlands. However their actions did not seem to tally with their motivation and this makes their response appear suspect. This area needs more research.

Teachers reported the efforts they had made to help in alleviating problems in the local wetlands. However this study revealed that they do not perceive wetlands holistically (section 10.2) and their actions were not in line with the principles of education for sustainability (section 10.4). These findings suggest that the assumption about teachers' use of the holistic aspects of wetlands and educating for sustainability did not hold in this study. This implies that the teachers may not be familiar with these aspects. This area also needs more research.

10.9.4 Theoretical framework and methodology

Chapters 2, 3 and 4 presented the theory generated from the viewpoints of various authors and authorities regarding wetland issues, environmentalism, sustainable development and environmental education. These views were considered relevant to this research and were used in two ways. The review of literature helped in the development of a theoretical and a conceptual framework for this study outlining what the researcher should look for from teachers as well as highlighting the challenges that teachers face in their practice of championing for sustainable use of wetlands (section 2.4). This grounded theory enabled the researcher to locate wetlands within a holistic view of the environment as well as to explore the implications of environmental ideologies and sustainable development debates on wetlands conservation (section 4.4 and 4.5).

The research underpinnings of this study were based on symbolic interactionism and meaning making (section 5.4) leading to action for sustainability of wetlands. The data and its interpretation in this thesis presents a comprehensive grounded theory that applies to the teachers who participated in this study. This research is considered meaningful and relevant to the Kenyan context since the grounded theory is informed by data as well as the current ongoing debate on sustainable development and wetlands.

10.9.5 Data collection techniques and tools.

This case study survey involved teachers who participated in an in-service training course in 1999. The researcher would have liked to involve more teachers to incorporate more views especially from the survey questionnaire. However this was not possible because of teachers' failure to return the questionnaires despite being reminded several times to do so (section 5.6). Problems with each tool of data collection are discussed in their respective sections in the thesis (section 5.8).

The triangulation of methods and data from various sources enabled this researcher to make the data more meaningful. For instance the methods used by teachers in teaching about wetlands, although initially stated in the questionnaires, became better understood when the teacher was

interviewed and observed (Appendix 3.11). More data was also obtained from the document analysis that traced the teachers' problems to the wider curriculum expectations (Appendix 3.1-3.10 and 3.12). The importance of data triangulation was also strengthened by the realisation that one teacher gave inconsistent information during the interview (section 9.4.2, Plate F)

10.9.6 The findings

The findings suggest that most of the objectives of the study were realised. Teachers suggested that they have contextually based meanings about wetlands (Chapter 7). The study also indicated identification of opportunities to address wetland issues in both formal (chapter 8) and non-formal (chapter 9) contexts. Teachers also highlighted the activities they undertake, their motivation and the problems they face and all these were critically analysed (Chapter 6-10).

However, categorisation of the issues into different areas of the holistic aspects (Figure 2.3, section 4.8) was not easy. Some of the activities were difficult to categorise. This strengthens the notion by the proponents of these typologies that the environment is an interacting system and not a set of neatly packed aspects that can be treated as independent. However, the separation of these aspects in this study was necessary to enhance their detailed discussion.

The findings of this study failed to respect the boundaries imposed during the research process in section 5.6.2. The research groups were initially divided into two categories (the active and inactive teachers in promoting wetland conservation) during phase two of the study with a view that the data gathered may portray some significant trends. Nevertheless, the teacher responses tended to show a lot of overlaps between the various teacher categories. The researcher therefore treated the responses uniformly without giving prominence to the teacher categories mentioned in section 5.6.2.

This explorative study sheds light on broad issues of wetlands conservation and could be quite informative on the strengths and weaknesses of pursuit of sustainable development for wetlands using primary school teachers. The study sheds light on the *status quo* of primary school teachers with regard to wetlands and how they champion for their conservation. Although the study shows

dismal performance of teachers in wetlands conservation (section 10.4), this does not constitute a weakness in the training programme but suggests a major problem in the meaning making process by the teachers. The study strongly suggests the need for an environmental education intervention to address meaning making and action processes for conservation of wetlands. The holistic approach proposed and used in this study may not be clear to most environmental educators and was even ignored in the wetland training programme that the teachers in this study were involved in (Appendix 1.1). This study is considered to be a significant contribution to wetlands education in that it combined views of various authors on the holistic aspects of the environment (section 2.3) and reflected these on the teachers' views to come up with suggestions on aspects that could be considered in future training sessions for teachers on wetlands sustainability (section 10.8).

10.10 Synthesis of areas for further research

This research identified various areas that may require further research attention. Details on how this research arrived at these proposals are given elsewhere in the text. Areas that need further research include

- What kind of posters and other resource materials on wetlands can be of greater value to teachers and how can they be developed, distributed and used?
- What relationships exist between motivation (perceptions) and actions for wetlands conservation?
- How can wetlands education programmes promote integration of the holistic aspects of wetlands in the various opportunities available to the teacher?
- What kinds of constraints exist in various contexts and what is their relevance to education for sustainability of wetlands?
- What policies inform education for wetlands and of what relevance are they in various contexts?

10.11 Conclusion

This thesis has explored several aspects of wetlands education using a case study of 83 teachers (54 in-serviced and 29 not in-serviced). The responses from teachers suggest that meaning making through symbolic interactionism (section 5.4) is relevant in the Kenyan wetlands context. The various meanings by teachers show a close and interactive relationship with wetlands which leads to generation of knowledge about them. These wetland aspects also influence teachers' motivation to promote wetlands conservation. Besides wetland aspects, curriculum and in-service training acted as a source of motivation. The variability in consideration of various issues in wetlands suggests the need for environmental education to promote consideration of wetlands holistically. Holistically in this case entails consideration of the holistic aspects of wetlands (section 2.3, Figure 2.3) which are grounded in the local context (section 5.3) and concomitant with the principles of education for sustainable living (sections 4.3, 4.4, 4.7 and 4.8).

Teachers reported availability of various opportunities where wetland issues could be integrated. These include subjects, clubs, environmental days and various community forums. However, the response on the use of these opportunities was seen to be inadequate. There was inadequate consideration of the holistic aspects of wetlands in both formal and non-formal contexts. Aspects of education for sustainability were seen to be conspicuously missing. Teachers attributed these inadequacies to various constraints they experience locally. The problems traverse lack of awareness on the holistic aspects of wetlands as well as education for sustainability.

The overall picture generated by this research is that environmental education for wetlands sustainability cannot be underrated and should be a crucial way forward in all levels of learning in Kenya. The absence of environmental education for teachers could be responsible for the persistence of problems in meaning making and inadequate response to environmental issues and risks at both school and the community contexts. The contextual differences in various regions suggest the need for environmental education for wetlands to be oriented towards enabling teachers to think critically and to reflect on local issues as well as to formulate and implement environmental action praxis.

REFERENCES

Abira, M.A. (1997). Water resources. In Ogola, J.S., Abira, M.A. & Awuor, V.O. (Eds.), *Potential impacts of climate change in Kenya* (pp 43-53). Nairobi: Climate Network Africa.

Aggleton, P. (1987). *Rebels without a cause*. London: Falmer Press.

Ames, C. & Ames, R. (1984). Systems of student and teacher motivation: Toward a qualitative definition. *Journal of Educational Psychology 76*, 535-556.

Amwatta, M.C.J. (1999). The disappearing Doum Palm (Hyphaene compressa): A tree that meets contingencies for the Turkana people of Kenya. *Dryland Biodiversity Biannual Newsletter* 3.

Anderson, G. (1990). *Fundamentals of educational research*. London: Falmer Press.

Apel, H. (1998). Education for sustainability from a northern perspective. In Veranu, J. *Adult and community education for sustainability in the Third World* (pp i-xi). Fiji South Pacific: Fiji Adult and Community Education Think Tank/FCEA.

Arksey, H. & Knight, P. (1999). *Interviewing for social scientists.* London: Sage.

Atkinson, P. (1990). *The ethnographic imagination: Textual constructions of reality*. London: Routledge.

Awer, M. (1997). WWF's contribution to the NGO's forum on development of a national wetlands policy. In Gichuki, N. & Nasirwa, O. (Eds.), *NGO forum for national wetlands policy: Contribution of NGOs.* Workshop proceedings, 13-14th February. Nairobi: KWWG & IUCN.

Babikwa, D. (2002). Policy playing out in the field: A case study of the implementation of sustainable agriculture in Uganda. In Janse Van Rensburg, E. (Ed.), *Environmental Education, Ethics and Action in Southern Africa,* (pp 47-61). Pretoria: Environmental Education Association of Southern Africa & Human Sciences Research Council.

Bailey, P. (1994). Environmental education and core and foundation subjects: Geography. In Goodall, S. (Ed.), *Developing environmental education in the curriculum* (pp 65-68). London: David Fulton.

Ballantyne, R.R. & Packer, J.M. (1996). Teaching and learning in environmental education: Developing environmental conceptions. *Journal of Environmental Education 27*(2), 25-32.

Barbier, E.B., Acreman, M. & Knowler, D. (1997). *Economic valuation of wetlands: A guide to policy makers and planners*. Gland: Ramsar Convention Bureau.

Barrington, A.L. (1984). History and environmental education. *Southern African Journal of Environmental Education 1*,25-26.

Bassey, M. (1995). *Creating education through research: A global perspective of educational research for the 21st century.* Kirklington, Newark: Kirklington Moor Press/BERA.

Becha, H.B. (1997). The East African Wildlife Society and wetlands conservation priorities for wetland policy development. In Gichuki, N. & Nasirwa, O. (Eds.), *NGO forum for national wetlands policy: Contribution of NGOs.* Workshop proceedings, 13-14th February. Nairobi: KWWG & IUCN.

Bell-Cross, G. & Minshull, J.L. (1988). *Fishes of Zimbabwe*. Harare: Trustees of the National Museums and Monuments of Zimbabwe.

Bennun, L. & Njoroge, P. (1999). *Important bird areas in Kenya.* Nairobi: East African Natural History Society.

Berteaux, D. (Ed.) (1981). *Biography and society : The life history approach in the social sciences.* Newbury Park: Calif.: Sage.

Blumer, H. (1969). *Symbolic interactionism: Perspective and method.* New Jersey: Prentice-Hall.

Boardman, D. & Ranger, G. (1996). Teaching sustainable development. *Teaching Geography 21* (4), 161-167.

Boserup, E. (1989). *Womans role in economic development*. London: Earthscan Publications.

Boulton, M. & Eddershaw, J. (1997). *Pan African wildlife clubs resource book.* Cheltenham: International Centre for Conservation Education.

Branson, M.S. (2001). Integrating civic education into the school system: Experiences from the United States of America. *The Independent Review 1* (1) 4-24.

Burgess, R.G., Pole, C.J., Evans, K., & Priestly, C. (1994). Four studies from one or one study from four? Multisite case study research. In Bryman, A. & Burgess R.G. (Eds.), *Analysing qualitative data* (pp129-146). London: Routledge.

Cain, D. (1994). Environmental education and core and foundation subjects: Mathematics. In Goodall, S. (Ed.), *Developing environmental education in the curriculum* (pp 48-50). London: David Fulton.

Cameron, D., Frazer, E., Harvey, P., Rampton, M.B.H. & Richardson, K. (1992). *Researching language: Issues of power and method*. London: Routledge.

Cantrell, D.C. (1993). Alternative paradigms in environmental education research: The interpretive perspective. In Mzarek, R. (Ed.), *Alternative paradigms in environmental education research* (pp 81-104). Troy, Ohio: North American Association of Environmental Education.

Capra, F. (1983). *The turning point: Science, society and the rising culture.* London: Fontana.

Carr, W. & Kemmis S. (1986). *Becoming critical: Education, knowledge and action research.* London: Falmer Press.

Carr, W. (1995). *Towards critical education inquiry*. Burmingham: Open University Press.

Carson, R. (1965). *Silent spring*. Harmondsworth, Middlesex: Penguin.

Clacherty, G. (1986). English as an arts discipline in environmental education. *Southern African Journal of Environmental Education 3*, 3-5.

Clandinin, D.J. & Connelly, F.M. (1994). Personal experience methods. In Denzin N.K. & Lincoln, Y.S. (Eds.), *Handbook of qualitative research* (pp 413-427). London: Sage.

Cohen, L. & Manion L. (1994) *Research Methods In Education* (4th ed.). London: Croom Hemd.

Cohen, L., Manion, L. & Morrison, K. (2000). *Research methods in education* (5th ed.). London: Routledge Falmer.

Dabbs, J.M. Jr. (1982). Making things visible. In Van Maanen, J., Dabbs, J.M. Jr., & Faulkner, R.R. (Eds.), *Varieties of qualitative research* (pp 31-63). Newbury Park, Calif.: Sage.

Daly, H.E. & Cobb, J.B. (1990). *For the common good: Redirecting the economy towards community, the environment and sustainable future*. London: Green Print.

Daly, H.E. (1996). *Beyond growth: The economics of sustainable development*. Boston: Beacon Press.

Daly, H.E. (Ed). (1973). *Toward a steady-state economy*. San Francisco: Freeman.

Denzin, N.K. & Lincoln, Y.S. (Eds.) (1994). *Handbook of qualitative research.* Thousand Oaks: Sage Publications.

Denzin, N.K. (1970). *The research act*. Chicago: Aldine.

Di Chiro, G. (1987). Environmental education and the question of gender: A feminist critique. In Robottom, I. (Ed.), *Environmental education: Practice and possibility* (pp 23-48). Geelong, Victoria: Deakin University.

Disinger, J.F. & Roth, C.E. (1992) Environmental education research news. *The Environmentalist, 12* (3), 165-168.

Dove, J. (2000). Conceptions of rainforests. *Teaching Geography 25*(1), 32-34.

Dryzek, J.S. (1998). Political and ecological communication. In Dryzek, J.S. & Sclosberg, D. (Eds.), *Debating the earth: The environmental politics reader* (pp 584-597). Oxford: Oxford University Press.

Dugan, P. (Ed.). (1993). *Wetlands in danger – a world conservation atlas.* New York: Oxford University Press.

Dugan, P.J. (Ed.). (1990). *Wetland Conservation: A review of current issues and required action*. Gland: IUCN.

Easterby-Smith, M., Thorpe, R. & Lowe, A. (1994). The philosophy of research design. In Bennet, N., Glatter, R. & Levacic, P. (Eds.), *Improving educational management through research and consultancy*. London: Paul Chapman.

Eckersley, R. (1992). *Environmentalism and political theory: Toward an ecocentric approach*. London: UCL Press.

Eisemon, T.O. (1989). The impact of primary schooling on agricultural thinking and practices in Kenya and Burundi. *Studies in Science Education 17*, 5-28.

Eisner, E.W. & Peshkin, A. (Eds.). (1990). *Qualitative inquiry in education: The continuing debate*. New York: Teachers College Press.

Ekins, P. (1993). *The gaia atlas of green economics.* New York: Anchor Books.

Emerton, L. (1998). *Economic tools for valuing wetlands in Eastern Africa*. Nairobi: IUCN.

Fien, J. & Hillcoat, J. (1996). The critical tradition in research in geographical and environmental education research. In Williams M. (Ed.), *Understanding geographical and environmental education* (pp 26-40). London: Cassell.

Fien, J. & Tilbury, D. (2002). The Global Challenge of Sustainability. In Tilbury, D., Stevenson, R., Fien, J. & Schreuder, D. (Eds.), *Education and sustainability: Responding to the global challenge*. Gland: IUCN.

Fien, J. (1993). *Education for the environment: Critical curriculum theorising and environmental education*. Geelong, Victoria: Deakin University.

Fien, J. (1997). Curriculum, sustainability and civil society. In Scoullos M.J. (Ed.) *Environment and society: Education and public awareness for sustainability* (pp 177-183). Proceedings of the Thessaloniki International Conference organized by UNESCO and the Government of Greece, 8-12 December, Athens.

Freire, P. & Shor, I. (1987). *Pedagogy for liberation: Dialogues on transforming education*. London: Macmillan.

Gang, P.O. (1997). SPEK's activities relating to wetlands and issues for consideration in the development of a national wetlands policy. In Gichuki, N. & Nasirwa, O. (Eds.) *NGO forum for national wetlands policy: Contribution of NGOs*. Workshop proceedings, 13-14th February. Nairobi: KWWG & IUCN.

Gatheru, S.W. (1996). *Cultural dimensions of biodiversity.* Paper presented at the Biodiversity Module for Teacher Training Colleges Workshop, ICCT College, Nairobi.

Gayford, C. (1991). Environmental education in the national curriculum: An update. *Annual Review of Environmental Education 4*,11-13.

Gichuki, N. & Nasirwa, O. (Eds.) (1997). *NGO forum for national wetlands policy: Contribution of NGOs*. Workshop proceedings, 13-14th February. Nairobi: KWWG & IUCN.

Gichuki, N. & Ndiritu, G.G. (1999). The traditional mechanisms of managing wetland resources by pastoral communities: A case study of the Maasai community. In NMK Wetland Resources Programme, *Publications on biodiversity of wetland ecosystems in Kajiado District 1996-1999*. Nairobi: NMK.

Gichuki, N. (1997). Kenya Wetlands Working Group: Policy issues pertaining to wetlands in Kenya. In Gichuki N. & Nasirwa O. (Eds.), *NGO forum for national wetlands policy: Contribution of NGOs*. Workshop proceedings, 13-14th February. Nairobi: KWWG & IUCN.

Gichuki, N.N, Oyieke, H.A. and Ndiritu, G.G. (1999). Assessment and monitoring of wetlands for conservation and development in drylands: A case study of Kajiado district, Kenya. In NMK Wetland Resources Programme, *Publications on biodiversity of wetland ecosystems in Kajiado District 1996-1999.* Nairobi: NMK.

Gichuki, N.N., (1999). Wetlands biodiversity value and potential for sustainable utilization in arid and semi arid lands of Kenya. In NMK Wetland Resources Programme,

Publications on biodiversity of wetland ecosystems in Kajiado District 1996-1999. Nairobi: NMK.

Gichuru, N. (1999). Fisheries resources of the central Rift Valley lakes. In Gichuki, N. (Ed.), *Proceedings of stakeholder consultation workshop on conservation and sustainable use of biodiversity in the Eastern Rift Valley lakes held at Lake Bogoria National Reserve on 17-19 June*. Nairobi: NMK.

Gillet, D.P., Thomas, G.P., Skok, R.L. & McLaughlin, T.L. (1991). The effects of wilderness camping and hiking on the self-concept and the environmental attitudes and knowledge of the 12th graders. *Journal of Environmental Education 22*(3), 33-44.

Gitahi, P. (1997). Friends of Lake Nakuru and Lake Elmentaita. In Gichuki, N. & Nasirwa, O. (Eds.), *NGO forum for national wetlands policy: Contribution of NGOs*. Workshop proceedings, 13-14th February. Nairobi: KWWG & IUCN.

Glaser, B.G. & Strauss, A.L. (1967). *The discovery of the grounded theory*. Chicago: Aldane.

Goodman, J. (1992). Theoretical and practical considerations for school based research in post-positivist era. *Qualitative Studies in Education 5*(2), 117-133.

Goodson, I. (1980). Life histories and the study of schooling. *Interchange, 11* (4), 62-76.

Gough, A.G. & Robottom, I. (1993). Towards a socially critical environmental education: Water quality studies in a coastal school. *Journal of Curriculum Studies, 25*(4), 301- 316.

Gough, N. (1987). Learning with environments: Towards an ecological paradigm for education. In Robottom, I. (Ed.) *Environmental education: Practice and possibility* (pp 49-67). Geelong, Victoria: Deakin University.

Greenall, A. (1987). A political history of environmental education in Australia: Snakes and ladders. In Robottom, I. (Ed.), *Environmental education: Practice and possibility* (pp 3-21). Geelong, Victoria: Deakin University.

Grundy, S. (1987). *Curriculum: Product or praxis*. London: Falmer Press.

Guba, E.G. & Lincoln, Y.S. (1989). *Fourth generation evaluation.* California: Sage Publications

Habermas, J. (1972). *Knowledge and human interests (*2nd edn.). London: Heinemann.

Hale, M. (1986). Approaches to ecology teaching: The educational potential of the local environment. *Journal of Biological Education, 20* (3), 179-184.

Haluza-Delay, R. (2001). Nothing here to care about: Participant constructions of nature following a 12-day wilderness program. *Journal of Environmental Education, 32* (4), 43-48.

Hammersley, M. (1990). *Reading ethnographic research: A critical guide.* London: Longman.

Hanna, G. (1995). Wilderness-related environmental outcomes of adventure and ecology education programming. *Journal of Environmental Education, 27*(1), 21-32.

Hardy, P. (1988). The role of fine art in environmental education. *Southern African Journal of Environmental Education, 8*, 6-10.

Hargreaves, L. (1994). Environmental education and core and foundation subjects: Music. In Goodall, S. (Ed.), *Developing environmental education in the curriculum* (pp 83-86). London: David Fulton.

Hattingh, J. (2002). On the imperative of sustainable development: A philosophical and ethical appraisal. In Janse Van Rensberg, E. (Ed.) *Environmental education, ethics and action in Southern Africa* (pp 5-16). Pretoria: Environmental Education Association of Southern Africa & Human Sciences Research Council.

Higgs, P. (1995). Metatheories in philosophy of education: Introductory overview. In Higgs, P. (Ed.), *Metatheories in philosophy of education* (pp 3-17). Johannesburg: Heinemann.

Higgs, P. (1998). Theory and practice in educational discourse. In Higgs, P. (Ed.), *Metatheories in educational theory and practice* (pp 1-9). Johannesburg: Heinnemann..

Howard, G.W. (1992). Definition and overview. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.) *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 1-4). Nairobi: NMK

Howard, G.W. (1994). Wetland training institutions in East Africa. In Howard, G.W. (Ed.), *Understanding wetland biodiversity in East Africa*. Proceedings of a workshop on wetland biodiversity, Nakuru, Kenya 9-13th November. Field document 10. Nairobi: IUCN.

Huckle, J. (1991) Education for sustainability: Assessing pathways to the future. *Australian Journal of Environmental Education, 7*, 43-62.

Huckle, J. (1996). Realizing sustainability in changing times. In Huckle, J.B. & Sterling, S., *Education for sustainability* (pp 3-17). London: Earthscan.

Hughes, C. (1994). From field notes to dissertation: Analysing the step-family. In Bryman, A. & Burgess, R.G. (Eds.), *Analysing qualitative data* (pp 35-47). London: Routledge.

Hughes, R.H. & Hughes, J.S. (1992). *A directory of African wetlands*. Gland: IUCN.

Inter-Governmental Authority on Development (IGAD). (1999). *Summary literature review for the formulation of the IGAD project on environmental education and training.* Nairobi: Camfor Consultants.

Intergovernmental Panel on Climate Change (IPCC) (1990) *Climate change: First assessment report.* WMO/UNEP.

International Union for Conservation of Nature (IUCN). (1971). Education and the environment. *Papers of the Nevada conference of 1970 and the Zurich conference of December 1971. Morges. IUCN.*

Iozzi, L.A. (1989) What research says to the educator. Part two: Environmental education and the affective domain. *Journal of Environmental Education,* 20 (4), 6-13.

Irwin P.R (2002). *An introduction to conducting surveys and the use of questionnaires*. Unpublished research methodology course notes, Rhodes University, Education Department.

Irwin, P.R. (1984). The origin and development of environmental education: A world perspective. *Southern African Journal of Environmental Education, 1*, 7-9.

Irwin, P.R. (1993). *Environmental education in Bophuthatswana with particular reference to pre-service primary education.* Unpublished doctoral thesis, University of South Africa, Pretoria.

IUCN/Tana Delta Wetlands Steering Committee (TDWSC) (1994). *Environmental planning workshop*, 7-10th February 1994. Nairobi: IUCN East Africa Regional Technical Office.

IUCN/UNEP/WWF. (1980). *World conservation strategy: Living resources for sustainable development*. Nevada: IUCN/UNEP/WWF.

IUCN/UNEP/WWF. (1991). *Caring for the earth: A strategy for sustainable living*. London: Earthscan Publications.

Janse Van Rensburg, E. & Le Roux, K. (1998). *Goldfields participatory course in environmental education: An education in process. Course evaluation report.* Grahamstown: Rhodes University Environmental Education Unit.

Janse Van Rensburg, E. & Shongwe, D. (1994). Environmental education as a response to the environmental crisis. *Environmental Education Bulletin 8*, 9-12.

Janse Van Rensburg, E. (1995). *Environmental education and research in Southern Africa: A landscape of shifting priorities.* Unpublished doctoral thesis, Rhodes University, Grahamstown.

Jensen, B.B. & Schnack, K. (1997). The action competence approach in environmental education. *Environmental Education Research 3*(2), 162-178

JICA/GoK. (1992a). *The study of the National Water Master Plan: Sectoral report (B): Hydrology.* Nairobi: Japan International Cooperation Agency.

JICA/GoK. (1992b). *The study of the National Water Master Plan: Sectoral report (N): Environmental conservation.* Nairobi: Japan International Cooperation Agency.

JICA/GoK. (1992c). *The study of the National Water Master Plan: Sectoral report (D): Domestic and industrial water supply*. Nairobi: Japan International Cooperation Agency.

Jickling, B. & Spork, H. (1998). Education for the environment: A critique. *Environmental Education Research, 4* (3), 309-327.

Jickling, B. (1992). Why I don't want my children to be educated for sustainable development. *Journal of Environmental Education, 23*(4), 5-8.

Jickling, B. (1999) Beyond sustainability: Should we expect more from education? *Southern African Journal of Environmental Education 19*: 60-67.

Kamunge, J.M. (1980). Ministry of Education policy in regard to environmental education. In Kenyatta University College (KUC), *Environmental education workshop final report* 23-25 May (pp 66-71). Nairobi: KUC.

Karanja, F. (1997). The impacts of aquaculture and saltwork on mangrove forest ecosystem. In Gichuki, N. & Nasirwa, O. (Eds.), *NGO forum for national wetlands policy: Contribution of NGOs*. Workshop proceedings 13-14th February. Nairobi: KWWG & IUCN.

Karembu, M. & Kinyanjui, K. (1997). *Coordination, emerging needs and actions in environmental education.* Report of the regional workshop for the Eastern and Southern Africa, held in Nairobi, Kenya, 2-8 November.

Karembu, M. (1999) The philosophy and principles of communicating on the environment. In Karembu, M. and Kiai, W. (Eds), *Understanding environmental communication* (pp10-34). Nairobi: African Council for Communication Education – Kenya Chapter.

Karembu, M.G. (2002). *Developing responsible environmental behaviour through formal school curriculum: The case of Kajiado, Kiambu and Nairobi districts of Kenya.* Unpublished doctoral thesis, Kenyatta University, Nairobi.

Kareri, R.W. (1992). The sociological and economic values of Kenya's wetlands. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 99-107). Nairobi: NMK.

Kemmis, S., Cole, P. & Suggett, D. (1983). *Orientations to curriculum and transition: Towards a socially critical school.* Melbourne: Victoria Institute of Secondary Education.

Kenya Indigenous Forest Conservation Programme (KIFCON). (1993). *Directory of environmental education programmes in Kenya*. Nairobi: KIFCON.

Kenyatta University College (KUC). (1980). *Environmental education workshop: Final report,* 23-25 May 1979. Nairobi: KUC.

Kerr, D. (1994). Environmental education and core and foundation subjects: History. In Goodall, S. (Ed.), *Developing environmental education in the curriculum* (pp 60-64). London: David Fulton.

Khalim, M. (1993). Economic policy reforms and environmental education. In Lindhe, V., Goldstick, M., Muturi, S. & Rimmerfors, P. (1993), *Environmental education experiences and suggestions.* Report from a regional workshop in Nyeri, Kenya, 4-10 October (pp 13-14). Nairobi: Regional Soil Conservation Unit, Swedish International Development Authority.

Kiithia, S.M. & Musingi, J.K. (1995). Effects of land use systems on the water quality within the Nairobi river sub-catchment, Kenya. *Eastern and Southern African Geographical Journal 6* (1), 17-36.

Kirby, S.L. & McKenna, K. (1989). *Experience, research, social change. Methods from the margins*. Garamond: Toronto.

Kisee, A.M. (1993). Introductory remarks. In Howard, G.W & Bennun, L.A. (Eds.) *Research and monitoring for Lake Nakuru national park and catchment*. Report of a KWS/KWWG/WWF planning workshop, Nakuru 29-30th May. Nairobi: KWWG.

Koech, M.K. (1991). Evolution of environmental management in Kenya. In Kiriro, A. & Juma, C. (Eds.), *Gaining ground: Institutional innovations in land-use management in Kenya* (pp 21-34). Nairobi: Acts Press.

Kokwaro, J.O. (1985). The distribution and economic importance of the mangrove forests of Kenya. *Journal of East African Natural History Society 75*, 1-10.

Lather, P. (1986a). Research as praxis. *Harvard Educational Review 56*(3), 257-277.

Lather, P. (1986b). Issues of validity in openly ideological research: Between a rock and a soft place. *Interchange 17(4),* 63-84.

Le Grange, L., Lotz, H., Makou, T., Neluvlahani, E., Reddy, C. & Robottom, I. (2000). Introduction to the participatory research process. In Jenkin, N., Le Grange, L., Mabunda, K., Madisakwane, K., Makou, T., Mphaphuli, S., Neluvlahani, E., Reddy, C., & Robottom, I., *Education for social-ecological change: Case studies of changing practice in South African tertiary institutions* (pp 1-8). Grahamstown: Australian-South Africa Institutional Links Programme.

Le Roux, K. (2000). *Environmental education processes: Active learning in schools. Learning guide.* Pietermaritzburg: University of Natal Press.

Lee, Y. (1999). Sustainable wetland management strategies under uncertainties. *The Environmentalist 19,* 67-79.

Leftwich, A. (1983). *Redefining politics, people, resources and power.* New York: Methuen.

Lindhe, V., Goldstick, M., Muturi, S. & Rimmerfors, P. (1993). *Environmental education experiences and suggestions.* Report from a regional workshop in Nyeri, Kenya, 4-10 October. Nairobi: Regional Soil Conservation Unit, Swedish International Development Authority.

Lotz, H. & Janse Van Rensburg, E. (2000). *Learning for sustainability contextual profile. Learning for sustainability project.* Johannesburg: Learning for Sustainability Project.

Lotz, H. (1995). Programme and resource development in the light of emerging patterns in environmental education. *Environmental Education Bulletin, 10*:7-9.

Loubser, C.P., Swanepoel, C.H. & Chako, C.P.C. (2001). Concept formulation for environmental literacy. *South African Journal of Education, 21*(4), 317-323.

Lovelock, J. E. (1979). *Gaia: A new look at life on earth.* Oxford: Oxford University Press.

Madiba, S.S. (1987). Environmental education and the teaching of mathematics in the primary school. *Southern African Journal of Environmental Education, 4*:19.

Maina, C.K. (1996). *Kenya's wetlands: Developing a documentation collection.* KWWG Final report. Nairobi: KWWG.

Manguriu, D.G. (1999). Environmental concerns in Kenya. In Karembu, M. and Kiai, W. (Eds.), *Understanding environmental communication* (pp 97-113). Nairobi: African Council for Communication Education – Kenya Chapter.

Martens, E.E. (1992). Coastal wetland utilization. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 115-134). Nairobi: NMK.

Martin, P. (1993). Education, the environment and sustainable development. *Southern African Journal of Environmental Education, 13*, 21-27.

Maser, C. (1996). *Resolving environmental conflict: Towards sustainable community development.* Florida: St. Lucie Press.

Masese J.B. (1997). *The implication of human perception on the conservation of Sironga and Kianginda Wetlands in Kenya.* Unpublished Masters thesis, Kenyatta University, Nairobi.

Mason, J. (1994). Linking qualitative and quantitative data analysis. In Bryman, A. & Burgess, R.G. (Eds.) *Analysing qualitative data* (pp 89-111). London: Routledge.

Mavuti, K.M. (1989). Ecology of Yala swamp. *Resources 1*, 11-14.

Mavuti, K.M. (1992). An account of some important freshwater wetlands of Kenya. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 23-35). Nairobi: NMK.

McCulloch, R. (1994). Environmental education and core and foundation subjects: English. In Goodall, S. (Ed.) *Developing environmental education in the curriculum* (pp 43-47). London: David Fulton.

McDuff, M. (2000). Thirty years of environmental education in Africa: The role of the Wildlife Clubs of Kenya. *Environmental Education Research, 6* (4), 383-396.

Mcfarlane, J. (2000). *A critical investigation into course development for the preparation of school leaders.* Unpublished doctoral thesis, Rhodes University, Grahamstown.

McKernan, J. (1996). *Curriculum action research: A handbook of methods and resources for the reflective practitioner* (2nd ed). London: Kogan Page.

McNiff, J. (1988). *Action research principles and practice.* London: Macmillan Education.

Mead, G.H. (1934). *Mind, self and society.* Chicago: University of Chicago Press.

Meadows, D.H. (1990). *Harvesting one hundredfold: Key concepts and case studies in environmental education*. Nairobi: Afropress.

Melia, K. (1997). Producing 'plausible stories': Interviewing student nurses. In Miller, G. & Dingwall, R. (Eds) *Context and method in qualitative research* (pp 26-36) London:Sage.

Merriam, S.B. (1998). *Qualitative research and case study applications in education*. San Francisco, Calif.: Jossey-Bass Publishers

Mildren, J. (1993). Constructing metacognition: an argument for reflection in the constructivist classroom. In Malone, J.A. & Taylor, P.C.S., *Constructivist interpretations of teaching and learning mathematics.* Proceedings of topic group 10 at the seventh International Congress on Mathematical Education (ICME-7) held in Quebec, Canada, August. (pp 113-122). Perth: National Key Centre for School Science and Mathematics.

Miles, M.B. & Huberman, A.M. (1984). *Qualitative data analysis: A sourcebook of new methods Newbury Park, Calif.:* Sage.

Miles, M.B. & Huberman, A.M. (1994) *Qualitative data analysis: An expanded sourcebook* (2nd Ed) Thousand Oaks, Calif.: Sage.

Ministry of Environment and Natural Resources (MENR). (1994). *The Kenya National Environment Action Plan*: *Report.* Nairobi: MENR.

Ministry of Environment and Natural Resources (MENR). (1998). *Assessment of environmental training needs in Kenya: Final report.* Nairobi: MENR.

Morphet, A. (1994). My life was a transfer. In Flanagan, W., Hemson, C., Muller, J. & Taylor, N., *Vintage Kenton: A Kenton Education Association commemoration* (pp 283-290). Cape Town: Maskew Miller Longman.

Morrison, K.R.B. (1993). *Planning and accomplishing school-centred evaluation.* Norfolk: Peter Francis Publishers.

Moser, M., Prentice, R.C. & Van Vessen, J. (Eds.). (1993). *Waterfowl and wetlands conservation in the 1990's – a global perspective.* Proceedings of an IWRB Symposium, 12-19 November. St. Petersberg Beach, Florida USA

Mucunguzi, P. (1995). A review of non-formal environmental education in Uganda. *Environmental Education Research 1* (3), 337-344.

Murdoch, K. (1993). *New springboards: Ideas for environmental education*. Melbourne: Nelson.

Murray, S. (2001). Reading education: Texts which illuminate. *Perspectives in Education, 19* (1), 151-153.

Muthuri, F. (1992) Plant products from freshwater wetlands. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 109-113). Nairobi: NMK.

Nation Team (2001 March 10) Now 15 killed in water battles. *Daily Nation*. Retrieved from the World wide web http//www.nationaudio.com/news/DailyNation/10032001/News/News33.html.

National Museums of Kenya (NMK). (1998). *Museum education three year strategic plan 1998-2001*. Nairobi: NMK

National Museums of Kenya. (1999). *The nature of wetlands: A handbook of wetlands in Kenya,* Nairobi: NMK, KWS and KIE.

Ndaruga, A.M. (1998). *Impact of water quality changes on riverine macrozoobenthic diversity: A case study of River Gatharaini in Kenya*. Unpublished Masters thesis, Kenyatta University, Nairobi.

Ndaruga, A.M. (1999). *Report of proceedings of in-service training workshops on water and wetlands conservation.* Nairobi: NMK.

Ndaruga, A.M. (2002). *Dates with meaning "for the environment" in Kenya*. Unpublished manuscript.

Ndiritu, G. G. (2001). *Assessment of environment quality using diatoms in Nairobi River, Kenya*. Unpublished Masters thesis, Vrije Universitite Bruxelles, Brussels, Belgium.

Ndiritu, G.G. & Gichuki, N.N. (1999). *Inventory of wetland resources, their values and uses in Marsabit and Turkana Districts in Northern Kenya.* Nairobi: NMK.

Neumann, L.W. (2000). *Social research methods: Qualitative and quantitative approaches*. Needham Heights: Allyn & Bacon.

Newhouse, N. (1990). Implications of attitude and behaviour research for environmental conservation. *Journal of Environmental Education, 22*(1), 26-32.

Ng'weno F. (1992). Seasonal wetlands in Nairobi. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 55-64). Nairobi: NMK.

Njuguna, P.K. (1996). *Building an inventory of Kenya's wetlands: A biological inventory of wetlands of Uasin Gichu District of Kenya.* Nairobi: KWWG.

Njuguna, S. (1996). Kenya needs a wetlands policy. *Conservation Monitor: A Newsletter of the East Africa Wildlife Society, 2*: 1

Njuguna, S.G. (1990). *Tigoni dam: Effect of pollution,* Preliminary report. Unpublished.

Njuguna, S.G. (1992). Floating aquatic weeds in Kenya. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 85-90). Nairobi: NMK.

Nyamweru, C. (1992). Origins and geomorphology of Kenya's wetlands. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 5-12). Nairobi: NMK.

Nyamweru, C.K. (1989). New evidence for the former extent of the Nile drainage system. *Geographical Journal 155,* 179-188.

O'Donoghue R. & Ashwell, A. (1994). Trends and patterns in environmental education and their links to approaches to learning, teaching and evaluation. *Environmental Education Bulletin 9,* 14-16.

O'Donoghue, R. & Janse Van Rensburg, E. (1995). *Environments and methods*. Howick: ShareNet.

O'Donoghue, R. & McNaught, C. (1989). Environmental education: The development of a curriculum through 'grass roots' reconstructive action. *Southern African Journal of Environmental Education 10,* 16-24.

O'Riordan, T. (1989a). The challenge of environmentalism. In Peet, R. & Thrift, N. (Eds.), *New models in geography Vol. 1,* (pp 77-102). London: Unwin Hyman

O'Riordan, T. (1989b). Contemporary environmentalism. In Gregory, D. & Walford, R. (Eds.), *Horizons in human geography* (pp 395-414). London: Macmillan.

Odongo, O.R. (1996). *Building an inventory of Kenya's wetlands: An ethnobotany study of wetland plants of Uasin Gichu District of Kenya.* Nairobi: KWWG.

Okeyo, D.O. (1992). Wetland fish of Kenya. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 47-53). Nairobi: NMK.

Olindo, P. (1992). Food policy and wetlands. In Crafter, S.A., Njuguna, S.G. and Howard, G.W. (Eds.), *Wetlands of Kenya: Proceedings of a seminar on wetlands of Kenya* 3-5th July (pp 173-174). Nairobi: NMK.

Ong'or, D.O., Ogwae, T.A, Omondi, M.O. Kapiyo, R.A. (2001) *Community conservation initiatives towards livelihood security in the Lake Victoria basin: Issues, problems and opportunities.* A proceedings report. Kisumu: Uhai Lake Forum.

Ongile, G. A. (1999). *Gender and agricultural supply responses to structural adjustment programmes: A case study of smallholder tea producers in Kericho Kenya.* Research report No. 109. Uppsala: Nordiska Afrikainsitutet.

Onyango, P.O. (1997). Towards developing a national wetlands policy: The role of Lake Victoria wetlands team. In Gichuki, N. & Nasirwa, O. (Eds.), *NGO forum for national wetlands policy: Contribution of NGOs.* Workshop proceedings, 13-14th February. Nairobi: KWWG & IUCN.

Opie, F. (1986). The great neglected outdoor classroom. *Southern African Journal of Environmental Education 2*, 8-10.

Organization for Economic Cooperation and Development (OECD). (1996). *Guidelines for aid agencies for improved conservation and sustainable use of tropical and subtropical wetlands.* Paris: OECD

Orr, D. (1992). *Ecological literacy: Education and the transition to a postmodern world*. Albany: State University of New York Press.

Otiende, J.E. (1997). Environmental education in perspective. In Otiende, J.E., Ezaza, W.P. & Boisvert, R. (Eds.) *An introduction to environmental education*. Nairobi: Nairobi University Press.

Oulton, C. & Scott, W. (1991). Selling science and society short. *Times Educational Supplement* 12th November, pp 42-43.

Patton, M.Q. (1987). *How to use qualitative methods in evaluation*. Newbury Park Calif.: Sage.

Patton, M.Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, Calif.: Sage.

Pepper, D. (1984). *The roots of modern environmentalism*. London: Croom Helm.

Pepper, D. (1996). *Modern environmentalism: An introduction.* New Yolk: Routledge.

Plummer, K. (Ed.) (1991). *Symbolic interactionism, Volume 1 & 2: Classic and contemporary issues.* Hauts: Edward Elgar.

Popskewitz, T. (1984). *Paradigm and ideology in educational research: The social functions of the intellectual.* London: Falmer.

Pretty, J. (2002). *Agri-culture: Reconnecting people, land and nature*. London: Earthscan.

Ramsar (2001). *Additional guidance on reviewing and action planning for wetland communication, education and public awareness (CEPA).* Gland: Ramsar Bureau.

Ramsar (2002). *National planning tool for the implementation of the Ramsar Convention on wetlands: Kenya.* Retrieved from the worldwide web on 7th November 2002 at http//www.ramsar.org/cop8_nrs_Kenya.pdf

Rees, W. (1990). The ecology of sustainable development. *The Ecologist 20* (1), 18-23.

Reid, A. (1996). Exploring values in sustainable development. *Teaching Geography 21*(4) 168-171.

Republic of Kenya (1992b). *Primary education syllabus*, Volume 2. Nairobi: Kenya Literature Bureau.

Republic of Kenya. (1972). *Kenya national report to the United Nations on the human environment.* Nairobi: Government Printers.

Republic of Kenya. (1984). *8-4-4 system of education.* Nairobi: Government Printers.

Republic of Kenya. (1988). *Sessional paper No. 6 of 1988 on education and manpower training for the next decade and beyond.* Nairobi: Government Printers.

Republic of Kenya. (1991). *Tana Delta wetlands survey*. Coast ASAL Development Project, Ministry of Reclamation and Development of Arid, Semi Arid Areas and Wastelands, Nairobi.

Republic of Kenya. (1992a). *Primary education syllabus*. Volume 1. Nairobi: Kenya Literature Bureau.

Republic of Kenya. (1997). *Marsabit District development plan 1997-2001*. Nairobi: Government Printers.

Republic of Kenya. (1998). *Masterplan on education and training 1997-2010*. Nairobi: Jomo Kenyatta Foundation.

Republic of Kenya. (1999). *The Environmental Management and Coordination Act.* Kenya Gazette supplement No. 3 (Acts No. 1). Nairobi: Government Printers.

Republic of Kenya. (2001a). *The 1999 population and housing census.* Volume 1. Nairobi: Government Printers.

Republic of Kenya. (2001b). *Poverty reduction strategy paper 2001-2004*. Nairobi: Ministry of Finance and Planning.

Rhodes University. (2002). Unpublished lecture notes for the Advanced Diploma in Environmental Education 2002/2003. Grahamstown: Rhodes University, Education Department.

Rhodes University/Southern African Development Community (RU/SADC). (2000). Unpublished notes from the RU/SADC International Certificate in Environmental Education Course. Grahamstown: Rhodes University, Environmental Education Unit.

Robinson, C. (1993). *Real world research: A resource for social scientists and practitioner researchers.* Oxford: Blackwell.

Robottom, I.M. (1987). Two paradigms of professional development in environmental education. *The Environmentalist 7*(4), 291-298.

Rock, P. (1979). *The making of symbolic interactionism*. London:Macmillan.

Rodgers, W.A. (1993). The biodiversity of wetlands in East Africa. In Kenya Wildlife Service (KWS), *Understanding wetland biodiversity in East Africa*. Proceedings of a workshop, 9-13 November. Nakuru: KWS.

Ryle M. (1988). *Ecology and socialism*. London: Radius.

SADC REEP (2002) *SADC regional environmental education programme document*. Howick: Share-Net.

Salite, I. (2002). Teachers' views on the aim of education for sustainable development. *Journal of Teacher Education and Training 1*, 68-80.

Sanders, W.B. & Pinhey, T.K. (1983). *The conduct of social research.* New York: Holt, Rinehart & Winston.

Schumacher, S. & McMillan, J.H. (1993). *Research in education: A conceptual introduction* (3rd ed), New York: Harper Collins.

Share-Net. (2000). *A year of special days*. Howick: Share-Net.

Sharp, R. & Green, A. (1975). *Education and social control*. London:Routledge and Kegan Paul.

Sia, A.P., Hungerford, H.R. & Tomera, A. (1986). A study of predictors of environmental behaviour using U.S. samples. *Southern African Journal of Environmental Education 2,* 3-7.

Sinclair P., Clacherty, G. & Lotz, H. (1997). Youth making a difference. In *Environmental education in schools*. Cape Town: Juta & Co. Ltd.

Slocombe, D.S. & Van Bers, C. (1991). Seeking substance in sustainable development. *Journal of Environmental Education 23*(1), 11-18.

Smyth, J. (1989). Developing and sustaining critical reflection in teacher education. *Journal of Teacher Education 40* (2), 2-9.

Smyth, J.C. (1995). Environment and education: A view of changing scene. *Environmental Education Research 1*(1), 3-20.

Smyth, W.J. (1987). *A rationale for teachers' critical pedagogy: A handbook.* Geelong, Victoria: Deakin University Press,.

Solomon, J. (1994). The rise and fall of constructivism. *Studies in Science Education 23*, 1-19.

Spiers, A.G. (2001). Wetland inventory: Overview at a global scale. In Finlayson, C.M., Davidson, N.C. and Stevenson N.J. (Eds.) (2001) *Wetland inventory assessment and monitoring: Practical techniques and identification of major issues.* Proceedings of the 2nd International Conference on Wetlands and Development, Dakar, Senegal 8-14 November.

Stake, R.E. (1995). *The art of case study research*. London: Sage.

Stapp, W. & Wals, A. (1993). An action research approach to environmental problem solving. In Bardwell, L., Monroe, M. & Tutor, M. (Eds.) *Environmental problem solving: Theory, practice and possibilities in environmental education.* Troy, OH: North American Association for Environmental Association.

Stenhouse, L. (1985). A note on case study and education practice. In Burgess R.G. (Ed.) *Field Methods in the Study of Education* (pp 263-271) Lewes: Falmer Press.

Stevenson, R. (1987). Schooling and environmental education: Contradictions in purpose and practice. In Robottom, I. (Ed.), *Environmental education: Practice and possibility* (pp 69-82). Geelong, Victoria: Deakin University.

Stryker S. (1991). The vitalisation of symbolic interactionism. In Plummer, K. (Ed) *Symbolic interactionism, Vol. 1: Foundations and history*, (pp 419-434). Hauts: Edward Elgar.

Styles, K. (1995). The paradox of pedagogy transposition: Learning from inhibitors to teacher change. Lessons from Zimbabwean research project in environmental education. *Southern African Journal of Environmental Education, 15*, 49-56.

Sudman, S. & Bradburn, N.M. (1982). *Asking questions: A practical guide to questionnaire design.* San Francisco, CA: Jossy Bass.

Taylor, J. & Paxton, L. (1994). The environment and environmental crisis. *Environmental Education Bulletin 8,* 7-12

Taylor, S.J. & Bogdan, R. (1998). *Introduction to qualitative research methods: A guidebook and resource* (3rd ed). New York: John Wiley and Sons.

Thenya, T. (2001). Challenges of conservation of dryland shallow waters, Ewaso Narok swamp, Laikipia District, Kenya, *Hydrobiologia, 458,* 107-119.

Tilbury, D. (1995). Environmental education for sustainability: Defining the new focus of environmental education in the 1990s. *Environmental Education Research 1*(2), 195-212.

Tyson, B. (1994). Regional issues in environmental education. *Southern African Journal of Environmental Education 14,* 10-19.

UNEP. (1987). *Kenya national state of the environment report*. Nairobi: UNEP.

UNEP. (1993). *Global biodiversity*. Nairobi: UNEP.

UNESCO. (1976). The Belgrade Charter. *Connect, 1*(1).

UNESCO. (1977). From Stockholm to Tbilisi. *Connect, 2*(2).

UNESCO. (1978). The world's first intergovernmental conference on environmental education. *Connect, 3*(1).

UNESCO. (1986). Educating in environmental values. *Connect, 11*(3)

UNESCO. (1987). International comprehension of environmental problems, education and training. *Connect, 12*(2).

UNESCO. (1988). *Environmental education: A process for pre-service training curriculum development.* New Delhi: UNESCO

UNESCO. (1990). Environmentally educated teachers: The priority of priorities. *Connect 15*(1).

UNESCO. (1992). *UN Conference on environment and development: Agenda 21,* Conches: UNESCO.

UNESCO. (1996). Teaching for a sustainable world: Environmental education for a new century. *Connect, 21*(4).

UNESCO. (1997). *Educating for a sustainable future: A transdisciplinary vision for concerted action.* Paris: UNESCO.

UNESCO-EPD. (1997). *Environment and society: Education and public awareness for sustainability.* Background paper prepared for UNESCO International Conference, Thessaloniki.

Van der Merscht, H. (2002). *Four levels of rigour in interpretive qualitative research.* Unpublished research methodology course notes, Rhodes University, Education Department.

Veranu, J. (1998). *Adult and community education for sustainability in the Third World*. Fiji, South Pacific: Fiji Adult and Community Education Think Tank/FCEA

Vulliamy, G. (1987). Environmental education in third world schools: Rhetoric or realism? *The Environmentalist 7*(1), 11-19.

Wagiet, R. (1997). *Environmental education: A strategy for primary teacher education.* Unpublished doctoral thesis. Rhodes University, Grahamstown.

Waithaka, J.M. (1992). Foreword. In Republic of Kenya, *Primary education syllabus Vol. 1*. Nairobi: Kenya Literature Bureau.

Walker, R. (1983) Three good reasons for not doing case studies in curriculum research. *Journal of Curriculum Studies 15*(2), 155-165.

Wamicha, W.N. (1997). *The morphology of wetland soils in Kenya*. A paper presented at KWWG seminar series on 2nd April. Nairobi: NMK.

Wanaswa, S.A. (1993). Environmental education curriculum development for primary education. In Lindhe, V., Goldstick, M., Muturi, S. & Rimmerfors, P. (Eds.), *Environmental education experiences and suggestions* (pp 26-27). Report from a regional workshop in Nyeri, Kenya, 4-10 October. Nairobi: Regional Soil Conservation Unit, Swedish International Development Authority.

Wanjara, M. (1997). Kipsaina Wetland Conservation Group. In Gichuki, N. & Nasirwa, O. (Eds.) *NGO forum for national wetlands policy: Contribution of NGOs.* Workshop proceedings 13-14th February. Nairobi: KWWG & IUCN.

Wass, P. (1995) *Kenya indigenous forests: Status and conservation*. Nairobi: KIFCON Project.

Wenham, M. (1994) Environmental education and core and foundation subjects: Art. In Goodall, S. (Ed.) *Developing environmental education in the curriculum* (pp 73-77). London: David Fulton.

Wolcott, H.F. (1992). Posturing in qualitative inquiry. In Lecompte, M.D. Millroy, W.L. & Preissle, J. (Eds.) *The handbook of qualitative research in education* (pp 3-52). San Diego: Academic Press.

Woods, P. (1986) *Inside schools: Ethnography in educational research*. London: Routledge and Kegan Paul.

Woods, P. (1992) Symbolic interactionism: Theory and method. In Lecompte, M.D., Millroy, W.L. & Preissle, J. (Eds) *The handbook of qualitative research in education* (pp 337-404). San Diego: Academic Press.

World Commission on Environment and Development (WCED). (1987). *Our common future* Oxford: Oxford University Press.

World Resources Institute. (1998) *Reefs at risk*. Retrieved from the world wide web at http//www.wri.org/biodiv/marinehome.html

World Wide Fund for Nature (WWF). (1988). *A common purpose*. Surrey: WWF.

Yap, W.G. & Landoy, R. (1986). *Survey of the coastal areas of Kenya for shrimp farm development.* Nairobi: FAO & Ministry of Tourism and Wildlife, Fisheries Department.

Yin, R.K. (1994). *Case study research: Design and methods. (2nd ed)* Newbury Park: Sage Publications.

Yin, R.K., (1989). *Case study research: Design and methods.* Newbury Park: Sage Publications.

Yin, R.K., Bateman, P.G. & Moore, G.B. (1983). *Case studies and organisational innovation: Strengthening the connection.* Washington DC: COSMOS Corporation.

Zerner, C. (2000) Toward a broader vision of justice and nature conservation. In Zerner, C. (Ed.) *People, plants and justice: The politics of nature conseravtion.* (pp 3-20) New York: Columbia University Press.

Appendix 1.0: A critical reflection on the wetlands training for teachers held in 1999

The teacher in-service training was held in January 1999 (Ndaruga, 1999, section 1.3). Various documents were used during the training and were given to teachers as handouts to use in their local contexts. These documents addressed issues such as

- Status of wetlands in Kenya
- Strategies of managing water and wetlands in Kenya
- Threats to wetlands in Kenya
- Teaching environmental education in schools
- Possible learning activities during the field trip to a local wetland

An analysis of these documents revealed some constraints that could have caused the training to be of less relevance to the teachers as summarised below.

- The language used seemed technical and possibly not appropriate for use by primary school teachers. It is possible that the teachers had a difficult time trying to simplify the documents to pupils. The notes could have been suitable for another specialized audience but not the primary school teachers.
- The notes do not seem to relate to what teachers do at school. They seem to have failed to explore the local relevance of wetlands to teachers' work as described in section 4.7.1.
- The holistic aspects of wetlands (Figure 2.3, section 2.3) were conspicuously missing. The biophysical aspects were given more prominence.
- The notes on environmental education in the curriculum seem to have failed to address the issue of exploration of the status of environmental (especially wetlands) education in the curriculum.
- The objectives stated in the environmental education notes did not indicate the need for critical engagement with environmental issues. Bearing in mind that the facilitators of the workshops were not specialists in environmental education, it is possible that they failed

to involve the teachers in appropriate activities to generate relevant environmental knowledge, attitudes, skills and actions as outlined in section 4.7.

- The handouts did not show the relevance of environmental education in the curriculum. The notes did not address the issue of teaching wetlands education and only talked of environmental education in a theoretically conceived manner. There was no linkage with what teachers do in their local contexts.
- The practical activities in wetlands were narrowly conceived and were all dominated by biophysical concerns instead of the holistic approach (Figure 2.3).
- Various resource people from different disciplines conducted the workshops. The experts ranged from scientists, wetland managers and educators. Since many of these facilitators were not involved in the preparatory meetings for the workshops, there is a possibility of lack of harmony in the content emphasis and style of teacher involvement in the learning processes.
- Since many of the officers involved were not trained environmental educators, it is possible that the standards of environmental education training were compromised with preference for transmission of abstract concepts.
- There was lack of adequate equipment for use during the outdoor activity and this could have hampered involvement of teachers during the training, making most of the sessions theoretical.

Lessons from the analysis of the in-service programme

- Use simpler language during training
- Use wetland educators to conduct the training
- The programme should look at the holistic aspects of wetlands (Figure 2.3).
- Link the training to what the teachers do in their local context.
- Provide and develop relevant resource materials that teachers could easily adapt to their local context.
- Develop the programme with the teachers to address their needs

Appendix 2.1: **The Ramsar Convention definition and classification of wetlands**

Definition

Under the Convention on Wetlands (Ramsar, Iran, 1971) "wetlands" are defined by Articles 1.1 and 2.1 as shown below:

Article 1.1:

"For the purpose of this Convention wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres."

Article 2.1 provides that wetlands:

"may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands".

Ramsar Classification System for Wetland Type

The codes are based upon the Ramsar Classification System for Wetland Type as approved by Recommendation 4.7 and amended by Resolution VI.5 of the Conference of the Contracting Parties. The categories listed herein are intended to provide only a very broad framework to aid rapid identification of the main wetland habitats represented at each site.

Marine/Coastal Wetlands

A -- **Permanent shallow marine waters** in most cases less than six metres deep at low tide; includes sea bays and straits.

B -- **Marine subtidal aquatic beds**; includes kelp beds, sea-grass beds, tropical marine meadows.

C -- **Coral reefs**.

D -- **Rocky marine shores**; includes rocky offshore islands, sea cliffs.

E -- **Sand, shingle or pebble shores**; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.

F -- **Estuarine waters**; permanent water of estuaries and estuarine systems of deltas.

G -- **Intertidal mud, sand or salt flats**.

H -- **Intertidal marshes**; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.

I -- **Intertidal forested wetlands**; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.

J -- **Coastal brackish/saline lagoons**; brackish to saline lagoons with at least one relatively narrow connection to the sea.

K -- **Coastal freshwater lagoons**; includes freshwater delta lagoons.

Zk(a) – **Karst and other subterranean hydrological systems**, marine/coastal

Inland Wetlands

L -- **Permanent inland deltas**.

M -- **Permanent rivers/streams/creeks**; includes waterfalls.

N -- **Seasonal/intermittent/irregular rivers/streams/creeks**.

O -- **Permanent freshwater lakes** (over 8 ha); includes large oxbow lakes.

P -- **Seasonal/intermittent freshwater lakes** (over 8 ha); includes floodplain lakes.

Q -- **Permanent saline/brackish/alkaline lakes**.

R -- **Seasonal/intermittent saline/brackish/alkaline lakes and flats**.

Sp -- **Permanent saline/brackish/alkaline marshes/pools**.

Ss -- **Seasonal/intermittent saline/brackish/alkaline marshes/pools**.

Tp -- **Permanent freshwater marshes/pools**; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.

Ts -- **Seasonal/intermittent freshwater marshes/pools** on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.

U -- **Non-forested peatlands**; includes shrub or open bogs, swamps, fens.

Va -- **Alpine wetlands**; includes alpine meadows, temporary waters from snowmelt.

Vt -- **Tundra wetlands**; includes tundra pools, temporary waters from snowmelt.

W -- **Shrub-dominated wetlands**; shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.

Xf -- **Freshwater, tree-dominated wetlands**; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.

Xp -- **Forested peatlands**; peatswamp forests.

Y -- **Freshwater springs; oases**.

Zg -- **Geothermal wetlands**

Zk(b) – **Karst and other subterranean hydrological systems**, inland

Note : "**floodplain**" is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forests. Floodplain wetlands are not listed as a specific wetland type herein.

Human-made wetlands

1 -- **Aquaculture** (e.g., fish/shrimp) **ponds**

2 -- **Ponds**; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).

3 -- **Irrigated land**; includes irrigation channels and rice fields.

4 -- **Seasonally flooded agricultural land** (including intensively managed or grazed wet meadow or pasture).

5 -- **Salt exploitation sites**; salt pans, salines, etc.

6 -- **Water storage areas**; reservoirs/barrages/dams/impoundments (generally over 8 ha).

7 -- **Excavations**; gravel/brick/clay pits; borrow pits, mining pools.

8 -- **Wastewater treatment areas**; sewage farms, settling ponds, oxidation basins, etc.

9 -- **Canals and drainage channels, ditches**.

Zk(c) – **Karst and other subterranean hydrological systems**, human-made

(Source: http://www.ramsar.org/key_ris_types.htm)

Appendix 2.2: Organisations dealing with wetland issues in Kenya

There are many institutions in Kenya that deal with wetlands research, awareness and management. Some are government bodies while others are NGOs and CBOs. Some of the prominent ones are listed below.

Institution	Status	Roles
National Museums of Kenya	Government	Research, Education, collection management and exhibition (NMK, 1998)
Kenya Wildlife Service	Government	Research, management, public awareness collection (Kisee, 1993:15).
East African Wildlife Society	Regional NGO	Research, publications, advocacy, public lobbying; education and awareness, networking (Becha, 1997:10)
WWF	International NGO	Research, public awareness (Awer, 1997:12).
Friends of Lake Nakuru and Lake Elementaita	NGO	Educating the local community through seminars. It funds conservation activities within the catchment. It donates books and cash awards for environmental education to schools. Sponsors members to participate in seminars and workshops (Gitahi, 1997:13).
Kenya Wetlands Working Group (KWWG)	NGO	Research, inventorying, publications, public awareness. Major convenor of the World Wetlands Day since 1997 and schools are invited.
Society for protection of Environment in Kenya (SPEK)	NGO	Public awareness in Mombasa and Kwale districts. Rehabilitation of denuded mangrove sites, youth awareness through "Friends of mangroves", Village Integrated Sustainable Activities (VISA) (Gang, 1997:17).
Lake Victoria Wetlands Team	CBO	research and community education through workshops in some selected wetlands around Lake Victoria (Onyango, 1997:17
Kipsaina Wetland conservation group	NGO	Environmental awareness through lectures, songs and plays to schools and the local community (Wanjala, 1997:22).
Lake Naivasha Riparian Owners Association	CBO	Management. Promoting concerns about the lake as an important Ramsar site.
Osienala	CBO	*Osienala* is a *Luo* word for "Friends of Lake Victoria". The group is involved in educating the community about Lake Victoria and its cachment.

Appendix 2.3: Types, main features and examples of wetlands in Kenya

Types of wetlands	Main features	Distribution in Kenya (Region of occurrence
Coastal and marine wetlands	This refers to a variety of wetlands that occur along the coastal margins that experience different tidal regimes. Coastlines occur when the ocean is the only major significant water body. The Kenyan coastline extends for 640 km in length and is multi-indented (Figure 2.1). The coastline has a fringing reef located between 0.5-2.0 km off shore. Characteristic wetlands can be grouped into two types namely the subtidal and intertidal wetlands **a) Subtidal wetlands - includes** Sea grass beds and coral reefs **b) Intertidal wetlands – includes** Rocky marine shores, reefs, mud flats, sand flats, salt flats, estuarine marshes, salt marshes, estuarine swamps, sand beaches, lagoons and intertidal vegetated zones **Mangrove forests** Mangroves are special types of woody trees and shrubs that grow naturally along the coastal edges between high and low tide zones. Mangroves is a general term used to refer to four main types of plants*; Avicennia*, *Rhizophora*, *Bruguiera* and *Sonneratia*. Nine species of mangrove plants are found in Kenya. Mangrove trees are adapted to survive in deep soft mud or soft silt shallow soils with low oxygen content with regular water flow regimes and high salinity levels.	Along the Kenyan coast mangroves covers 54,380 ha of which 60% of the forest occurs in Lamu
Estuaries	Found at the mouth of a river where it enters the ocean or lake	Mombasa-shimo La Tewa

	in a single channel. The quality of water of an estuary is controlled by the mass of water of the major water body such as the ocean or lake. Along the Kenyan coast, estuaries colonised by mangrove trees and associated plants form a mangrove swamp/forest ecosystem	Kilifi-Turtle Bay Lamu Island and Pate Sabaki
Lacustrine wetlands (Shallow lakes glacial lakes, crater lakes and edges of deep lakes)	Sodic and/or saline waters, alkaline and soda lakes Shallow lakes-Occur in inundated shallow depressions Permanent or seasonal	Shallow alkaline lakes includes L. Elmentaita, Nakuru Kwenia, Kabongo, Lookujit. Soda lake represented only by L. Magadi Permanent shallow fresh water lakes includes L. Naivasha, Jipe, Baringo Seasonal lakes include Amboseli, Solai, Olbolosat, Suguta Marmar, Kisuma, Chalbi, and few Ox bow lakes of lower river Tana.
	Glacial lakes and tarns are formed by glacial erosion of rocky basins that existed on mountains. They are fed by melting fresh snow water in high altitudes. They have low biodiversity because of the low temperatures of high altitudes.	Glacial lakes include those found in Mt. Kenya and Nyandarwa ridges. Others include Saiwa swamp in Cherangani hills. Glacial tarns include Hut tarn, Tyndall tarn, Curling pond
	Crater lakes - Comprise of water accumulating on the blown out depressions of volcanic mountains. They are fed by rainfall on the lake surface and on walls of the crater or partly by springs.	Crater lakes include Sonanchi in Naivasha, Chala in Taita Taveta, Simbi Nyaima in Nyanza, L. Paradise, Sorkote Gunda and Sorkote diko in Marsabit, L Nkunga in Mt Kenya
	Edges of deep lakes	Deep lakes include Turkana and Chala. Lake Victoria is deep but its edges are shallow and are covered by many swamps..
Rivers	Comprise of flowing water in depressions with no permanent vegetation growing in the channel. Characteristic plant and animals occur along the river channel. A variety of wetland types occur along the river channel from source to mouth such as swamps, lakes, marshes, man made dams, canals etc.	Major rivers include Tana, Athi, Ewaso Ngiro (South), Ewaso Ngiro (North), Yala, Sondu Nyando, Nzoia, Malewa, Voi, Turkwel, Kerio, Molo, Waseges, Namanga, Kiboko, Kuja, Migori, Sio. The main rivers are fed by other smaller rivers which form a leaf like catchment with a network of

		tributaries. For instance river Tana is 1000 km long with a total catchment area of 95,000km^2
Man made dams and rice fields.	Emanate from deliberate human act of creating wetlands to serve economic purposes. These include agricultural wetlands and artificial wetlands. Agricultural wetlands include irrigated lands, irrigation canals and ditches. They are dominated by reed swamp grass. Rice fields are extensive areas that are deliberately seasonally flooded with water and planted with rice. They also include dams built and used for provision of domestic water, generation of hydroelectric power (HEP), for aquaculture such as fish and prawn farming, and for providing irrigation water. Minor man made dams are found in farmlands such as the coffee estates of Central Kenya; in dry land, and along the rivers to support horticultural crop farming. Man made dams also include constructed water treatment ponds or sewage treatment lagoons	Examples of rice fields include Mwea Tabere (5560 ha), Kano plains, Tana delta. Dams for providing domestic water include Sasumua, Ndakaini. HEP dams include Masinga, Kamburu, Gitaru, Kindaruma, Turkwel, and Sondu Miriu that is under construction presently. Prawn agriculture occurs along the Coast, Sagana fish ponds, Pokery dam and Entosopian fish pond in Kajiado district. Irrigation dams include Bura irrigation scheme, Limuru ponds and Chameron dams. Sewage treatment dams include Dandora sewage ponds, Kenyatta University sewage ponds, Nakuru sewarage ponds, Sampu lagoon on the outskirts of Kajiado town. Almost all major towns have sewage treatment ponds. Water treatment ponds include Carnivore and Splash in Nairobi.
Flood plains	Areas along the river course that are occasionally flooded during the wet season or when rivers overflow the banks as a result of an overspill from the main channel into the surrounding areas. This is common in the mature stages of rivers in lowlands. The main macrophytes in these wetlands include hygrophilous grasses such as *Echinochloa, Oryza, Cynodon, Pennisetum* and *Sporoborus*. Common wetlands include ox bow lakes and floodplain lakes and swamps.	Common in rivers Tana, Yala, Athi, Ewaso Nyiro (South), Kiboko, Esokota, Rombo. Floodplain lakes include Lake Kanyamboli, Nambongo, Sare, L. Kwenia. Ox bow lakes include Lake Ponge, Bilisa, Giritu, Shikababo, Dida Warede, Moa and Harakisha all along River Tana.
Deltas	Formed where a river loaded with silt slows down and deposits its silt as it enters the ocean or lake. The river thus breaks up into many distributaries. Deltas are characterised by swampy vegetation and flood plains.	River Tana delta is the biggest and is an arcuate delta. Minor deltas of lacustrine type include those of R Nzoia, Yala, Sondu Miriu on L. Victoria, Melewa on L. Naivasha, Ewaso Nyiro (North) on L. Dera
Swamps	Characterised by water above the ground with emergent vegetation reaching at least one metre above the water surface.	-Lorian, Songa, Lengurrahange Yala, L. Naivasha (northern part) Mogusi near Homa Bay along L

	The main macrophytes include cattails (*Typha),* reeds *(Phragmites),* water grass *(Vassia cuspidata)* and *papyrus (Cyperus papyrus).*	Victoria, along L. Kanyamboli, Amboseli basin, Ol Joro Orok, Sangoa & Lorian swamps
Marshes	May have water above, at or below ground level. They have shorter than one metre long vegetation size and are more open, allowing more light penetration into the water. Main macrophytes include sedges such as *Cyperus articulutus* and Hydrophilous grasses such as *Echinochloa spp*.	Ondiri marshes & swamps at Kikuyu town
Montene peat bogs	Rain fed wetlands located at high altitudes with low temperatures that make the rate of decomposition of organic matter very low and hence peat accumulates. They are mainly dominated by Sphagnum moss macrophyte	Found in high altitude on Mt Kenya (Vertical bog) and on Mt. Elgon
Springs	Refers to small sized flowing water bodies whose water is discharged from underground aquifers	Around Lakes Magadi, Elementaita, Bogoria, Nakuru & Amboseli
Hot springs	Hot water oozes out of these wetlands and is either forced out as a spray or flows as a small stream	South of Lake Magadi, north of Lake Natron
Watering pans	They occur naturally or are constructed by man	
Oasis	Common in dry areas and are rich in plants and animal species compared with rest of dryland due to human activities of pouring out water around the water hole.	
Temporary wetlands	Common all over Kenya during the rainy season Are temporary and do not live long enough to develop characteristic hydrosols and hydrophytes. Some persist longer and develop characteristic wetland fauna and flora. There are various varieties of temporary wetlands. These include: Rock slabs and rock pools - shallow depressions on rocks that are a few centimetres deep and one metre across. Seasonal pools - small depressions ranging from 1-4 metres wide and up to 1 metre deep or less. The hollows are formed naturally by water flowing over the rocks or artificially as	Examples include the Athi plain pools on the Nairobi-Kangundo road, Langata area, Nairobi National Park, Lake Kwenia, Kedong Valley and Tana Delta

	murram pits or where builders scoop up soil Seasonal springs and seepage areas - Formed when rain falls on hills and percolates down through the volcanic tuff and later emerges as natural springs and seepage areas along the hillsides. Springs are temporary although they last longer into the dry season wetting the ground setting off a series of ecological succession by several plant species and complex food chains by animals. Flooded grasslands - Formed on flat areas where a hardpan clay layer below the earth's surface prevents rainwater from percolating into the ground. Excess water floods the surface and may persist for several weeks	.

Source: NMK, 1999; Muthuri, 1992; Ng'weno, 1992; Mavuti, 1992; Martens, 1992 and Kokwaro, 1985.

Appendix 3.0 Environmental education potentials in different subjects

As discussed in chapter 3, there are many opportunities for integrating environmental issues in the curriculum. These are summarised in Appendix 3.1-3.10.

Appendix 3.1 Art and Craft subject

Class	Topics
1	Painting (identify colours), modeling using soft materials such as clay, puppetry, weaving using locally available fibres, make ornaments using locally available materials
2	Painting, puppetry,
3	Painting, make ornaments using locally available materials
4	Drawing, painting, pottery, identify sources of wood timber,
5	Drawing, painting, pottery, basketry, weaving, classify wood, identify locally available commercial timber,
6	Painting, drawing, pottery, basketry, describe natural seasoning and defects in timber, types of houses, traditional houses
7	Drawing, painting, basketry, weaving, building and construction,
8	Drawing, painting,

Appendix 3.2 Geography History and Civics subject.

Class	Topics
1	The home (family, location, basic needs, amenities, celebrations and functions), the school (way to school, compound, routine, history and school community.
2	School neighbourhood, the administrative sub-location and location (community, resources and their uses, social and cultural activities, economic activities)
3	Administrative division and district (physical features, people, social and cultural activities, migration and settlement, vegetation and economic activities).
4	Administrative province – physical environment and how they affect distribution of people, social and cultural activities, resources and economic activities including agriculture and fishing, political development and systems.
5	Kenya – physical environment, people, social and cultural activities, resources and economic activities, political development and systems
6	Kenya and her neighbours – physical environment (main physical features e.g. rivers and lakes), people, citizenship, resources and economic activities (including agriculture forestry and fisheries), political developments and systems.
7	Kenya and the rest of Africa - physical environment, people and factors affecting their distribution, resources and economic activities, political developments and systems. Fisheries and river development projects such as River Tana, Volta and Aswan High Dam.
8	Kenya and the world - physical environment, people, social and cultural activities, resources and economic activities (including agriculture and fishing), political development and systems

Appendix 3.3 Science subject.

Class	Topics
1	Health education, weather, animals, plants, water, air, light, soil.
2	Health education, weather, animals, plants, water, air, light, construction, soil
3	Health education, weather, animals, plants, water, soil, air
4	Weather and astronomy, living things, heat, properties of matter, health education, soil.
5	Living things, soil, heat, properties of matter, health education.
6	Weather and astronomy, Living things, health education, properties of matter, light, electricity
7	Weather, living things, environment, properties of matter, health education
8	Living things, environment, properties of matter, energy, and health education.

Appendix 3.4: Agriculture subject.

Class	Content
4	Parts of a farm (visit the farm), water sources (find out) and uses, marketing of farm products (visit the market), Youth organization (4K club activities), farm animals, crops, tree planting (practical), soil (Visit sites to see profiles), weather.
5	Land mapping (planning and modeling), soil erosion (look for types), uses of water on the farm (and practical), irrigation, water conservation (visit wetland), water containers, crop production practical, 4K club activities
6	Soil erosion (Visit sites and practical), farm hygiene and safety (use of chemicals), 4K club activities
7	Crop pests and diseases, methods of maintaining soil fertility, soil conservation, fish farming (visit fish farm, construct pond) farm produce storage methods, 4K club activities including participation in community activities such as water projects, methods of grazing (visit local farms)
8	No topic directly related to wetlands

Appendix 3.5: English subject.

Class	Content
1	Talking about pictures, drawings and models, everyday activities; singing simple songs
2	Verses, songs, simple stories; talking about objects and pictures
3	Verses, songs, stories, compiling simple class picture dictionaries, writing simple guided compositions
4	Acting plays, describing objects, writing composition
5	Describing objects, reading and responding to signs, notices and posters, playing, poems,
6	Poems, playing language games, telling stories and dramatizing them, describing objects, events and experiences, participating in debates; reading and responding to signs, notices and posters, playing, poems, writing compositions,
7	Poems, playing language games, telling stories and dramatizing them, describing objects, events and experiences, participating in debates; reading and responding to signs, notices and posters, playing, poems, writing compositions, giving reports, participating in

	interviews
8	Poems, playing language games, telling stories and dramatizing them, describing objects, events and experiences, participating in debates; reading and responding to signs, notices and posters, playing, poems, writing compositions, writing project reports, participating in interviews, recording observations from nature walks, experiments, fieldtrips etc.

Appendix 3.6 Kiswahili subject

Class	Topics
1	Good discipline; poems, songs, drama, identify and name living organisms in the local environment and express them in short sentences; write short passages.
2	Good discipline; poems, songs, drama, identify and name living organisms in the local environment and express them in short sentences; write short passages.
3	Good discipline; poems, songs, drama, identify and name living organisms in the local environment and express them in short sentences; write short passages.
4	Good discipline; poems, songs, drama, identify and name living organisms in the local environment and express them in short sentences; write essays.
5	Good discipline; write essays on the environment;
6	Good discipline; Write essays on the environment,
7	Good discipline; Write essays on the environment, places such as museums, artefacts
8	Good discipline; Write essays on the environment, harvests, industries,

Appendix 3.7 Christian Religious Education subject

Class	Topic
1 & 2	Creation – look at nature and name things of nature
4	Jesus and creation – understand that laws of nature which science describes are evidence of the continuing upholding by God of this world.
6	Caring for the environment – practice some ways of caring for the environment,
7	Creation – look at mans discoveries and marvel at God's creation.
8	Leisure – explain proper use of leisure, illustrate destructiveness of the misuse of leisure.

Appendix 3.8 Home Science subject.

Class	Topics
4	The family basic needs, Health education (use and care of latrines and toilets), water sources and sedimentation,
5	Health education (sources of water for home use, prevention of contamination of water sources, safe water, storage of water for drinking, proper drainage and care of the drains; health hazard in home and the community from water, rivers and dams.
8	Refuse disposal, care and cleaning of the compound

Appendix 3.9: Mathematics subject.

Class	Topics
1	Sort and classify objects – use colour, shape , size, marching objects, counting, ordering, addition, subtraction, measurement (length, capacity, weight, time).
2	Addition, subtraction, multiplication, division, measurement (length, capacity, weight, time),
3	Measurement (length, capacity, weight, time), making patterns using squares, triangles and circles.
4	Measurement (length, capacity, weight, time, perimeter, area, volume), collecting data and recording in tables; angles
5	Measurement (length, capacity, weight, time, perimeter, area, volume); lines, angles; collecting data and recording in tables, bar graphs, linear scale.
6	Measurement (length, capacity, weight, time, perimeter, area, volume); geometry, linear scale;
7	Measurement (length, capacity, weight, time, perimeter, area, volume); geometry, scale drawing, ratio and proportion;
8	Measurement (length, capacity, weight, time, perimeter, area, volume); geometry; tables and graphs; scale drawing; ratio and proportion

Appendix 3.10: Music subject.

Class	Topics
1	Sing simple songs, collect and use songs and singing games,
2 &3	Sing simple songs, collect and use songs and singing games, appreciate other people's culture
4	Write music, respect other people's culture, collect and preserve traditional songs, dances and musical instruments,
5, 6 & 7	Write music, respect other people's culture, collect and preserve traditional songs, dances and musical instruments
8	Write music, respect other people's culture, collect and preserve traditional songs, dances and musical instruments, types of music and their social roles, ornaments and make-ups in song and dance.

Appendix 3.11: Insights from classroom visits

Nine out of ten teachers who participated in the interview schedule (Table 6.1) were assessed in the classroom to establish the methods used in teaching and the level of involvement of learners in practical learning activities. A summary of the findings is given below.

Methods used by teachers in classroom teaching

Subject	Class	Topic	Methods	Remarks
Science	5	Health Education - foods	Guided questioning, show food exhibits (e.g. fruits, vegetables, millet, beans), tell pupils about foods, pupils draw, teacher gave notes	No use of outdoors, teacher came with fruits
Science	6	Digestion	Guided questioning, lecture	Children asked to eat food from their lunchboxes.
Mathematics	5	Pie charts	Guided questioning, text book exercises, lecture	No use of real situations to generate data for use in drawing pie charts
Mathematics	5	Graphs	All pupils read a question together, lecture, guided questioning	Over reliance on textbook, pupils confused
Geography	4	Communication	Guided questioning, lecture, give notes	No display of objects such as the horn, drum, radio, mobile phone and newspapers that were mentioned during the lesson.
English	7	Composition – tree planting	Guided questioning, discussion	No teaching aids, no outdoor activity
Kiswahili	8	HIV/AIDS *insha* (composition)	Guided questioning, group work discussions	No teaching aids
Agriculture	5	Trees	Lecture, guided questioning	No teaching aids, no outdoor activity
CRE	6	Creation	Guided questioning, lecture, notes given in class	No outdoor activity, no teaching aids.

Appendix 3.12: Insights from the schemes of work and lesson plans

A document analysis was done on the schemes of work and lesson plans for nine teachers (section 5.8.5). The aim was to explore how they planned for their teaching in terms of stating their objectives, learner activities and learning resources. Their responses are given below.

Document analysis of schemes of work and lesson plans

Topic	Objective	Learning activities and teaching aids
Food	Pupils should state components of a balanced diet	List the foods eaten at different times of the day and classify them as proteins, carbohydrates etc.
Physical features	Identify the main physical features and their effects on the distribution of people. Identify main vegetation types in the province State the social and cultural activities of people	No activities
Germination of seeds	State conditions necessary for germination	Show pupils some germinating seeds Assignment – ask pupils to germinate some seeds after the lesson.
Geometry – points of intersection	Pupils to identify points of intersection	Identify intersection of several lines drawn on the blackboard. Identify points of intersection in class Give pupils work from their books
Kiswahili vocabulary	Pupils to be able to state vocabulary used for various plants.	No activities
Resources and economic activities	To help pupils to know and suggest local foods	Map showing where the crops are
Wildlife	Help pupils name different birds and animals	No teaching aids, no activities
Fishing	Help pupils know the main fishing areas, traditional methods of fishing, buying and selling of fish, fish processing	No activities, no teaching aids
Adaptation in animals	To learn about methods of adaptations in animals	Teaching aids- teeth, claws, hands etc. No activities

Clouds	Differentiate different types of clouds	Discuss, clouds, chart
Water pollution	State different types of pollutants in water	No activities mentioned
Light	Name sources of light e.g. torch, sun, bulb	Teaching aids- candles, lamps, firewood, no activities
Measurement - volume	Pupils to be able to calculate the volume of regular shapes Demonstration of how to solve volume problems	Teacher demonstrates
Environment	Pupils should understand components of the environment.	Discussion, explanation, answering questions and writing notes.

Appendix 5.1 Reminder letter to the teacher to return the questionnaire

NATIONAL MUSEUMS OF KENYA

PO Box 40658-Nairobi
Telephones: 742131/4, 742161/4
448930/1
Faxcon: +254-2-741424
E-Mail: nmk@Africaonline.co.ke

Date: 17th October 2000.

Water and Wetlands Education Programme

Dear .....

RE: Reminder of questionnaire reply deadline

Thank you for confirming receipt of the Wetlands Education Evaluation Questionnaire. This proves your great interest in being an active participant in the development of an effective Wetlands Education Programme in Kenya.

I just want to remind you to post back the filled questionnaire as soon as possible so as to reach me by 25th October 2000. I will keep you informed about any further development in the Water and Wetlands Education Programme.

Thank you for your continued support.

Yours sincerely,

Ayub Macharia Ndaruga,
Coordinator, Water and Wetlands Education Programme,
National Museums of Kenya.

Appendix 5.2: A letter to the head teacher introducing the questionnaire

NATIONAL MUSEUMS OF KENYA

PO Box 40658-Nairobi
Telephones: 7421171, 7422163
4446390/1
Faxcon: + 254-2-741424
E-Mail: nmk@Africaonline.co.ke

Date: 21st February 2001.

The Head teacher

.....

.....

.....

Dear Sir/Madam,

RE: **Wetlands education programme evaluation questionnaire**

This letter is a request to you to forward this questionnaire to

.....

who is a teacher in your school (if nothing has changed since January 1999). The teacher participated in an in-service training programme on water and wetlands conservation, which was organised by the National Museums of Kenya (NMK) in January 1999. The NMK, through technical assistance from Rhodes University, South Africa, is now evaluating how teachers are applying this programme within the school and community contexts with an intention of identifying the teacher's abilities and limitations. This programme recognises the strategic placing of teachers in school and the community and would like to ensure that they are appropriately empowered to address local environmental problems. But this aspiration can only be achieved if those who participate in our environmental education programmes inform us of their abilities and limitations. It is therefore important that the teacher named above should answer all questions in this questionnaire.

The reason why I decided to write to you is because I have realised that some teachers who participated in the training workshops have been transferred. It would be hard for me to know who has/hasn't been transferred. But since every school has a head teacher, it is possible to know who has been transferred and remedial measures can be taken instantly. I therefore request you kindly to forward this letter to the above-mentioned teacher immediately so that he/she can confirm receipt of the questionnaire. If the teacher has been transferred, please put the questionnaire in the self addressed envelope and send it to me immediately. If you know the school where the teacher was transferred to, please write a small note indicating his/her present address and mail it back together with the questionnaire. Postage has been paid.

For any enquiries, you can phone me using the telephone numbers above and ask for extension **290** during office hours or call me any time on the mobile phone number **072728572.** I will appreciate every assistance you give me to make this evaluation exercise a success. Thank you.

Yours sincerely,

Ayub Macharia Ndaruga,
Coordinator, Water and Wetlands Education Programme,
National Museums of Kenya.

When replying please quote our reference.

Appendix 5.3 A letter to the teacher introducing him/her to the questionnaire

NATIONAL MUSEUMS OF KENYA

PO Box 40658-Nairobi
Telephones: 742131/4, 742161/4
448930/1
Faxcon: +254-2-741424
E-Mail: nmk@Africaonline.co.ke

Date: 21st February 2001.

Water and Wetlands Education Programme

Dear .....

RE: Wetlands education programme evaluation questionnaire

The Water and Wetlands education programme at NMK is one of several environmental education programmes focusing on teachers. You are one of the teachers who participated in the above named programme in January 1999. This questionnaire asks for your views on how you apply your training, both in school and in the community. The NMK considers you strategically placed to promote wetlands conservation within your local set up. This programme would like to make you more effective, but this can only be done best if you tell us your abilities and limitations. It is therefore necessary that you give me all the details requested in this questionnaire.

I therefore request you kindly to respond to the questionnaire attached. Please feel free to give me all your views regardless of how negative they appear to you. All information will be treated with utmost confidentiality and will only be used for the purpose of this research. This research is part of environmental education research collaboration between National Museums of Kenya and Rhodes University, South Africa whose goal is to establish **'how teachers apply in-service training within the school and community contexts'**. On the basis of the questionnaire responses, 20 teachers from all over Kenya will be selected for in-depth interviewing with regard to the implementation of this in-service training programme.

Please answer all questions and mail the questionnaire back to me using the self-addressed envelope enclosed. Your participation in this wetlands education evaluation exercise will be a milestone achievement towards conserving our precious wetlands. Please make sure your questionnaire reaches me latest 10th March 2001. I have also included a small envelope with a letter for you to confirm receipt of this questionnaire. Please post back the small envelope as soon as possible to inform me that you have received your questionnaire.

For any enquiries, you can phone me using the telephone numbers above and ask for extension 290 during office hours or call me any time on the mobile phone number 072728572. I hope to receive your answered questionnaire as soon as possible. Thank you.

Yours sincerely,

Ayub Macharia Ndaruga,
Coordinator, Water and Wetlands Education Programme,
National Museums of Kenya.

When replying please quote our reference.

Appendix 5.4 A questionnaire receipt confirmation letter

NATIONAL MUSEUMS OF KENYA

PO Box 40658-Nairobi
Telephones: 742131/4, 742161/4
448930/1
Faxcon: +254-2-741424
E-Mail: nmk@Africaonline.co.ke

Date: 21st February 2001.

Water and Wetlands Education Programme

Dear .....

RE: Questionnaire receipt confirmation

This letter requests you to confirm that you have received a copy of the wetlands education programme evaluation questionnaire. This letter will inform me who has received the questionnaire and who has not. Your immediate response is necessary. Please fill in the details requested below and post this letter back to me **immediately** using the small self-addressed envelope attached. You can then respond to all questions in the questionnaire and post it back so as to reach me latest **10th March 2001**. Thank you.

Yours sincerely,

Ayub Macharia Ndaruga.

Confirmation note

I confirm that I have received a copy of the wetlands education programme evaluation questionnaire.

Date .....

Name of teacher .....

Name of school .....

Address .....

Telephone Number .....

E-mail (if available) .....

Location of the school

Province ..... District.....

Division..... Location.....

Sub location..... Village.....

NB. Please post back this letter immediately.

When replying please quote our reference.

Appendix 5.5: Questionnaire.

Instructions to be followed when answering the questions.

1. Please ensure you have answered all questions since your responses will form the basis upon which we can understand your experiences

2. For the close-ended questions, circle the option that you agree with as shown in the examples below.

Examples

Did you attend the wetlands workshop? (Yes) / No .

What are your views regarding the workshop sessions?

(Most enjoyable)

Enjoyable

Neutral

Boring

Most boring

3. **Note** that some questions require further explanation regardless of whether your answer is 'Yes' or 'No'. Please don't ignore any question.

SECTION I. Background information about the teacher.

1. Name ……..

2. Sex: Male **(Please circle the option you agree with)**

Female

3. Age: Between 20 – 30

Between 30 – 40

Between 40 – 50

Above 50

4. a) Give me a clear location of your school just in case I intend to visit you for an interview.

Name of your school …….……... ……..……

Address ……. ……..……..……

Telephone…….. E-Mail……

Province……...….. District……

Division …….…… Location…….

Sub- location ……....…… Village…….

b) Is your school a rural or an urban school?

Urban

Rural

5. a) For how many years have you been a teacher? …….

b) Are you a trained or untrained teacher?

Trained teacher

Untrained teacher

c) For how many years have you been teaching in this school? ……

6. Which classes do you teach and what are your teaching subjects?

Classes taught	Teaching subjects

7. a) Of the classes you mentioned in 6 above, which one do you prefer most?

b) Which of your teaching subjects listed above do you feel most comfortable teaching?

8. a) Do you have any other responsibilities in the school other than being a classroom teacher? Yes/ No **(remember to circle the option you agree with)**

b) If 'Yes', please explain.

9. a) Are you a resident of the area around the school? Yes / No

b) i) If 'Yes', do you live on your parent's land or on your own land?

ii) Does the land border a wetland? Yes/ No

iii) If 'No', how far is your land from the nearest wetland? ……

10. What benefits do you personally get from the wetlands around you?

11. a) Do you have any special responsibilities in the community? Yes / No

b) If ‘Yes’, please explain.

12. a) Except for the water and wetlands conservation workshop, have you ever attended any other environmental in-service training since you started teaching? Yes / No

b) If ‘Yes’, please explain.

SECTION II. **Context of the catchment**

13. a) Do you have any wetlands near the school? Yes /No

b) If 'Yes', list the names of the 5 nearest to the school, identify their types, and state the approximate distance to the wetland from your school.

Name of local wetland	Type of wetland	Approximate distance to the wetland from school

c) Write a short description of the wetland nearest to your school.

14. a) The list below gives some of the major **uses** of wetlands in Kenya. Perhaps some of the uses listed apply to your local wetlands. Please select and indicate in the spaces provided the corresponding magnitude of these uses as they apply to your local wetlands.

(NB. Feel free to add any other use that might not be included in the uses given).

Wetland uses	Very important	Important	Neutral	Less important	Not at all important
Provide domestic water					
Provide fish					
Provide water for farming					
Assist the water cycle					
Provide water for animals					
Modify climate					
Centre for recreation					
Habitat for plants and animals such as Hippos and birds.					
Cultural and religious practices done there					
Control flooding					
Filter silt from water flowing downstream					
Attract tourists					
Provide transport					
Support local crafts such as basket making					
Provide building materials eg. Sand					
Grazing areas in dry seasons					
Centre for research					
Centre for learning about interrelationships					
Purification of waste materials					

b) List some of the very special uses of wetlands **to your local community** which if absent, could have a major negative impact for the community.

15. The list below gives some of the major **threats** to wetlands in Kenya. Perhaps some of the threats listed also apply to your local wetlands. Please select and indicate in the spaces provided the corresponding magnitude of the threats listed as they apply to your local wetlands.

(NB – Feel free to add more threats to your wetlands on the space provided)

Threats to wetlands	Very important	Quite important	Important	Less important	Not important
Reclamation for agriculture					
Pollution by farm chemicals					
Pollution by industries					
Pollution by solid waste					
Over-extraction of water					
Over-harvesting of products eg fish, papyrus					
Overgrazing					
Deforestation					
Soil erosion leading to siltation of wetlands					
Introduction of exotic species eg water weeds					
Population pressure demanding more land					
Destruction to get rid of mosquitoes and bilhazia					
Sewage damping sites					

16. a) Do you think the community and the school are aware about threats to their wetlands? Yes/No

b) Explain your response to 16a above.

17. a) Have there been any interventions or efforts by your school to tackle the threats identified in question 15 above. Yes / No

b) If ‘Yes’, please explain.

c) If ‘No’, please explain possible reasons why they have not been there.

SECTION III. Implementation of the programme.

18. a) It is now over one year since the workshop you attended on wetlands. If you reflect back, how would you evaluate the different aspects of the workshop with regard to the use of the training in your practice of teaching?

	Good	Above average	Average	Below average	Poor
Quality of workshop sessions					
Take away notes and brochures					
Wetlands poster					
Outdoor activity in the local wetland at the workshop site					
Interaction among workshop participants and facilitators					

b) Do you wish to comment further on your responses to 18a above.

19.a) How many copies of the wetland poster did you take away to distribute? ……..

b) List the names of teachers and schools that you distributed a copy of the poster to, and the approximate distance of that school from yours.

(NB. The researcher will visit the schools for similar enquiries)

Name of school	Name of teacher	Distance from my school	Number of posters

c. You may also have distributed posters to other people not necessarily teachers. Please list them also.

Name of person	Institution	Designation	Number of posters

20. Give a short explanation of the strategy you used to distribute the posters (for instance did you post them, take to the school, meet the teacher on your way and gave him/her or conduct a workshop prior to giving them out, etc, etc?)

21. a) When you went back to school, did you inform your fellow teachers about the proceedings of the workshop? Yes / No

b) Please explain your answer to 21a above.

22. Where did you display any remaining poster(s)? **(You can circle more than one option)**.

a. In my house

b. On the students' notice board

c. On the staff room notice board

d. In one of the classrooms

e. In the headmaster's office

f. Other (Specify)……..

23. a) Since the workshop, have you ever involved children in knowing about their local wetlands? Yes / No

b) If 'Yes', please explain.

c) If 'No', what has hindered you from doing this?

SECTION IV. **Teacher's use of wetlands training in the school curriculum.**

24. a) Is the wetlands poster still being used in your school? Yes /No

    b) Please explain your answer to 24a above.

25. a) Do you use the wetlands training and learning materials (posters, notes etc) in any of your teaching subjects? Yes/No

    b) If 'Yes', for which subjects and topics have you used wetlands training, and in what practical activities did you involve the children?

Subject	Topics	Wetland activities

26. Based on your answer to 25b above do you have any comments about the quality of your teaching now as compared to before you attended the in-service workshop?

27. a) Which of the following terms best describe how you feel about integrating the water and wetland training into the entire environmental education context as required in the school curriculum? **(Please circle the option you agree with)**.

Very difficult

Difficult

Neutral

Easy

Very easy

b) Please explain your answer to 27a above.

28. What motivates you to apply the water and wetlands training in your curriculum based teaching?

SECTION V. Integration of the programme in the extra-curricular context

29. a) Which environmental extracurricular movements (school clubs) are present in your school in which wetland issues can be tackled appropriately? Please, list them below.

b) Have you ever used any of these forums to address wetland issues with children? Yes / No

c) Explain your answer to 29b above.

30. a) Do you mark any other environmental days in school? Yes/No

b) If ‘Yes’, which ones and what sort of activities does your school organize for the children?

Name of environmental day	Children activities

c) If your answer to 30a above is ‘No’, please explain why environmental days are not marked in your school?

31. If you apply your wetland training in the extracurricular context, what has motivated you to do so?

SECTION VI. Use of the training at community level

32. a) Since the workshop, have you initiated any community activity to enlighten them on the wise use of their wetlands? Yes / No

b) If 'Yes', please outline the strategies you employed and activities you involved the community in.

Strategies e.g. public *barazas*, workshops for women's groups, youth etc	Practical activities

c) If no, what has hindered you from addressing wetlands degradation problems at community level?

33. a) Have you ever marked any environmental day with members of the community? Yes/No

b) Please explain your answer.

34. If you have applied your wetlands training at the community level, what has motivated you to do so?

SECTION VII. Problems/Inhibitors to application of wetlands training

35. a) Are there any problems that hinder you from applying the water and wetlands training within your school and the community? Yes/No

b) If 'Yes', please explain.

Problems within the school context

Problems at community level

36. a) Have you ever sought assistance (from within and outside the school) to solve some of the problems you have faced while applying the water and wetland programme. Yes/No

b) Please explain your answer to 36a above.

37. In your own opinion, what changes would you propose to the water and wetlands training to encourage teachers to be more active in implementing wetlands education within their schools and their community?

Appendix 5.6 A letter informing the teacher about the interview

NATIONAL MUSEUMS OF KENYA

PO Box 40658-Nairobi
Telephones: 742131/4, 742161/4
448930/1
Faxcon: +254-2-741424
E-Mail: nmk@Africaonline.co.ke

12th August 2001

To: .....

Through:

The Head Teacher,

.....

.....

.....

Dear Sir/Madam,

RE: INTERVIEW VISIT

My earlier letter to you dated 15th May 2001 refers. As I promised you, the review of the Water and Wetlands Programme Evaluation questionnaire was to culminate in selection of ten teachers to participate in phase 2 of the study. The review of the questionnaire responses is now complete. I am delighted to inform you that the research team have nominated you to participate in phase 2 of the study. This will involve me visiting your school for interviews and observations. I intend to interview you, three other teachers and some pupils. The interview and observations will take about 2 days. I plan to visit your school on

Dates .....

I look forward to meeting you then.

Yours sincerely,

Ayub Macharia Ndaruga
Coordinator, Water and Wetlands Education Programme,
National Museums of Kenya

When replying please quote our reference.

Appendix 5.7: Interview questions

Section 1: Teacher pre-service training

1. When did you graduate from college?
2. What do you understand by the term environmental education (EE)?
3. Did you learn EE in college?
4. Was EE a separate course or integrated?
5. How were you taught EE? Was learning participatory or teacher dominated?
6. a) Can you remember any special moment in an EE class during your college days? Explain. (If a teacher talks of a trip to the national park, ask question 6b).
   b) Can you remember a special moment in an EE class in the school compound?
7. What environmental problems do you experience around your locality?

Section 2: Teacher's personal concepts about wetlands.

8. What is a wetland?
9. In your opinion, is the local wetland useful? Explain.
10. What do you personally gain from wetlands?
11. What do you specially like/appreciate in your local wetland?
12. What do you dislike in your local wetland?
13. Since the workshop, have you engaged yourself in any practical activity that is directly linked to conservation of local wetlands? Explain.
14. What perceptions do you have about yourself as an agent sensitised about water and wetland conservation and required to apply this training within your locality?

Section 3: Teacher – curriculum – wetland interaction.

15. How do you teach about local wetlands to pupils?
16. What pertinent issues of the local wetlands have you addressed using the curriculum?

17. What practical activities do you involve learners in while teaching them about local wetlands using the curriculum? If ‘no’, why?
18. Who tells you the practical activities in which to involve the pupils?
19. What goals/outcomes would you like to fulfil by teaching pupils about wetlands?
20. What lessons/insights have you developed as a result of teaching pupils about wetlands?
21. Who makes decisions on how internal exams are set in this school?
22. Do you include local wetland issues in your internal exams? Explain.
23. Explain one of the lessons you have prepared and conducted using the local wetlands.
24. Do you have any specific complaint arising from your experience so far in teaching about wetlands using the school curriculum perspectives?

Section 4: Teacher – extra-curricular – wetland interactions.

25. Which extra-curricular movements are there in your school?
26. Which ones do you have special interests in and why?
27. Which club do you think would comfortably address local wetland issues?
28. How have you made use of this opportunity? Explain.
29. Do your school mark special environmental days such as World Environment Day, World Wetlands Day etc?
30. What activities do you organise for children and why?
31. Do you have any specific complaint arising from your experience so far in addressing wetland issues using the extra-curricular context?

Section 5: Teacher – Community – Wetland interaction

32. What can you say about your interaction with the local community?
33. What do you appreciate/like about your local community’s interactions with wetlands?
34. What do you dislike about your local community’s interactions with wetlands?
35. What practical action have you initiated to address unsustainable community-wetland interactions? If ‘No’, why?

36. Do you have any complaints arising from your experience after involving yourself with the community to address local wetlands?

Section 6: Teacher – Training – Practice Interaction

37. How did you benefit from the Water and Wetlands training?
38. What can you say about the application/practice of what you learnt into your local context?
39. Have you told your fellow teachers about their local wetlands? Please Explain.
40. Do your fellow teachers work hand in hand with you to conserve the local wetlands? Do you use the wetland posters?
41. What insights do you have about yourself after teaching learners about wetlands?
42. Do you have any specific complaint arising from your experience in practice of the water and wetlands training?

Section 7: Questions to the senior teachers

43. Have you ever heard about wetlands? Who told you about them?
44. What are wetlands?
45. Do you think they are important?
46. Have you used the local wetlands in your teaching? Please explain.
47. What motivation do you have when teaching pupils about the local wetlands?
48. As a member of the community, what activities have you done to address the local wetland problems?
49. Have you seen the wetlands poster? What do you think about it?
50. Do you use the poster in your teaching subjects? Please explain.
51. Have you ever sought for guidance from the teacher who participated in the wetlands workshop to conserve the local wetlands?

Section 8: Questions for the focus group interviews with pupils.

52. Has your teacher taught you about wetlands?
53. What are wetlands?
54. What do you like about your local wetlands?
55. What do you dislike about your local wetlands?
56. Have you seen the wetlands poster? What do you think about it?
57. Have you done any practical activity in your local wetlands? Explain.
58. What vision do you have as a club in addressing the future of your wetlands?

Appendix 5.8 Acknowledgement letter

NATIONAL MUSEUMS OF KENYA

P.O. Box 40658, Nairobi, KENYA
Tel: (02) 742131/4
742161/4
448930-3
Fax: 254-2-741424
Telegram:MUSEUMS
Email:nmk@museums.or.ke
Website: http://www.museums.or.ke

15th May 2001

To: .....

Through :

The Head Teacher

.....

.....

.....

Dear Sir/Madam,

RE: ACNOWLEDGEMENT

I wish to acknowledge receipt of your reply to the questionnaire that I sent you concerning the Water and Wetlands Education Programme. I thank you most sincerely for sparing us your time to read and respond to all the questions that were presented to you. Indeed the National Museums of Kenya and our technical team from Rhodes University, South Africa feel greatly honoured.

Your responses are being analysed in an effort to identify significant trends in the application of this wetlands in-service training. I will keep you informed of any development in this project. We have updated your name and address in our database and will get in touch with you any time we come across environmental education opportunities and resources. We will also respond to any assistance you requested for in your responses. Feel free to seek more assistance from us on how to conserve our precious wetlands.

I am highly optimistic that something good will come out of this evaluation exercise and that the benefits will definitely spill over to you. I would therefore request you kindly to inform us of any changes in your postal address to enable us to get in touch with you easily all the time.

Thank you for your continued support.

Kind regards,

15 MAY 2001

Ayub Macharia Ndaruga
Coordinator, Water and Wetlands Education Programme,
National Museums of Kenya.

When replying please quote our reference

Appendix 5.9: List of plates

The photos below show some of the activities done by teachers that were noted during the interview visits. The photos are referred to elsewhere in the text. Some of the pictures such as Plate F revealed a contradiction of the teacher responses to the interview. This strongly supports the need for triangulation of research methods and data.

Plate A Teacher holding the wetlands poster

Plate B Writings about wetlands on the wall of a primary school

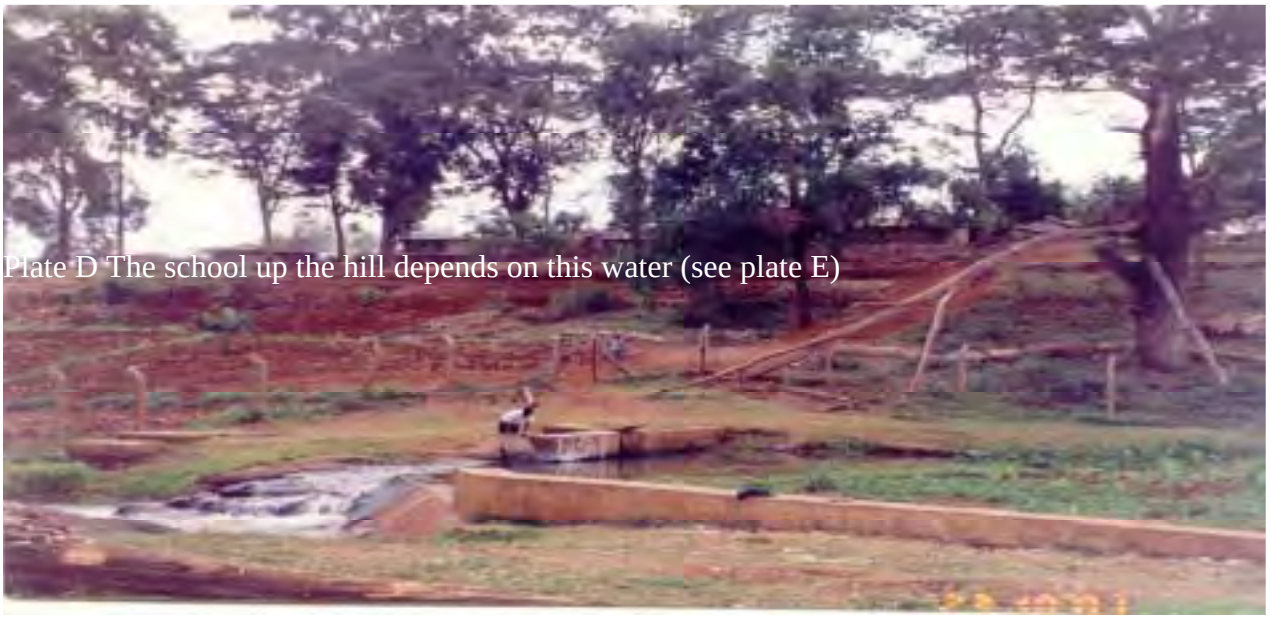


Plate C A dam next to a school. The school is situated behind the trees. The dam is rarely used during teaching.

Plate D The school up the hill depends on this water (plate E)

Plate E Water from river (Plate D) used to cook food for pupils

Plate F Teachers on the right hand side had reported that people do not wash clothes in the river (see section 9.4.2). This contradiction was revealed through observation.

Plate G Teacher admires a community water project he initiated

Plate H Tree planting at school

Plate I A tree nursery