



**Exploring expansive learning and co-management in the uMzimvumbu
catchment**

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MZUKISI KUSE

(G09K0373)

SUPERVISOR

DISTINGUISHED PROFESSOR HEILA LOTZ-SISITKA

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Abstract

South Africa is a water-stressed country which is currently confronting numerous water challenges which include security of supply, degradation of ecological infrastructure, poor landscape governance and resource pollution. These are compounded by built infrastructure, which is ageing, an increasing population and the impact of climate change. South Africa's water issues are influenced by a myriad of factors such as weather patterns, governance issues, historical apartheid policies, structural integrity of ecological and built infrastructure, and general provision of services. The most vulnerable members of society usually positioned in low-income communities are the ones who mostly bear the brunt of these harsh conditions.

To address water insecurities and challenges, South Africa has defined several Strategic Water Source Areas (SWSAs), which are important for water security in South Africa. The Living Catchments Project (LCP) is a collaborative project, situated in four catchments in South Africa, with the aim to strengthen the enabling environment for the governance of water in South Africa's strategic water resource areas. The central focus of the LCP is on co-learning and co-creation through communities of practice in order to enable, collaborate, and amplify the practice of transformative social learning and improve the policy advice practice and engagement with the water sector to contribute to the Water Research, Development and Innovation (RDI) Roadmap. This study is positioned in the LCP, which is also a case study for transformative innovation policy and Just Transitioning in South Africa.

The aim of this study was to address the need for more substantive understanding of learning in co-management, and the evaluation of such learning, which was identified as a gap in the scientific literature, and which was confirmed through policy review. The study set out to explore expansive learning and co-management in the uMzimvubu catchment, which is one of the SWSAs in South Africa and forms part of the LCP, which in turn is part of the Transformation Innovation Policy Consortium's cases of Just Transitioning.

Cultural History Activity Theory (CHAT) was the foundational theory of this research, with a particular focus on 3rd generation activity analysis (Engeström, 1987), and formative intervention methodology, in which I was positioned as a formative interventionist researcher. I used individual interviews, focus group interviews, field observations, and Change Laboratory methods to identify activity systems, the shared object of activity, and to engage multi-voiced participants in resolution of contradictions to expand their learning. The study

also identified indicators of learning relevant to co-management in a LCPs context. Monitoring of learning occurred in two different phases; before the expansive learning process (A-view), and after the expansive learning process (B-view). The Value Creation Framework tool adapted from Wenger et al. (2011) was used to identify indicators of learning.

This study shows that the object of co-management of water resources in a catchment can be enhanced through learning platforms and processes that are collaborative and expansive. One of the study's contributions to new knowledge lies in relation to the expansive learning process and how it expanded the learning around co-management in a Living Catchments Project context. A second contribution of the study shows that the expansive learning process embarked on qualitatively changed the nature of the indicators of learning in the catchment. A better set of indicators was attained following the expansive learning process, which are more aligned with the nature of transformative social learning. The study's contributions can be summarised as offering insights into learning processes for co-management, as well as evaluation of these learning processes.

Although the contributions emerging from this study may be at niche level innovation in the framing of Just Transitions, they have a potential to inform other catchments, where multi-actors are working together on co-management of water resources to secure water provision, as was the case for the uMzimvubu catchment communities who participated in this study.

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List of Acronyms/Abbreviations

CHAT	Cultural-History Activity Theory
CoP	Community of Practice
COSATU	Congress of South Africa Trade Unions
CRADLE	Centre for Research on Activity, Development and Learning
CSA	Conservation South Africa
CSIR	Council for Scientific and Industrial Research
DFFE	Department of Forest, Fisheries and the Environment
DSI	Department of Science and Innovation
DWS	Department of Water Affairs and Sanitation
ELRC	Environmental Learning Research Centre
ERS	Environment and Rural Solutions
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
ICS	Improved Cook Stove
IDP	Integrated Development Planning
IHP	International Hydrological Programme
IIED	International Institute for Environment and Development
IK	Indigenous Knowledge
IKS	Indigenous Knowledge Systems
IWQM	Integrated Water Quality Management
IWRM	Integrated Water Resources Management
JMP	Joint Monitoring Programme
LCP	Living Catchments Project
MFMA	Municipal Finance Management Act

MLP	Multiple-level Perspective
MOU	Memorandum of Understanding
NBA	National Biodiversity Assessment
NDP	National Development Plan
NGO	Non-governmental Organisations
NPC	National Planning Commission
NRM	Natural Resource Management
NW&SMP	National Water and Sanitation Master Plan
NWSMP	National Water and Sanitation Master Plan
PCC	Presidential Climate Commission
RDI	Research, Development and Innovation
RSA	Republic of South Africa
SADC	Southern African Development Community
SANBI	South African National Biodiversity Institution
SDG	Sustainable Development Goals
SPRU	Science Policy Research Unit
STI	Science, Technology and Innovation
SWSA	Strategic Water Source Areas
TADS	Transformative Agency by Double-Stimulation
TEK	Traditional Ecological Knowledge
TIP	Transformative Innovation Policy
TIPC	Transformative Innovation Policy Consortium
TOT	Training of Trainers
UCP	UMzimvubu Catchment Partnership
UCPP	UMzimvubu Catchment Partnership
UN	United Nations
UNDP	United Nations Development Programme

UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VCF	Value Creation Framework
VET	Vocational Education and Training
WMA	Water Management Areas
WRC	Water Research Commission
WSP	Water Source Partnership
WWF	World Wildlife Foundation
ZPD	Zone of Proximal Development

CHAPTER 1: BACKGROUND AND CONTEXTUALISING THE STUDY

1.1 Introduction

South Africa is a water-stressed country which is currently confronting numerous water challenges including security of supply, degradation of ecological infrastructure, poor landscape governance and resource pollution. These are compounded by built infrastructure that is ageing, an increasing population and the impact of climate change (Department of Water and Sanitation, 2019). Water scarcity poses a serious threat to growing the economy as the development agenda of the country's most strategic sectors such as agriculture, energy security, mining, tourism, urban and rural development are entirely dependent on an adequate water supply (Department of Water and Sanitation, 2019). South Africa's water issues are influenced by a myriad of factors such as weather patterns, governance issues, historical apartheid policies, structural integrity of ecological and built infrastructure, and general provision of services. The most vulnerable members of society, usually positioned in low-income communities, bear the brunt of these threats.

The availability of water is crucial for all living organisms and ecosystems to survive and is vital for the health of humans, production and securitisation of food, as well as for social and economic development (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2012). Political commitment, societal agency and numerous other factors including those influenced by cultural and academic disciplines indicate the multiple-perspective value of water (UNESCO, 2012). The Intersectoral Platform (2010) stated that according to the United Nations (UN) World Water Development Reports, the impending water crisis was not just related to the availability of the resource but was a consequence of existing government approaches. Greenpeace (2018) states that safe, affordable and accessible water can be perceived as one of our planet's scarcest natural resources. Furthermore, this is especially true of the continent of Africa, where water insecurity is an everyday reality; simultaneously, equitable access to water is essential to life, human health and well-being (Greenpeace, 2018). In South Africa there are challenges relating to water, nutrition and food, and these challenges exert immense pressure on the agricultural sector as it is the primary user of the allocated water in the country (Pesanayi & Weaver, 2016).

The impacts of climate change on hydrological systems, coupled with a cumulative demand for water from an increasing population, have resulted in tensions over water resources in semi-arid regions across the world (Calverley & Walther, 2022). Even though water is vital to human health and survival as well as for the production and growth of the economy, over a billion people in developing countries are without sufficient access to water (Ziervogel et al., 2010). Du Plessis (2019) states when it comes to freshwater ecosystems, global climate change will certainly be a key stressor, especially in arid and semi-arid areas in the latter half of the twenty-first century. According to Calverley and Walther (2022), the history of water access in South Africa is a mirror of its political history, including racial and economic divisions. As a result of a past steeped in unfairness, the policy results of this event may serve as a litmus test for the justice concerns that accompany water scarcity in other locations (Calverley & Walther, 2022). This water crisis has accelerated present trends in South African water governance and heightening tensions between economic solvency and water redistribution aims, with implications for future access (Millington & Scheba, 2020). This has consequences for our understanding of climate change adaptation politics in South Africa and beyond (Millington & Scheba, 2020). As a result of South Africa's being in an arid and semi-arid zone with an average rainfall of 464mm, the country is susceptible to environmental risk and climatic extremes (Warner & Meissner, 2021). Furthermore, Greenpeace (2018, p. 6) states the following with regard to rainfall in South Africa:

South Africa has insufficient and unreliable rainfall, which means that it is a net importer of water. The country has a mean annual precipitation of 497mm/year, which is almost 50% less than the global average of 860mm/year. In fact, all three of the most economically developed countries in the Southern African Development Community (SADC) - Botswana, South Africa and Namibia - are water-scarce. This means that 'water scarcity is a fundamental development constraint', not only for this country, but for the entire SADC region.

It is against this very backdrop that the South African government took steps to try to remediate this matter by establishing the Water RDI Roadmap and initiating other strategic interventions to better manage the water resources in the country. The Water RDI Roadmap is important as it is the plan to implement Chapter 14 of the National Water Resources Strategy (SANBI, 2020). The Water Research Commission (WRC), the Department of Science and Innovation (DSI) and the Department of Water Affairs and Sanitation (DWS) joined efforts and established the Water Research, Development and Innovation (RDI) Roadmap, a high-level planning intervention (SANBI, 2020). As a way of contributing to the Water RDI, the South African National Biodiversity Institute (SANBI), in partnership with the WRC and the DSI, established

the Living Catchments Project (LCP). The LCP is a collaborative project with the aim of strengthening the enabling environment for the governance of water in South Africa (SANBI, 2020). The LCP is geared to respond specifically to the RDI Roadmap's Supply Cluster 3. Cluster 3, in which this study is located in, can be explained as follows:

Improve adequacy and performance of supply infrastructure by enabling collaboration, co-learning and co-creation among researchers, development practitioners, communities, traditional leaders and policy practitioners at the nexus of the built and ecological infrastructure for water security. (SANBI, 2020, p. 3)

The central focus of the LCP including in the uMzimvubu catchment, which provides the empirical case in this study, is on co-learning and co-creation through communities of practice in order to enable, collaborate, and amplify the practice of transformative social learning and improve the policy advice practice and engagement with the water sector to contribute to the Water RDI Roadmap (SANBI, 2020). As yet there is no clear methodology or approach outlined for supporting and evaluating this intended co-learning, which is the gap that this study seeks to address. In other words, this study seeks to give definition to *how* such ambitions can be realised in practice, and what can be learnt from this for extending the work to other catchments.

Educating communities about the importance of conserving natural resources has always been important to me. I was born and raised in the Eastern Cape and nature has always fascinated me. I come from an Environmental Science and Physical Geography background, and throughout my learning journey I realised that good research concerning natural resources was being done, but the intended recipients (mostly communities in villages) rarely accessed the information. It is for these reasons that I decided to embark on a PhD in Environmental Education. I wanted to partner with different stakeholders to try to ensure that there was co-management of ecological infrastructure, and to explore how expansive and transformative learning took place. My motivations and aim then led me to the LCP. The LCP is an ongoing project (established in 2019) and it is a national project (described further in Chapter 2). My PhD research is situated in this bigger project and my case study is the uMzimvubu catchment. The LCP is implemented in the four primary catchments associated with SWSAs, namely, the uMzimvubu catchment, Tugela catchment, Berg-Breede catchment and the Olifants catchment. The title for my PhD study is: *Exploring expansive learning and co-management in the uMzimvubu catchment*. The title of my research captures the important elements which are imperative for this study: ***expansive learning and co-management***. These two key concepts

and other important concepts relating to the study will be elaborated on further in the literature review (in section 1.3). Chapters 2 and 4 will highlight other theoretical concepts foundational to this study.

1.2 Rationale for This Research

As mentioned above, South Africa is one of the 40 driest countries in the world with an annual average rainfall of 497 mm; in essence, South Africa is a water-scarce country (Meissner et al., 2018). Human consumption of water has become a global crisis (Ngaira, 2007). The Republic of South Africa (RSA) is a water-scarce country that strives to provide safe drinking water. However, one of the issues is that the position of water sources in relation to the distance from residences is not given much consideration during the process of water provision (Polasi et al., 2016). In addition to this, South Africa's rate of economic development is closely linked to its water security (Meissner et al., 2018). Currently, more than 98% of the reliable available surface water is already allocated, and demand surpasses supply in most catchments. The DWS issued a warning that unless the current water challenges were addressed, the country would be facing a disastrous 17% deficit in water supply by 2030 (DWS, 2019). In addition, the SANBI's National Biodiversity Assessment (NBA) reported the following:

64% of river ecosystems are threatened and only 13% well protected. Wetlands are even worse at 79% threatened and only 6% under protection. This is an indication that the benefits of these ecosystems are currently compromised by the level of their ecological conditions, threat pressures and protection level. (SANBI, 2019, p. 1)

Securing water resources is a critical issue which cannot be ignored, and steps have to be taken in order to prioritise this matter. The issue of water security is not just a South African problem. It is a phenomenon which has emerged as a critical issue of concern in global, regional and national discourses. Internationally, water security has been a feature in the eighth phase of UNESCO's International Hydrological Programme (UNESCO IHP, 2015) and filtered into the conceptualisation of Goal 6 of the UN post-2015 Sustainable Development Goal Framework (UN, 2015). On a regional level, achieving water security has also emerged as a major objective in Africa; yet an analytical or diagnostic framework for assessing water security in African countries is not known to exist. Results from a study by Holmatov et al. (2017) show that economic water security in the SADC region is greatest in the Seychelles and South Africa, and lowest in Madagascar and Malawi. Strengthening water security has received recognition as a regional challenge in SADC countries to meet increasing food demands of growing populations under conditions of climate change (Rampa & van Wyk, 2014). It is also no

surprise that water security is the central focus of regional conferences (Holmatov et al., 2017). Given this fact, it is essential to understand what water security means precisely.

Opperman et al. (2020) state that water security can be equated to ensuring adequate volumes of water for people's health and livelihoods, but this also includes how water and its management influence a range of other resources and development goals, including food security, public safety and ecosystem conservation. The definition of water security from UN Water (2013), lays a good foundation for understanding why this research is important, and why co-management and expansive learning play a role in potentially strengthening water security. The definition of water security is:

The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socioeconomic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability. (UN Water, 2013, p. 1)

The above-mentioned definition of water security involves different actors working together in order to preserve water resources, but it goes further than just dealing with water securitisation because this definition highlights the importance of managing water resources for water quality, sustainable development and ecosystem conservation. Water resources cannot just be managed by the government and a few organisations: a holistic and collaborative approach is required to ensure that water security is a reality in South Africa. The South African Constitution (Act No 108 of 1996), highlights the different spheres of the government's water service provisioning and management responsibilities; it stipulates that the DWS' responsibility is the bulk management of the country's water resources. This means that municipalities have legislative powers and duties regarding water and sanitation services to communities (Meissner et al., 2018).

Prior to the 1998 South African legislation, the emphasis was on riparian ownership and commercially based control of water. This was the case until the National Water Act of 1998 (RSA, 1998) formally recognised water as a public good (Lotz-Sisitka & Burt, 2006). Integrated Water Resources Management (IWRM) is a management approach which involves several parties across many levels to participate actively in many ways (Lotz-Sisitka & Burt, 2006). United Nations Educational, Scientific and Cultural Organization (UNESCO, 2009) states that IWRM is a holistic approach that seeks to integrate the management of the physical environment with the wider socioeconomic and political framework. Implementing IWRM is

sensitive to diverse world views or ideologies, which are value systems and beliefs regarding institutions and societal processes that are accepted as fact or truth by a group of people (Sargent, 2009). This research is focused on how different stakeholders can come together and potentially learn about water, cross traditional boundaries, and co-produce knowledge which can assist in improved water co-management in the uMzimvubu catchment. The outputs and the lessons learnt from this research can potentially benefit the implementation of IWRM. Lotz-Sisitka and Burt (2006, p. 9) state the following:

Given the history of water management in South Africa, implementing IWRM requires a change from single sector, centralised, delivery-orientated management to sector-integrated, locally focused management, which incorporates the interests of diverse stakeholders. IWRM and Participatory Water Resources Management are inseparable.

In particular, there is a need for more insight into the learning processes associated with participatory IWRM, especially as it relates to co-management of water resources in South Africa. Armitage et al. (2008), writing from an international adaptive natural resource management perspective pointed to what they call a ‘learning paradox’ in the field of natural resources management. By this, they mean that while emphasis is placed on learning to support co-management, not enough attention is given to understanding and supporting the necessary types of learning, the mechanisms by which learning takes place, and the outcomes of learning. They also point out that the processes by which people come to participate in learning are also under-elaborated. Armitage et al. (2008) add further that there is need for systematic evaluation to monitor and measure the learning outcomes. It is also not clear what value is created for participating communities in the learning process, and as argued by Cundill and Fabricius (2009), there is a need to consider how learning can be promoted through practical application of monitoring and evaluation in co-management. Cundill and Fabricius (2009) refer to the importance of reflexivity as a means of understanding the process of learning supported through monitoring, but they do not point to the value that is created for people through a reflexive learning process.

Overall, as argued by Armitage et al. (2008), the social-ecological systems literature points to a need for collaboration, and thus collective learning processes, with an emphasis being placed on social learning approaches, which are described as self-organising learning approaches (Kilpatrick et al., 2003; Lebel et al., 2010; Whaley & Weatherhead, 2016) mostly using community of practice theory (Wenger, 1998). Relevant to this study and its interest, is the statement by Armitage et al. (2008, p. 87) that

Learning is an important area for research within adaptive co-management and allied approaches given that organizations and institutions at different levels are often weak or are ill-prepared for multi-stakeholder collaboration.

Additionally, Armitage et al. (2008) note that attention to learning in the design and operation in co-management is an evolving area of research, with few robust tools available to critically assess the processes of learning in co-management. Plummer et al. (2017) note that evaluation is a ‘rare void’ in co-management and is rare in collaborative planning. They argue for evidence-based approaches to establish the value of co-management, and they note that learning is an important contributor to co-management. Learning tends to be evaluated as part of co-management, but the evaluation of learning itself within co-management is a neglected area. This study seeks to address this particular gap, specifically developing an understanding of the expansion of learning in co-management, and the evaluation of such learning in the LCP in South Africa, with emphasis on value creation for participants in expansive learning oriented to the object of co-management. The LCP is a policy innovation case study in the Transformative Innovation Policy Consortium seeking to frame co-management as a policy innovation for Just Transitioning in South Africa as elaborated in Chapter 2. I therefore start this study with an overview of the policy context, as this also becomes an important dynamic in understanding the object of activity in this study, as elaborated further in Chapter 2, and then again in chapters 7-9 in this study.

1.3 Aim, Research Question and Objectives

This study contributes to an existing body of work in the field of Environmental Education that is developing understanding of community-based learning approaches (see section 3.6), with a focus on exploring expansive learning and co-management of the uMzimvubu catchment. The study particularly seeks to explore how expansive learning between all relevant stakeholders involved in the LCP (with a focus on the uMzimvubu catchment) potentially affects the object of co-management and the value that is created for participants in the expansive learning process, and its contribution to outcomes of increased water security in the catchment. The study provides recommendations on how communities, government, research institutes, NGOs and centres of environmental learning could collaborate in order to learn together about the importance of catchment level co-management of water resources which has implications for ecological infrastructure and livelihoods security. It also offers insight into how learning in co-management can be evaluated.

1.3.1 Aim

To explore and evaluate whether and how expansive learning by the different stakeholders involved in the LCP contributes to effective co-management of the uMzimvubu catchment, and establish what value is created.

1.3.2 Research questions

- Why is the LCP work important in South Africa; what is the value-add of the LCP in terms of advancing catchment co-management, and how can this value be enhanced via expansive learning for co-management?
- What are the current experiences of and opportunities for co-engaged expansive learning and co-management which exist in the LCP? What value has already been created in this area, if at all?
- What are the different catchment management activity systems present in the uMzimvubu catchment? And what contradictions emerge within or between the catchment management activity systems that have potential to shape expansive learning and co-management?
- How can an expansive learning process potentially contribute to value creation, collaboration, co-learning and co-creation of knowledge in and across catchment management activity systems among the interacting activity systems?
- What insights from this study can contribute to the evaluation of expansive learning in co-management in the LCP? And what is the significance of this for the LCP as a policy innovation case study conceptualised as Just Transitioning in the water sector?

1.3.3 Objectives

- Review the impetus for co-learning and management in South Africa's living catchments (Phase 1) (Chapters 1, 2 and 3).
- Use an activity system analysis framed by 3rd generation CHAT to understand the activity systems and their cultural historicity, and to surface contradictions within and between activity systems, as this relates to the object of co-management of water for increased water security (Phase 2) (Chapters 4 and 5).
- Review and evaluate existing learning in the different activity systems found in LCP in the uMzimvubu catchment, using the Value Creation Framework (VCF) tool to establish what value has been created (or not) for activity systems so far through any learning and co-management in the catchment to date, and consider how this may inform the contradictions analysis (Phase 2) (Chapters 6 and 7).

- Engage in expansive learning to resolve some of the contradictions and absences in the learning with interacting activity systems (Phase 3) (Chapter 8).
- Through Change Labs and my role as a formative interventionist researcher in the expansive learning process support the expansion of the object of water management towards more collaborative approaches (i.e. shared co-management), and help to create a new norm involving shared responsibility for co-management for water security (Phase 3) (Chapters 8 and 9).
- Provide recommendations to assist in water security at a national level in South Africa by evaluating the expansive learning for co-management strategies that emerge from the process in the uMzimvubu catchment, and potential policy application thereof (Phase 4) (Chapters 10 and 11).

To situate the study in its wider context, and to deepen understanding of the object of co-management that is investigated empirically in the uMzimvubu catchment, I begin with a short policy review. This is because an understanding of the policy context for water co-management in South Africa is necessary for developing an in-depth understanding of the object and the arising contradictions, and thus the expansive learning process and its evaluation.

1.4 Policy Context of the Study

The object of the expansive learning discussed in this research (namely co-management of water in an IWRM context) needs to be contextualised in relation to various water policies, strategies and plans, and associated national and international commitments, as these influence the context and therefore also the arising contradictions in the research setting. There are various bodies of work and policies which relate to water management in South Africa which are too numerous to cover. Here I briefly consider relevant aspects of the following policies and strategies only, as they appear to be most significant to the study focus and context.

- a) National Water and Sanitation Master Plan, Volume 1
- b) National Development Plan, 2030
- c) Sustainable Development Goals
- d) Integrated Water Quality Management Policy and Strategy, 2017
- e) Integrated Water Quality Management Implementation Plan

The National Water and Sanitation (NWS) Plan 2030 of South Africa (DWS, 2018) indicates that South Africa is well known for its rich diversity of ecosystems. The aquatic ecosystems include seven of the world's freshwater ecoregions, and extensive ranges of river, wetland and

estuarine ecosystem types are some of the characteristics (DWS, 2018). In conjunction with their catchments, many of these aquatic ecosystems constitute South Africa's **ecological infrastructure** (nature's equivalent of built infrastructure) that produces and delivers benefits in the water value chain (DWS, 2018). Currently, ecological infrastructure is an under-realised asset that possesses the ability to play a vital role in enhancing returns on investment in built infrastructure (such as dams), especially if the maintenance of ecological infrastructure is explicitly incorporated in the planning and construction of built infrastructure (DWS, 2018). The LCP is a project oriented towards protecting South Africa's ecological infrastructure.

Large parts of South Africa's high-value aquatic ecological infrastructure assets are not well protected, and in various areas of the country, they are under immense pressure, for example from intensive agriculture, mining and urban sprawl that leads to loss or degradation of ecosystems. As is the case with built infrastructure, ecological infrastructure requires maintenance, and in some cases restoration, for its socioeconomic benefits to be realised (DWS, 2018). This perception of ecosystems as providers of ecological infrastructure is vital in altering the insights of people into the relationship between water management and ecosystems. It is one of the main reasons for establishing the LCP, and is relevant in the uMzimvubu case context, as will be revealed in this study.

Sketching out some aspects of water inequality in South Africa, an issue which also affects the object of co-management in the LCP project, the NWS Plan 2030 (DWS, 2018, p. 1) reports the following:

1. Over 3 million people still do not have access to a basic water supply service and 14.1 million people do not have access to safe sanitation.
2. Only 64 % of households have access to a reliable water supply service. 56% of wastewater treatment works and 44% of water treatment works are in poor or critical condition. 11% are dysfunctional.
3. More than 50% of South Africa's wetlands have been lost, and of those that remain, 33% are in poor ecological condition.
4. Only 5% of agricultural water used is by black farmers. 41% of municipal water does not generate revenue. 35% is lost through leakage.
5. Municipalities are losing about 1660 million m³ per year through non-revenue water. At a unit cost of R6/m³, this amounts to R9.9 billion each year. R33 billion more is needed each year for the next 10 years to achieve water security.

These conditions are related to water resources, with reference to access and management. However, a careful analysis of the NWS Plan (DWS, 2018) reveals bigger issues related to water resource management which appear to be overlooked. These are positioned within the context of people and communities. The reality is that water resources do not occur in a vacuum; they are situated in various human contexts. Most of the catchments (or Strategic Water Source Areas [SWSAs] as discussed in detail in section 1.6) in the LCP, are situated in provinces with relatively unreliable water supply and sanitation services; yet these provide a significant proportion of water to the country (Figure 1.1), which shows the levels of reliability of water supply to the provinces in South Africa, including the Eastern Cape, where the uMzimvubu catchment is situated. From this it can be seen that the Eastern Cape is most poorly served when it comes to levels of reliability of water access, making water an issue that is increasingly attracting interest in discussions on Just Transitions to sustainability, as will be further discussed in Chapter 2, and as will be further elaborated through empirical data in chapters 6-9 in the expansive learning co-management case study that is in focus in this study.

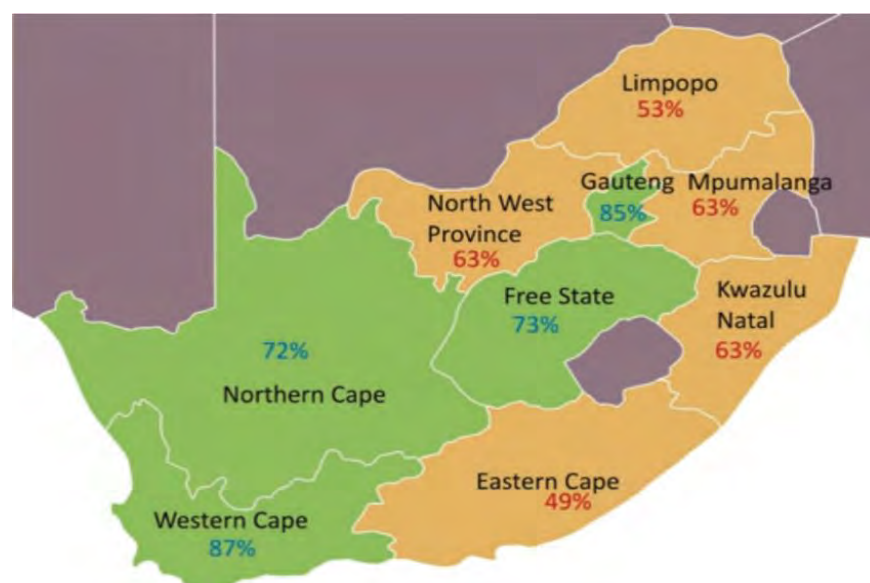


Figure 1.1: National statistics in relation to the reliability of water supply and sanitation services per province (DWS, 2018)

The NWS Plan seeks to bring together all water sector stakeholders in South Africa to work together in a bid to ensure that the country improves concerning both current and future challenges (DWS, 2018). While the Plan and the political willingness to initiate this collaboration is commendable the question is: “How do we do this?” This is the abiding

question dealt with in my study. Along with this Plan is a need to ensure that by 2030 and beyond, South Africa as a country possesses adequate reserves of water to take it safely into the future; and that there is accelerated progress towards attaining constitutional imperatives and that service delivery commitments, such as meeting Sustainable Development Goal 6: *Ensure access to water and sanitation for all*, are achieved.

Adopted in 2015 by all UN member states, including South Africa, Sustainable Development Goal 6 is another policy intervention that influences South African water policies and has implications for collaboration and expansive learning (United Nations Development Programme [UNDP], 2022). Looking critically at the goals, however, one can decipher that these goals are quite generic and ambitious. Importantly, the goals promote a view that development needs to balance social, economic and environmental sustainability. Figure 1.2 shows how the goals are integrated and how they are expressed in a collective.

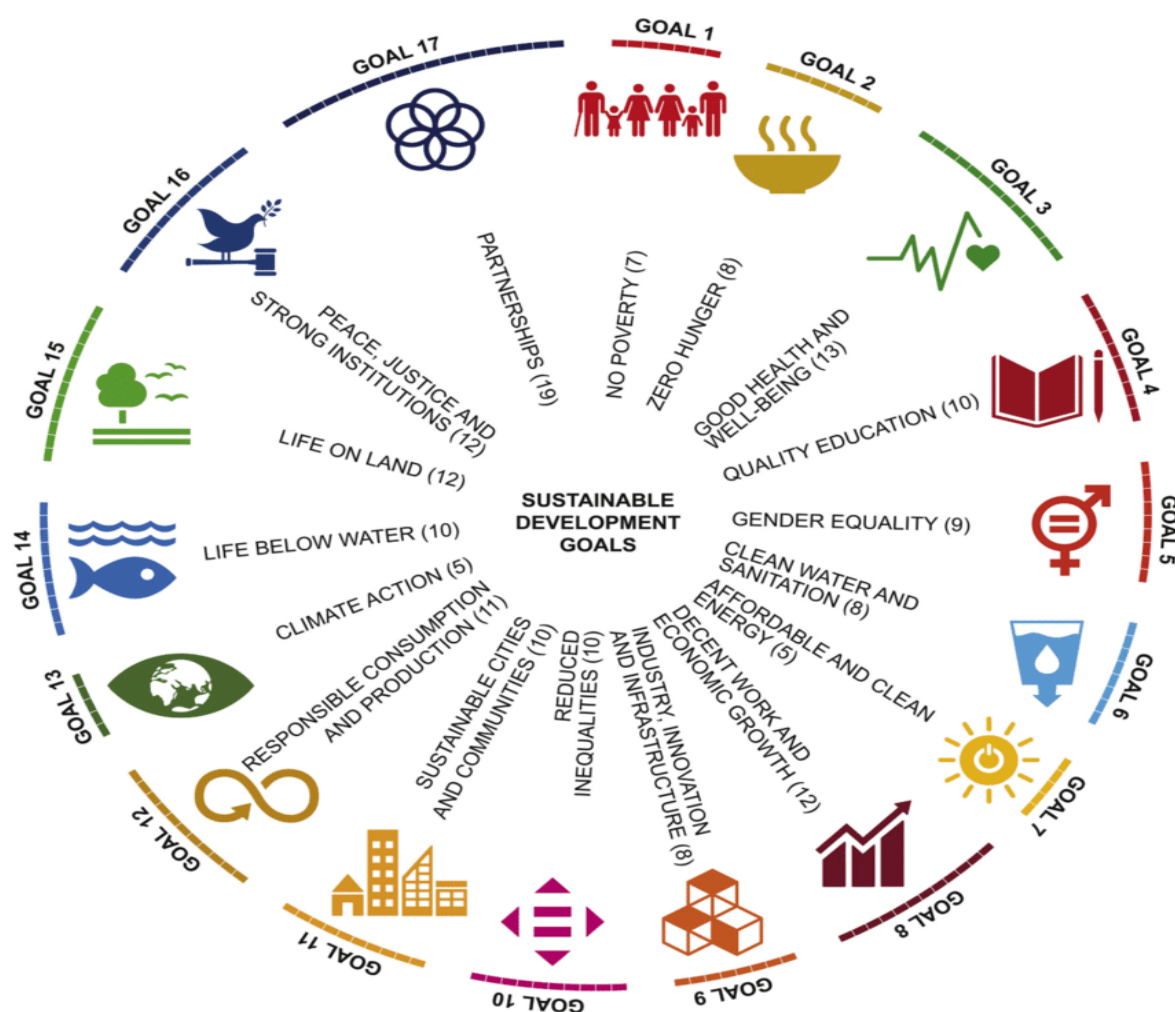


Figure 1.2: The 17 UN Sustainable Development Goals (SDGs): Numbers indicate amount of goal targets (Carr et al., 2021)

The creativity, knowhow, technology and financial resources from society in its entirety are pivotal in attaining the SDGs in every context (UNDP, 2022) as the goals do not occur in silos and they can only be achieved through a collaborative effort, a key tenet highlighted in this study. Looking at the current trajectory and the strides towards meeting the goals, the picture has not been that positive to date, with some reporting that the goals are stalled or not progressing as planned (UN, 2021)

For South Africa, attaining a target of having more equal societies and a healthier natural environment has a direct link with the 6th SDG, because water resources are positioned in catchments and within communities. The Department of Statistics South Africa (Stats SA, 2019) states that the National Water Act (1998) and the Water Services Act (1997) are the two pieces of legislation that create an environment which can enable the attainment of SDG 6 targets in South Africa. Collectively the Water Services Act (1997) and the National Water Act (1998) form the foundational legislative framework for water and sanitation in South Africa. Even though there have been improvements in rural and urban areas from 2016, there are still discrepancies in the provision of safely managed water between these two areas (Stats SA, 2019). Below is a quote from one of the villagers in the Tugela catchment, which is one of the sites of the LCP (discussed in more detail in section 1.2.3) which points to inequality of provisioning and access to water in South Africa:

We see the water in our villages and in our catchment being piped and it goes to Gauteng; however, we in the location are struggling with water access. We have to rely on springs and rivers. Sometimes the condition of the water is not so good and at times animals drink that water. This leads to us having to drink water with animals, and that lowers our dignity.

South Africa is an unequal society and unless this fundamental aspect is addressed, water provision will be prioritised for those who can afford it and management of water resources will be designated to those who have resources and finances, and whose voices are easily heard. The UN (2021) report indicates that there are still vast inequalities related to water access and provisioning, with 2 billion people still not having access to safely managed drinking water in 2020, and this includes 771 million who were without even basic drinking water. Fifty percent of those lacking basic drinking water services (387 million) live in sub-Saharan Africa. In South Africa, rural communities have not maintained the same levels of securely managed water supply as urban areas have over the years from 2015 to 2017 (Stats SA, 2019). Furthermore, the topography presents additional challenges to accessing sanitary services,

especially in rural areas in South Africa. Certain regions have such difficult geology and terrain that it is not viable to offer even the most basic sanitation services (Stats SA, 2019).

Carr et al. (2022) refer to the need to consider the complexities, synergies and trade-offs related to the SDGs. They argue that policymakers and development agencies will need to understand how various aspects of development present trade-offs that can undermine efforts to conserve biodiversity and ecosystem services, while conversely, other aspects can lead to synergies that benefit the environment or facilitate its conservation (Carr et al., 2021). Therefore, a new and responsible notion of development has to be entrenched even in the National Development Plan, so as to enhance the synchronisation and harmony of policies, as the country endeavours to attain both the national and international goals.

In South Africa, the National Development Plan (National Planning Commission [NPC], 2011) is an important guiding document which seeks to provide ways to assist the country with its goals relating to its development agenda; the issue of managing water resources is one of the key elements in its agenda. The NDP aims to alleviate poverty and reduce inequality by 2030, that is, seven years from now. South Africa can reach these goals by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society. Relevant to the concept of co-management, is the insight that success of the Plan necessitates a complex interplay of actors and actions, and progress in any one area is almost always dependent on progress in another (NPC, 2011). Underpinning the trajectory to be followed for the achievement of these goals is a people-centric approach. This again highlights the point I made about the proliferation of government policies relating to the “What needs to be done?” question and the persistent question of “How exactly can it be done?”

The Plan may fail if there are shortcomings in the processes driving the implementation. Policies should not be written only to fulfill governmental or departmental objectives: they need to answer issues on the ground and be practical solutions to questions plaguing the country. One of the immediate needs which the Plan has to address speedily is that of water security, and this can only be done if communities and policy actors are allowed to meet and interact at the same level. Figure 1.3 paints a picture of the reality that the country may potentially face if more relevant approaches to policy implementation are not. According to the NPC (2011, p. 203):

Sustainable communities are built through well-structured development planning processes that help to guide them to optimally manage natural resources and environmental risks in the pursuit of social and economic goals. ... The challenge of building environmentally sustainable communities must inform the progressive devolution of responsibility for human settlements to local government.

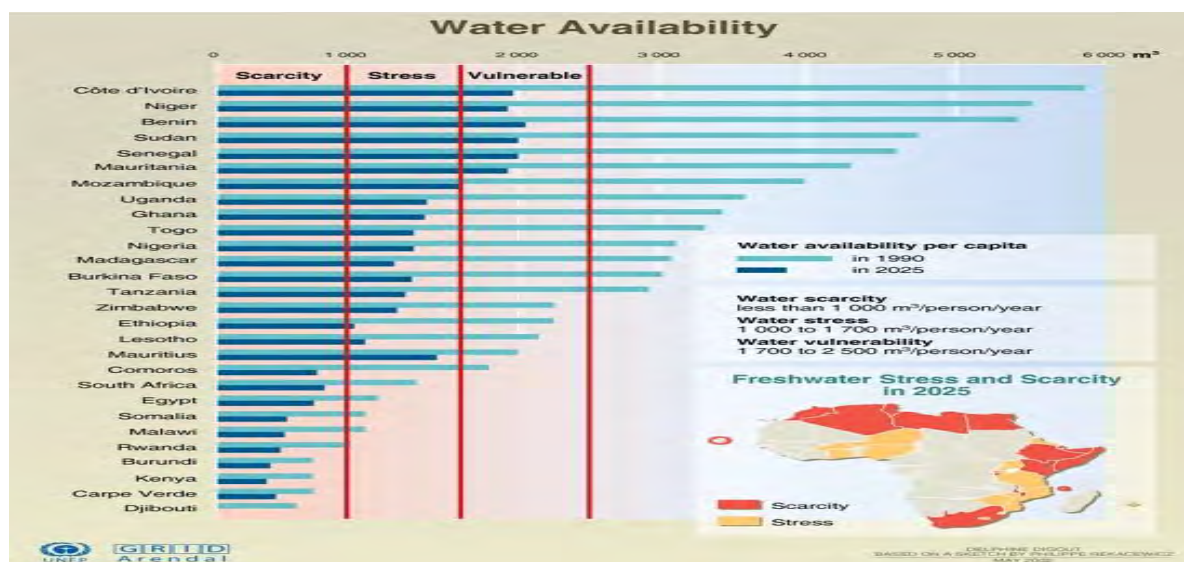


Figure 1.3: Projected population growth and water stress in Africa, 1990–2025 (United Nations Economic Commission for Africa [UNECA], 1999)

The South African national government has received a great deal of negative feedback with respect to the capability of its municipal departments and local governments to deliver basic services (such as water and sanitation) to the public. Numerous, regular and often violent service delivery protests throughout the country have erupted as a result of the lack of service delivery (Brettenny & Sharp, 2016). In response to the stance on the issue of the right to water, civil society organisations are increasingly making water-related claims by means of the discourse of a human right to water, in spite of there being no legal or constitutional recognition. The human right to water is gradually intersecting with the contextual outcomes of the Neo-liberalisation of water governance – such as water commodification, payments for water, and demand management (Yates & Harris, 2018). To enable the proliferation of sustainable communities in the country and to ensure a reduction in similar negative environmental encounters, education theories relating to multi-stakeholder participation need to feature more strongly in national plans.

There is political will from government to foster such intertwinement in multi-stakeholder efforts because the NDP states that partnerships are imperative for drawing together the

capabilities, interests, and resources of different stakeholders. The NDP further states that a framework to coordinate the production of knowledge and guide the investment of public funds should support such partnerships (NPC, 2011). This study seeks insight into the “how” of drawing various stakeholder offerings together, how to practically coordinate partnerships for co-management of water in the context of IWRM, and lastly how to coordinate or facilitate the co-development of knowledge through an educational approach, expansive learning.

A recent addition to IWRM policy in South Africa is the DWS Integrated Water Quality Management (IWQM, 2017a) Policy, Strategy (DWS, 2017b) and Implementation Plan (DWS, 2017c). This is seen as a leading policy for its intention to support an integrated, inclusive and adaptive approach to IWQM, as it also includes a focus on participation and citizen sciences (Lotz-Sisitka et al., 2022). The policy is progressive compared to previous attempts to manage water resources. An interesting theme added to this policy is the openness towards learning, being susceptible to the influence of education, the realisation that managing water resources cannot exclude people and the importance of focusing on adaptation in efforts to achieve water resource management as a country. Lotz-Sisitka et al. (2022) state that the IWQM policy indicates the need for integration into the education and training system, grass roots education and learning, capacity building and support for active participation in IWQM. An example of the dedication to collaboration and integration is found in the following text:

The management of water quality requires the bringing together of a wide range of knowledge in a structured process that allows co-learning, co-creation, and co-adaptation in order to move forward. (DWS, 2017a, p. xi)

For further augmentation of the requirement of education to further the targets of the IWQM policy, the DWS (2017a) states that the promotion of joint custodianship of water resources through education from grassroots level to ensure that the public is well informed and have the capacity to care for scarce resources of water and to play an active role in participating in its protection and management, are important steps in guaranteeing the required change in behaviours. The DWS (2017b) states that in order to deal with current challenges and to be prepared for challenges in the future, a new approach is needed. The structuring of the IWQM Policy and Strategy has been centred on a fundamental shift in approach that is enabling of a sector-wide engagement through more partnerships which are active with government departments and institutions, as well as with the private sector and civil society. Figure 1.4 is an expression of the approach represented by the relationship between policy, strategy, and

implementation. Interestingly for this study's focus, the policy embraces a co-management approach:

Managing water quality requires integrating a wide range of knowledge in a structured process that allows co-learning, co-creation, and co-adaptation as our society and economy develops. With this in mind, the responsibility for managing water quality cannot be that of the Department of Water and Sanitation alone. In effect, there is a significant array of government departments that oversee sectors that impact upon land and water use. (DWS, 2017a, p. xviii)

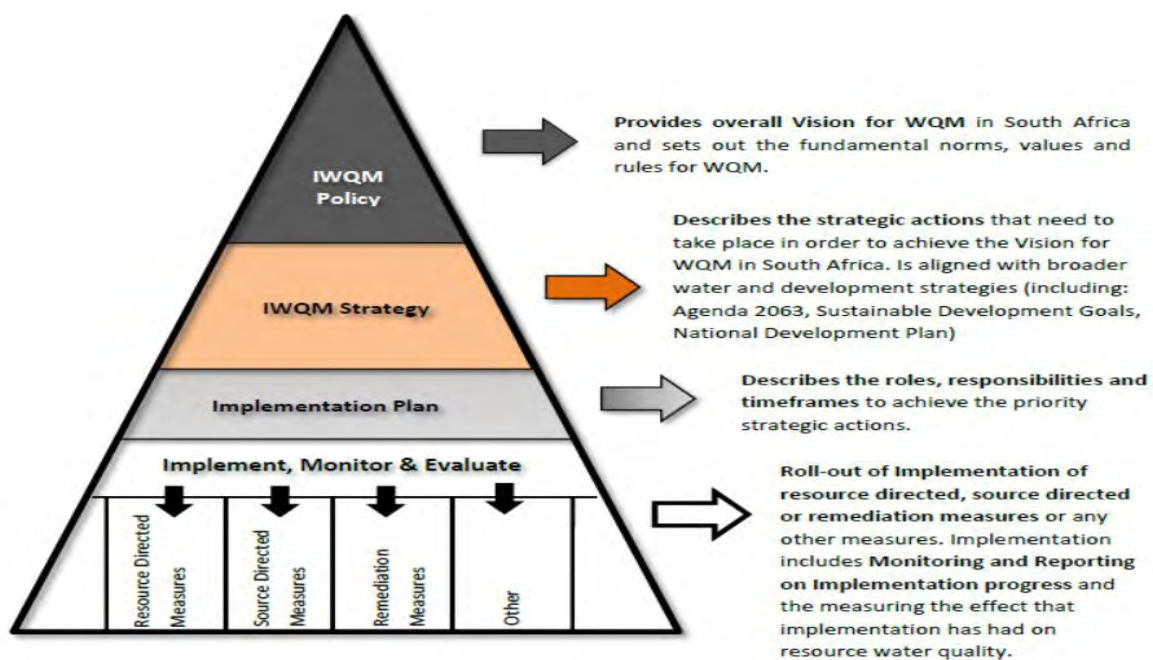


Figure 1.4: Relationship between policy, strategy, and implementation (DWS, 2017)

The notion of expansive learning used in this study finds a place of expression in this process because this IWQM Implementation Plan (DWS, 2017c) is situated in “new norms” and uncharted water management activities. For successful implementation of the plan, expansive learning (see below) is required in order to cope with the water management activities which will emerge in the upcoming three-year cycles.

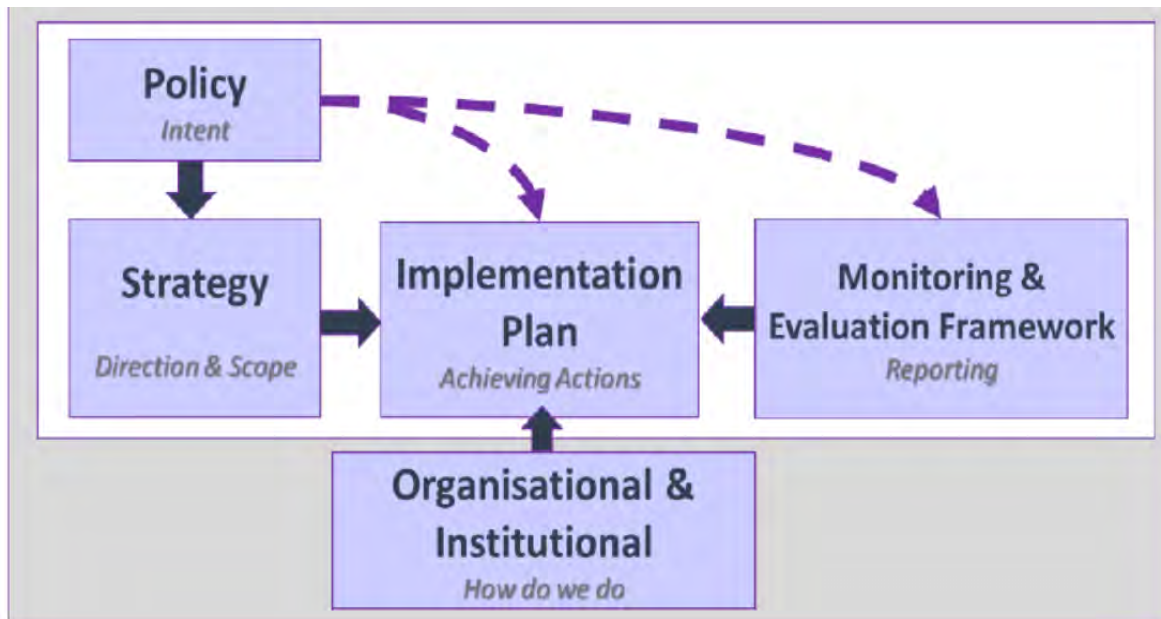


Figure 1.5: From policy to strategy to implementation (DWS, 2017)

From the diagram above (Figure 1.5), it is clear that there is space for my research to provide insights into the operationalisation of this Plan and also other implementation plans going forward. The Monitoring and Evaluation Framework (Reporting) and Organisational Institutional (How do we do) aspects, indicated in the diagram above, are the two areas this research is focused on. The DWS does require input from various stakeholders as they move forward in attaining the successful management of water resources. As a way forward, the DWS stipulates the following:

This document provides the agreed framework and structure for the conversion of the IWQM Policy and Strategy into Implementation Actions. The IWQM Policy and Strategy guide the aspirational and pragmatic intent, for improved water quality management of the country's resources. However, in order to wholly effect change, an understanding supported by results chains showing the interlinkages and dependencies between different activities. Those workflows provide an opportunity to understand roles and responsibilities towards an objective as well as matter of causality, providing the foundation for improved and effective inter-connectedness and integration. (DWS, 2017c, p. 31)

From the above excerpt it is clear that this research is located in a context where there is a growing commitment (or at least rhetorical commitment) to co-management approaches to water policy implementation. However, as highlighted above there is little said as to *how* this is to be done, which reflects the concerns of Armitage et al., (2008), Plummer et al., (2017) that more attention is needed to learning and its evaluation in co-management of water resources in South Africa.

The work of the LCP is implemented in various SWSAs, and this work is guided by various water policies, which I have briefly introduced above. One of the issues in this study is understanding how these SWSAs, uMzimvubu catchment being the case study, can achieve co-management of water resources, through collaboration and expansive learning, and how such learning can be evaluated. Strategic water source areas (SWSAs) provide a key context for exploring the actual “how” of developing co-management approaches to water resources management in practical but also strategic ways that relate to policy intention, hence I turn to a brief discussion of these as they equally make up an important dimension of the study’s context which becomes necessary to understand the scope of the object of co-management.

1.5 Understanding the role of Strategic Water Source Areas in the work of the Living Catchments Project

Strategic Water Source Areas (SWSAs) occupy 10% of South Africa and provide 50.4% of the river flows. The SWSAs sustain water supply systems for over 50% of the population; however, only 18% of SWSAs are protected (Le Maitre et al., 2018). The problem with the management of water resources is complex and multifaceted, as it consists of a mosaic of factors to consider. Molobela and Sinha (2011) state that challenges regarding the management of water resources are numerous and that issues such as inadequate rainfall may contribute to water mismanagement, but political breakdowns and histories of spatial development and segregation under apartheid also play a role. Furthermore, some major contributors to water mismanagement include limited physical resources, a long cycle of inadequate rainfall, a rapidly growing population and stagnant economies (Molobela & Sinha, 2011).

Strategic water source areas (SWSAs) are those that contribute disproportionately great volumes of mean annual runoff to an area of importance. Strategic water source locations are critical because they have the ability to significantly contribute to overall water quality and supply (Net et al., 2013). Strategic water source sites are commonly referred to as “water towers”, a phrase coined by Meybeck et al. (2001) to define mountain areas that provide disproportionate runoff compared to neighbouring lowland areas (Net et al., 2013). In terms of national planning, SWSAs are natural water source locations that provide disproportionately high amounts of water per unit area and are seen as strategically important for ensuring the security of the nation’s water supply, whether for surface water, groundwater, or both. The strategic water source areas can be thought of as “water factories” that supply needs for development and growth that are frequently located far from the SWSAs themselves. They make a sizeable

contribution to the nation's overall surface and groundwater supply (Statistics SA, 2023). The SWSAs are areas that produce disproportionately more water per unit area than other areas, such as water catchments. This may be caused by physical factors like the soil's capacity to hold water as groundwater or by meteorological factors like a region's propensity for heavy precipitation (Council for Scientific and Industrial Research [CSIR], 2023).

In South Africa, the concept of safeguarding water source sites is not new. As early as 1959, the Soil Conservation Board established an interdepartmental group to explore the conservation of the country's "principal mountain catchments," which were regarded to be "the main sources of the country's water supply" (Nel et al., 2013, p. 15). SWSAs are key components of the nation's ecological infrastructure and are crucial for ensuring water security, which in turn supports other national development objectives including inclusive growth, job creation and poverty reduction. Natural functioning ecosystems that produce or provide beneficial services and advantages to people and the economy are referred to as ecological infrastructure (SANBI, 2016). Wetlands, rivers, riparian zones, SWSAs, and their associated catchments are examples of water-related ecological infrastructure. These features help produce clean water, moderate floods, prevent erosion, and withstand droughts while also promoting climate change resistance (Statistics SA, 2023).

Ecological infrastructure is just as vital as built infrastructure, such as dams that store water that flows from upstream SWSAs, and ecological infrastructure in excellent shape typically improves the effectiveness of built infrastructure. SWSAs for surface water have been calculated to supply water that sustains half of the country's population, two-thirds of national economic activity, 70% of irrigated agriculture, and more than 90% of urban water users while originating from only 8% of South Africa's land area (Le Maitre et al., 2018; Nel et al., 2017). SWSAs have received extensive attention in recent years and have been incorporated into a variety of national policies and frameworks.

Strategic Water Source Areas (SWSAs) are now recognised as areas of land that either (a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and are therefore regarded as nationally important; (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b). They consist of transboundary water source areas that reach into Swaziland and Lesotho. The fact that all surface water SWSAs are situated in high

rainfall regions with baseflows of at least 11 25 mm/a demonstrates the close connection between groundwater and surface water in the SWSAs. (Statistics SA, 2023, p. 1)

Strategic water source areas (SWSAs) have been known to the public, businesses, and government for ten years now, but the process of obtaining their legal protection is still at the conceptual stage (CER, 2021). In South Africa there are 22 SWSAs that have been scientifically recognised; together, they make up 10% of the country's total land area yet provide 50% of its water resources (Nel et al., 2017). Figure 1.6 below shows the types of SWSAs in South Africa and how they are distributed across the country's landscape (CSIR, 2023).

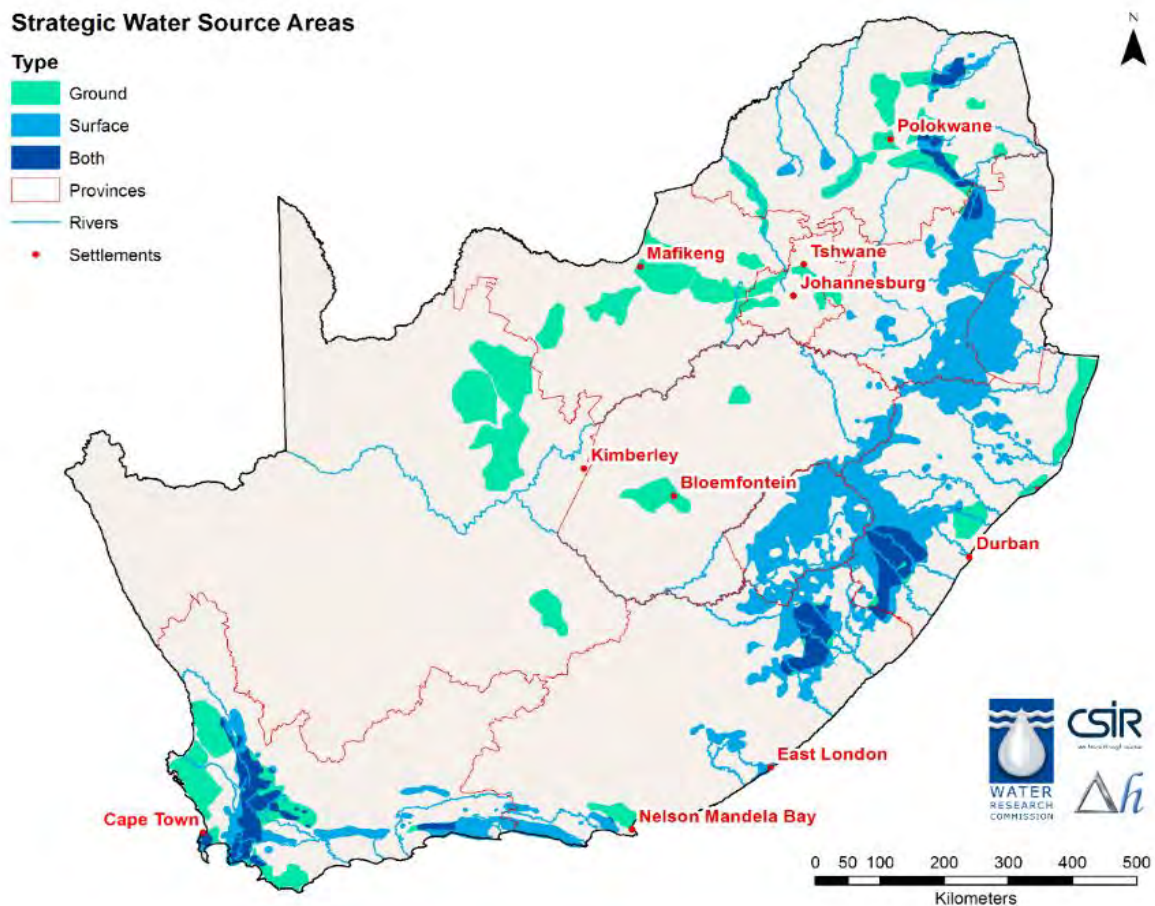


Figure 1.6: Identification and delineation of South Africa's SWSAs (CSIR, 2023)

The SWSAs have a critical role since they sustain more than 50% of the population, 64% of the local economy, and 70% of agricultural activity (CSIR, 2017). The huge volume of water that SWSAs supply to the various national water supply systems compared to their small size and their participation in important activities that anchor South Africa and its people form the two pillars on which their strategic importance is built (Mkhonza, 2022). SWSAs are becoming

increasingly important and valuable. Their strategic significance stems from their substantial ability to meet the country's economic, agricultural, and fundamental human needs (Mkhonza, 2022). However, a number of activities, such as soil degradation, massive alien plantings, coal and gold mining, pollution and fires, continue to pose a threat to SWSAs (CER, 2021). These dangers typically relate to each SWSA's geographic location and the predominant industrial operations there. For instance, in Mpumalanga, dangers are primarily related to coal mining, but in KwaZulu-Natal, the majority of SWSAs are endangered by large-scale alien and invasive plantations (Le Maitre et al., 2018).

1.6 uMzimvubu as a Strategic Water Source Area and Case Study Context

According to Le Maitre et al. (2018), out of the seven of the 22 SWSAs for surface water, four are shared with Lesotho and three with Swaziland; these are transboundary SWSAs. Ten per cent of South Africa's land area, Lesotho's land area, and Swaziland's total land area is covered by surface water SWSAs, which contributes 50% of the combined mean annual runoff of these three nations. As was mentioned earlier, these transboundary SWSAs make up about 8%3 of South Africa's land area, and the accounting for SWSAs included in this report deal solely with those portions of these transboundary SWSAs that are located inside of South Africa (Statistics SA, 2023). Six of South Africa's nine provinces have surface water SWSAs. A total of 34.5% of KwaZulu-Natal, 26.5% of Mpumalanga, 14.0% of the Western Cape, 12.9% of the Eastern Cape, 4.8% of Limpopo, and 2.1% of the Free State are covered by SWSAs (Figure 1.7). There are no surface water SWSAs of national importance in Gauteng, North West, or the Northern Cape. These provinces do, however, include water source regions that are significant from a provincial standpoint (Statistics SA, 2023).

Province	Total area of province	Area of province covered by SWSAs (ha)	Proportion of province covered by SWSAs	Names of SWSAs in province
Eastern Cape	16 884 228	2 181 081	12,9%	Amathole, Eastern Cape Drakensberg, Kouga, Southern Drakensberg, Tsitsikamma
Free State	12 982 488	276 057	2,1%	Enkangala Grasslands, Maloti Drakensberg, Northern Drakensberg, Upper Vaal
Gauteng	1 817 814	0	0,0%	
KwaZulu-Natal	9 329 945	3 121 956	33,5%	Enkangala Grasslands, Mfolozi Headwaters, Northern Drakensberg, Southern Drakensberg
Limpopo	12 574 338	601 032	4,8%	Mpumalanga Drakensberg, Soutpansberg, Waterberg, Wolkberg
Mpumalanga	7 649 527	2 027 078	26,5%	Enkangala Grasslands, Mbabane Hills, Mpumalanga Drakensberg, Upper Usuthu, Upper Vaal
North West	10 487 080	0	0,0%	
Northern Cape	37 285 988	0	0,0%	
Western Cape	12 955 045	1 813 516	14,0%	Boland, Groot Winterhoek, Kouga, Langeberg, Outeniqua, Swartberg, Table Mountain, Tsitsikamma

Figure 1.7: Provincial distribution of SWSAs (Stats SA, 2023)

According to Statistics SA (2023), one of seven transboundary SWSAs, the Southern Drakensberg SWSA is located 91.5% in South Africa and 8.5% in Lesotho. 1 842 165 acres (1.5%) of South Africa's Mainland are covered by the SWSA. It is South Africa's biggest SWSA. It is spread across nine municipalities, including two district municipalities in the Eastern Cape, Alfred Nzo (12.1%) and O.R. Tambo (0.3%), as well as two district municipalities in KwaZulu-Natal, Harry Gwala (38.6%), uMgungundlovu (35.3%), Umzinyathi (5.5%), Uthukela (4.9%), Ugu (3.4%), iLembe (<1.0%) and the metropolitan municipality of eThekweni (<1.0%) (Statistics SA, 2023). This SWSA is highlighted because it is where the uMzimvubu catchment, the study site, is located. Grassland makes up the majority of the Southern Drakensberg SWSA (89.4%), with tiny amounts of Savanna (6.1%) and Forest (1.9%) biomes. With a population density of roughly 71.9 people per km², the Southern Drakensberg SWSA's South African part had an estimated total population of 1 324 309 in 2011. In the Southern Drakensberg SWSA, a water service provider supplied most of the domestic water for 51.3% of households. In comparison, 9.0% of households got their water primarily from boreholes and 24.1% got it mostly from springs, rivers, or streams (Statistics SA, 2023). These statistics are important background in understanding the context of this study and how they influence contradictions which are discussed in-depth in Chapter 7. The uMzimvubu catchment is one of the SWSAs in South Africa and is one of the catchments in the LCP. The uMzimvubu is regarded as one of the least altered freshwater systems in the country. This basin is also rich in biodiversity, with over 2 000 plant and animal species that are unique to the area (Freshwater Health Index, 2022). The catchment is a vital water resource for South Africa, and it is experiencing significant decreases in water quality and supply due to the fast-growing population (De Winnaar, 2019). The uMzimvubu Catchment is located in the former Transkei homeland which has impacted the contemporary difficulties of poverty and environmental deterioration in this area (Freshwater Health Index, 2022) (see Figure 1.8).

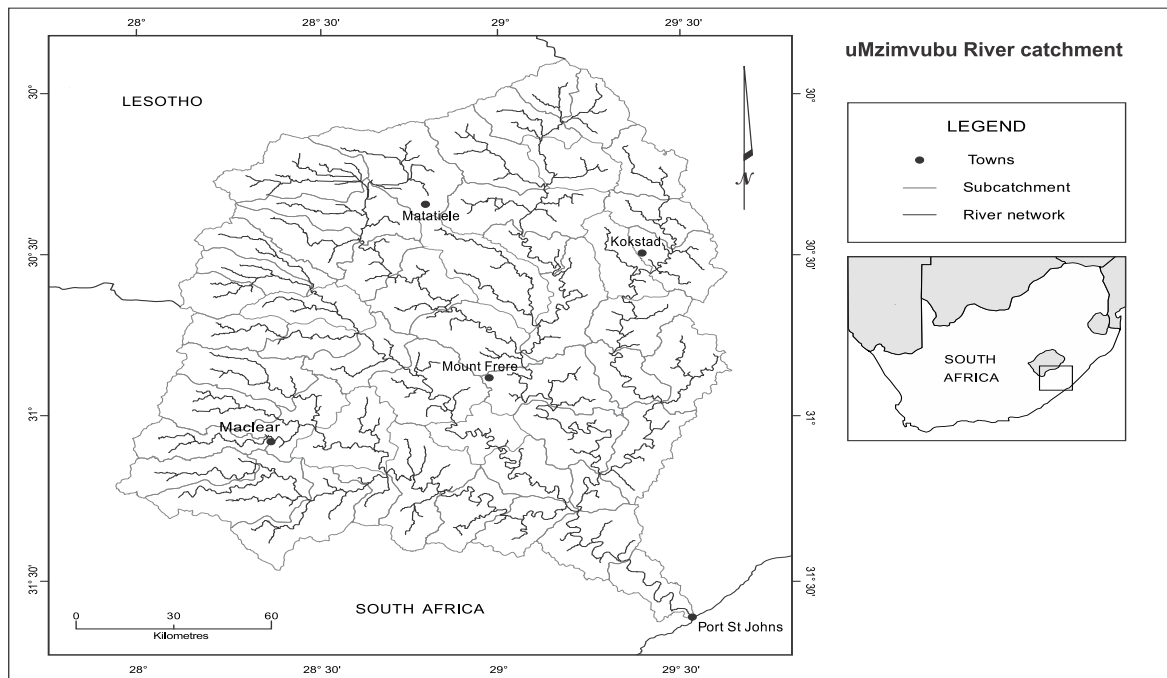


Figure 1.8: uMzimvubu catchment area (Freshwater Health Index, 2022)

The catchment serves almost 2 million people, the majority of whom live in rural and peri-urban areas. As a result, there is an urgent need for water improvements that meet the increasing water demand (e.g. residential usage, agricultural) in order to improve the quality of life for those living in the landscape (Freshwater Health Index, 2022).

The uMzimvubu catchment and river system runs along the northern border of the Eastern Cape Province for more than 200 kilometres, from its headwaters in the Maloti-Drakensberg watershed on the Lesotho escarpment to the Port St. Johns coastal mangroves, where it reaches the Indian Ocean (Freshwater Health Index, 2022). The uMzimvubu River System has been identified as one of the least changed freshwater systems in the country (Songca et al., 2013). Nonetheless, it is classed as vulnerable owing to the watershed's high rate of erosion. River pollution can be created by three sectors: agriculture, households, and industries, resulting in an abundance of heavy metals in river water and sediment. These heavy metals have the potential to endanger plant and animal life (Songca et al., 2013). The quality of a stream or river in South Africa is frequently a good indicator of the way of life in the community through which it flows. A diverse range of aquatic life is supported by healthy streams, marshes and rivers. High quantities of oxygen can be found in rainwater and rushing mountain streams (Songca et al., 2013). Water pollution impacts the plants and organisms that live in these bodies of water, and the result is nearly always detrimental, not just to individual species and

populations, but also to natural biological communities (Foy et al., 2000). Water pollution occurs when contaminants are dumped into bodies of water, either directly or indirectly, without proper treatment to eliminate dangerous substances (Lopes et al., 2005). There is growing concern, for example, about the rapid invasion of alien plants (primarily *Acacia mearnsii* and *Acacia dealbata*), uncontrolled burning, overgrazing, inappropriate infrastructure placement, and land degradation, all of which could irreversibly alter the amount and quality of water in this catchment (Freshwater Health Index, 2022). The uMzimvubu basin contains South Africa's third largest river and 435,000 hectares of grasslands, mist belt forest, and wetlands (Snorek et al., 2022).

South Africa is a water-scarce country that strives to provide safe drinking water for its inhabitants. The position of water sources in relation to the distance from the residences is not given much consideration during the process of water provision (Polasi et al., 2016). One of the issues highlighted in the study by Polasi et al. (2016) in the uMzimvubu catchment was the lack of compliance with the "200m policy". According to the National Water Act (Act No 36 of 1998), the acceptable distance between households and water sources should be 200m (Polasi et al., 2016). From the study by Polasi et al. (2016), it is evident that people in the catchment are struggling as a result of non-compliance with this policy by authorised water service providers (see Chapter 7 for an in-depth discussion of this contradiction). It is also evident that there are also other issues at play which are influencing people's ability to access water, such as the misspending of funds and unscrupulous governance activities (Mbele & Mubangizi, 2023). In their study on the uMzimvubu catchment, Mbele and Mubangizi (2023) state that water scarcity has a negative impact on human life and is a serious issue for long-term livelihoods. Catchment areas, depending on how they are managed, are critical for both supplying and maintaining continuous water availability, which is a challenge, as explained by Mbele and Mubangizi (2023):

Water governance in the Alfred Nzo District, which is part of the uMzimvubu-Tsitsikama Water Management Areas (WMAs), pose a threat to water availability and use. Water governance requires significant financial investments, involves public commercial, and non-profit actors, and is crucial for addressing development needs. (Mbele & Mubangizi, 2023, p. 1)

1.6.1 Sociocultural context of the uMzimvubu catchment

The catchment is home to 250 000 people who live on communal grounds, as well as over 70 vulnerable and endangered plant and animal species (Nel et al., 2013). Individuals in the catchment rely primarily on livestock raising. Rural livelihoods are increasingly supported by

a complex mix of income and resources derived from sources such as social grants, irregular employment, remittances, and small-scale agricultural activities such as home garden cultivation and small-scale cropping (Muller & Shackleton, 2014, Shackleton & Luckert, 2015; uMzimvubu Catchment Partnership [UCPP], 2012). Black wattle (*Acacia mearnsii*), an alien invasive tree that consumes a lot of water, has expanded uncontrollably throughout the upper catchment, jeopardising the local water supply (Mayo et al., 2009, Oelofse et al., 2016).

Six traditional, Indigenous authorities representing communities near Matatiele have been encouraging watershed restoration through community education, rangeland management, and alien invasive species removal in the upper catchment (Snorek et al., 2022). Although the uMzimvubu Catchment's scenic vista shows generally intact landscapes and naturally functioning ecosystems, the intensification of human activity in the catchment is beginning to put pressure on its ecosystem (Freshwater Health Index, 2022). The UCPP, a voluntary alliance of diverse stakeholders including governmental bodies, parastatal organisations (state-owned corporations), private entities, non-governmental organisations (NGOs), community-based organisations (organisations directly connected to or consisting of members of rural communities), and research organisations, has been collaborating with communities and traditional authorities since 2013 (Snorek et al., 2022). The UCPP helps to restore and maintain these systems. This is accomplished through cooperative efforts to safeguard and conserve water resources in an equitable manner (Freshwater Health Index, 2022). The catchment does possess a history of collaboration and co-learning across various systems, and the UCPP plays a vital role in facilitating the interactions among the various stakeholders.

In their work, Mbele and Mubangizi (2023) explored the challenges faced by rural communities in water governance in the context of the uMzimvubu River catchment of South Africa. Mbele and Mubangizi (2023) state that water resources are becoming scarcer and of poorer quality as a result of watershed degradation, conflicts, and a lack of community involvement. Programmes and efforts have struggled to fulfill the requirements of an expanding population, and many have fallen short of their original goals (Mbele & Mubangizi, 2023). With regard to their investigation of water resources in the uMzimvubu catchment, the Freshwater Health Index (2022) reported that underground water resources represent a significant portion of the water resources available for human use and, usually, their reserves are much higher than surface water availability. Increasingly, groundwater extraction is becoming important to meet the demands of rural communities in the uMzimvubu catchment, although knowledge about

the number of wells/springs and their volumetric capacities is lacking (Freshwater Health Index, 2022). The above-mentioned information underlines the importance of springs in the catchment and the commitment from various partners to help in the co-management of water sources. However, springs are and have always been in the villages. The springs have been managed by the community activity system by various rules rooted in culture and history (discussed further in chapters 6 and 7).

Since 2011, Conservation South Africa has led a process to build a 20-year strategy to conserve the vulnerable uMzimvubu catchment in collaboration with Environmental and Rural Solutions (UCPP, 2015). Collectively, the UCPP partners have had a considerable impact on many elements of catchment management in the area. Over the course of three years, they have invested more than R50 million on projects in the subregion (UCPP, 2015). In terms of investing in the catchment, the NGO activity system has invested substantially over the years and it has shown commitment to improving the livelihoods of the subjects in the community activity system. However, funding is usually accompanied by terms and conditions, and this is usually the source of tensions and conflicts.

The uMzimvubu catchment region encompasses over 20 000 km² of the Eastern Cape Province's poorest rural communities (UCPP, 2015). Communal land tenure spans up to 70% of the catchment area, and this land is deteriorating. The catchment's extremely diversified grassland and woodland matrix is endangered by poor land management practices and land cover change for development purposes such as access roads and dwellings (UCPP, 2015). The area is also plagued by major alien plant invasions, with species such as black wattle threatening an estimated 20% of the watershed. Alien plants have an impact on river flow, grassland integrity, grazing availability, soil erosion rate, and the richness of natural ecosystems (UCPP, 2015). Black wattle (*Acacia mearnsii*, De Wild.) is a fast-growing tree species that was brought to South Africa for commercial interests in the nineteenth century. While black wattle is an important source of timber and firewood for local communities, it is an aggressive invasive species with widespread negative environmental impacts in South Africa (Oelofse et al., 2016). Figure 1.9 shows the relationship between invasive species, land cover and water consumption. Black wattle tops the list as the worst invasive plant/tree species, and it covers 484 489 hectares of land. There are 483.23 million cubic metres of reduced water runoff caused by this species (SANBI, 2017).

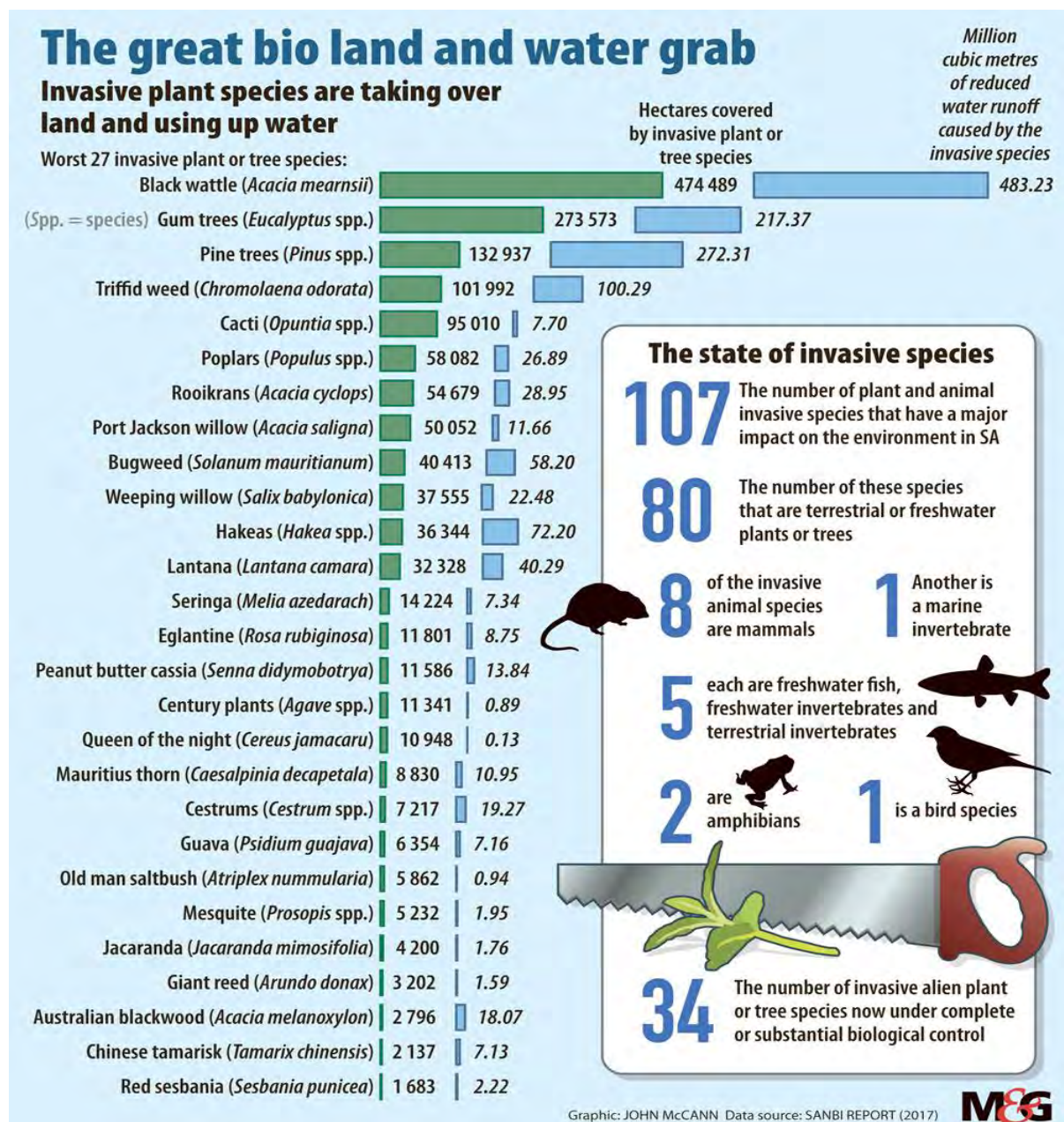


Figure 1.9: Illustration of relationship between invasive species, land cover and water consumption (SANBI, 2017)

1.6.2 Partnerships and challenges in the uMzimvubu catchment

The LCP is involved in four catchments which are associated with SWSAs: the uMzimvubu catchment in the Eastern Cape, the Tugela catchment in KwaZulu-Natal, the Berg-Breede catchment in the Western Cape, and the Olifants catchment in Mpumalanga (SANBI, 2020). In those unique catchments there are different organisations that coordinate the work and mandate of the LCP (see Chapter 5). In the case of the uMzimvubu catchment, the organisation which facilitates the LCP work is an organisation called Environment and Rural Solutions (ERS). The ERS is an organisation which links sustainable developments of rural communities and their resource base with the positive aspects of what the 21st century demands. ERS

provides environmental and tourism planning services in the northern part of the Eastern Cape, Southern KZN and Lesotho (Environmental and Rural Solutions, 2021).

Associated with ERS is a consortium called the uMzimvubu Catchment Partnership Programme (UCPP). The UCPP is concerned with conserving the full extent of the uMzimvubu River system (from source to sea) through the sustainable restoration and maintenance of the catchment area in a way that supports the development of the economy and job creation for local people and enhances the flow of benefits from ecosystem goods and services to people and nature (UCPP, 2022). The UCPP comprises various stakeholders ranging from catchment community members, a number of chiefs representing the villages in the catchment, NGOs, research and science organisations, and other partners who are interested in the general well-being of the uMzimvubu catchment (UCPP, 2022).

The uMzimvubu catchment in the Eastern Cape exemplifies fascinating South African water governance partnerships, each of which is distinctive in terms of watershed management and water use (De Winnaar, 2019). The UCPP aims to safeguard the river system by restoring and maintaining the catchment in a sustainable manner. The catchment is a vital water resource for South Africa, and it is experiencing significant decreases in water quality and supply because of the fast-growing population (De Winnaar, 2019). The uMzimvubu Catchment is located in the former Transkei homeland, which has impacted the contemporary difficulties of poverty and environmental deterioration in this area (Freshwater Health Index, 2022). The catchment serves almost 2 million people, the majority of whom live in rural and peri-urban areas. As a result, there is an urgent need for water improvements that meet the increasing demand for water (e.g. residential and agricultural usage) in order to improve the quality of life for those living in the landscape (Freshwater Health Index, 2022).

In this study, co-management will be explored as a viable strategy to contribute to the management of water for water security, and expansive learning will be used as a methodological approach to see how the different stakeholders in the uMzimvubu catchments can potentially *learn* together to co-manage water, with the VCF tool (see chapters 5, 6 and 9) applied to assess existing and emerging value that has and can be created for the stakeholders involved in such a process. Supporting the different stakeholders in being aware of their agency and also exercising their agency throughout the expansive learning process is a central tenet of this study. Stakeholder participation is also an important theme in this research because the diverse knowledge bases can potentially add to the effective water management in the

uMzimvubu catchment. It is critical to be considerate of the stakeholder position (owing to South African history) and recognise previously disadvantaged stakeholders which are required to participate in water resources management (Lotz-Sisitka & Burt, 2006).

1.7 Exploring Co-management and Expansive Learning As Viable Solutions

1.7.1 Understanding learning with regard to natural resources management

According to Claassen (2013) water has served as a catalyst for both strife and collaboration for a very long time. Conflicts have been documented as far back as Sumeria in 2500 BC (Gleick, 1998), with religious hostilities, intellectual disagreements, governmental boundaries, and economic progress serving as their main causes. Water disputes caused 21 military conflicts (Gleick, 1998) and 37 violent conflicts during the 20th century (United Nations Environmental Programme [UNEP], 2002). Given the region's highly fluctuating and unstable water resources, disputes and collaboration are nothing new in Southern Africa. In this region, rivers frequently run through several nations or serve as international borders (UNEP, 2002). Shared river basins like the Orange (Botswana, Lesotho, South Africa, and Namibia), Incomati (South Africa, Swaziland, and Mozambique), and Limpopo (Botswana, Zimbabwe, South Africa and Mozambique) have sparked arguments over water rights, water abstraction, hydropower, water pollution, and land ownership (Turton et al., 2003), including the unresolved South African-Namibian border dispute (Claassen, 2013).

Jadallah and Ballard (2021) state that social and ecological crises are becoming more prevalent, larger, and more complicated as the twenty-first century goes on. In light of the ongoing environmental change and disturbance, scholars in the conservation social sciences have increasingly identified learning as a crucial factor and an essential mechanism for achieving successful conservation outcomes and social-ecological resilience (Armitage et al., 2008; Berkes, 2009; Gerlak et al., 2019). To describe how and what people learn in the special context of conservation and natural resource management, as well as how such learning relates to social-ecological resilience, a variety of terms, including social learning, policy learning, and organisational learning, have been used in empirical research (Gerlak et al., 2018). Among these concepts, social learning has received the most attention in the social sciences of conservation, in part because it is essential to the success of multi-stakeholder projects (Ernst 2019; Gerlak et al., 2018; Pahl-Wostl, 2006; Suškevičs et al., 2018). To overcome current theoretical flaws in the social learning scholarship and improve future research in this area, ideas from outside the fields of conservation and natural resource management are required

(Fazey et al., 2007; Gerlak et al., 2019). For example, by referring to ideas of transformational learning theory and experiential learning, researchers in conservation and natural resource management have previously utilised theoretical perspectives from educational research to better explain learning in these situations (Jadallah & Ballard, 2021).

According to Jadallah and Ballard (2021), collective learning happens when individual learning is transformed into group-level social or institutional transformation, or when shared knowledge is co-created (Argyris & Schön, 1996; Gerlak & Heikkilä, 2011; Reed et al., 2010). Sociocultural learning theories can provide a useful lens for examining learning at both the individual and collective levels, as well as the function of context in mediating learning in conservation and natural resource management. Learning is regarded as a viable method for dealing with rapid environmental change. The implications of learning for natural resource management (NRM) have not been well investigated, and evidence on the subject is dispersed across many sources (Suškevičs et al., 2018). In the literature on NRM, concepts of learning are becoming more prevalent. Examples include adaptive co-management (Berkes, 2009; Fabricius & Cundill, 2014) as well as in more specialised study domains like water management (Mostert et al., 2007), forestry (Dedeurwaerdere, 2009), and others. The idea that learning – as it is experienced by those who use resources – has the potential to address issues related to complexity and uncertainty in NRM is one of the main justifications for extending these research domains to the study of learning (Armitage et al., 2008; Brugnach & Ingram, 2012).

According to Jadallah and Ballard (2021), learning has grown pervasive in NRM. It is difficult to find contemporary papers on NRM that do not mention learning, and especially social learning in recent years (Cundill, 2010). A number of mainly concurrent changes that occurred in the 1980s and 1990s had an impact on the growth of collaborative management, leading to a changed view of who learns, how people learn, and what they learn in the field of NRM. These changes were motivated by calls for increased civic engagement in development decision making (Chambers, 1994) and for rights-based development strategies that empowered the underprivileged and put a focus on concerns of access to resources (Mansuri & Rao, 2004; Sen, 1981, 1999). The learning sciences have taken a sociocultural turn over the last few decades. Sociocultural learning theory is a significant area of educational study that draws on insights from psychology, cognitive science, and cultural anthropology is the learning sciences (Sawyer, 2005). Contrary to narrowly focusing on learning as a vertical process in

which people advance from ignorance to competence or from a lack of understanding to a complete understanding, sociocultural theories of learning emphasise learning as a horizontal process in which expertise is developed within and across practices and communities (Gutiérrez, 2008). Cultural Historical Activity Theory (CHAT), which takes activity systems as its primary unit of analysis, offers yet another theoretical viewpoint for comprehending learning as a sociocultural activity by emphasising how knowledge is mediated through artefacts in relation to shared objects (Jadallah & Ballard, 2021). In complex social-ecological systems where many people participate in shared activities within a single or multi-organisational setting, CHAT is particularly well suited to researching learning (Yamagata-Lynch, 2010). CHAT follows the expansive learning process, which is composed of different learning actions (see Chapter 4 for further elaboration).

1.7.2 Expansive learning as an approach to natural resource management

Any process in living things that leads to a lasting change in capability and is not just the product of biological maturation or ageing is typically referred to as learning (Illeris, 2018). Expansive learning is the process by which an organisation, for example, resolves its urgent internal contradictions by creating and executing a wholly new method of operating for itself (Engeström, 1987, 2001). Another definition is:

The theory of expansive learning puts the primacy on communities as learners, on transformation and creation of culture, on horizontal movement and hybridization, and on the formation of theoretical concepts. (Engeström & Sannino, 2010, p. 2)

This theory of expansive learning has been most systematically and cumulatively used in studies conducted at the University of Helsinki, at the Centre for Research on Activity, Development and Learning (Engeström & Sannino, 2010); hence, I worked with insights gained from, and the theory developed by this school. Importantly for this study, Engeström's expansive learning is different from other learning theories, because it is centred on collective learning to expand activity and shared activity. Other learning theories are centred mostly on expanding individuality and cognition. Sannino and Engeström (2018) describe the process of expansive learning as follows:

The process follows and nurtures the logic of ascending from the abstract to the concrete. In expansive learning the very subject of learning is transformed from an individual to a collective activity system or a network of activity systems. Initially, individuals begin to question the existing order and logic of their activity. As more actors join in, a collaborative analysis and modelling of the zone of proximal development are initiated and carried out. Expansive learning leads to the

formation of a new, expanded object and pattern of activity oriented at the object. (Sannino & Engeström, 2018, p. 52)

The view articulated is that this is the kind of learning that occurs when individuals or groups question and revise or replace the implicit rules and procedures that regulate a particular context. This attention to radical, innovative and fundamental change has been a driving force in the research that has been associated with the work of the Centre for Developmental Work Research in Helsinki (Daniels et al., 2010). Associated with expansive learning are Change Laboratory interventions (explained in detail in Chapter 5) which employ the use of the principles of double-stimulation and of ascending from the abstract to the concrete, guided by a well-planned sequence of tasks and learning actions (Figure 1.10) (Sannino & Engeström, 2018).



Figure 1.10: Expansive learning cycle with seven learning actions (Sannino & Engeström, 2018)

Expansive learning is well suited to the LCP because there are different activity systems (diverse stakeholders involved in the project) which need to come together in order to learn together how to co-manage water resources. This effectively means that the different role players (in activity systems) have to learn collectively to understand the contradictions (including tensions, challenges, differences and obstacles) and confront them, in order to create a new shared object. Engeström (2010) states that in expansive learning, learners learn something that is not yet there (Engeström, 2016); in the case of the Living Catchments that is how different stakeholders in the catchments can potentially learn how to co-manage water resources in a catchment collectively. In other words, the learners can construct a new object and concepts for their collective activity and implement this new object and the concepts in

practice. The formation and resolution of continuously evolving contradictions should be seen as the expanded learning process (Engeström, 2010) (see Chapter 7).

According to SANBI (2020), the LCP aims to make it possible for effective, well-resourced water governance structures to be established at a catchment level, so that they are better placed to influence decisions about how water catchments are managed towards a water secure future. The different activity systems involved in the project vary from researchers, government departments and officials, NGOs, to traditional leaders and the community; therefore, conflicts and tensions are likely to arise. However, contradictions are not necessarily a problem or impediment to learning, because learning needs to occur in a changing mosaic of activity systems which are energised by their own inner contradictions and contradictions between activity systems (Engeström, 1987). The theory of expansive learning is based on foundational ideas put forward by four key figures in the Russian cultural-historical school: Lev Vygotsky, Aleksei Nikolajevitch Leont'ev, Evald Il'enkov, and Vasily Davydov (Engeström & Sannino, 2010). However, for the sake of this research, the focus will be on Engeström's work on expansion of activity, which was built on the work of Leont'ev (discussed further in Chapter 4). For the Living Catchment Project to potentially attain success in meeting its aim, deliberate actions and conscious interventions directed towards working through contradictions can play a role in enabling expansive learning. This study will endeavour to explore how the expansive learning process can assist in the co-management of water resources, for enhanced water security in the uMzimvubu catchment.

1.7.3 Exploring expansive learning in the co-management of Integrated Water Resources Management

Co-management has a history of being studied by researchers working from a relatively diverse array of traditions including geography, political economy, planning, business, anthropology, law and biology. Co-management usually exists alongside terms such as collaboration, cooperation and community; this can lead to confusion about the terms which are employed to convey participatory sentiment and sharing of power (Plummer & Fennel, 2007). The definition of co-management has evolved over time, but most definitions still hold the essence of what the term means. One of the well-cited definitions of co-management by Carlsson and Berkes (2005, pp. 65–66) is as follows:

Co-management should be understood as a continuous problem-solving process ... such an approach has the effect of highlighting that power-sharing is the result, and not the starting point of the process.

Berkes (2009), Gutiérrez et al. (2011), Ho et al. (2016), Sandström et al. (2014) and Ming'ate et al. (2014) expand on the argument by stating that the ideal expectation of co-management is to build local capacities, ensure that local opinions and conditions are reflected in NRM, resulting in benefit sharing, livelihood enhancement, and ensuring legitimacy and conflict management (Soliku & Schraml, 2020).

Co-management as explained and defined above possesses characteristics which could potentially contribute to the suite of IWRM approaches for managing water resources in the Living Catchment Project. Trust and commitment are two key factors which can ultimately determine the success trajectory of a newly developed co-management system (Plummer & Fennel, 2007). This is because co-management systems may be disrupted when trust is not developed in the absence of an emotional foundation of generosity, i.e. government talk as opposed to action (Plummer & Fennel, 2007). It is therefore important to ensure that newly developed co-management systems ought to commence with immediate acts that support the emergence of a shared object and its development in a trusting environment; this requires collaboration among all parties, sustained over time (Plummer & Fennel, 2007). Before a new co-management system can be initiated in the LCP in the uMzimvubu catchment, stakeholder mapping and engagement are a necessity because co-management varies based on the degree and type of sharing of responsibility and authority between the state and stakeholders (Soliku & Schraml, 2020). This will be further detailed in the methodology section (Chapter 5), because in this study I use activity system analysis to understand the stakeholders involved, and not stakeholder mapping generically. As several Southern African studies have revealed (see Chapter 3), stakeholder mapping frequently fails to take full account of the activity systems or the cultural past of the stakeholders' activity and activity systems (e.g. Lindley, 2014; Mukute, 2010; Pesanayi, 2019; Weaver, 2019); hence I used activity theory as a methodological approach to assist in understanding stakeholders involved in this study (see chapters 4 and 5).

Co-management refers to a variety of interactions between the state, civil society, and local communities in which the central government shares or delegates control over managing natural resources to localities or subnational levels of government (Béné et al., 2009; Carlsson & Berkes, 2005). However, it is also important to note that these different relationships can be manifested in a variety of ways in a co-management system. McConney et al. (2008) state that there is a spectrum of co-management arrangements and that there are three main co-management types: consultative, collaborative and delegated (Figure 1.11). The consultative

co-management type of arrangement is not suited to the LCP, because there is minimal exchange of information between government and the community, and while mechanisms exist for consultation between government and other stakeholders, decisions will be primarily taken by the government (Pathmanandakumar, 2017). The delegated co-management type of arrangement would also not be suited to the Living Catchment Project, because the government of South Africa is legally obliged and responsible for making decisions concerning water resources in the country; there are policies and legal mandates which ensure that the government possesses a certain level of decision-making power. McConney et al. (2008) argue that the ideal co-management arrangement is the collaborative style where the government jointly shares with the stakeholders to make decisions. This is because collaboration is key in ensuring that co-management is a reality and it is central to but not necessarily synonymous with co-management (Plummer & Fennel, 2007).

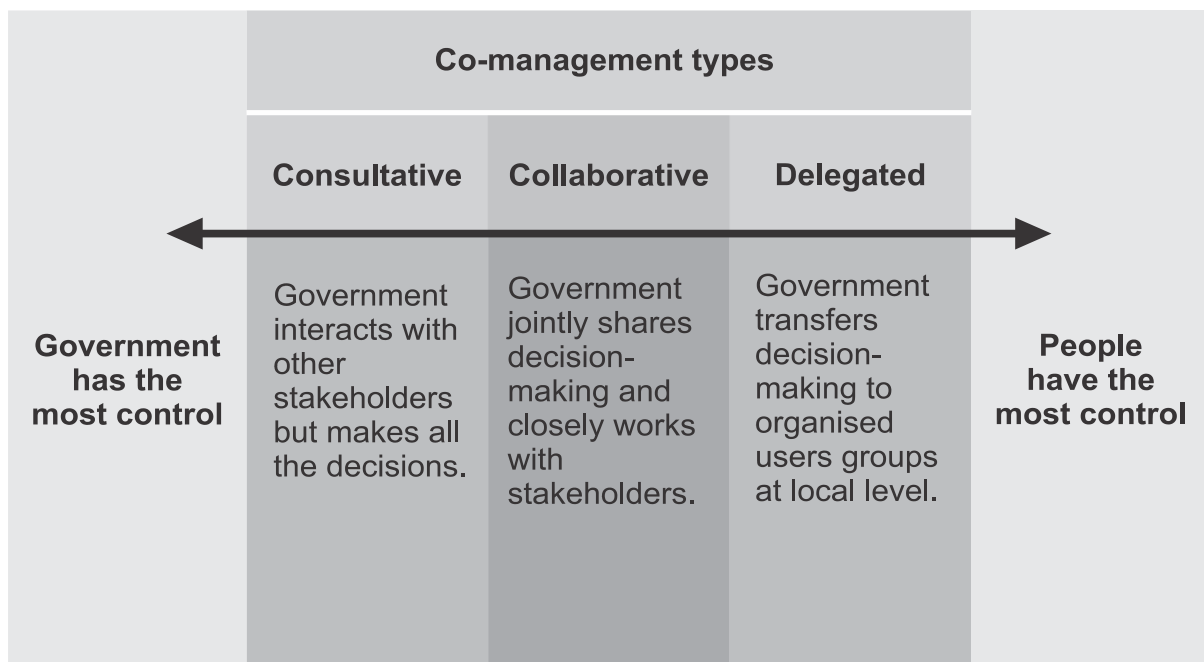


Figure 1.11: Spectrum of co-management arrangements (adapted from McConney et al., 2008)

Collaboration is one of the key objectives of the LCP and Cluster 1 of the project is centred on collaboration of stakeholders in the primary catchments. Cluster 1's work is described as follows:

To enable collaboration and learning platforms in primary catchments associated with Strategic Water Source Areas across South Africa, informed by research, innovation and best practice. Critical elements for this cluster are to facilitate collaboration and learning informed by research, innovation and best practices. (LCP, 2020, p. 2)

As part of developing their theory of change, the LCP interventions aim to ensure collaboration between all the stakeholders, holding an engagement space focused on collaboration and co-learning across disparate fields, knowledge systems and historical power imbalances, and strengthening the implementation, research and policy feedback loop (LCP, 2020). I therefore suggest that for the LCP to fulfill this objective concerning collaboration, a co-management system consisting of all the necessary stakeholders and involving a co-learning process (in the uMzimvubu catchment in the case of my study) has to be initiated and/or expanded. This is to support co-learning as people *learn* how to co-manage because historically most management systems have been top-down and have excluded people in the decision-making process (as a result of the history of racially biased laws in South Africa). In other words, it is a practice that will need to be learnt in the setting since it may not as yet exist in practice despite contemporary policy intentions as discussed above.

In the past, governments have planned on behalf of communities in their absence and that has resulted in some unfavourable outcomes; hence there is a need for co-management of natural resources. Kaluma and Umar (2021) argue that co-management has been regarded as a substitute to centralised management systems which are unable to provide resource users the opportunity to co-manage natural resources with state agencies and make decision that will affect the well-being of those resources in due course. Co-management aids in the reduction of the government's bias towards solely attaining state needs and enhances the quality of the regulations being designed (Kaluma & Umar, 2021). Other benefits of co-management include conflict resolution platforms (through diverse established local institutions), building of trust and transformation of the behaviour and attitudes of resource users towards government agencies and other resource users (Ballet et al., 2009; Donda, 2017; Ho et al., 2016; Jentoft et al., 1998). As expressed in policy intentions, it is imperative to learn how to move towards co-management systems for natural resources, and this can potentially be achieved if the stakeholders in the catchments embark on learning together in an expansive learning process. Expansive learning is a theory of and approach to learning that can assist with co-management, because in order for co-management to be a reality in the LCP and in the uMzimvubu catchment context, all the stakeholders involved need to come together to boundary-cross and jointly learn; in other words, it is a collective, yet open-ended learning process that is required (further explained in section 1.7.2).

1.8 Conclusion

Chapter 1 provided the introduction of the study, the purpose of the study, the context of the study, the aim and the objectives of the study. This first chapter provides the foundation of the research and rationale of the study. This study is situated within the context of the LCP, particularly in the uMzimvubu catchment. The study seeks to add to the knowledge repository of the LCP and possibly highlight some solutions and recommendations which emerge from this body of work. The LCP work is an important undertaking, as it seeks to promote collaboration, co-learning and transformation among the stakeholders in the various catchments. The chapter also highlighted the policy context of the LCP, and the study, subsequently. The various policies, plans and strategies underlying water co-management are critical because they invariably affect water security at national, provincial, district and local level. Additionally, international treaties, such as the SDGs, also affect the provision of water resources and water security in general, hence Sustainable Development Goal 6 was analysed, because of its implications for South African water security and collaboration.

For the policies, plans and strategies to achieve the various intended outcomes, collaboration has to be a reality in the local and ground contexts. This will allow support from the ground up and assimilation of the objectives by the catchment dwellers. Catchment communities are located in SWSAs, which are locally situated, but nationally and sometimes regionally important. The uMzimvubu catchment also is an important strategic water source area, and this study seeks to understand how expansive learning can enable water co-management in this important area. The sociocultural context of the uMzimvubu catchment was provided to detail the anthropogenic and historical factors related to the uMzimvubu catchment as a strategic water source area. The contemporary issues related to the uMzimvubu catchment were detailed to begin to understand what possibly hinders water co-management efforts. This is the gap this study seeks to focus on by using expansive learning as a means of assisting in co-managing water resources. As a result of this study being situated in the LCP, it has potential implications for the Transformative Innovation Policy Consortium (TIPC) (elaborated in Chapter 2) because the LCP is a live policy experiment of the Transformative Innovation Policy Consortium.

Chapter 2 describes the work of the Transformative Innovation Policy Consortium (TIPC) and the theoretical underpinnings as these relate to the LCP and the impetus for innovations in catchment management in South Africa. Chapter 3 details the process of exploring learning in and for co-management, and how the VCF tool is important to guide evaluation and monitoring

of potential learning from the study. It also reviews different case studies in the Southern African context, relating to expansive learning. Chapter 4 provides the theoretical underpinnings of the study, namely the CHAT to guide expansive learning. It also highlights the importance of transformative agency and how it is expressed. Chapter 5 deals with the methodology that was followed in the study. This chapter provides an explanation of how the research was designed and how the data were collected and analysed. Chapter 6 deals with understanding the nature and characteristics of activity systems which are part of this study. It also looks at past learning and value created for stakeholders using the VCF. Chapter 7 of the study is related to surfacing contradictions which were prominent in the study site and how they came about. It further explains how these contradictions were manifested. Chapter 8 is centred on the solutions emerging from the expansive learning process in the Change Labs which were modelled by the research participants and intended for the catchment to enhance the object of shared activity i.e. co-management for water security. Chapter 9 centres on the evidence of value created from the expansive learning process which we had embarked on as a learning group. Chapter 10 focuses on the potential contributions this study made towards the LCP. The chapter also highlights the approaches and potential new knowledge which emerged from the study. Chapter 11 surfaces the conclusions from the research, and provides the recommendations and lessons learnt from the study, so that lessons learnt can be considered in other catchments and potentially factored into policy.

CHAPTER 2: LIVING CATCHMENTS PROGRAMME AS A CASE INFORMING INNOVATION POLICY

2.1 Introduction and Background

As briefly introduced in Chapter 1, the research that I have embarked on is part of the greater LCP, which is a national initiative. Significant to the research is the fact that the LCP forms part of various live policy experiments around the globe. The inceptor and coordinator of these live policy experiments is the Transformative Innovation Policy Consortium (TIPC) (TIPC, 2022). The TIPC is a conglomeration of science, technology and innovation researchers, policymakers and funding agencies working together to provide substance to a new framing for Science, Technology and Innovation (STI) policy, namely Transformative Innovation Policy (TIP). The aim of TIP is to address international societal challenges, as encapsulated in the UN SDGs (TIPC, 2022). In a bid to expand its programme of policy experimentation, the TIPC has included a project from South Africa. The focus of this project is on meeting the SDGs related to provision of water and sanitation (TIPC, 2022). The LCP, which is collaborative in character, aims to promote water governance in South Africa, as mentioned in Chapter 1.

The LCP, which is the first TIP policy experiment in South Africa, is a component of a bigger strategic plan for the provision of ecological water in South Africa. SGD 6: Water and Sanitation, which is a component of the UN Water Action Decade from 2018 to 2028, is firmly rooted in the ideal of water security and access to clean water for all members of the population (TIPC, 2022) as described in section 1.4.2. The LCP plays a crucial role in moving towards the attainment of water security for all in South Africa. This is significant since water security is connected to numerous other SDGs, namely 1: No Poverty; 2: No Hunger; 3, Good Health and Well-being; 11: Sustainable Cities; and 14: Life below water (TIPC, 2022). An important element of the LCP is embracing uncertainty and complexity through the promotion of experiments to inform and facilitate learning processes and transformation in people, organisations and institutions. The LCP team therefore had to work directly with the Transformative Innovation Policy Consortium (TIPC) researchers to add a transformative layer to the design and implementation of the project (Boni & Tau, 2021). Other important elements of the project design include the growing of the capacity for transformative social learning

facilitation and improved policy advice practice contributing to the country's water roadmap. The SANBI leads the LCP, while the South African DSI and the WRC support the project financially (Boni & Tau, 2021). An in-depth understanding of the design of the LCP and how it relates to the TIPC is imperative for my research because the outputs from my study feed into a greater body of work.

The TIPC is a five-year programme focusing on experimentation of policy, evaluation, capacity building and research agenda development (TIPC, 2022). The global adoption of fresh disruptive innovation policies and practices is one of the TIPC's main objectives. With the use of this transdisciplinary approach, work on developing new frameworks, norms and narratives as well as exploring cutting-edge ways to foster reciprocal policy learning across nations in the Global North and South has already begun (TIPC, 2022). This study has endeavoured to support the TIPC's aim by embarking on research on the ground in a particular catchment feeding into the transformative innovation and evaluation goals. South Africa plays a crucial role in the establishment of the TIPC's targets because the current members, innovation ministries and funding agencies include Colombia, Finland, Norway, South Africa and Sweden, with additional associate programmes in China, Brazil, Senegal, Ghana, and Kenya, and all of this is coordinated by the Science Policy Research Unit at the University of Sussex in the United Kingdom (TIPC, 2022). The theme of transformation learning and agency runs through the study chapters. However, it is important to highlight the theory which underpins the TIPC's work. Understanding the conceptual framework supporting an intervention is important. The TIP is informed by a paper on the Three Frames of Innovation (2018) by TIPC founders Professor Johan Schot and Professor Ed Steinmueller. After an analysis of the paper on the Three Frames of Innovation, an examination of the Just Transition and system transformation change in the water sector will be done. Grasping the conceptual work will lay a foundation for understanding the approach I undertook in my PhD and the methodological process I developed and followed.

2.2 The Three Frames of Innovation

Over the past 20 years there have been two conceptual frameworks which have been dominant in the development of innovation policymaking, established upon the 20th century supply-driven innovation model, which takes competition between nations and support for research and development as the key point of entry for policy making (Schot & Steinmueller, 2018). Common to these frames is the assumption that economic growth is always positive, ignoring

the numerous unintended consequences of science and technology development that have had an adverse impact on society and the environment. A third frame, the TIP is emerging. It places social and environmental problems at the centre (Schot & Steinmueller, 2018). This study has possible implications for policies on water, education, innovation and training, hence a thorough investigation of these frames has to be embarked on. Each has its own unique characteristics, and historicity. The reason for the emergence of the third frame will be explained and clarified in detail along with the problem it aims to solve and the great strides it has taken. To understand the roots of the frameworks and their various purposes, one has to fathom the argument presented by Schot and Steinmueller (2018, p. 1):

Science, technology and innovation (STI) policy is shaped by persistent framings that arise from historical context. Two established frames are identified as co-existing and dominant in contemporary innovation policy discussions. The first frame is identified as beginning with a Post-World War II institutionalisation of government support for science and R&D with the presumption that this would contribute to growth and address market failure in private provision of new knowledge. The second frame emerged in the 1980s globalising world and its emphasis on competitiveness which is shaped by the national systems of innovation for knowledge creation and commercialisation. STI policy focuses on building links, clusters and networks, and on stimulating learning between elements in the systems, and enabling entrepreneurship. A third frame linked to contemporary social and environmental challenges such as the Sustainable Development Goals (SDGs) and calling for transformative change is identified and distinguished from the two earlier frames.

So, even though a third frame has emerged, the previous two frames had a particular role to play in history and they had their own significance in that regard. As mentioned earlier, the notion of transformative change is an important element in my work, and the nature of the intervention I embarked on sought to address social and environmental challenges related to water resources and has implications for national policy and international targets such as the SDGs. This study seeks to augment the validity of the emergence of the third frame, because research should not just be done to be shelved in academic vaults, or just added to academic repositories; it should answer practical questions rooted in reality and actual contexts. The strength of concepts and frameworks has to be grounded, supported by theory, aided by case studies and potentially scalable. In this way, the value of TIPC as the backdrop to my research can emerge.

Framings have evolved over time and changed when they were perceived as being inadequate to address current circumstances. Even though the available framings of the science and technology policy that have evolved since World War II continue to be relevant, they offer limited guidance for managing the negative consequences of the socio-technical system of modern economic growth to which they have contributed and of which they are a part (Schot & Steinmueller, 2018). Figure 2.1 depicts the Three Frames of Innovation, their historicity and how they overlap. Schot and Steinmueller (2018) state that the three framings that relate to the science and technology policy are clearly distinguishable; two of which are available and are systematically used in policy discourse and action. Furthermore, these framings comprise a model of innovation which defines the roles of actors and describes actions that may be undertaken in a bid to address goals that form part of the framings.

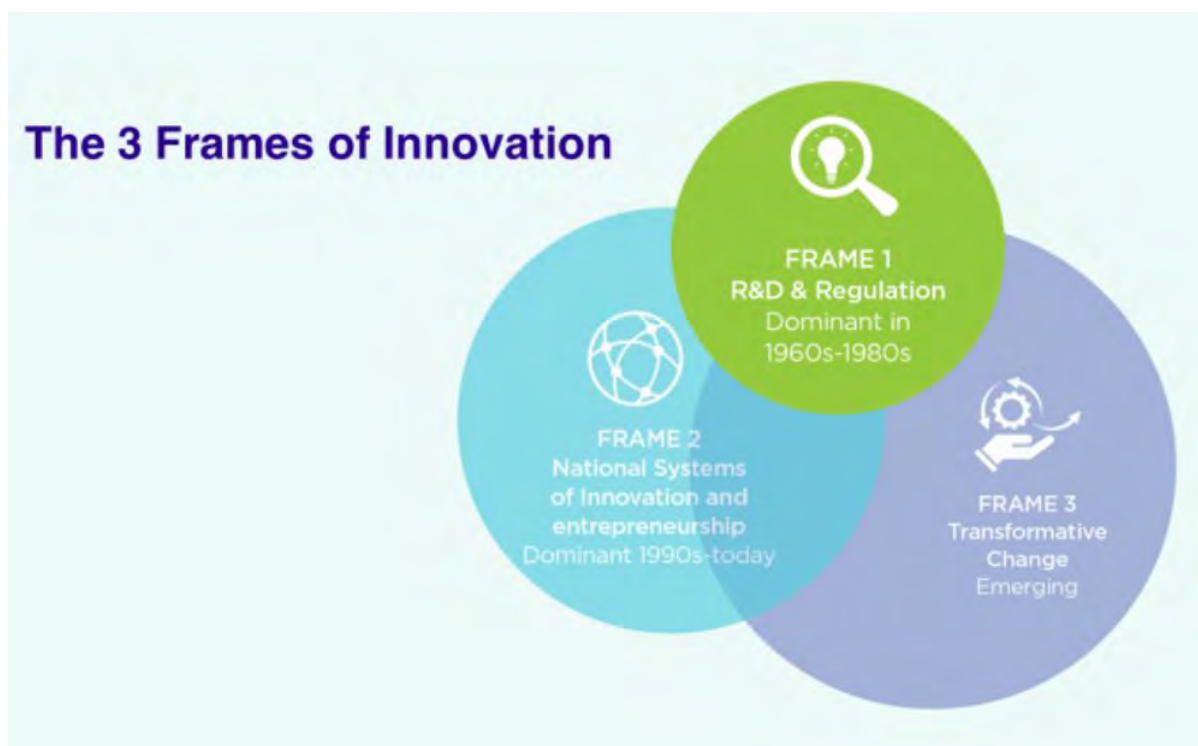


Figure 2.1: The 3 frames of innovation (Schot & Steinmueller, 2018)

The three framings of innovation have different characteristics, have unique histories and follow specific processes. They were developed for unique circumstances to answer specific questions. The work of Schot and Steinmueller (2018) on the three frames is summarised by the TIPC (2022, p. 1) as follows:

- I. The first framing portrays innovation policy as providing incentives for the market to produce socially and economically desired levels of science knowledge (R&D). This is mainly implemented by subsidies and measures to enhance the ‘appropriability’ of innovation (IPR). To identify which areas need support, foresight has been developed.

With respect to negative externalities, various forms of technology assessment have been established and, to protect society if the impacts are becoming a problem, regulation is put in place. This framing identifies the most important element of innovation as the discovery process (invention) and gives rise to the linear model in which technology is the application of scientific knowledge. The linear model privileges discovery over application. In part because the rewards of application are assumed to be carried out through an adequate functioning of the market system. Only in the case of market failure, is government action required.

- II. The second framing aims to make better use of knowledge production, supports commercialisation and bridges the gap between discovery and application. This framing takes as central various forms of learning including: those acquired by using, producing and interacting; linkages between various actors; absorptive capacity and capability formation of firms; and finally, entrepreneurship. The rationale for policy intervention is system failure – the inability to make the most out of what is available due to missing or malfunctioning links in the innovation system. Innovation policy focuses, for example, on technology transfer, building technology platforms and technology clusters to stimulate interaction and human capital formation. Further, in this model, foresight, technology assessment and regulation are add-ons to the core activity of promoting innovation (on the assumption that any innovation is desirable and good since innovation is the motor for producing economic growth and competitiveness).
- III. A third frame for innovation policy is that of TIP which takes as a starting point that negative impacts or externalities of innovation can overtake positive contributions. TIP focuses on mobilising the power of innovation to address a wide range of societal challenges including inequality, unemployment and climate change. It emphasises policies for directing socio-technical systems into socially desirable directions and embeds processes of change in society. TIP explores issues around socio-technical system change to give a structural transformation in: governance arrangements between the state, the market, civil society and science; experimentation and societal learning; responsible research and innovation; and, finally, a more constructive role for foresight to shape innovation processes from the outset and on a continuing basis.

For the sake of this study, it is important to understand Frame 3 and how it differs from the two other frames. Frame 3 underpins the work which I embarked on, because the key tenets highlighted in Frame 3 are a central theme in my work. The intervention I embarked on was unique because it evolved focusing on an issue (water co-management in my case), and instead of just delineating the solving of the problem to science and technology, a new type of innovation was in focus that is multi-stakeholder based, composed of diverse knowledge systems and action orientated (see Chapter 8). In rooting my research in a real and local context in one of the Living Catchments that is part of the LCP, through the use of the expansive learning cycle, I sought to facilitate the process of contradiction analysis: a process that involves analysing the tensions and conflicts associated with water security in the catchment

but still works with the learning participants to formulate solutions, in the process surfacing indicators from value created to inform evaluation in a TIP context.

Cultural History Activity Theory (CHAT) is important in innovation because its approach bridges imagined, simulated, and real situations that require personal engagement with material objects and artefacts (including other humans) that follow the logic of an anticipated or designed future model of the activity (Nussbaumer, 2012; Engeström, 2007a). CHAT, as an analytical framework, is able to offer an understanding of how solutions can emerge through contradiction analysis and how societal activities can be transformed in the future (see detailed explanation in Chapter 4). The use of CHAT has increased in educational research over the years as a result of its recognition by researchers as important in social aspects of learning (Batiibwe et al., 2019). CHAT is useful to research because it enables the re-imagining of a future which is not yet there and, through the expansive learning process, collaborating in learning what is not yet there. This is what social innovation is about, working with diverse stakeholders to innovate and produce solutions for real-life contexts.

When contradictions escalate certain participants start to question and deviate from established practices and norms which results in a deliberate change effort that ultimately affects the activity in its entirety (Adamides, 2022). An expansive transformation occurs in the activity when, after the emergence of contradictions, the purpose of the activity is reconceptualised to embrace a significantly expanded range of problems and opportunities (Adamides, 2022). The use of activity theory in socio-technical system transformation and system innovation emanates from problems and inconsistencies developing over time in systems fulfilling societal functions as different agencies evolve independently. This is founded on two central ideas, the first being that socio-technical system change and innovations in the system can be associated with changes in the individual and collective technology-mediated activities/practices of the agencies involved in fulfilling the needs of society (Adamides, 2022). Secondly, innovations develop from attempts to resolve inconsistencies (contradictions) and tensions developed by dialectic and conflictual historical processes in activities internally or between activities and their context, that is, other activities (Adamides, 2022). The CHAT is a multidisciplinary framework for studying how humans purposefully engage in the modification of natural and social reality, including themselves, as an ongoing culturally and historically located, materially and socially mediated process (Roth et al., 2012). The evolution of solutions

emanating from CHAT research possess the potential to be innovative and are suited to deal with solutions which are contextual and catalyse transformation.

The expansive learning process seeks out grounded solutions to innovation focusing on shared activity and co-development. The intention is to initiate a process of continual learning and to spur innovation from the ground up and not wait on traditional systems to always develop solutions for the local contexts. This is how my research seeks to contribute to the TIPC and Frame 3. Frame 3 offers a new foundation for innovation policy that is potentially restorative of challenges such as water insecurity. Therefore, it is important to clarify how this can be achieved and how its innovation processes differ from frames 1 and 2, a process that needs to be worked out empirically in the Living Catchments TIPC case study. Social justice principles are important in innovation as society embraces transitions. Any form of innovation devoid of principles of justice can potentially exclude some stakeholders to benefit a few. In the past solutions have emerged from specialists or industries related to solving a particular societal problem. An example would be the issue of energy production by using wind energy. This type of innovation is intended to solve an environmental problem but is influenced by economics and development and may result in the just and equitable transfer of benefits. This is why Frame 3 offers a better innovation policy than frames 1 and 2.

Figure 2.2 below depicts the primary difference between frames 1 and 2, and then presents the process of Frame 3. Frames 1 and 2 assume that public welfare will be addressed through the stimulus of new knowledge and innovation which will be used by industry to attain the goal of economic growth (TIPC, 2022). Frames 1 and 2 have been heavily influenced by the development agenda and economic growth goal which characterised the past century; hence the focus on economic growth and industrialisation to achieve public welfare. However, Frame 3 takes on a different trajectory altogether, because it explicitly and fundamentally addresses the goals of society and sustainability as a primary focus. Frame 3 does this according to the following process: it deals with the challenges of society first and foremost; it supposes that by paying attention to social and environmental welfare, greater productivity and less inequality will result, and therefore, an increase in the growth of the economy (TIPC, 2022).

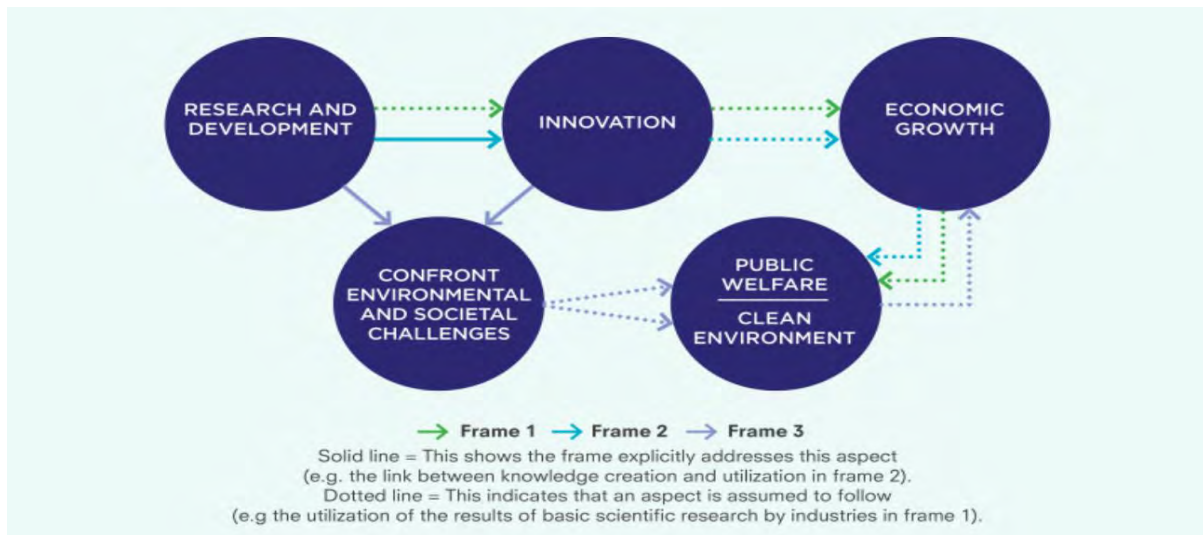


Figure 2.2: Principal difference between Frames 1 and 2, and then that of Frame 3 (TIPC, 2022)

It is interesting to see how the Frame 3 process flows counter to that of Frame 1 and 2 assumptions, expressing the need for innovation which is contrary to current measures yet can alleviate societal and environmental problems. This is the reason why Frame 3 has emerged: it raises questions about the shortcomings of STI, in endeavouring to address issues of sustainability and poverty, or inequitable income distribution.

Schot and Steinmueller (2018) do, however, clarify that their articulation of Framing 3 should not result in governments completely abandoning Framings 1 and 2, because investment in knowledge infrastructure and research and development is a vital component of any STI policy as well as the construction of a set of linkages between key actors and the encouragement of productive interactions and processes of learning among them in the context of national, sectoral, regional and in fact transnational systems of innovation (Schot & Steinmueller, 2018). The reason that an endeavour such as the LCP has been included as a case study for the TIPC in South Africa is that it seeks to draw solutions from actors and stakeholders who are positioned in the local context where the problems exist; it seeks local and sustainable solutions and co-engaged and action-oriented learning is encouraged. The LCP would not achieve success if it was founded of Framings 1 and 2, because these framings arose and were developed chiefly in the US and Europe, and have received criticism from a development perspective (Schot & Steinmueller, 2018). Frame 3 laid a good foundation for my research and LCP work because it does not assume that innovation and socio-technical system change will emerge mostly from the Global North or that other countries need to play catch-up with those innovations. Frame 3, on the other hand, assumes that both the Global North and Global South are in a position to experiment with and contribute to transformative change and that mutual

deep learning is of great benefit. My research was centred on this notion of experimenting in order to effect transformative change as related to the expansive learning process; therefore, I also sought to evaluate and contribute to Frame 3 and the LCP's intention to contribute insights into the TIPC. The framing is interesting for water resources co-management and ecological infrastructure for water security. The terms which underlie the rationale for TIPC have been analysed and have been explained in the context of this study. Table 2.1 below provides the tenets underlying the TIPC and an explanation of their properties which can lead to possible transformative change on the ground. I elaborate on these from the perspective of expansive learning and activity system analysis (see chapters 1 and 4).

Table 2.1: Description of terms underlying the rationale for TIPC

<u>Term</u>	<u>Underlying rationale to TIPC</u>
Actors	The proponents of and opponents to transformative change that respectively seek to accomplish or seek to block, divert, or slow transformative change for a variety of reasons including a perception or the reality that such change will disadvantage their current interests. Actors can be individuals, groups of individuals working within organisations and across organisational boundaries (so networks or coalitions) and organisations. <i>(In this study this equates to Subjects in Activity Systems)</i>
Actor Map	Overview of proponents and opponents as well as included and excluded actors and how they relate to each other and interact with each other. The actor map would include attention to power dynamics between actors (their dependencies, struggles, conflicts, divergent rationales and values). <i>(In this study this equates to Activity Systems and Contradictions emerging within and between Activity Systems)</i>
Co-Creation	A process in which participants attempt to reach a common understanding based upon reasoned discussion with attention to the opportunities and barriers for conveying this understanding to others. The aim is not consensus, but a better understanding of points of differences and overlap. <i>(In this study this equates to Expansive Learning and Contradictions)</i>
Deep Transition	Series of connected and sustained individual transitions in a wide range of socio-technical systems towards a similar direction. <i>(In this study these are interlinked and interacting Activity Systems: Connected in Living Catchments around the object of co-management over time)</i>

Democratisation	This refers to participation. It is expected that achieving transformative change may require participation by many actors and drawing on their innovative potential. Participation also means that many actors have a voice and the least powerful are in the position to challenge the most powerful actors. <i>(In this study this equates to Multi-voicedness, and Collective Learning and Transformative Agency and centring of activity systems in the expansive learning process)</i>
Directionality	Based upon one of the stylised facts of innovation research we can say that innovation is cumulative (building upon the past), innovation can be said to have a direction. Only certain solutions are looked for while others are typically ignored. This direction (sometimes called a trajectory or pathway) can be altered by transformative innovation that establishes a new direction and thus process of accumulation (also a new trajectory or pathway). <i>(In this study this is Co-development of Solutions emergent from cultural historicity that shape contradictions and potential for the shared object of co-management)</i>
Great surge of development	Combinations of technological revolutions and techno-economic paradigm leading to major economic and social impacts <i>(In this study this equates to Boundary-Crossing in order to develop new and contextualised solutions)</i>
Inclusiveness	Closely coupled with democratisation, this refers to the inclusion of all actors in decision-making processes but goes beyond that since it also refers to actors having the access and capabilities to participate. So it includes a consideration of the context in which actors interact. <i>(In this study this equates to Multi-voicedness of stakeholder participation (diverse actors in activity systems) in the expansive learning process and transformative agency emergence)</i>
Innovation	An idea, or process whose novelty distinguishes it from prior ideas and processes and is taken up and used (including processes of articulation, adaptation, or customisation) by people other than the originator(s). The idea of process can be a re-invention or re-use of older ideas and processes. Innovation is basically a process of renewal. <i>(In this study this equates to Social Innovation: It includes solutions collectively developed by the diverse stakeholders emerging from internal contradictions to expand the object of activity)</i>
Landscape	Exogenous events and trends that shape niche-regime dynamics. <i>(In this study this equates to Governmental Rules and Policies regulating catchment dynamics)</i>

Niche	Spaces for radical innovation that are protected by specific selection criteria. <i>(In this study this equates to collaborative catchment partners, such as the UCPP and Change Labs)</i>
Reflexivity	This notion refers on the one hand to the ability of actors to reflect on their own routines, and worldviews, the routines, position and worldviews of other actors, and the rationality. <i>(In this study this equates to Reflection and Reflexivity involved in transforming the object of activity)</i>
Regime	Relatively stable and aligned set of rules directing the behaviour of a set of actors along a trajectory of incremental innovation. <i>(In this study this equates to Rules and Division of Labour in Activity Systems)</i>
Second Order Learning	Or deep learning refers to a process in which routines are questioned. This includes a fundamental rethink of how problems are defined, and what solutions are considered appropriate. First order learning refers to a process in which routines are sharpened and become better defined. <i>(In this study this equates to Collaborative Contradiction Analysis, modelling of solutions and expansion of the object)</i>
Socio-Technical Regime	Sets of routines which are often aligned. This is what we call a socio-technical regime. We can make a distinction between heuristics (design rules, search rules); policy routines, user routines (preferences), cultural routines (expectations, perceptions, frames). These routines can be formal and informal. <i>(In this study this equates to Rules in Activity Systems)</i>
Socio-Technical Systems	Norms, routines, and standards (regimes) become expressed in socio- technical systems. Such a system is a configuration of actors (their knowledge, skills), technologies (products, infrastructures), and institutions (regulations, cultural symbols, markets) for fulfilling a certain societal function (mobility; or inland mobility; urban mobility). <i>(In this study this equates to Rules, Subjects and Instruments in Activity Systems)</i>
Techno-Economic Paradigm	A set of best practices for the employment of technological revolutions <i>(In this study this equates to Policies and Rules Regulating Innovations)</i>

Technological Revolution	Systems of systems; sets of interrelated, radical breakthroughs, forming a major constellation of interdependent technologies. <i>(In this study this equates to the Transformation of the Object of Activity at Multiple Levels)</i>
Transformative	In our context, there are two important meanings for this adjective as applied to innovation: 1) a break or distinction from past practices or routines which opens new possibilities for further innovation across a broad front or over a wide variety of contexts (i.e. this definition is a qualitative statement of the potential or an achievement being large as compared to other innovations) and 2) further to 1), a process that establishes a new directionality. <i>(In this study this equates to Transformation in Human Activity that can contribute to TIPC)</i>
Transition	In its simplest form, the change from one socio-technical system to another (which thus also implies a change of regime, e.g. rules). The term is usually built on the premise that current socio-technical systems are not socially or environmentally sustainable and there is a social and/or economic need for a specific type of transition, one whose directionality is more compatible with social or environmental sustainability. <i>(In this study this equates to Collaboration, Co-development of contextualised solutions and Transformation in the object of activity)</i>

Source: TIPC (2022)

These terms have been listed in alphabetical order and they have been elaborated on. The list provides a good summary of the ingredients which underpin the TIPC work and how I will approach them. These terms have received considerable attention in TIPC discussions and analysis and therefore are regarded as key in achieving the aims of the TIPC. I qualify these with insights from the Just Transition discourse and expansive learning processes. This is important as the TIPC has required considerable resources and investment in developing the terms and the necessary tenets to build the work of the Transformative Innovation Policy. Throughout my study, many of these terms will be expressed and exemplified but also critically appraised. Some of the terms from the list will be used but under a different name, because my work supports the work of the LCP and the greater TIPC work. There is also an interesting correlation between Frame 3 of Innovation Policy, the Transitions Studies theory and the terms underlying the rationale of the TIPC. This correlation is also apparent in my study and this theme is sustained through this study (see Chapter 5). This congruency was enabled through the process of spending considerable time researching the LCP and its underlying conceptual work, drawing theories which are relevant to the aim and objectives of my study, embarking

on well-planned conceptual profiling trips and building trust and transparent relationships between and among the stakeholders. The following section explains the importance of Just Transition and how the theory relates to TIPC, and also the LCP. As can be seen in Table 2-1, the TIPC and the TIP are essentially promoting transitioning theory and practice in a South African context. It is necessary to probe transitions theory further through the notion of Just Transition.

2.3 Just Transitions, Socio-technical Theory and the Multiple-level Perspective

2.3.1 Background of Just Transitions

To understand the concept of Just Transition, it is important that its history and development are explained. The concept of Just Transition is closely aligned with the principles of fairness, and awareness of previously marginalised voices including historically overlooked stakeholders who are potentially undervalued members involved in NRM activities. This is the reason why this concept is important for this study. Just Transition is a term that emerged in the late 90s when it was apparent that the preservation of the ecosystem and resources and employment are inextricably linked (Scholtz, 2011). Eisenberg (2019) argues that the term can be defined from various contexts and all these terms can assist in providing a Just Transition Framework for a legal perspective. In the context of climate change, Eisenberg (2019) states that Just Transition is the principle of easing the burden decarbonisation exerts on those who depend on high-carbon industries. In another context, Eisenberg (2019) states that the idea behind the concept originated with the labour movement in the late twentieth century, in part as a response to the environmental movement. Eisenberg (2019) states that Tony Mazzocchi, a labour and environmental activist, is credited with coining the word originally referring to a “Superfund for Workers.” His approach was founded on the assumption that people who had been exposed to toxic chemicals throughout their life should be entitled to minimum wage and education benefits in order to migrate away from hazardous jobs (Eisenberg, 2019).

Swilling and Annecke (2012), writing in South Africa, argue that a Just Transition must reconcile the sustainable use of natural resources with a widespread commitment to what is increasingly being referred to as sufficiency (that is, where people who consume excessively are satisfied with less so that those who consume insufficiently can secure enough without wanting more than their fair share). In their perspective, a transition towards more sustainable forms of development that excludes these socioeconomic inequalities intact will not produce an outcome that can be sustainable. Henry et al. (2020) state that the concept originated with

the 1970s United States labour movement and grew as labour organisations established alliances with environmental justice groups beginning in the 1990s. In this context, Just Transition s developed in response to heightened regulations of industries linked with pollution in the wake of the National Environmental Policy Act and the establishment of federal Superfund law in the US (Henry et al., 2020). The Just Transition Centre (2017) provides a similar definition and origin of the concept. North American Unions started to develop the Just Transition concept in the 1990s. Originally trade unions had an understanding that Just Transition was a programme of support for workers who were no longer employed as a result of environmental protection policies. However, as time progressed, the concept developed a wider meaning for unions and their partners a deliberate attempt to plan for and invest in a transition to environmentally and socially sustainable employment, sectors and economies (Just Transition Centre, 2017). Another interesting definition of the term was put forth by Swilling (2020, p. 6):

A Just Transition is a process of increasingly radical incremental changes that accumulate over time in the actually emergent transformed world envisaged by the SDGs and sustainability. The outcome is a state of well-being (Fioramonti, 2015) founded on greater environmental sustainability and social justice (including the eradication of poverty). These changes arise from a vast multiplicity of struggles, each with their own context-specific temporal and spatial dimensions.

In the definition, Swilling (2020) argues that essentially a Just Transition implies that new forms of finance, equitable access to property and productive capital may be needed if we want to avoid repeating inequality in a decarbonised world. Swilling (2020) further adds that an unjust transition is quite possible. Just Transition is important in the context of South Africa because it is a country which has a history of inequality and unjust policies which have benefitted the minority to the detriment of the majority. Francis and Webster (2019) state that the meaning of inequality in South Africa is not the same as in other parts of the world because of the country's distinct history of racialised dispossession, and a labour market extremely divided by race and gender. The post-apartheid government has endeavoured to redress the injustices and inequalities of the past through various programmes, policies and legislation. However, inequality remains a key issue and a severe socioeconomic challenge. Francis and Webster (2019) further state that injustice and inequality have persisted in the 30 years of the post-apartheid era, and this has led to South Africa to have the greatest inequality of income in the world (Sulla & Zikhali, 2018), deep inequality in wealth (Orthofer, 2016), and access to water, as discussed in Chapter 1.

As Just Transition grew roots from the labour movement, the Congress of South Africa Trade Unions (COSATU) has some thoughts on how it should develop. In terms of climate change, COSATU (2011, p. 35) argues as follows:

Climate change jeopardises human rights. It is essential that the fight against environmental degradation and climate change be carried forward with full regard to overall trade union goals of social justice, decent work and gender equality, within the framework of a strategy of Just Transition from the current production and consumption pattern to a sustainable low-carbon climate-resilient alternative.

According to Scholtz (2011) as things stands, if countries with emerging economies were required to start reducing their emissions, this would result in emerging economy countries being at a disadvantage competitively in a globalised economy, and this in turn affects the poor. When one perceives this situation, the solution lies in a more sustainable use of the country's resources, while in a quest to take opportunities to deepen economic democracy equitably to create employment and develop sustainable industries; this needs a transition to a new economic model (Scholtz, 2011). South Africa as a country is required to create employment and strengthen its labour force. Labour unions play an important part in ensuring that there is a fair distribution of employment among the people of the country and that people are not unfairly treated during times of transition which may result in job losses. COSATU (2011) argues that if the success of the country is based on economic policies and management that relies upon a one-dimensional indicator such as Gross Domestic Product (GDP), then there is minimal hope of attaining the insight and maturity to attain a Just Transition. COSATU (2011) believes that if we are to expand our concept of the determinants of successful "growth we can start to assess the decisions and choices needed to attain a Just Transition to a truly sustainable economy, embedded in a healthy society and environment". The above sentiments express that South Africa requires a Just Transition which supports the growth of the economy, while ensuring that the country's environment is protected, and that the society is in a healthy state.

The adoption of the Just Transition Framework in South Africa is a potentially enabling factor for including communities in NRM activities. The research I embarked on consists of stakeholders in the various catchment communities. Some of the stakeholders from the catchment are aware of the water security issues, but there has not been a reported or formal means of learning with them about how they can potentially co-manage their catchment with the more formally authorised stakeholders. The Just Transition Framework therefore provides a theoretical basis for this research. Furthermore, the Just Transition Framework provides an

alternative way to traditional means of developing solutions to issues on the ground; it provides a platform for sustainable and responsible transitions to other ways which are collaborative, boundary crossing, respectful and aware of Indigenous Knowledge Systems (IKS) and consider previously unrecognised voices.

In South Africa, the work on Just Transition dates to more than a decade ago, starting with the labour movement (Presidential Climate Commission Report [PCC], 2022). Following this, the national government focused on achieving a Just Transition, and in 2011, the National Climate Change Response White Paper emphasised Just Transition as a policy imperative and an important component of an effective climate change response (Department of Environmental Affairs, 2011). In December 2020, President Cyril Ramaphosa commissioned the PCC (originally named the Presidential Climate Change Coordinating Commission) to do the following: “Advise on and facilitate a common understanding of a Just Transition, cognisant of the socioeconomic, environmental and technological implications of climate change” (PCC, 2020, p. 8). This means that for South Africa, Just Transition has been entrenched into policy and legislation and the concept has to be actualised pragmatically. Climate change exerts significant stress on food security and South Africa’s already constrained water resources, which results in the creation of knock-on impacts (Department of Forest, Fisheries and the Environment [DFFE], 2019; NPC, 2020). According to the PCC (2022), South Africa’s triple challenges of poverty, unemployment and inequality are exacerbated by climate change.

South Africa is already one of the most unequal countries in the world, as mentioned above, and the gulf between the rich and the poor is greater than ever; presently, the rate of unemployment, which is over 35%, is at a record level (StatsSA, 2022). For the PCC (2022), the definition of a Just Transition includes aiming to attain a quality life for all South Africans, in the context of increasing the ability for adapting to the negative impacts of climate change, fostering climate resilience, and achieving net-zero emissions of gas by 2050, which align with the best science available. This means that for South Africa, Just Transition has to be put into practice according to policy with support from the best available science in order to attain the pre-determined goals. Whatever goals that have been set by the government in order to attain Just Transition, people have to be at centre of the transition, the environment has to be protected and sustainability has to be ensured as it is envisaged in other policies (see section 1.4.4). The PCC (2020, p :9) argues:

A Just Transition contributes to the goals of decent work for all, social inclusion, and the eradication of poverty. A Just Transition puts people at the centre of decision making, especially those most impacted, the poor, women, people with disabilities, and the youth—empowering and equipping them for new opportunities of the future. A Just Transition builds the resilience of the economy and people through affordable, decentralised, diversely owned renewable energy systems; conservation of natural resources; equitable access of water resources; an environment that is not harmful to one’s health and well-being; and sustainable, equitable, inclusive land-use for all, especially for the most vulnerable.

According to the PCC (2020), from a South African perspective, Just Transition is situated at the nexus of climate and development issues in South Africa. The framework of Just Transition therefore supports the country’s endeavours to redesign the economy to the benefit of the majority of the citizens to enable deep, just, and transformational shifts (i.e., the addressing of social, economic and environmental challenges), in the deliverance of an effective response to climate change (i.e. improving resilience, making substantial cuts to greenhouse gas emissions, and protecting and promoting the health of communities) (PCC, 2020).

The PCC has done considerable work in the area of Just Transition. A review of the current reports and dialogues reveals several issues which need to be discussed. Firstly, South Africa has developed broad consensus on defining what a Just Transition is, and the perspective is committed to by all stakeholders across sectors. Secondly, there is broad consensus on who is deemed as vulnerable- not just those employed in fossil fuel value chain, but also those without jobs, poor households, communities, young people, and women affected by both climate change and mitigation measures (PCC, 2020). Thirdly, Just Transition is not merely an issue of the environment; it is more directly an issue for economics and society with deep implications for competitiveness of the South African economy and livelihoods of its people. This means that a Just Transition in South Africa will require an implementation plan which sequences and align economic, social, and mitigation and adaptation measures (PCC, 2020). Lastly, among the social partners there is a commitment to procedural justice which involves those most affected in decision-making processes, and a reconfiguring of processes of governance to ensure all aspects of justice in the transition are addressed (procedural, redistributive, and restorative) (PCC, 2020). In their work, Abram et al. (2022), also adds “recognitional justice” as an aspect of justice which has to be addressed in transitions. Abram et al. (2022, p. 1036) define these various types of (in)justice as follows:

- Procedural justice: Affected parties are meaningfully and continually consulted;
- Distributive justice: Sharing costs and benefits of the transition fairly and equitably;

- **Recognitional justice:** Recognising that not all members of society are equally valued in current sociocultural, economic, and political arrangements, and that climate change and transitional policies threaten to exacerbate existing inequalities along gender, class, and ethnic/racial lines;
- **Restorative justice:** Redressing past harm, e.g. compensation, or reducing the likelihood of future harm through, for example, implementing transition frameworks for workers from polluting industries or compensating low-lying island states.”

The above-mentioned factors are underpinned by principles of sustainable development because South Africa has developed plans and processes to achieve their SDGs.

Viewed through the framework of sustainable development, the concept of Just Transition is not foreign. In principle, environmental decision makers already possess a framework which considers questions of economic equity and their relation to environmental decision making (Eisenberg, 2019). Just Transition has concerns for avoiding or mitigating inequitable impacts on livelihoods when it comes to making environmental decisions and is thus a doctrine of economic equity. Therefore, a fitting place for Just Transition is for it to run parallel to environmental justice, along economic equity (Eisenberg, 2019). In bringing sustainable development and Just Transition together, the outcome expected is to have decision makers considering and advancing environmental protection at the same time they are considering the advancement of their economic and social development goals; this is in direction contrast with conventional development, where environment concerns in times past arose only as afterthoughts (Eisenberg, 2019).

The sustainable development approach creates the need for a Just Transition because it is fundamentally based on a shift to renewable energy sources. It also has the potential for the provision of tools which ensure that a Just Transition occurs because of its concern for economic and equity-related-priorities (Eisenberg, 2019). Figure 2.3 below shows how the sustainable development framework is interrelated with Just Transition and the concept of environmental justice. The figure below depicts how the Just Transition concept exhibits a significant parallel with environmental justice because both these ideas arose as social movements in the late twentieth century as a response to the environmental movement; environmental justice calls for racial equity (and other forms of non-discrimination, especially recognitional justice cited above), while Just Transition calls for labour equity (Eisenberg, 2019). It is therefore clear that for Just Transition to become a reality in South Africa, government needs to understand the role of communities in environmental matters and allow society to have a strong voice with regard to making decisions about its environmental context;

hence the focus on recognitional justice and how this is potentially advanced by expansive learning and co-management of water resources is interesting to explore in this study.

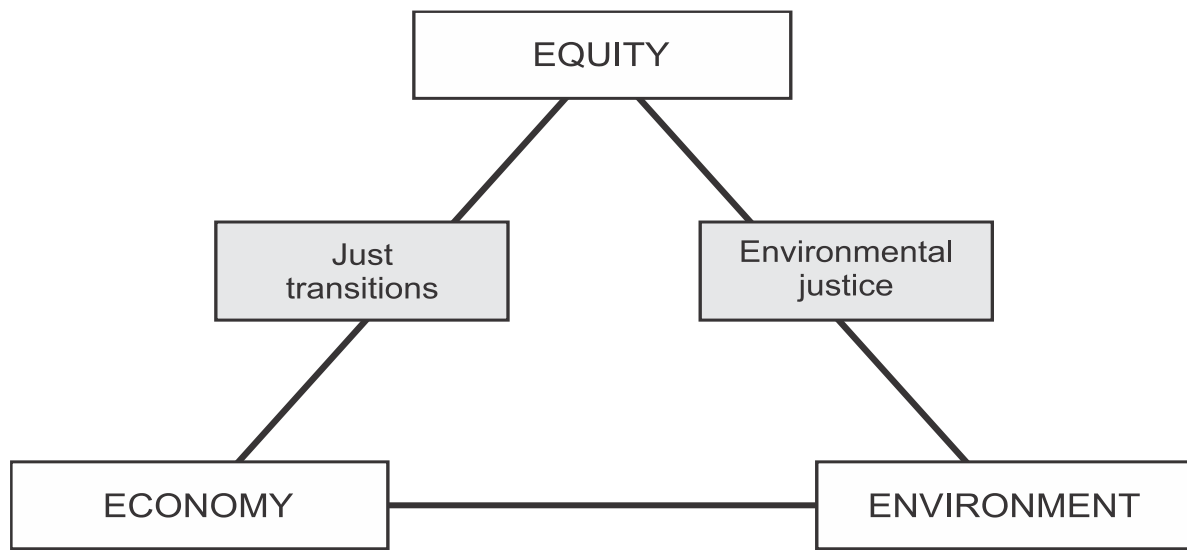


Figure 2.3: Sustainable development framework with Just Transition and environmental justice (Eisenberg, 2019)

When it comes to Just Transition planning, governments should commence with the establishment of Just Transition funds (Just Transition Centre, 2017). These funds should be used to support activities which address climate action and related employment risks through implementing Just Transition plans for workers and communities, regions, value chains and industry sectors which are vulnerable and at risk. These funds also need to cover investment in vocational education and training, reskilling and retraining and grant and loan programmes for diversifying community and regional economies (Just Transition Centre, 2017). I have mentioned this above factor because Just Transition requires that society is equipped, well-resourced and ready to face changes. In addition to this, communities need to be educated about their unique environments and expansive learning has to occur, so that learning what is not already there is possible.

The NPC (2020) states that essentially people are at the centre of South Africa's water solution. The NPC (2020) argues that for a Just Transition to be a reality in water management in South Africa, strong governance needs to be in place and corruption needs to be eradicated. Furthermore, water resource management decisions need to be decentralised to the most appropriate level and institutions need to be capacitated to manage local, regional and national water systems. The NPC (2020) also envisions that by 2050 water will be deemed a high value resource and that South Africa's people, institutions, policies, and water resource management

structures will also place a high value on all sources of water. From the NPC, it is clear that for effective water resource management, people have to be central and instrumental in decision making. It is encouraging to see the country's commitment to working with communities in order to achieve effective water resource management. However, it is one thing to see something in policy but another to see the policy being practically enacted as pointed out to in Chapter 1. As a commitment to achieving a Just Transition the NPC (2020, p. 18) identified seven critical approaches to this vision:

1. The Just Transition must be considered from an economy-wide perspective and not only as an energy transition.
2. There needs to be a proactive and managed approach to systemic and structural changes to the economy to prevent social and economic disruption. This includes the negotiation of labour and social plans for sectors impacted by the transition.
3. Collaboration, partnership, and good governance are central to achieving a Just Transition. Without the participation of all stakeholders, especially workers, there will be no Just Transition.
4. Political will is essential to enable vertically integrated policies and regulations to support the transition.
5. Policy alignment and implementation are critical.
6. Information and knowledge sharing, transparent data, awareness and communication with all parties will facilitate the planning for a Just Transition.
7. Costing the pathways for a Just Transition, including the identification and mobilisation of resources is critical for the achievement of a Just Transition.

These approaches show that economics, collaboration, politics, policies, knowledge sharing and resources are important tenets in enabling Just Transition in South Africa. However, achieving Just Transition will not be without tensions and conflicts. The history of the concept shows that it arose as a result of conflicts and tensions. Tensions and conflicts are a feature of this study as they express contradictions within and between activity systems and are a source of collective learning and activity transformation. This is discussed in-depth in Chapter 4 and 7 of this study. Just Transition arose at the human, economic and environment nexus. This is an important nexus and a point of contention for numerous planned activities. For the LCP, the Just Transition Framework is an essential component of their work, because this programme occurs at the heart of the communities. The catchments involved in the LCP are important for the water resources present in their environment. Humans in this environment require sustenance in order to ensure the continuous maintenance of life in their catchment, usually

expressed by income and job securitisation. For the catchment dwellers, any planned intervention needs to be cognisant of this usually sensitive nexus and consulting with the locals is a first step in making any progress. So, for the LCP, the Just Transition Framework is an enabling factor in achieving the programme goals because entrenched within the programme aims and objectives will be the awareness of acting in a “just” manner in partnering with catchment communities. As argued by Eisenberg (2019) the term can be defined from various perspectives and even disciplines, but at the heart of this concept is the notion of not leaving people behind in issues that potentially concern them. Whether Just Transitions are in the context of environmental justice or climate change, it is important that people must not be left behind in the conversations regarding matters concerning them; in other words, recognitional justice must be prioritised and planned for. As a living experiment of the TIPC in South Africa, the LCP, is centred on those premises and foundational stances. Along with Just Transition the TIPC’s work is also founded on sustainability transitions and socio-technical transitions theory. The next section will discuss the history and background of the transitions work, so as to understand the importance of the theoretical framings guiding the work of the TIPC.

2.3.2 Background and history of transitions work

The TIP is largely underpinned by the thinking of sustainability, transitions and socio-technical transitions theory. This section consists of the background and history of these concepts and how they link with the work of the LCP and TIPC. These theoretical underpinnings influence the various live experiments established by the TIPC and they should influence the guiding principles for the pioneers of the TIPC work on the various catchments, areas or project sites in the different countries. Current environmental issues such as climate change, biodiversity loss, and depletion of resources such as (clean water, oil, forests, and fish stocks) present daunting challenges to society (Geels, 2011). Addressing these concerns necessitates an improvement in environmental performance which is accomplished through structural changes in transportation, energy, agri-food and other sectors (Elzen et al., 2004; Smith et al., 2010; Van den Bergh & Bruinsma, 2008). These changes in the system are usually termed ‘socio-technical transitions’ because they involve transformations in the overall configuration of elements such as transport, energy, and agri-food systems, which entail technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge (Elzen et al., 2004; Geels, 2004). Transitions are therefore intricate and multifaceted and are long-term processes which comprise multiple actors. These multiple actors, such as firms and

industries, policy makers and politicians, consumers, civil society, engineers and researchers, reproduce, maintain and transform the above-mentioned elements (Geels, 2011).

Much of the TIPC work focuses on two areas in transition studies: Deep Transitions theory which makes sense of what has happened in the past, and sustainability transitions which enable reflection on future transformations (TIPC, 2022). This intertwining of theories is advantageous for the future of interventions, as this duality aids in the understanding of the past context while preparing for the future. Constant reflection is important in interventions and in projects which aid in transforming societal norms; hence reflection features prominently in my research methodology. Within the Deep Transitions thinking there are predominantly two systems of thought, First Deep Transitions and Second Deep Transitions Thinking. For the sake of this thesis and its objectives, I will provide a brief overview of these two schools of thought to highlight their importance in the TIPC work. According to the TIPC (2022), the Second Deep Transition must be sustainable in order to address humanity's massive social and environmental issues. This approach involves a comprehensive rethinking of today's socio-technical systems and societies, and the Second Deep Transition must be distinct from the first in that its starting point must be sustainability, rather than aimless, unfettered progress. The Transformative Innovation Policy (TIPC, 2022) could be used to provide future direction for transitions.

The First Deep Transition resulted in considerable industrial progress and the age of "modernity", as we know it, has generated immense wealth (TIPC, 2022), especially for empires and colonial countries. With it, however, have emerged new, complex problems and challenges, termed "wicked problems" (TIPC, 2022). Most notably, industrial consumption and production has resulted in the growth in inequality and impoverishment across the globe, while the fundamental alteration in our planet has left us with the ramifications of unprecedented climate change and inequality of resource distribution (TIPC, 2022), including issues of water pollution, catchment degradation and water insecurity, the focus of this study (see Chapter 1). Various scholars have a belief that we are currently in the Second Deep Transition, which has manifested as a fundamental re-ordering of the First Deep Transition to respond to the challenges created by modernisation (TIPC, 2022). Since the 1970s, there has been a growing recognition among key stakeholders (governments, international organisations, businesses, and NGOs) that any future industrial development must be sustainable in the sense that it provides wealth and economic growth without exceeding the limits of our environment.

As a result, policies and initiatives addressing climate change and inequality have emerged, with the most significant recent initiative being unanimous acceptance of the UN SDGs (TIPC, 2022). This study has implication for the Second Deep Transition because the study was a deliberate attempt to embark to confront contradictions (explained in detail in Chapter 7) relating to water management and to use those contradictions as secondary stimuli for learning which may contribute to policy development and recommendations relating to water management. At the core of transitions thinking is the notion of looking at the past, and the striving towards unmaking unsustainable systems which societies are founded on to secure and shape a sustainable future.

According to Newell and Simms (2021) there is considerable debate about transitions. Newell and Simms (2021) further state that among the increasing body of actors there a growing sense of the necessity, desirability and urgency to detach from ecologically and socially destructive systems of accumulating wealth and means of meeting human needs for energy, water, food, and mobility, towards ones which are consistent with the maintenance of what may be referred to as a safe operating space for humanity (Rockström et al., 2009). Newell and Simms (2021) argue that governments, international institutions, business and civil society actors are embracing the ‘transitions’ language and are mobilising strategies towards that goal, supported by an ever-increasing scientific consensus on the seriousness of the threats we face and the burdens we are placing on the planet (Newell & Simms, 2021). According to Elzen et al. (2004) addressing these persistent and worsening environmental problems (such as climate change, biodiversity loss, and resource depletion) necessitates fundamental changes in systems which are referred to as ‘socio-technical’ because fulfilling these functions of societies involves not only technologies but also situated consumer practices, cultural meanings, public policies, business models, markets and infrastructures. In other words, it should also be a Just Transition as discussed above.

Bush and Doyon (2021) argue that transitions have a primary focus on the meso level of socio-technical systems and micro-level niche innovations (Geels, 2004; Köhler et al., 2019) and that transformations are related to macro-level processes of change in society which involve social-ecological systems (Folke et al., 2010). In response to these interconnected climate change and biodiversity emergencies, there has to be a facilitation of change from the niche (micro) level, through to the regime (meso) and landscape (macro) level, and this requires targeting socio-technical and social-ecological systems simultaneously. The role of the of LCP is to work with

diverse parties to facilitate the changes in order to answer these natural management resource questions. As a TIPC experiment, the research outputs emerging from the catchment level have to influence the other levels of society, government and policy. As the LCP also recognises social innovation as a valid form of innovation, studies such as this one are potentially suited to facilitating changes and development of novel solutions at the catchment level which can have an impact at a larger landscape level.

As transition researchers address emergent concerns, goals, and approaches to intersecting emergencies, knowledge co-production and transdisciplinarity must be included in research techniques, findings, and action. It is critical that transition studies academics are challenged by ‘outsiders’ to benefit from new viewpoints and bring about further refinement of present transition methodologies (Köhler et al., 2019). For the scientific community a key issue in transdisciplinary knowledge co-production is related to recognising, respecting, and negotiating pluralistic sources of knowledge and incorporating “notions of reflexive practice and multiple knowledges into their working practices” (Norström et al., 2020, p. 189). Foregrounding Indigenous voices is essential for epistemic fairness and enabling recognitional justice, as well as acknowledging and using profound knowledge of sustainability, land management and cultural custodianship (Bush & Doyon, 2021). According to Barlo et al. (2021), Indigenous peoples have exhibited incredible flexibility and resilience in the face of colonisation and environmental damage, and hence their experiences are critical for addressing present concerns. In this study the inclusion of traditionally marginalised voices of local Indigenous people is a vital component. Along with this is the deliberate exploration of the awareness of the agency of the people in the catchment and the creation of a platform for them to exercise this agency further. Chapter 6 of this study highlights the various activity systems involved in the shared object of co-management of water. The inclusion of these voices has implications for facilitation of change on the ground because as the Indigenous people in the catchment context, they are the custodians of valuable traditional ecological knowledge and IKS. A unique transdisciplinary approach was taken in order to try to incorporate the diverse knowledge types which could potentially influence the object of this study. This forms part of potentially assisting in the transitioning from traditional research to more co-engaged knowledge production.

Transition researchers have to actively seek and engage in the construction of relationships with Indigenous people to create opportunities for relevant transdisciplinary research that

responds to Indigenous peoples' aspirations for their land and cultural responsibilities (Bush & Doyon, 2021). These issues, according to the researchers, hint at new research objectives that necessitate new ways of working, the development of knowledges and methodologies aimed at solving complex system problems, and research across disciplines and scales. Transitions research embraces open-endedness and uncertainty (Köhler et al., 2019); transitions researchers are encouraged to explore and develop new pathways and initiatives by collaborating with transformations scholars and Indigenous peoples through a transdisciplinary knowledge co-production approach (Bush & Doyon, 2021). Furthermore, as part of the process of co-production of knowledge with Indigenous peoples, research has to adopt practices that are more respectful, ethical, and useful for people, culture and ecosystems (Bush & Doyon, 2021). Bush and Doyon (2021, p. 58) highlight the importance of Indigenous peoples in transition studies by also emphasising aspects of recognitional justice:

There is an urgency to support the development of Indigenous Peoples as researchers (Tuhiwai Smith, 2012), to value knowledge of Indigenous Peoples, and to apply principles of epistemic justice (Cousins, 2021; Woroniecki et al., 2020) that aim to bring together different knowledges, rather than trying to push or fit Traditional Knowledges within Western knowledge systems. Indigenous perspectives reinforce the obligations of increasing complexity and connectedness, rather than seeking to reduce complex systems to simplified and isolated representations (Barlo et al., 2021; Yunkaporta and Shillingsworth, 2020). Knowledge co-production that foregrounds Indigenous perspectives requires time to build respectful relationships, to ensure research relevance, and cultural rigor (Doyon et al., 2021; Yunkaporta and Shillingsworth, 2020).

Respectful and effective relationships based on trust and shared understandings take time to establish, but everyone involved in responding to these emergencies recognises their urgency. This means that navigating the tension inherent in the need to proceed with both patience and urgency must be prioritised (Bush & Doyon, 2021). The unique positionality of the LCP enables this formulation of effective relationships as this programme seeks to strengthen and facilitate spaces which allow boundary-crossing and co-learning to occur. Chapter 5 details the methods I followed in order to try to establish relationships in the catchment with the different stakeholders involved in co-management. The issue of establishing values of respect and trust in research should be taken seriously. In the context of research in catchments where there has been a degree of marginalisation and seclusion in the access to vital resources, such as water, new ways of linking with local people are required. This is especially true for people in the Global South.

There have been some attempts to look at transitions in different regions of the world, and one of the early attempts to adapt notions from transitions research to developing economies was “Socio-technical experiments in Asia - a driver for sustainability transition?” (Berkhout et al., 2010). Since then, the topic has gained traction with more transition researchers publishing on non-European case studies, and information regarding socio-technical transitions in non-European contexts becoming common in the community (Ghosh & Schot, 2019; Wieczorek, 2018; Yang et al., 2021). The research and case studies which will emerge from the students and other scholars in the LCP will play a vital role in adding to transition knowledge from other non-European contexts, i.e. unique South African contexts. The particular work of the various scholars in the LCP is situated in catchments around South Africa, mostly rooted in rural contexts, underpinned by developing economies as in this case. The LCP scholars are positioned in various disciplines with diverse skills, which can allow them to be adequately positioned to add variety to the research repository. Enabling transitions led by southern actors for southern contexts necessitates a different set of skills and training to account for local sensitivities, sociopolitical and cultural conditions that confronts colonial thinking and practices (Ghosh et al., 2021). However, investigating the repository of current of various and diverse local human capabilities and how to harness those into further developing capacities instead of building capacities from scratch are usually omitted from the discussions (Frediani et al., 2014; UN SDGs, 2017). The decolonisation of transitions research will commence by embracing of transformative agency of Southern actors, assisting in the construction of communities of practice and embedding social and technological innovations in local contexts (Ndege & Onyango, 2020; Silvonen, 2004).

According to Ghosh et al. (2021), the Global South refers to regions with a colonial history, different ontologies and epistemologies, and as yet inadequate basic services for most of its people. The word alludes to specific sociopolitical-economic circumstances of mostly previously colonised countries where institutions were established under discriminatory principles that assist in the maintenance of the advantages of the minority while damaging the well-being of the majority. As a result, a major proportion of the population often relies on clientelist and exclusive provision systems which has resulted in the perpetuation of social exclusion (Ghosh et al., 2021). This study is situated in a catchment which was in the former Transkei Homeland, established under apartheid separatist policies (see Chapter 1). A great majority of the locals in the catchment are still bearing the burden of past apartheid policy outcomes. As a result, there is a widespread lack of access to basic services in large areas of

the catchment, such as water provision and waste disposal facilities (see Chapter 7). As discussed in Chapter 8 expansive learning provided an avenue for establishing local catchment solutions which can affect policies at various points in the decision-making hierarchy. Countries situated in such contexts, such as South Africa in my case, are deeply influenced by their colonial past in physical and aspirational forms and pursue development (Escobar, 1995). However, numerous Global South countries are in fact ahead of the developed North in terms of ecological resilience, social solidarity, and sustainable living (Hayward & Roy, 2019; Hickel, 2020). In the pursuit to “catch up” (Perez, 1988; Yap & Truffer, 2019), socio-technical trajectories towards development have been inspired by models of Western industrial modernisation (Ghosh et al., 2021). These models have overlooked (and sometimes weakened) endogenous worldviews and assorted philosophies as globalisation and colonisation resulted in ‘One-world view’ being exported to many regions, suppressing plurality. This leading worldview has resulted in numerous injustices being expressed in society and degradation of ecosystems (Kanger & Schot, 2019).

Research on transitions in the Global South is still predominantly an extractive process that does not lead to the researched communities benefitting (Pinet, 2019). This is why an important research agenda in transitions studies is to develop participatory action research and transdisciplinary methodologies that could partially lead to addressing the issue (Köhler et al., 2019). The world is rapidly approaching all planetary boundaries and the moment has come to focus on socio-technical changes based on alternative epistemic and ontological foundations (Escobar, 2015; Fry, 2017). The Change Labs used in this study (see Chapter 5) represent a different approach to working with communities and collaborating with locals on the ground. The expansive learning process in the Change Labs (see Chapter 5) provides a platform for interventionists and researched communities stakeholders to come together, boundary-cross and co-learn, instead of promulgating a traditional extractive research agenda. This expansive learning process offers different means of coming up with solutions to our planet’s problems. In addition, working with communities on their issues on the ground has the potential of creating more sustainable solutions to natural resource issues because the communities remain in the project sites even after the funding has ceased. Participating and collaborating with communities instead of just researching them is an important step in achieving this goal.

This is the reason why there has to be a migration towards the decolonising of transitions research. Decolonising sustainability transitions in the Global South means that processes

situated on local, non-Western worldviews need to be embraced (Ghosh et al., 2021). For researchers this means challenging power structures that relate to knowledge creation and dissemination to make room for alternative pathways to socio-technical systems change. This is why in the next 10 years transitions research needs to be decolonised both in discursive theories and research practices (Ghosh et al., 2021). Addressing recurring and worsening environmental issues necessitates a change in socio-technical systems which provide essential functions in society (Geels, 2019) and multiple and varied perspectives. One way of achieving this is through the multiple-level perspective (MLP), a middle-range theory that conceptualises overall patterns in socio-technical transitions (Merton, 1968).

2.3.3 Socio-technical transition research and the multiple-level perspective

Socio-technical transition research and the MLP offer a unique approach to the larger transitions in sustainability issues. The MLP provides a ‘big picture’ integrative strategy that can accommodate numerous actors and variables, ranging from local projects to niche innovations to sectoral regimes and larger societal settings (Geels, 2019). According to the MLP (Smith et al., 2010; Geels & Schot, 2007; Geels 2002), transitions originate through the interaction of processes at the niche, system and landscape levels. Transitions are considered non-linear processes that result from the interaction of developments at three analytical levels: niches, socio-technical regimes and the socio-technical landscape (Geels, 2011). To further elaborate on this point, Geels (2011, p. 26) describes these analytical levels and how they interact as follows:

Niches (the locus for radical innovations), socio-technical regimes (the locus of established practices and associated rules that stabilise existing systems), and an exogenous socio-technical landscape (Rip and Kemp, 1998; Geels, 2002, 2005a). Each ‘level’ refers to a heterogeneous configuration of elements; ‘higher’ levels are more stable than ‘lower’ levels in terms of number of actors and degrees of alignment between the elements.

Geels (2019) argues that even though specifics differ between domains and countries, the general multi-level dynamic is that: (a) niche innovations progressively have a build-up of momentum internally, (b) niche innovations and landscape changes exert pressure on the system and regime and (c) the destabilisation of the regime produces windows of opportunity for niche innovations which then results in the diffusion and disruption of the existing system. For the LCP, niche processes are those which occur at the local catchment level. In this study, niche innovations include the various learning spaces convened in uMzimvubu in order to learn more about the overarching aim of attaining co-management of water resources. These spaces

of innovation include the ones before this study and after the expansive learning process. The novel social innovation outputs through intentional stakeholder co-production means have the ability to influence the socio-technical regime. For the LCP uptake of diverse research recommendations emanating from empirical research can potentially build up momentum through research effects on the ground and influence the policy, science, research and development space at the socio-technical regime. For the LCP these regime changes have the potential to influence the socio-technical landscape. In other words, potential uptakes in the regime level which emerged from the niche level can potentially influence the greater landscape level. In the case of this study, potential niche innovations in the uMzimvubu catchment facilitated and mediated through the expansive learning process can possibly influence policies at the departmental level, which can eventually have an effect on the national level.

The relationship between these three concepts can be regarded as a layered hierarchy or multi-level perspective (Figure 2.4). At the macro-level, landscapes are made up of slowly changing external elements that provide gradients for paths. The formulation and development of radical ideas occurs at the micro-level of niches (Geels, 2002). Regimes are embedded inside landscapes and niches within regimes, owing to the unique layered nature of these levels. Novelties emerge in niches within existing regimes and landscapes, each with its own set of issues, laws and capacities. Novelties are formed based on knowledge and skills and are targeted at existing regime challenges; new technologies are initially developed within the old framework (Freeman & Perez, 1988), as illustrated in Figure 2.4 below.

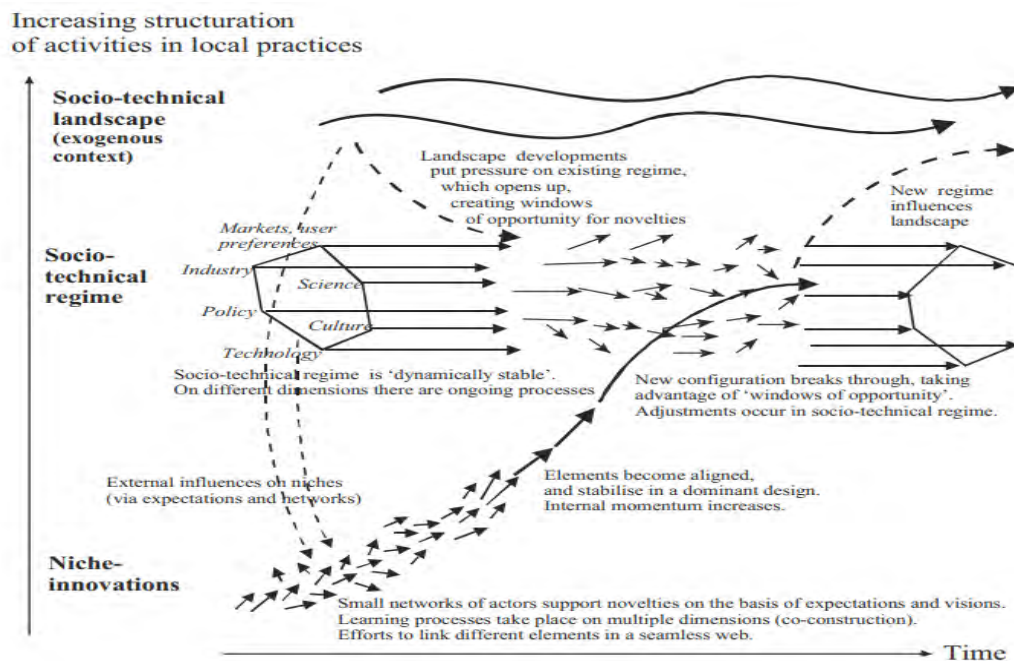


Figure 2.4: Multi-level perspective on transitions (Geels, 2002)

In Figure 2.4 above the dotted arrows indicate that the development of niches is strongly influenced by existing regimes and landscapes. Alterations at the landscape level exert pressure on the regime and generate openings for new technologies (Geels, 2002). Geels (2002) further describes niches as being important as they offer locations for processes of learning, e.g. learning by doing, learning by using and learning by interacting (Lundvall, 1988; Rosenberg, 1976; Von Hippel, 1988). Niches also provide space for the development of social networks that foster innovation; these internal niche processes have been studied and described under the umbrella of strategic niche management (Hoogma, 2000; Kemp et al., 1998; Kemp et al., 2001). Niches are also seen as protected places that are important for transitions and supply the seeds for systemic change (Geels, 2011). Following the niche level, the socio-technical regime produces the deep structure that accounts for the existing socio-technical system's stability (Geels, 2004). This regime is a semi-coherent system of laws that permits social groupings to organise and coordinate their actions in order to produce the various components of socio-technical systems. In summary, according to Geels (2004), the socio-technical regime notion aims to capture the meta-coordination between various sub-regimes. According to Geels (2011), the process of sub-regime alignment might increase stability and possibly cause conflicts. The laws of the regime also function as both a channel and a result of action (a concept known as "duality of structure" Giddens, 1984). The socio-technical landscape is the next level, which is in the larger environment and influences niche and regime dynamics (Rip & Kemp, 1998). According to Geels (2011) the socio-technical landscape includes

demographical trends, political beliefs, societal ideals, and macroeconomic patterns in addition to the technical and material backdrop that maintains society.

Since they generate an external backdrop that actors at the niche and regime levels are unable to affect in the short run, these heterogeneous sets of characteristics can be integrated inside a single landscape category (Geels, 2011). Changes at the landscape level occur gradually over time (Geels, 2011), and this socio-technical landscape generates an external environment that is beyond the direct reach of niche and regime players but has a range of effects on them. This process might happen gradually, as in changes in cultural preferences, demographics, and macropolitical events, or it can happen suddenly, as in macroeconomic recessions and oil shocks (Geels, 2011). The various levels have the potential to affect and influence each other. The socio-technical landscape exerts influences at the niche level and in a way regulates the environment at the niche level. The national policies and regulations affect the catchment processes on the ground. However, if it so happens that that landscape developments and processes affect the regime level, new windows of opportunity can open up at the regime level to allow novel solutions to affect the landscape level. For this study the aim is to explore expansive learning as a viable means to convene learning spaces at the catchment level, in order to bring different stakeholders involved in the shared object of co-management of water. The envisioned purpose is then to use the Change Labs along with double-stimulation tools to develop model solutions to water security issues in the uMzimvubu catchment. The landscape level processes have influenced the formation and establishment of the LCP, which is at the regime level, to create platforms and enable the modelling of solutions to eventually affect landscape (national and regional) discourses, potentially TIPC and Just Transition s water management policy. This process will require monitoring and evaluation of the purpose to ascertain if the expansive learning process managed to lead to practical changes on the ground, which can eventually lead to the influencing of activities higher up in the hierarchy; hence I also include a focus on monitoring and evaluation in this study.

Associated with the TIPC work is the process of evaluation and this was a key tenet of the work. My research also involved evaluation, because TIP work and TIPs in general require evaluation if they are to be influential and effect systemic change. My study used the VCF as a tool to evaluate expansive learning in the uMzimvubu in the LCP. My research showed how the VCF was used to evaluate expansive learning, situated within the LCP, and how this could affect the objectives of the project on a bigger scale (see chapters 6 and 9). However, before I

can further elaborate on the process of evaluation which I undertook in my study, it is imperative to examine the conceptual underpinnings of evaluation of the TIPC work. Various authors have contributed to the evaluation dimension of the TIPC and I shall endeavour to analyse some of that material to highlight the importance of evaluation of TIPs and also to better situate the evaluation approach and findings of my study in the wider system that it is contributing to.

2.5 Evaluation of TIPC Work

According to Molas-Gallart et al. (2021), TIPs provide a substantial evaluation challenge as they spread and gain legitimacy. How can these policy experiments be evaluated within a limited geographic and time frame when the end goal is an ambitious systemic one? How can it be known whether a specific set of policy experiments is contributing to systemic transformation? These are valid questions relevant to the LCP; they are an attempt to attain an objective disposition to TIPs because the way to achieve success is to monitor whether what is being done is meeting the targets. This is the reason why, in this study, I had to employ the VCF to evaluate and assess so that I could ascertain whether any social learning and transformative change was occurring. Transformative Innovation Policies (TIPs) are founded on the notion that addressing the principal challenges facing our societies necessitates profound alterations in current socio-technical systems (Schot & Steinmueller 2018; Weber & Rohracher 2012). As cited above, to take advantage of such socio-technical transitions a diverse range of research and innovation programmes are needed, with a focus on social experimentation. These initiatives, which are essentially demonstration projects, are focused on societal and/or ecological issues and involve a wide range of parties, including innovators from the social, grassroots and civil society (Molas-Gallart et al., 2021). The initiatives – which can be aided by strategic visioning procedures – aim to address long-term policy objectives that are typically followed by long-term targets and plans to attain them. They could be the implementation of policy mixtures based on various policy instruments, such as tax breaks, research and development subsidies, initiatives to create platforms for innovation, and research and development and entrepreneurship-spurring policies (Molas-Gallart et al., 2021).

The work of evaluation is not a simple feat and the type of work required by the TIPC to feed into the evaluation targets needs support. My work with evaluation in the LCP can be helpful because it is feeding into a greater body of work and supports the ambitions of the TIPC. The TIP evaluation process involves the assessment of the changes associated with or leading to

transitions and this is a very challenging task. Molas-Gallart et al. (2021) argue that it is of utmost importance to deploy evaluation approaches that enable policy stakeholders to participate while providing evidence of the extent to which a policy is contributing to a systemic change in the desired direction. Evaluations will also assist in determining directionality as TIPs propose inclusive approaches to policy definition, an inclusiveness which also requires to be expressed through evaluation practices. However, these challenges are not unique to TIPs but are the norm in the assessment of all policies that aim to support sustainability transitions and address environmental problems. There is an extensive body of research and practice that has endeavoured to assess the results, efficiency, and effectiveness of these activities (Molas-Gallart et al., 2021). The consequence of diverse and complex societal and environmental problems is different TIP work being implemented on the ground. This complexity further fuels the complexity related to the evaluation of such interventions. This is why I had to spend considerable time researching the evaluation dimension of my research and how it can reflect the process which occurred on the ground with rigour and transparency. The data captured by the VCF in this study (see chapters 6 and 9) can add to the TIPC work; it is a depiction of a unique type of evaluative work because evaluative work differs from context to context. This difference in evaluative work is well articulated by Molas-Gallart et al. (2021, p. 433) and captures the essence of the kinds of evaluative work:

We can distinguish three main kinds of evaluative work. Some studies undertake policy assessment from an academic perspective; that is, they try to determine policy success and failure factors and try to improve our understanding of how policies work and yield results, but without being directly part of the policy process. In contrast to this work, we find evaluative research that is almost undistinguishable from the policy initiatives they assess: this occurs in the case of many policy experiments. Policy experimentation is very common among sustainability policies, and although there are different types of experimentation, ‘learning is an essential justification’ for them (Kivimaa et al. 2017). When the main objective of an (experimental) policy intervention is to learn about the effectiveness and efficiency of the policy tools being experimented upon, it is designed in order to be assessed and such assessment is part of the experimentation. Finally, policy evaluation practice constitutes a body of policy assessments intended to feedback into the policy cycle in such a way that it becomes part of such cycle. Policy evaluations have a wide variety of goals, can be implemented in different stages of the policy cycle and use varied methodologies, but they are always targeted to a specific policy or portfolio of policies and constitute a tool for their definition and management. A very substantial part of the evaluative work addressing sustainability transitions is linked to policy experimentation and has seldom appeared in mainstream evaluation journals.

My research is of the latter type and includes evaluative work linked to policy experimentation. Ghosh et al. (2021) say that in the wake of persistent social and ecological challenges new

approaches to STI policy are necessary. Internationally, STI and other agents of change have begun to experiment with challenge-led innovation policies which are ambitious in achieving SDGs but are lacking in appropriate implementation and evaluation processes in order to mitigate the issues of coordination, lack of reflexivity and inclusion. The work of the TIP is important because it provides a lens which is a critical entry point to assist in guiding the operations of STIs and other change agents towards more transformative results. Table 2.2 below provides a framework for the 12 types of transformative outcomes and all these outcomes are identifiable in individuals, groups, and organisations involved in experiments (Ghosh et al., 2021). These transformative outcomes assist greatly in the evaluation process and are an excellent framework developed to assist in mapping the work of the TIPC and evaluating it.

Table 2.2: Twelve types of transformative outcomes

NICHE BUILDING	
Shielding	Offering protection for niche experiment and normalising these protection measures. Protection can be offered through subsidies but also market benefits such as a VAT exemption, or cultural protection by trying to change the meaning or perception of a specific solution through a media campaign.
Learning	First order (optimising existing behaviour) and second order (changes in frames and assumptions) in or across several system dimensions (science, technology, innovation, markets, culture and symbolic meanings, industrial strategy).
Networking	Participation in the niche of a wide range of diverse(in terms of niche and regime actors and in terms of regime dimensions) stakeholders. Building and strengthening ties among actors in a niche. Creation of a community of practice ensuring resources mobilisation. Emergence of intermediaries in facilitating the above.
Navigating expectations	Creating space for voicing new and alternative expectations and bridging the diversity of expectations building a shared vision.
NICHE EXPANSION AND EMBEDDING	

Upscaling-increasing user adoption	Spread of the adoption of new practices and rules, bandwagon effect.
Replication	Replication of niche conditions in different contexts. Adaptation of niche in a different locality.
Circulation	Circulation of ideas, people, tacit knowledge, rules across niches, and system dimensions. Emergence of system intermediaries.
Institutionalisation (formal and informal rules)	Developing standards definitions, narratives, regulations and preferred types of behaviours, beliefs, and values. Establishment of certification schemes, protocols. Development of a mature market niche.
OPENING UP AND UNLOCKING REGIMES	
Destabilising and de-aligning regimes	Disrupting policy frameworks and governance arrangements taking advantage of tensions between regime dimensions. Phasing out of policies and implementation of other policies disrupting the dominant socio-technical system.
Unlearning and deep learning of regime actors	Second order learning among regime actors change existing values and beliefs. Unlearning routines based on existing skills and capabilities. Emergence of new policy assumptions.
Empowering niche-regime interactions	Creation of formal and informal linkages between niche and regime actors. Emergence of intermediators facilitating such linkages.
Changing perceptions of landscapes pressures	Regime actors develop new interpretations of the nature and consequences of trends (such as climate change, loss of biodiversity, pollution, rising inequality, digitalisation, urbanisation and shocks).

Source: Schot et al. (2019) and Ghosh et al. (2020)

In this study my focus is on the learning, networking and navigating expectations, transformative outcomes and niche building outcomes in Table 2.2. I use the VCF to provide a refined methodology for evaluation within the wider TIPC framework. This approach to evaluation is new and requires learning to be a principal activity; hence my particular research is centred on the notion of expansive learning because underpinning this concept is the notion

of learning what is not yet there. Schot and Geels (2008), Raven et al. (2010) and Naber et al. (2017) argue that learning is a cognitive process of knowing, understanding and reflecting. Such processes are fundamental to niche building and nurturing as innovation that is radical can only occur through continuous learning in strategic locations that shielding offers. The work being developed by the TIPC is drawn from a series of activities aimed at bridging academic and policy knowledge in ways that support intentional and reflexive policy praxis and respond directly to a demand from TIPC members for approaches to conduct and evaluate their transformation efforts. In addition to this, the work of Ghosh et al. (2021) argues that an approach to evaluation for TIPs has to be formative with the aim of improving the definition and implementation of the interventions under evaluation and involving the policy participants. In other words, evaluation needs to be conducted in real-time as a form of constructive monitoring. This approach requires that evaluation be central in the planning of interventions and not an afterthought. This new way of doing things is also expressed in my research, because I designed a methodology which encapsulates evaluation in an intervention: it was not an afterthought but featured constantly as I embarked in Change Labs during data collection (see Chapter 5). The process of reflection offered by formative evaluation and the focus on transformative outcomes can drive policies towards achieving their transformative goals. In summary, the development of a new approach to transformative evaluation is a reflexive, participatory process that is intertwined with all stages of the policy process (Ghosh et al., 2021). In summary, TIPs will require a new strategy for evaluation that must be co-created through the same stakeholders who conduct the transition experiments for sustainability (Ghosh et al., 2021).

This issue of constant reflection is essential in TIPs and interventions involving social and ecological challenges: it even has ramifications for evaluation purposes. According to Taanman (2014), reflexive evaluation of experiments allows for learning by doing which is a critical mechanism for facilitating sustainability transitions. As a result, evaluation emerges as a primary activity in transitions, informing experiments to adapt, extend and change the envisioned pathway on a regular basis. Ex-ante evaluation, which informs experiment design prior to implementation, formative evaluation, which helps refine and improve ongoing experiments, and ex-post evaluation, which assesses the impact of experiments on sustainability after they have been completed, are necessary to achieve this (Luederitz et al., 2017). This process was followed in my research and factored into the research process and methodology. The VCF, as a tool for evaluating the intervention, was enacted before the actual

formative intervention process (see Chapter 5). Secondly, the data from the VCF narratives were used as a double-stimulation tool to stimulate learning during the expansive learning process and following the expansive cycle (see Chapter 8). Lastly, I embarked on a final VCF to see if any value was created for the learning participants and if the intervention/experiment resulted in transformation of their activities relating to water management and awareness of their agency (see Chapter 9). The intention was also to consider how to undertake the kinds of reflexive evaluations that can strengthen and shed light on expansive learning in Just Transition experience, such as those occurring in the LCP.

Evaluations are beneficial and significant because they scrutinise assumptions, structures, and values as well as related and unrelated changes in society in order to inform future actions (Loorbach & Rotmans, 2010; Robinson, 2003; Schot & Geels, 2008). Within these various modes of evaluation is embedded a reflexive learning process which continuously assesses the potential of transformation of experiments and the actual evaluation itself. As a consequence of sustainability transition experiments being embedded within structures and power relations, advanced reflexivity within an evaluation is a necessity (Avelino & Rotmans, 2009). This advanced reflexivity is important because transitions to sustainability are necessary to address the intertwined challenges of economic development, ecological integrity and social justice, from local to global scales. This constant act of reflexivity within evaluations is important in aiding these experiments because collaborative science-society initiatives are forming to conduct experiments in support of sustainability transitions (Luederitz et al., 2017). Evaluation is a key activity in the objective assessment of the experiments on the ground.

Luederitz et al. (2017) provide an evaluative scheme for sustainability transition experiments which is a structured appraisal to help with sustainability transition experiments to become more effective and efficient. The purpose of this scheme is to facilitate and accelerate learning across different experiments. It is also notable that the description of the scheme to evaluate is generic so that contextualisation is a necessity in applying empirical experiments, concretising and adapting each feature. The features in the assessment and the instructive definitions offer tentative principles for designing sustainability transition experiments. This evaluation scheme enables comparative evaluations of various experiments to identify success factors which are critical (Forrest & Wiek, 2014, 2015). It provides a coherent set of principles to assist in designing experiments and evaluative questions that can assist in the further development of the reflexive nature of initiatives and how they contribute to sustainability transitions

(Luederitz et al., 2017). This scheme was important for assisting in the evaluating work of my research because it was designed for experiments which are dedicated to solving social and ecological problems. This scheme is founded on certain principles and criteria and is the foundation of tentative evaluation schemes to assist in interventions which are action oriented.

Luederitz et al. (2017) state that the tentative evaluation scheme for appraising sustainability transition experiments is framed by four criteria that inform the development of the scheme: generic, comprehensive, operational, and formative. These criteria are supported by literature and can be clarified as follows:

- i. Generic, i.e., applicable to different types of sustainability transition experiments;
- ii. Comprehensive, i.e., capturing the ultimate outcomes as well as the intermediate and mediating attributes (inputs, processes, outputs) of experiments;
- iii. Operational, i.e., ready to be applied (including guidance on how to specify it for application to particular cases and contexts); and,
- iv. Formative, i.e., support experiments in becoming more effective and efficient (Luederitz et al., 2017, p. 16).

To conclude, the scheme outlined above is neither finished nor a recipe for success; however, it serves as a foundation for structured reflection and strategising in order to support experiments that assist society to migrate towards sustainability.

2.6 Conclusion

As a live policy experiment of the TIPC, the work of the LCP feeds into a greater body of international work. This study, although locally positioned in the uMzimvubu catchment, seeks to support the ambitions and objectives set by the TIPC, the inceptors and coordinators of the LCP. Of particular importance is the quest for the LCP to meet the SDGs to provide water and sanitation. As stated in section 2.1 the LCP, which is collaborative in character, aims to promote water governance in South Africa as introduced in Chapter 1. Therefore, it was important for this study to be embarked on at a local scale but to have a degree of international focus. Therefore, innovation is one of the key tenets of this study because the catchment problems which occur in South Africa are unique, hence requiring unique and contextual innovations. The innovation which the study seeks to express wanted to answer practical questions rooted in reality and actual contexts, and supported by theory; hence the use of CHAT and the VCF tools to assist in monitoring and evaluating expansive learning.

South Africa seeks to embark on its journey towards Just Transition so as to proceed on a sustainable development path which protects the environment while ensuring that its population is not left behind in the process. Transition studies are important in highlighting the various levels of transitions and how actions at one level can influence other levels. This is important for this research as it is located at the niche-innovations level in the uMzimvubu catchment in the LCP, which is part of the TIPC. The intervention embarked on at this level has the potential to influence the socio-technical regime (LCP level) and at the socio-technical landscape level (TIPC level). There is an emphasis on the need to apply the scheme to facilitate learning and fast-track progress across various experiments as well as for advancing the evaluation of sustainability transitions. This work is offered as a preliminary evaluation scheme for evaluating individual sustainability transition studies at niche level, potentially permitting cross-case comparisons. This set of proposed qualities must be broadly relevant, practical, comprehensive, and used to improve the performance of current and future experiments (Luederitz et al., 2017). Furthermore, research work in the future is expected to apply, question and improve frameworks to expand the evidence base for designing and conducting the next generation of sustainability transition experiments (Luederitz et al., 2017). My work, as an LCP student has to seek to contribute to attaining this goal. My case study seeks to add to the immense work established by the TIPC on evaluation practices and processes. To gauge the progress of the work of the LCP at the catchment level it is important to embark on evaluation and monitoring of the intervention. Expansive learning can assist in fostering collaboration between the various activity systems in the study (see Chapter 5), which can potentially result in co-management of water resources in the catchment. The next chapter seeks to explore learning in and for co-management, so as to potentially assist in enhancing water security in the uMzimvubu catchment.

CHAPTER 3: EXPLORING LEARNING IN AND FOR CO-MANAGEMENT

3.1 Introduction

Chapter 1 provided the background and the context of the study, along with the aim and objectives of the study. The uMzimvubu catchment is a strategic water source area which provides significant amounts of water to the catchment dwellers and beyond the catchment. This catchment is important for the LCP's aim and ambitions because the issues faced by this catchment do not just require a technocentric approach but innovative solutions founded on principles of collaboration and co-learning. That is why expansive learning is explored as a viable option to assist in co-management of water resources in the catchment. Chapter Two provided the international policy context underpinning the LCP and the theoretical underpinnings of the project at large. This is a niche-level innovation study and has the potential to influence the socio-technical regime, however, that requires monitoring and evaluation of interventions. This is the reason for using the VCF (detailed in section 3.5) as a supporting tool to monitor and evaluate if there was any learning before and after the expansive learning process embarked on in this study.

This chapter provides a general context for this study and a motivation for exploring expansive learning as a viable means to assist in providing solutions for water insecurity in the uMzimvubu catchment. This chapter fulfils the first objective of the study, which is to *review the impetus for co-learning and management in South Africa's Living Catchments* (Phase 1). A discussion is embarked on to try and explain the current situation concerning water governance in South Africa. The availability of water is crucial for all living organisms and ecosystems to survive; in addition, water is vital for the health of humans, production and securitisation of food and for social and economic development (UNESCO, 2012). Political commitment, societal agency and numerous other factors including those influenced by cultural and academic disciplines indicate the multiple-perspective value of water (UNESCO, 2012). As stated in Chapter 1, the Intersectoral Platform (2010) stated that according to the UN World Water Development Reports, the impending water crisis was not just related to the availability of the resource, it was a consequence of existing government approaches.

3.2 Water Governance in South Africa

In South Africa there is pressure from the public to provide numerous basic services, therefore, adequate resource utilisation is imperative. A decrease in the resource usage of one sector could enable an increase in resource allocation to another (Brettigny & Sharp, 2016). Humanity's right to water does not simply materialise in place to transform policies which are in existence, but rather circulates with other competing and complementary policies to co-constitute the regulatory landscape. Human right to water is endorsed by the South African Constitution, yet millions of citizens are still disconnected from the national water infrastructure (Bulled, 2017). The global demand for water has increased six-fold in the past century (United Nations Population Fund, 1999). As there is already an increasingly limited supply of water, an outcome of inappropriate water management, climate change, increasing populations, industry demands, pollution and privatisation, governments will experience further pressure to ensure that citizens have an abundant supply of safe water (Bulled, 2017). In addition, the drivers of water insecurity, namely inequitable distribution of water rights, economic resources and resource availability need to be addressed by governments (Whiteford & Whiteford, 2005).

Drawing on an approach that has proven useful in research on food insecurity, scholars have developed scales to measure water insecurity – “the insufficient and uncertain access to adequate water for an active and healthy lifestyle” (Hadley & Wutich, 2009, p. 451; FAO, 2004; Stevenson et al., 2012). Scholars developed these scales from the ground up, beginning with qualitative research on water use in specific cultural contexts. This approach develops experience-based measures of water insecurity, reflecting local idioms of stress and suffering (Ennis-McMillan, 2001). Wutich (2006) pioneered this approach, showing how ethnographic evidence on water insecurity could be used to develop locally grounded scales of water insecurity through a series of studies in urban squatter settlements in Bolivia. Wutich (2006) demonstrated that households with greater water insecurity (related to water access and not limited to quantity of water used) was significantly associated with high scores on the measure of emotional distress (including symptoms of anger, bother, fear and worry) (Hadley & Wutich, 2009; Wutich & Ragsdale, 2008). Taken together with ethnographic evidence (Wutich, 2009), these findings suggested that water insecurity is determined not only by physical access and adequacy of supply quantity, but also by the stresses inherent in negotiating inequitable systems of water regulation. Stevenson et al. (2012) further demonstrated the relationship between water insecurity and psychosocial distress among women in Ethiopia. Scholars have indicated that understanding the social dimension of water insecurity is “useful for informing and

evaluating interventions to improve water supplies” (Stevenson et al., 2012, p. 392). Therefore, it is important to understand how the relationship between water insecurity and emotional distress influences how individuals engage in improving their access to water, particularly in different contexts.

In an examination of two South African communities, Goldin (2010) found that emotional distress, not just simply water insecurity, influenced engagement in citizenship. Negotiations for improved water infrastructure and services appeared directly related to emotional states, specifically feelings of shame. Communities and individuals disconnected from state systems of education, politics and economics, partially visualised through lack of infrastructure, felt greater shame and consequently were more reluctant to participate in civic engagements to improve their water situation (Goldin, 2010). This has been supported by other scholars examining the situation in post-apartheid South Africa, who recognised the value of infrastructural connections in defining citizenship in South Africa (Robins, 2013a, 2013b; Von Schnitzler, 2008). Over the past 20 years, access to purified drinking water, and subsequently the prevention of deadly disease, has drastically improved. In 2010, 89% of the global population accessed improved drinking water sources, with two billion people gaining access to improved sources between 1990 and 2010 (JMP, 2013). The UN (2004) declared the period between 2005 and 2015 the “International Decade for Action ‘Water for Life’”. However, countless communities, which are situated in countries where water is a human right, are still disconnected from national water infrastructure (Bulled, 2017).

Global access to water has become the principal goal of international development organisations over the last four decades, and it is “enshrined” in the Millennium Development Goals and the planned SDGs (Sutherland et al., 2015). International conventions and the principle of the right to water for all have been adopted by the RSA, and water as a communal good is entrenched in the Constitution of South Africa (Sutherland et al., 2015). However, municipalities have to deal with the directive to govern water as an economic good according to the national neoliberal cost-recovery policies of the delivery of water (McDonald & Pape, 2002). With regard to governments in the Global South and issues of water provision, Sutherland et al. (2015, p. 493) states:

In the Global South, governments increasingly lack the resources to provide all citizens with services they are mandated to deliver, and hence water and sanitation failures abound (McFarlane, 2008; Sultana, 2011; Sultana and Loftus, 2013). The provision of services in fast-growing cities in the South with large backlogs, such as Durban, is a challenging process. In South Africa, this

process reflects the tension between the discourses of pro-growth and pro-poor, as water and sanitation provision is considered both an economic good and a human right. Water, and by implication sanitation, is therefore ‘provisionally assembled’, as discourses, technologies and practices change or are contested in particular hydrosocial cycles.

South Africa possesses a three-tiered governmental system, namely national, provincial and local government. Each tier of government is tasked with distinct responsibilities; however, they function in a system of cooperative governance (Sutherland et al., 2015). Understanding the government structure will assist in understanding the different actors in government and how they are positioned towards water provision. Some of these actors will feature in the research and their role in the different activity systems will be unpacked (see chapters 5 to 7). According to Lotz-Sisitka and Burt (2006), the competency levels required to participate in water management are high. This is because ineffective decisions related to water management are costly and there is an expectation that people who lack experience in the complexities of water management systems, operating in highly complex and diverse structures, complex contexts along with their factors and social processes are required to manage water issues. This expectation also applies to those who are required to facilitate and mediate this process (Lotz-Sisitka & Burt, 2006). In South Africa, mismanagement of water resources has affected almost everyone, hence those who reside in impoverished areas are the most affected because they lack access to potable water and proper sanitation (Molobela & Sinha, 2011).

Numerous policymakers, researchers and water managers advocate the management of water at the river basin level; this is premised on the argument that river basins are a “natural” unit and therefore the logical unit for management of water (Molobela & Sinha, 2011). However, even though stakeholder participation in water management is advocated, the inclusion of poor people and attaining a substantive stakeholder representation has not yet been realised in practice (Molobela & Sinha, 2011). Lotz-Sisitka and Burt (2006) argue that incompetence must not be used as an excuse for abandoning a participatory approach, but is rather a call for a realistic understanding of the various stages of change required to democratise water resource management. In most cases, participation is most often perceived as token consultation, void of actual decision-making power in the hands of the parties concerned (Molobela & Sinha, 2011). Most often, the participation discourse takes attention away from the actual social and economic differences between people and the necessity to redistribute resources entitlements and opportunities (Molobela & Sinha, 2011). The identification of the various kinds of competencies required for the tasks of water resource management is essential and it is important to commence addressing this realistically and effectively (Lotz-Sisitka & Burt,

2006). This is why learning is an important tenet in this research; it is a potential vehicle to foster collaboration between actors in and across different activity systems to work towards the object of co-managing water resources. Exploring expansive learning could potentially assist in the uptake of participatory approaches towards NRM which is one of the objectives of the LCP for the different catchments, as reported earlier. In the NRM sector, researchers tend to use the concept of social learning to explain collaborative and collective forms of learning such as expansive learning, learning in communities of practice, hence I start with a discussion on social learning in NRM and then move onto the discussion on expansive learning, as used in this study. In section 3.6 I draw on Baloi (2017) to clarify an interpretation of expansive learning relevant to NRM contexts and use of social learning discourse.

3.3 Understanding the Role of Social Learning in Natural Resource Management

Eaton et al. (2021) state that the shortcomings of top-down approaches to managing complex environmental problems become clear and participatory approaches to environmental management, including stakeholder participation, are becoming more popular (Halvorsen et al., 2019). Stakeholder engagement in environmental management is a process in which stakeholders, or those who are directly or indirectly affected by and have the ability to influence a decision, play active roles in research, planning and activities that affect their life (Lockwood et al., 2010; Plummer et al., 2017). Engagement refers to procedures in which parties with stakes in a decision are involved. Engagement encompasses various forms of social interaction, from one-way interactions (communication and consultation) to two-way collaborations (deliberation and empowerment), all of which depend on institutional mandates and structures as well as stakeholders' authorities, capacities, needs and wants (Matarrita-Cascante et al., 2019; Reed et al., 2018). Advocates of stakeholder engagement contend that allowing stakeholders to participate in decision making alongside experts facilitates learning, builds relationships, strengthens capacities and fosters the coordination needed to address complex environmental problems, even though engagement serves a variety of goals, including fulfilling a bureaucratic requirement (Armitage et al., 2008; Pahl-Wostl, 2009). However, little is known about how, and in what circumstances, stakeholder engagement procedures connect to social and environmental change outcomes (Gerlak et al., 2019; Koontz & Thomas, 2006).

According to Reed et al. (2018), systematic inclusion of a diverse range of a community's social, epistemological, livelihood and other identities in engagement processes enables sound and efficient judgements by involving people who will oversee acting on outputs from the

beginning. Increased epistemic diversity broadens the range of potential solutions and reduces “trial and error” methods that waste time and money by making the effects of a decision that may be hidden to one area of knowledge visible to another (Eaton et al., 2021). Due to the complexity and evolution of socio-ecological systems and the uncertainty and surprise that comes with managing them, it is imperative to give up on the idea of a global steady state. Instead, managing intricate, concurrently evolving socio-ecological systems for sustainability necessitates the capacity to handle, adapt to, and influence change without sacrificing bright prospects for future progress – an argument that also underpins the transitions theory as shared in the previous chapter. A crucial strategy for navigating complexity and ambiguity is learning. Therefore, it is not unexpected that dynamic social theories frequently include learning as a component (Garmendia & Stagl, 2010). Many of society’s most difficult challenges must be tackled through collective efforts. The growing scholarly interest in collaboratives recognises that the ability to learn together may be key to their success. However, there has been little theoretical or empirical research to explain how learning occurs and the factors that promote learning in this situation (Gerlak & Heikkilä, 2011). Given that collaborative arrangements entail “collective” or group behaviour, comprehending learning within a collaboration necessitates a fundamental understanding of collective learning features (Gerlak & Heikkilä, 2011). Gerlak and Heikkilä (2011, p. 623) state collective learning involves the following:

Both (1) a ‘collective process,’ which may include acquiring new knowledge through diverse actions (e.g., trial and error), assessing information and disseminating new knowledge or opportunities across individuals in a collective, and (2) ‘collective products’ that emerge from the process, such as new shared ideas, strategies, rules, or policies).

From the above extract, it is important to understand that for learning to be fully expressed in the uMzimvubu catchment, the learning actors should not only gain new knowledge but have to actively participate in the process, transform their activities and produce new knowledge products (see Chapter 8). The socio-environmental problems at the catchment level may be new to the formative interventionist researcher, but the actors in the different activity systems are acquainted with them. This is why the formative interventionist researcher is not there to just teach and give knowledge, but they play a role in facilitating knowledge co-production, provide double stimulus tools to work towards the contradiction and assist the learning actors to express their transformative agency (see chapters 7 and 8). Because they are characterised by high levels of uncertainty linked to cross-scale feedback, ambiguous problem definition and resolution, and a variety of policy interests (Bressers & Rosenbaum, 2000; Folke et al. 2005), environmental concerns provide a fertile ground for the study of learning (Gerlak et al., 2018).

Governmental institutions, organisations and communities may not be well-equipped to handle such complexity on their own, let alone successfully adapt policy and governance frameworks to shifting social and ecological situations (Gerlak et al., 2018; Innes & Booher, 2010; Newig & Fritsch, 2009). Over the past two decades, environmental policy and NRM experts have become increasingly interested in questions related to learning (Gerlak et al., 2021). Over the past two decades, research on learning in environmental and natural resource governance has expanded quickly (Gerlak et al., 2021). According to Gerlak et al. (2018), this research has looked at cases from every continent, at all levels of government, and in a variety of environmental and natural resource situations, such as water, forestry, fisheries, urban areas, agricultural communities, energy and biodiversity (Gerlak et al., 2020). This research also adds to the body of knowledge that seeks to understand and explore the role of learning in assisting communities to work towards solving their unique environmental issues.

Eaton et al. (2021) state that social learning refers to information sharing and learning that enables actors within an expanding network to alter or at least call into question common knowledge about the issue or solution at hand and related stakeholders (Herrero et al., 2019; Pahl-Wostl, 2009). Wals (2007) defined social learning as a process of unearthing what people want to learn, how they learn, how they overcome personal biases and group thinking and how they can become more sensitive to different ways of knowing, valuing and doing. Lotz-Sisitka (2012) further states that literature on social learning frequently refers to the bringing together of manifold perspectives, values and interests to creatively work on stubborn practices that lead to unsustainability. From the above definitions, one can understand why social learning has increasingly become an important theme in issues of resource management and multi-stakeholder engagements. Van Bommel et al. (2009) state that social learning has been championed as an approach which promises to address complex resource problems. However, to fully grasp the notion of social learning, it is imperative to grasp the roots of this concept and its progression throughout history. Pahl-Wostl (2006, p. 5) provides a good summary of the historical context of social learning in the following statement:

In the influential work of Bandura (1977), social learning refers to the learning that individuals obtain by observing others and their social interactions within a group, e.g., through imitation of role models. This concept assumes an iterative feedback between learners and their environment, i.e., the learner is changing the environment, and these changes are affecting the learner.

Reed et al. (2010) also state that early work conceptualised social learning as the learning of the individual which occurs in a social context and therefore influenced the norms of society

e.g. by imitating role models (Bandura, 1977). In their work, both Pahl-Wostl (2006) and Reed et al. (2010) expressed that this conceptualisation of social learning was not particularly useful and too narrow to embrace all of the learning processes of relevance in resource management. This is why it is vital to understand how social learning was used in the past and how it is being used now because the literature on social learning originates from human psychology, sociology, management studies, policy studies, organisation studies and communication studies (Van Bommel et al., 2009). Social learning has gained traction in resource management, adaptive management, ecology and sustainability science because research has shown that you cannot conserve or protect natural resources without working with the people found in the contexts of those resources; hence, there has also been a move towards social-ecological systems thinking. Van Bommel et al. (2009) add that there are other numerous concepts which possess overlapping connotations or related meanings for social learning, and these include multi-party collaboration, public-private partnerships and multi-actor governance, loop learning and frame reflections, even though social learning may not be explicitly mentioned in these works. In summary, social learning has increasingly become a normative goal in NRM and policy (Reed et al., 2010); the notion of social learning has gained popularity, but its meaning is very broad (Pahl-Wostl, 2006). However, social learning has found increasing importance especially among environmental management research as a way to avert past management failures in complex social-ecological systems (Lee & Krasny, 2015).

Despite this, there has been widespread criticism of the lack of theoretical rigour in social learning research, which has hindered scholars' ability to produce comprehensive insights and substantial understandings of the phenomenon (Gerlak et al., 2019; Muro & Jeffrey, 2008; Reed et al., 2010; Rodela, 2013). However, despite this factor, social learning is still an important process for conservation and NRM (Jadallah & Ballard, 2021). Jadallah and Ballard (2021) state that because of this lack of clarity, several separate "strands" or sub-fields of inquiry have emerged, making it difficult to create cumulative insights on the phenomenon of social learning (Gerlak et al., 2019). Ideas from outside the realm of conservation and NRM are required to address current theoretical shortcomings in social learning scholarship and to enrich future study in this area (Fazey et al., 2007, Gerlak et al., 2019). Scholars in conservation and NRM have already used educational research theoretical views to better explain learning in various contexts, such as transformational learning theory and experiential learning (Jadallah & Ballard, 2021). Social learning approaches seek to help people overcome social norms, values and established ways of thinking about problems in order to cope with social-ecological

change (Wals & van der Leij, 2007), and thus play a direct role in fostering institutional innovation (Cundill, 2010). According to Keen et al. (2012), social learning in the context of NRM is described as the collective action and reflection that both individuals and groups engage in as they try to regulate the interactions between social and ecological systems. Natural resource management (NRM) now emphasises social learning as a key concept. This increased interest is supported by a variety of claims regarding the results of social learning and the mechanisms that enable these results (Cundill & Rodela, 2012). Cundill (2010, p. 3) further states the following concerning the monitoring of social learning and processes that influence it:

However, monitoring social learning and the formation of communities of practice remains a significant challenge. Scholars have argued that a small set of key variables tend to be dominant in observed system change, and that by identifying this small set of key variables important changes in systems can be understood (Walker et al. 2006). This potentially holds true when monitoring learning processes because a set of contextual factors influence the ways in which social learning takes place during collaborative efforts and whether or not communities of practice form (Michael 1995, Wenger 1998, Ison 2005, Wals 2007). A generally agreed upon precondition for social learning is that multiple meanings, understandings, and realities are acknowledged (Ison 2005, Fazey et al. 2007, Plummer and Armitage 2007).

The fact that authors are using the same phrase to refer to quite different phenomena is one of the main reasons why scholars and practitioners feel disoriented when they start reading about social learning in the context of NRM (Cundill & Rodela, 2012). Social learning has evolved through time in NRM for a variety of reasons. Understanding the historical background from which each management paradigm arose is crucial to comprehending how social learning is conceptualised in various management paradigms and why there are discrepancies (Cundill & Rodela, 2012).

3.4 Understanding Learning in the Context of Communities of Practice

The term ‘community of practice’ (CoP) is a relatively new one, even though the phenomena it alludes to is centuries old and has been discussed by social scientists under numerous names (Wenger, 2001). A CoP is a collection of people who have an interest in a field of human endeavour and engage in a process of collective learning that links them together: a tribe, a garage band, or a group of engineers working on comparable challenges (Wenger, 2001). Wenger et al. (2002, p. 4) defined the CoP as follows:

Groups of people who share a concern, a set of problems, a passion about a topic and who deepen their knowledge and expertise in that area by interacting on an ongoing basis.

According to Eckert (2006), a CoP is a group of people who work together on a regular basis on a common issue. Communities of practice (CoPs) originate because of a shared interest or perspective, and they play a significant role in shaping their members' participation and orientation in the world around them. McDonald (2015) states that CoPs have evolved as a powerful concept for cultivating both individual and community knowledge within a social learning system. They consist of three core elements: a 'domain' of activity or knowledge that fosters a feeling of shared identity, a 'community' of members who care about that domain, and a shared 'practice' produced by community members. With regard to the 'domain' – a CoP is more than just a group of friends or a network of relationships (Wenger-Trayner & Wenger-Trayner, 2015). Its identity is established by a common area of interest. Membership requires a commitment to the domain, and thus a shared competency that separates members from others (Wenger-Trayner & Wenger-Trayner, 2015). In terms of the 'community' – members pursue their interest in their domain by participating in joint activities and debates, assisting one another and sharing information. They form relationships that allow them to learn from one another; they are concerned about their position with one another (Wenger-Trayner & Wenger-Trayner, 2015). On the element of the 'practice' – a CoP is not the same as a community of interest such as people who prefer certain kind of films (Wenger-Trayner & Wenger-Trayner, 2015). Practitioners are members of a CoP. They create a shared repertoire of resources, including experiences, stories, tools and methods for dealing with reoccurring problems – in short, a shared practice. This requires time and consistent contact (Wenger-Trayner & Wenger-Trayner, 2015). Wenger-Trayner et al. (2023) state that when the three characteristics are properly aligned, a CoP can make a significant difference in members' ability to achieve their goals, both individually and collectively. Figure 3.1 is a visual representation of all the structural elements of a CoP and how they align. The various activity systems in my study, when put together, formed a CoP. The activity systems possess all the structural elements which make up a CoP. In terms of the domain, the activity systems were connected and identified with managing water resources. The community element includes all the different activity systems in the catchment (described more in Chapter 5), which are the stakeholders in the uMzimvubu catchment. For the practice element, the expansive learning process through the CHAT framework provided a methodology on how the stakeholders should learn together and boundary cross.



Figure 3.1: Structural elements of a CoP (Wenger-Trayner et al., 2023)

The concept of a CoP has been used by social scientists for a range of analytical objectives but it originated and was first applied in learning theory. While researching apprenticeship as a learning mechanism, anthropologists Jean Lave and Etienne Wenger coined the phrase (Wenger-Trayner & Wenger-Trayner, 2015). The phrase “community of practice” was created to describe the group of people who serve as the apprentice’s “living curriculum”. Once the concept was established, even in the absence of a structured apprenticeship system, they noticed similar communities everywhere (Wenger-Trayner & Wenger-Trayner, 2015). No one is excluded from learning in a CoP. A community’s practice is dynamic and entails continual learning on everyone’s part (Wenger-Trayner & Wenger-Trayner, 2015). According to Wenger-Trayner and Wenger-Trayner (2015), CoPs have existed for as long as people have shared learning experiences. Essentially, a CoP is defined as a long-term learning partnership among practitioners who are willing to connect frequently over time to improve collectively and individually in a shared practice (Wenger-Trayner et al., 2023).

With regard to learning and the structural elements which make up the CoPs, the community fosters connections that support reciprocal engagement and group learning, the domain gives

members and external stakeholders a shared direction, and the practice grounds learning in what people actually do – both as a source of real-world problems and as a location to test new things (Wenger-Trayner et al., 2023). As a result of the dynamic nature of the practice of a community, all the involved parties in a CoP need to be continuously learning (Wenger, 2001). Members occasionally provide fresh ideas and insights: it is their experience that propels the community's competency forward. Learning can be viewed as a conflict between competence and experience (Wenger, 1998). Wenger (2001, p. 2341) describes the learning relationship in a CoP as follows:

Whenever either starts pulling the other, learning takes place. Learning so defined is a dynamic, two-way relationship between people and their communities. It combines personal transformation with the evolution of social structures.

In summary, the strength of CoPs is self-perpetuating. They strengthen and replenish themselves as they generate knowledge. A community can consist of tens or even hundreds of people, but it usually has a core of participants whose enthusiasm for the issue energises the community and who give intellectual and social leadership (Wenger & Snyder, 2000). To encourage people to participate actively, large communities are frequently segmented by geographic region or subject matter (Wenger & Snyder, 2000). Communities of practice (CoPs) can help drive strategy, establish new lines of business, solve challenges, share best practices, enhance people's professional abilities and assist businesses in recruiting and retaining talent (Wenger & Snyder, 2000). The concept of the CoP has found practical applications in a variety of fields, including business, organisational design, government, education, professional associations, development projects and civic life (Wenger-Trayner & Wenger-Trayner, 2015).

While the CoP has its origins in sociocultural theory, it does not offer theoretical tools for articulating “how” CoPs form around complex objects or practices that are not there yet; hence, I worked with CHAT to consider how a co-managed CoP could be established and supported via expansive learning (see Chapter 4). In my research, the different activity systems formed a CoP, as they were learning together to work towards managing the water resources in the catchment. As mentioned above, the surfaced activity systems (see Chapter 5), which shared the partial object of water co-management began on the expansive learning journey, and the VCF tool was an important framework used in the research to evaluate and monitor the learning which occurred. The VCF is a tool developed out of CoP theory. As mentioned in Chapter 2, evaluation is one of the tenets of the TIPC, and since this research was at a niche innovation level, monitoring and reflecting on the learning journey was important to gauge if the learnings

from this catchment could be taken up at higher levels (regional to national) and reproduced in other catchments.

3.5 Evaluating Learning in Communities of Practices

Methodologies of participation that draw on expansive learning theory and CoP can inspire and assist practitioners and researchers to work together towards the creation of environments and activities which foster change (Macdonald, 2002). These methodologies can drive learning that allows for co-creation of knowledge, identity construction, institutional development and transformation of the object of activity (McDonald & Cater-Steel, 2017), with co-creation of knowledge in this context being defined as the process that amalgamates a plurality of knowledge sources and types to address a defined issue (Armitage et al., 2011). These methodologies can also increase the potential for research impact, for example, by initiating a shared purpose and transforming the object of activity of interacting activity systems between the researchers and the researched (Seale et al., 2014). Although there has been a plethora of work on CoPs in the social sciences, organisations and professional disciplines (Oreszczyn et al., 2010; Tran et al., 2018), an analysis of what community members accrue from their participation in these communities is still an under-researched issue (Dingyloudi & Strijbos, 2019). While it is important to understand how objects of activity are transformed, it is also necessary to find ways of capturing the social consequences of formative interventions such as policies, programmes and projects – and then to understand the change processes emerging from those interventions through an analysis directed towards the social consequences of the interventions or projects (Argote et al., 2003). The above sentiments highlight the importance of developing methodologies and methods that allow a focus on both what is meaningful in terms of process and what is measurable in terms of outcomes (Booth & Kellogg, 2015).

The basic model of social learning is straightforward. What people do in their practices, what they try, and whether it works, all contain information that could be useful to someone else (Wenger-Trayner et al., 2017). They gain new insights and resources through participation in learning interactions which leads to a change in practice and, hopefully, improved results (Wenger-Trayner et al., 2017). Thus, Wenger-Trayner and Wenger-Trayner (2015) define learning as a formative journey through a social landscape of practices, boundaries and interactions; an identity-shaping trajectory through a landscape that can be welcoming at times but also exclusionary or marginalising, producing experiences of identification but also dis-identification (Clarke et al., 2020). This could even change them or their surroundings. When

they feed these effects back into their communities, learning comes full circle. Social learning can be called the loops between learning interactions, insights, practice, results and feedback (Wenger-Trayner et al., 2017).

According to Wenger-Trayner and Wenger-Trayner (2020), there are numerous ways of discussing learning. You can discuss behavioural modification. You can discuss the development of knowledge and skills. You can discuss the successful transmission of certainty through processes like observation or imitation. You can discuss structured opportunities to build your own knowledge (Wenger-Trayner & Wenger-Trayner, 2020) or like Engeström, you can discuss expansion and transformation of activity and agency which is what I focused on in this study (see chapters 4 to 8). The VCF framework provides an evaluation template for social interventions, which are interventions in a social context whose impact is determined by the value that relevant actors place on the intervention (Wenger-Trayner et al., 2017). The assessment of social interventions is difficult because the effects are indirect and frequently attributable to multiple factors. As a result, the evaluation must make two distinct but related claims. The first claim is that there is an effect on things that are important to stakeholders; the second claim is that at least some of this effect can be attributed to the intervention (Wenger-Trayner et al., 2017).

3.5.1 Development of the Value Creation Framework

Value creation must be approached through the lens of personal and collective narratives. Narratives provide a perspective on what learning occurs (or does not occur) and thus what value is created (or not) (Clarke et al., 2020). The Wenger-Trayners discuss narratives as both accounts and aspirations, both of which have implications for our research in terms of evidence to be gathered and examined (Clarke et al., 2020). Wenger-Trayner et al. (2017) state that monitoring indicators and collecting value-creation stories can occur concurrently and there is no need for one to wait for the other. In particular, value-creation stories can be started at any point in a project, even before the monitoring of indicators has yielded significant results. Value-creation stories emerge from two sources: participants with value-creation experience and participants with no experience with value creation (Wenger-Trayner et al., 2017). The Wenger-Trayners also argue that tensions between personal and collective narratives and between every day and aspirational narratives, create a valuable learning space. The framework's ability to capture both retrospective and prospective views on value is extremely useful (Clarke et al., 2012).

It is with this intention, that Wenger et al.'s (2011) VCF was formulated as a means of demonstrating value created in learning communities and networks (Lotz-Sisitka et al., 2023). In this framework, value as a concept relates to participation in spaces where there is social learning occurring and is defined as being what is important, worthy and useful to the individuals involved in a community (Wenger-Trayner et al., 2017).

The value-creation framework is grounded in (Wenger's) social learning theory [which also has antecedents in Vygotsky's work] (Wenger, Trayner and de Laat, 2011), and is based on viewing learning as a social process and embedded within activity, context and culture (Lave and Wenger, 1991). The VCF offers both a theory of change regarding how social learning can make a difference in the world and a rigorous method for assessing learning in a community [which can be usefully enriched or extended by CHAT expansive learning insights, as Wenger's work does not engage contradictions or activity system analysis]. The focus and emphasis is on the experience and identity of learners, on relationships and interactions, rather than knowledge, skills or curriculum (Wenger-Trayner and Wenger-Trayner, in press:). The framework accounts for the complex ways in which a community creates value by enabling examination of the "interrelationship between learning insights, practice and results that happen as a result of participation in social practices" (Wenger-Trayner et al., 2017, p. 3)

Participants value a social learning space to the extent that their participation is perceived to make a significant difference. It is a matter of perspective whether value is positive or negative (Wenger-Trayner & Wenger-Trayner, 2020). There are four distinct social learning modes which have been identified by the Wenger-Trayners. The first is ***generating value*** – creating something of value with the intention of making a difference. The second is ***translating value*** – extracting something of value in the space and doing something with it. The third is ***framing social learning*** – setting aspirations and expectations for emerging social learning. Last is ***evaluating social learning*** – examining whether learning makes a difference (Wenger-Trayner & Wenger-Trayner, 2020).

In my study, I was interested in exploring the value created for participants in boundary-crossing expansive learning processes, as explained via the 3rd generation CHAT model described in more detail in Chapter 4. I drew on the VCF to monitor learning and evaluate the emergence of outcomes in the expansive learning process. The VCF provided a lens to ascertain the value being created for people out of a social or potentially an expansive learning process; it is a theory developed to see what value is being created as we follow the learning process (Wenger et al., 2011; Wenger-Trayner & Wenger-Trayner, 2014). The VCF is based on reflective praxis because people can constantly review and build on their practices as they monitor the outcomes (in this case, the learning processes associated with co-management). In

this study, I used VCF data as a double-stimulation tool in and for the expansive learning process and to assess process outcomes of the expansive learning process (see Chapter 9). Constant evaluation of the LCP is important; according to Rosenberg (2018), evaluation of programmes is important for the sake of reporting and being accountable to stakeholders (those who invest time, money and hope that projects will succeed). However, evaluation is also required to inform implementation. Important questions to be considered in project evaluation include sentiments such as “What is working in this project, and why? What is not working in the project, and why?” (Rosenberg, 2018, p.15).

The answers to such questions allow implementers to improve practice and change course when necessary (Biggs et al., 2003). It also allows programme designers and government to design innovative programmes and take successful initiatives to scale, based on a sound understanding of programme theories and mechanisms – why they work and in what contexts (Rosenberg, 2018) – to which I add in this study, *how* they can come to work. The VCF assisted with monitoring the co-learning and co-creation objectives of the LCP objectives, because it is designed to evaluate social learning processes – especially in this case, expansive learning and responsible catchment co-management for water security at the niche level. The VCF was employed as a double-stimulation tool and a review tool to see how agents learnt to transform their object of activity. According to the LCP (SANBI, 2020) report which concentrated on the theory of change process for the project, valuable inputs and insights were shared among the participants to grasp the overall objective and the outcomes of the project; this was done so that the developed results chain could enable the tracking of progress on various activities towards achievement of the aims of the project.

Tracking progress and continual evaluation of aims and objectives are essential elements of the LCP. This is why the VCF, which evaluates different types of value along the process chain through reflectively developed indicators that emerge from the process via consideration of the ground or need state and the aspiration, was seen to be a useful tool for this project – especially for the aspect of the tracking of emerging learning in the expansion of the object in order to co-manage the catchments better for a water secure future. The VCF lenses (Figure 3.2) assisted me as a researcher to perceive if the LCP has been creating any value for the stakeholders involved, and it also assisted in identifying any gaps (in learning and management) which were present and required attention.

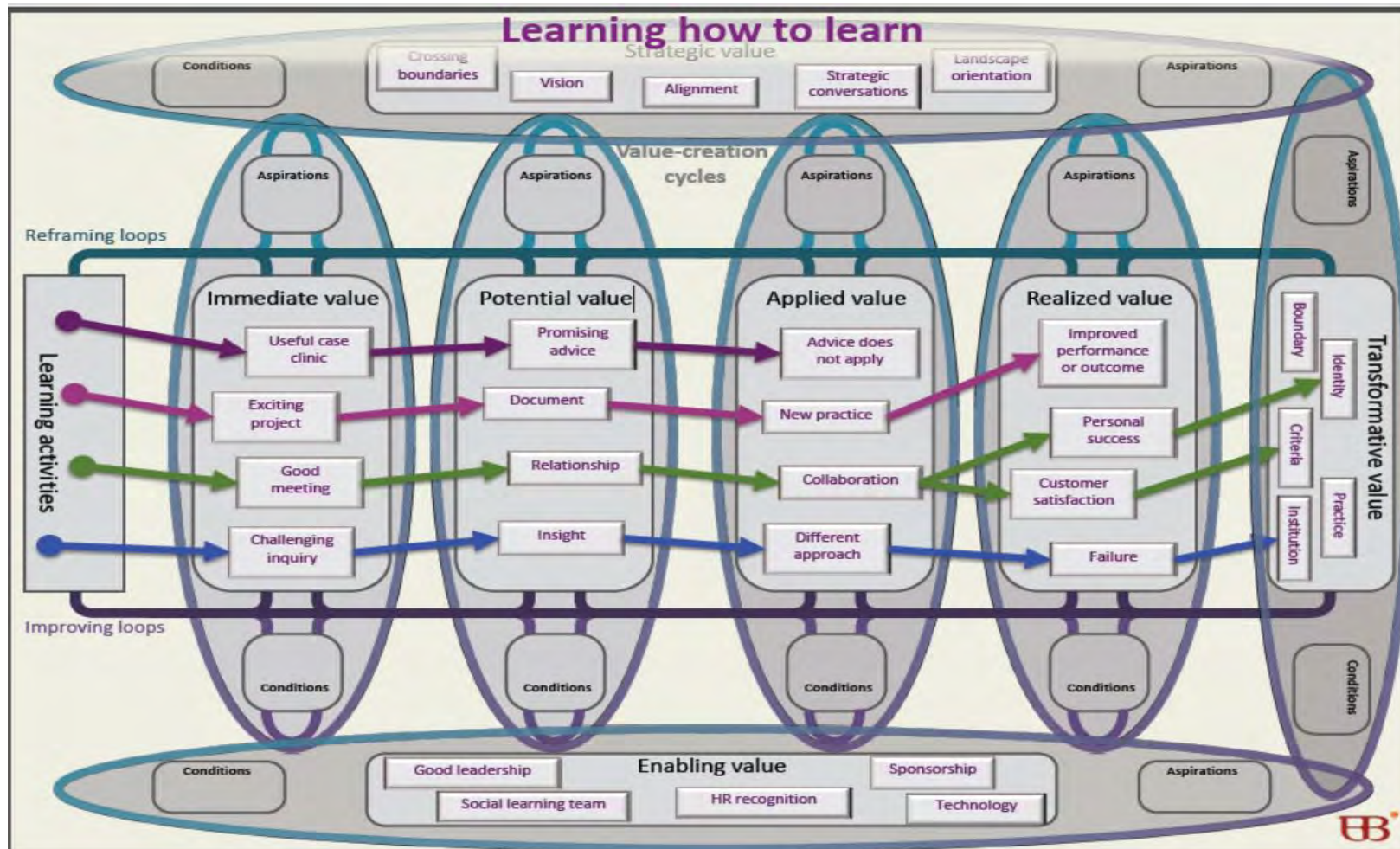


Figure 3.2: VCF tool (Wenger-Trayner & Wenger-Trayner, 2014) with different types of value and associated indicators that can be developed (i.e. indicators may be different in different applications of the framework)

In its design, the framework is intended to support the integration of diverse sources and types of data (Wenger et al., 2011) as “the evaluation of social interventions is challenging because effects are indirect and often attributable to multiple factors” (Wenger-Trayner et al., 2017, p. 4). It is imperative to capture the effects on things that matter to stakeholders while at the same time having the ability to claim that the intervention contributed to this effect (Wenger-Trayner et al., 2017). The lenses are as follows:

- a) **Immediate value:** What happened and what was my experience of it? (The activities and interactions between members have value in and of themselves.)
- b) **Potential value:** What has all this activity produced? (The activities and interactions of cycle 1 may not be realised immediately, but rather be saved up as knowledge capital whose value is in its potential to be realised later.)
- c) **Applied value:** What difference has it made to my practice/life/context? (Knowledge capital may or may not be put into use. Leveraging capital requires adapting and applying it to a specific situation.)
- d) **Realised value:** What difference has it made to my ability to achieve what matters to me or other stakeholders? (Applied new practices or tools are not enough. A change in practice does not necessarily lead to improved performance, so it is important to find out what effects the application of knowledge capital is having on the achievement of what matters to stakeholders.)
- e) **Transformative value:** Has it changed my or other stakeholders’ understanding and definition of what matters? (This happens when learning causes a reconsideration of how success is defined. It includes reframing strategies, goals and values.)

The work of Wenger-Trayner and Wenger-Trayner (2020) also detailed three more value cycles (Figure 3.3):

- f) **Enabling value:** Learning how to enable learning. This includes internal enabling value and external enabling value.
- g) **Strategic value:** Negotiating learning imperatives. (This includes conversations with stakeholders).
- h) **Orienting value:** Locating the social learning space in the broader context. (What is happening that we do not know and who is doing something potentially relevant?)

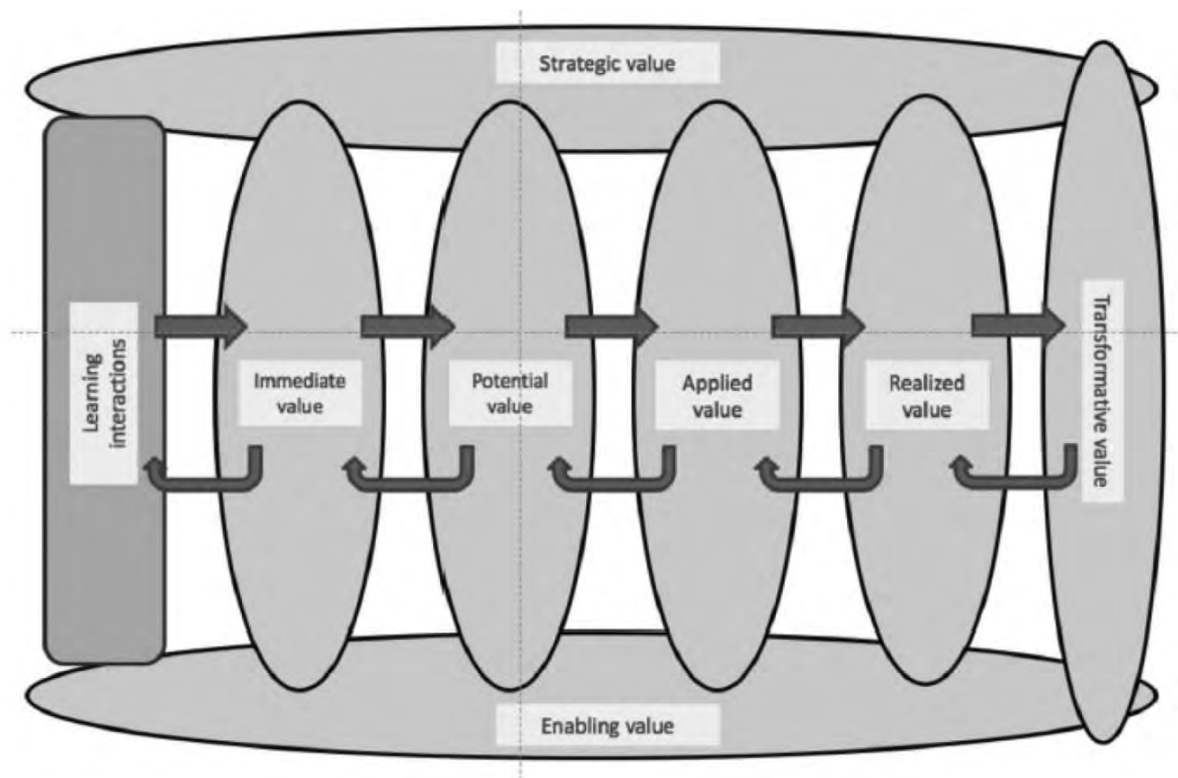


Figure 3.3: Extended Value Creation Cycles framework with strategic and enabling value (Wenger-Trayner & Wenger-Trayner, 2015)

Wenger-Trayner et al. (2017) extended on the original VCF so that it could also serve as a planning template (see Figure 3.3 above). They note that, while the framework was designed to frame retrospective assessments of learning from CoPs, some communities have begun to use it to create a vision and plan their activities in the future, setting aspirations, considering conditions and establishing risks and mitigation strategies (Clarke et al., 2020). According to Wenger-Trayner et al. (2017) the framework includes seven cycles of value creation, and it can be described as follows:

(a) Engaging in a social learning interaction can produce immediate value, such as enjoying the company of like-minded people or doing something exciting; (b) this engagement can generate potential value, such as insights, connections, or resources; and (c) applying these insights, connections, or resources to change one's practice requires much creativity and learning, and is thus viewed as generating applied value; (d) social learning produces realised value to the extent that changes in practice make a difference to what matters; (e) if it transforms people's identities or the broader environment, we say it has produced transformative value; (f) successful communities engage with relevant stakeholders to ensure that their learning makes a difference: the quality of these conversations and relationships produces strategic value; and (g) improving one's ability to support or enable social learning results in enabling value. This framework theorises social learning as loops that carry value creation across cycles and back. (Wenger-Trayner et al., 2017, p. 3)

The work by Wenger on CoPs was important for evaluating the learning. This work played an important role in the development of the VCF, which serves as an important tool for evaluating social learning. However, in the case of my study, there was a gap which this research sought to address: *how to advance and expand the learning?* This is one of the reasons why this study sought to explore expansive learning – to advance learning relating to managing of water resources at the uMzimvubu catchment level. Activity system analysis, based on CHAT, which is a process that allows for modelling of solutions, was one of the ways used by the learning actors in the study as a second stimulus to try and work through the issues they faced in the catchment regarding the object of water co-management.

3.6 Expansive Learning in Southern Africa

As indicated in Chapter 1, and above, the work I embarked on sought to develop insight into learning in co-management, and the evaluation thereof, as this was identified as the gap that this study sought to work into. And as indicated in Chapter 1 and above, communities of practice theory is often used to discuss social learning in co-management contexts. However, I planned to use expansive learning theory as it allows a way of developing the *how* of engaging with co-management at niche level contexts. By including a focus on evaluation of such learning using the VCF of Wenger-Trayner et al., (2020), I also sought to contribute to the already existing work on expansive learning in Southern Africa. In doing this, it was important to gain insight from studies that have specifically worked with CHAT and expansive learning, hence I review them below, so that my study could also be informed by earlier work on expansive learning in natural resources management in contexts such as that in which my study was situated.

As my study was situated in a catchment in the Eastern Cape, which is a province in South Africa, I sought out studies that have been working in similar contexts in Southern Africa. The intent was to consider each study to see what I could learn in order to inform my study's development. I review each study separately below, with key insights captured. The studies reviewed include two studies in Malawi (Jalasi, 2020; Kachilonda, 2014); one from Mozambique (Baloi, 2017), one working across Zimbabwe, Lesotho and South Africa (Mukute, 2010), and one in South Africa (Mentz and De Beer, 2017). Each of these are extensive reviews of expansive learning which detail the full process and were useful for understanding the expansive learning process in great detail. However, here I capture those aspects which have helped me to develop a fuller understanding key expansive learning

dynamics as they were developed in contexts similar to that of my research. They also offer a grounded means of assessing the possibilities and also the validity of working with CHAT in similar contexts to that of my study and also testify to the *how*, or *how* go about supporting and expanding learning in such contexts. All are studies of collective or co-learning around a shared object of activity. All involve multiple activity systems, or diverse types of actors, as is called for in co-management and also in participatory water governance (Chapter 1). None of these studies offered specific evaluation tools for evaluating the expansive learning as envisaged by TIPC policy innovation research (Chapter 2), although they did show significant outcomes of the learning through especially transformative agency pathways and expansion of the object of activity. The value created for participants in the learning process was therefore mainly implicit, or generalised into expansions of the shared object of activity.

The study of Jalasi (2020) focused on rural women, who have been described as the poorest members of the population in Malawi, which in turn has been described as one of the poorest nations in Africa (Malawi Ministry of Finance, Economic Planning and Development, 2016). Ninety-seven per cent of the population still use solid fuels for cooking purposes and a substantial proportion of the population (91.4%) cooks with firewood in both urban (51.2%) and rural (98.3%) populations (Clean Cooking Alliance, 2016; Sepp, 2014). According to Jalasi (2020), the adoption of Improved Cook Stove (ICS) technology in the nation was required due to the environmental and other health issues related to biomass cooking (World Health Organisation, 2016). Using ICS as a key technological solution could help reduce the harmful effects of biomass cooking on the environment and human health and help people cope with a shortage of fuel wood. However, despite the availability of these programmes and policies to promote the provision and promotion of ICSs, problems in their adoption and usage persist (GoM, 2014), particularly the abandoning of ICSs and the continuous use of traditional cooking stoves.

To address this challenge, Jalasi (2020) drew on CHAT and formative intervention research. Through the use of the six different transformative agency expressions (Engeström & Sannino, 2011; Haapasaari et al., 2016), transformation in human agency was investigated and analysed primarily within the CHAT framework (Jalasi, 2020). Jalasi sought to investigate how stakeholders were learning about the ICS technology and how this learning could be expanded to promote the growth of transformational agency that may influence long-term uptake (Jalasi, 2020). Jalasi's (2020) study revealed that transformation in human activity was reflected in

transformative pathways emerging from expanded learning processes. Her study showed how expansive learning leads to the emergence of transformative agency that allowed transformation in activity systems that were involved in the formative interventions (Jalasi, 2020). Transformation happened most notably in the tools, division of labour and subjects, resulting in the expansion of the shared object across the socio-spatial, moral-ideological and anticipatory temporal dimensions (Jalasi, 2020).

Her study examined the emergence of will and volitional activities from participants. It demonstrated how an expansive learning cycle supported by Change Labs and double-stimulation tools elicited transformational agency expressions, reflexive comments and modalities of boundary interaction from participants who were mobilised and supported in their agency to modify their actions (Jalasi, 2020). Importantly, her study demonstrated, through participant expressions and actions, that actors working in the ICS, particularly end-users who are on the periphery of socio-technical transitions and women producers whose voices are rarely heard (Jalasi, 2018), can change their own lives if they are placed at the centre of the development, diffusion and adoption processes. Her paper shows how participants, through expansive learning, engaged in activity transformation using the frameworks of coordination, cooperation and reflexive communication (Jalasi, 2020). Her study shows how expansive learning at the niche level intersects with other levels of the multi-level perspective through boundary-crossing interactions in socio-technical transitions (see section 2.3.3)

In another study undertaken in Malawi, Kachilonda (2014) explored and expanded learning related with fisheries resource co-management to inform extension and training in the fisheries industry in two case study locations in Malawi. The study, also drawing on CHAT and expansive learning theory, focused on the ways in which fisheries stakeholders' learning in and across different activity systems involved in co-management could be mediated by expansive learning processes. Not unlike my study, the study by Kachilonda (2014) had a focus on community learning, agency and sustainability practices in the co-management of fishery resources, and it was situated in the field of Environmental Education. The study by Kachilonda (2014) had a certain gap it sought to address, which is not unlike the gap I aimed to explore in this study. As stated by Kachilonda:

The study's literature review revealed that co-management approaches assume collaborative learning, or co-learning, also termed social learning, or approaches that promote the engagement of different actors who are working on shared practice. They also assume a new form of agency among co-management stakeholders and extension workers. However, the theoretical foundations

for establishing co-learning or social learning approaches in support of co-management policies are not well established in the fisheries co-management sector in Malawi, nor are the practices of how to support co-learning amongst diverse stakeholders in the fisheries co-management in the Lake Malawi context. (Kachilonda, 2014, p. i)

Kachilonda's study shows that CHAT emphasises in-depth examination and attentive co-engagement with contradictions as a possible source of fresh learning in co-management arrangements in Southern Africa in community contexts not dissimilar to those in focus in my study. Kachilonda examined the contradictions associated with co-management at the primary, secondary, tertiary and quaternary levels within the various activity systems involved in the fishing co-management system (fishing community activity systems, government activity systems and the college activity system), with the goal of reflecting these insights back to co-management participants in Change Lab workshops (Kachilonda, 2014). This approach to learning was deemed relevant to the main goal of co-management since it provides a framework for collaborative and ongoing learning. Kachilonda's study also showed how CHAT and expansive learning allow for the resolution of conflicts and the modelling and development of solutions in collaborative ways via expanded social learning processes (Kachilonda, 2014).

Kachilonda's study offers a way to understand historically specific practices, their objects and mediating artefacts as these relate to co-management in the historically emerging context of fisheries co-management and extension training and practice. In addition, it demonstrated how fishing communities and the social organisations that aid them are constantly improving their human activities and influencing changes to contemporary fishing practices (Kachilonda, 2014). The study offers useful insight into the practice and potential of expansive learning in co-management policy environments, particularly by illuminating how such learning processes can assist in mediating emerging tensions and contradictions that characterise the intended paradigm shift to co-management in fisheries resource management. This study was particularly helpful to my interest in expansive learning on co-management of water resources, and like Jalasi's study, it confirmed how this approach can strengthen community transformative agency.

In Mozambique, Baloi (2017) conducted research to investigate transformational social learning and sustainability in the context of community-based irrigation systems. His study sought to better understand transformative social learning in the context of irrigation associations and new agrarian policy development in Mozambique. Like the cases of Jalasi

(2020) and Kachilonda (2014), the research entailed identifying and examining interacting activity systems, contradictions, and dissonances. It entailed recognising current learning and doing formative intervention research to expand learning in two case study sites (Baloi, 2017).

Like Jalasi (2020) and Kachilonda (2014), the study was qualitative in nature and was based on the application of CHAT through the formative interventionist approaches of expanding learning. Baloi's (2017) role in the study was as a formative interventionist researcher, where he sought to foster learning for change in two irrigation associations. Useful as an insight for niche level studies of expansive learning such as my study, Baloi argued that the findings of his study have the potential to inform scaling to other irrigation systems, however, this should be done with caution and should not overlook the fact that each irrigation system has a unique context in terms of its creation and goal of production (among other difficulties). His study advances knowledge of Environmental Education and NRM learning strategies. He argued that transformational social learning *is expansive learning that encourages farmers to engage in transformational praxis, the building of transformative agency and the continuation of reflection and reflexivity after the learning process*. Thus, he gives further definition to the generalised use of the concept of social learning in natural resources management discussed above, which was useful for this study. He argues further that rather than merely doing things differently, such reflective and reflexive contemplation focuses on what farmers are doing, how they are working together with others across activity systems, and considers the purpose of their activities (Baloi, 2017). Again, this work showed how expansive learning can lead to transformative agency among traditionally marginalised communities in Southern Africa.

Mukute (2010) embarked on a study with farmers and other key players to investigate how to improve the learning and practice of sustainable agriculture in Southern Africa. His case studies were based in three countries in Southern Africa, namely Zimbabwe, South Africa and Lesotho. His study is contextualised, like mine, in a context where climate change has been associated with increased frequency and duration of droughts, increased danger of flooding and increased climate variability in Southern Africa and in a context where many people still experience poverty.

Mukute's (2010) study used CHAT and critical realism to analyse and expand farmer learning in Southern Africa. The study argued that in a risk society where "normal science" is no longer able to deal with the complicated repercussions of contemporary and postmodern development, diverse modes of knowing have become necessary (Mukute & Lotz-Sisitka, 2012), as stated in

Chapter 2. Mukute reviews how top-down learning and development is used in technology transfer: scientists do research and design; extension workers communicate the knowledge and technologies developed and farmers apply the research outcomes. He argues that people-centred learning and innovation, on the other hand, stresses the need to put farmers at the core of identifying research needs and co-developing knowledge and technology to solve them (Mukute & Lotz-Sisitka, 2012). Mukute argues that one of the major issues in Southern Africa, where a variety of learning methodologies are still used, has been to find a theory that bridges the top-down and participatory agricultural learning and development approaches (Leeuwis, 2004). His research illustrates how CHAT provides such a bridging theory (Mukute, 2010). A similar need for bridging approaches between niche and regime level interventions was articulated in Chapter 2 in the context of TIPC, which has relevance for this study.

Mukute's (2010) formative intervention research assisted participants in developing model solutions to some of the workplace difficulties they faced, including the invisible dimensions. He reported that participants valued the expansive learning process and continued working with these collaborative engagement approaches beyond the intervention workshops, as evidenced by feedback sessions (Mukute, 2010). He noted further that the change laboratories boosted relational and collective agency while also laying the groundwork for increased agency. In Mukute's study, change laboratories were used at the three research sites to embark on the expansive learning process with research participants. Mukute (2010) stated that the three case studies revealed that time for learning, insufficient budgetary resources and ineffective government extension programmes were the biggest barriers to learning and practising sustainable agriculture. Mukute's (2010) study offers in-depth understanding of participatory research and learning processes, particularly in the context of innovation and learning that is centred on people in the field of agricultural development. By analysing learning and change linkages in three sustainable agricultural practices, it offers empirical and explanatory insight into how change-oriented learning can originate and be expanded in education for sustainable development.

Also working with CHAT but in a different context, the study of Mentz and De Beer (2017) focuses on inequality in South African schools. They reflect on the many tensions and challenges and argue that CHAT is a useful research lens in the South African context because it considers the country's historical, cultural and socioeconomic background while examining education (Mentz & De Beer, 2017). They argue further that CHAT provides insight into the

complexities of an activity system, highlighting tensions that would otherwise be hidden (Mentz & De Beer, 2017). In their study, the authors present one perspective on the use of CHAT as a lens to focus on enhancing science education in South Africa through successful teacher professional development, arguing that an emphasis on problem-based learning may also promote the development of self-directed learning.

According to Igira and Gregory (2009), CHAT has the potential to offer a solid meta-theoretical framework for comprehending and studying numerous fields of study and practice. Useful for my study, Mentz and De Beer (2017, p. 98) state that “CHAT is a barometer of tensions”; by using CHAT as a research lens, researchers can see where there are tensions or “fracture lines” within and between activity systems. CHAT provides a cross-disciplinary viewpoint for evaluating human practices as development processes that involve both individual and social levels. Mentz and De Beer (2017) argue further that CHAT is a versatile lens that can be applied on a personal, interpersonal, or institutional level (Mentz & De Beer, 2017). In their study, the authors concentrated on examples from activity systems in both school and university education, surfacing insights on self-directed learning. They argue that people who can adapt to new circumstances and who can be accountable for their own learning are needed in South Africa. They further contended that CHAT could be a beneficial lens to apply in this regard. Relevant to this study, but applied to a different context, they argue that much research is needed into such practices promoting self-directed learning (Mentz & De Beer, 2017) – a skill that they were able to support via their expansive learning research among educators.

From the different studies reviewed above (Jalasi, 2020; Kachilonda, 2014; Mentz & De Beer, 2017; Baloi, 2017; Mukute, 2010), it is important to note that CHAT has been used as a tool to foster collective learning in Southern African contexts. CHAT with its formative intervention methodology was important in expanding the learning in the different studies. Similar to my study, some of the studies reviewed above have supplemented CHAT with another theory or educational tool. In my study, I have used the VCF as a tool to assist in monitoring expansive learning, as it was the best method and tool I could identify to monitor and evaluate a social learning process occurring over time, which, when interpreted as per Baloi’s definition, and shown by the other studies, expansive learning is or could be. The role of traditional knowledge was another important aspect emerging from these studies. This I found to be important for informing my research because my study is situated in a catchment which is predominantly rural. The role of expansive learning in assisting learning participants in different activity

systems to bring their various knowledge types into the process, is an important theme in my study (see chapters 5, 6, 7 and 8). Lastly, the importance of transformative agency and how it can assist in innovation was highlighted in these different studies. This is another particularly important theme for my research, as my study was at a niche level, with a focus on collaboration to assist different activity systems to boundary-cross, resolve contradictions and develop contextual based solutions and work towards the shared object of co-managing water resources.

3.7 Conclusion

The chapter opened by providing a background context for the importance of exploring learning in and for co-management. As mentioned in Chapter 1, South Africa is a water-scarce country, which requires interventions to assist in meeting the fresh water and safe drinking needs of its population. The study is located in the Eastern Cape which has been experiencing droughts over the past few years. The chapter also focused in on governance processes, and provided some insights relating to the consequences of poor governance of water resources and how that impacts communities, and provided a rationale for the role of social learning in NRM noting that social learning discourse is predominant as a way of referring to learning in NRM. The chapter expands on the introductory views on learning offered in Chapter 1, noting the importance of ongoing development of perspectives on collective learning and collaboration between stakeholders so that they can resolve NRM issues.

Along with this, the chapter discussed the notion of understanding the role of learning in the context of communities of practice. Wenger's work on communities of practice was highlighted and the background of his work on communities of practice and learning was provided as this is a dominant discourse on learning in NRM as also referred to in Chapter 1. This is because CoPs possess certain elements which are similar to the different activity systems that came together to learn in the context of this research, in the uMzimvubu catchment. Along with this, the chapter also provided the reasoning behind the conceptualisation or the development of the VCF. The VCF was developed in a bid to evaluate and monitor if any social learning is occurring in a certain context. The rationale behind using the VCF as a tool in this study was explained. As mentioned above, it was important to understand and to address the issue of "how to advance and expand the learning?" In his work, Wenger developed the VCF to monitor or evaluate social learning over time, which in effect is similar to an expansive learning process, if not theorised in the same way, and if not using the same analysis tools.

As also indicated in this chapter, this study sought to add to the already existing work on expansive learning in Southern Africa, and the work of various formative interventionist researchers was explored and insights from these studies were surfaced that were useful for informing my research. As shown in this chapter, there are different authors who have sought to advance or expand learning by closing the gap relating to “how to advance and expand learning?”, if not in co-management, then in NRM contexts similar to that of my study. This review of the expansive learning work, which was done in Southern Africa, is important because this research also forms part of that repository of knowledge, and I could learn a lot from it in terms of *how* to develop the research project. Important contextual dynamics were also surfaced such as the importance of mobilising various forms of knowledge, and the insights into the agency of those who are most marginalised (e.g. the rural women in Malawi in Jalasi’s (2020) study). This was instructive for this study as it also gave me confidence to use this approach to strengthen understandings of learning in co-management of water in South Africa. It also helped me to identify that the gap outlined in Chapter 1 on the evaluation of learning in co-management extended to evaluation of expansive learning processes in rural NRM contexts in Southern Africa as I did not find formal evaluation tools other than those built into the CHAT framework itself to evaluate the learning. For this reason, I drew on the VCF from Wenger-Trayner et al., (2021) to strengthen and expand this aspect of the study given the emphasis on evaluation in the TIPC, including at niche level as discussed in Chapter 2.

The next Chapter (Chapter 4) provides further background to CHAT and its importance and relevance for my study and potentially for studies similar to mine. This is also important background for the methodology chapter (Chapter 5) which follows the next chapter and for the empirical chapters following (Chapter 6-9)

CHAPTER 4: THEORETICAL FRAMEWORK UNDERPINNING THE STUDY

4.1 Background and Introduction

As indicated in Chapter 1, and following deliberations on learning in NRM in the previous chapter, this study drew on CHAT as the foundational theory and was informed by the expansive learning cycle as a methodological approach (see Chapter 5). Chapter 3 explored the role of expansive learning in co-management of water resources and the role of social learning in NRM. As discussed in Chapter 1, co-management is an important tenet in this research. The activity system analysis approach provided by CHAT enables or allows for the analysis of different stakeholders to work towards a common object: in this case, the shared object of water co-management. Various Southern African studies which have drawn on CHAT were highlighted; this was to review past studies which were in a similar context and explored expansive learning as a viable approach. In this chapter, I will provide a more in-depth orientation to this approach. As mentioned in Chapter 1 of the study, collaboration and co-learning are foundational concepts to aid the LCP in achieving its aim. The CHAT offers tools to assist these concepts to become a possible reality, because CHAT, as a theoretical framework allows the different stakeholders, found in the various activity systems, to boundary-cross and potentially work towards the common goal of co-managing water resources. It offers depth insight into the *how* of enabling co-management through learning.

CHAT was initiated in the 1920s and 1930s by Russian psychologists Vygotsky (1978) and Leont'ev (1978) and developed by Engeström from 1978 to the present. Vygotsky's (1978) research aimed to study both elementary and higher psychological functions. Vygotsky's experimental studies displayed how culture mediates human learning and development: as active agents, individuals construct and use cultural artefacts (tools and signs) to control their acts and thoughts and break away from the constraints of their surroundings (Cole, 1996). Building on the work of Vygotsky and Leont'ev, the concept of an activity system was formulated by Engeström (1987), and it describes the interaction of humans in a bounded system. The CHAT emphasises both cultural and historical contexts, and it is an applicable and valuable lens for IKS research (de Beer & Kriek, 2021). According to Chaiklin (2012), concepts relating to social change – a pursuit to understand the world not as it is but as it is

coming to be – are characteristics of CHAT. The work by Sannino (2020, 2022) and Stetsenko (2020a, 2020b, 2021) highlights that most of CHAT-related research promotes change which has a commitment to a sociopolitical ethos connecting research, development and practice.

Theories of CHAT possess a unique position to contend with the emerging social and ecological injustices which are aggravated by a wide array of modern-day crises (Hopwood, 2022). The CHAT has a focus on human agency and transformation of the world (Roth et al., 2009) and a vital component of CHAT is the notion that agency cannot solely be perceived as the property of individuals, but it emerges and is positioned in social and material interactions (Roth et al., 2004) – also illuminated in the work of Southern Africa researchers discussed in Chapter 3. Engeström et al. (2022) argue that the notion of agency can make an important contribution to this agenda, but that this contribution has not yet been fully realised.

Activity theory is today a global multidisciplinary approach to research (Chaiklin et al., 1999; Engeström et al., 1996), which was increasingly oriented towards the study of work and technologies in the 1990s (Nardi, 1996), and has recently been more oriented towards the study of learning in social justice and sustainability movements (Engeström, 2016). As argued in Chapter 3, CHAT is a very applicable lens to use in South Africa, with its cultural diversity, socioeconomic challenges and transformation agenda (Lindley, 2014; Mukute, 2010; Pesanayi, 2019). Numerous other countries, to various degrees, struggle with similar problems as South Africa; using CHAT as a lens provides insight into the complexity of an activity system, identifying tensions that would otherwise not necessarily be visible (Mentz & De Beer, 2017). Thus CHAT (Engeström, 1987; Leont'ev, 1978, 1981) provides a conceptual and methodological basis for expansive visibilisation of work, learning and development of shared activity.

CHAT is a theoretical framework that is practice-based and practice-oriented that has a focus on tool-mediated actions by collective actors, this includes socioeconomic relations which exist within and between institutional contexts over time (Foot, 2014). The emphasis of CHAT is different to the foci of traditional Western social science that is typically characterised by point-in-time actions and/or attributes of individuals (or sets of aggregated individuals) failing to include factors such as culture, history, economics or material things (Foot, 2014). Foot (2014) argues that a theoretical framework can be designated as practice-based and practice-oriented when there is an emphasis on the vital connection between the interpretive lens and shared human practices in which it is positioned and to which it is applied. CHAT is beneficial in

helping with the understanding and explaining of social phenomena (the development of social theory) from real human practices instead of abstract ideas or normative ideals or standards. Another benefit of using CHAT in the analysis of professional practices is that the CHAT framework provides the means to use practice-based theory to reflect on one's previous, current and anticipated practices, and the multi-level sociocultural, political-economic and institutional contexts of one's field of practice (Foot, 2014).

CHAT centres on three core ideas: 1) humans act collectively, learn by doing, and communicate in and via their actions; 2) humans make, employ, and adapt tools of all kinds to learn and communicate; and 3) community is central to the process of making and interpreting meaning – and thus to all forms of learning, communicating, and acting (Vygotsky, 1978). The CHAT model of an activity system that is constantly evolving through collective learning actions, in response to systemic contradictions, enables multifaceted analyses of the complex practices of professional work. The essential task of CHAT analysis is to grasp the systemic whole of an activity, not just its separate components. This makes possible the analysis of a “multitude of relations within an activity system, both at a particular point in time, and as it evolves over time” (Foot, 2014, p. 3).

Over the past two decades, researchers have gradually drawn from CHAT as an alternative to predominant behavioural and cognitive theories including in Southern African research contexts as reported in Chapter 3. CHAT arose out of Vygotsky's (1978, 1993) revolutionary experimental research on human-context interactions and cultural mediation (Bal et al., 2020). The core assumption of CHAT is that learning associated with humans is a socially and historically constructed and culturally mediated process situated in goal-oriented collective activity systems.

4.2 Activity Theory and Contradictions

The expansive learning theory is based on the dialectic of moving from the abstract to the concrete, according to Engeström (1987). A simple initial concept is transformed into a complex object in the cycle of expansive learning, producing a new type of practice. An abstract, straightforward explanatory relationship, or “germ cell,” is how a new theoretical idea or concept first appears when it is developing (Engeström, 1987). Sannino (2011) states that in activity theory research there are two fundamental principles: the double-stimulation principle and the principle of ascending from the abstract to the concrete. The expansive learning cycle typically begins with individual subjects questioning accepted practice and gradually expands

into a shared movement or institution. This transition from the abstract to the concrete is accomplished through certain epistemic or learning actions which combine to form an expanded cycle or spiral (Engeström, 1987) (see section 1.7.2 and Figure 1.9). According to Engeström (1987) this process of expansive learning should be seen as the building and resolving of successively evolving contradictions in the activity system (see chapters 1 and 3).

A central feature among the founders of activity theory is the insight that the mind of a human is not positioned within the brain, nor is it even bounded by the individual's skin. The human mind is situated in its actions and activities in which people have an engagement with the world, by ways of cultural artefacts such as signs and tools (Sannino & Engeström, 2018). Activity theory shifts our perception from what is occurring inside a person to what is going on between human beings, their objects and their instruments when they pursue and alter their purposeful collective activities (Sannino & Engeström, 2018). The above-mentioned principles are not abstract, they need a connection to be made alive with a real object-oriented or a collection of activity systems (Sannino & Engeström, 2018).

The progression of activity theory should be perceived as a succession of four generations of theorising and research, with the emergence of a prime unit of analysis for each generation (Engeström & Sannino, 2020). According to Foot (2014), the shared activity undertaken by actors with diverse roles, positions and perspectives, are well modelled by activity systems through their multi-voiced characteristic. Activity systems are also multi-layered, because they are made up of conscious actions including unconscious, routinised operations. In the development of activity theory, it was Engeström (1987) who established analytical methods within activity systems theory by the introduction of activity system analysis. Yamagata-Lynch (2010) argues that the purpose of activity system analysis is to map the co-evolutionary interaction between individuals or groups of individuals and the environment, and their relations towards each other.

Activity systems' generation is interconnected and interdependent, and numerous contemporary studies have adopted a constellation of two or more activity systems that have a partially shared object as their unit of analysis (see section 4.3 for more details) (Sannino & Engeström, 2018). An activity system is not just a mechanical sum of its components as an activity weaves together its unique dynamic context (Sannino & Engeström, 2018). According to the work of Engeström (1999, p. 381) the "motive force of change and development" is made up of instability, internal tensions and contradictions, and "transitions and reorganizations

within and between activity systems are part of evolution” (Daniels & Warmington, 2007, p. 377). According to Engeström (1987), an activity system is comprised of six fundamental components, and each component holds cultural and historical dimensions (Figure 4.1), with relations between these. Cong-Lem (2022) argues that there are seven components to an activity system, because the “outcomes” form part of the activity system. Foot (2014, p. 5) summarises the activity system components as follows:

An activity system has six core components, each of which holds cultural and historical dimensions. ...These six components are often depicted as nodes of intersection in a triangular figure depicting an activity system. Although there are many dyadic and triadic relations between these six components, the analytical strength of CHAT is best leveraged when the activity system is understood as a single/whole unit.

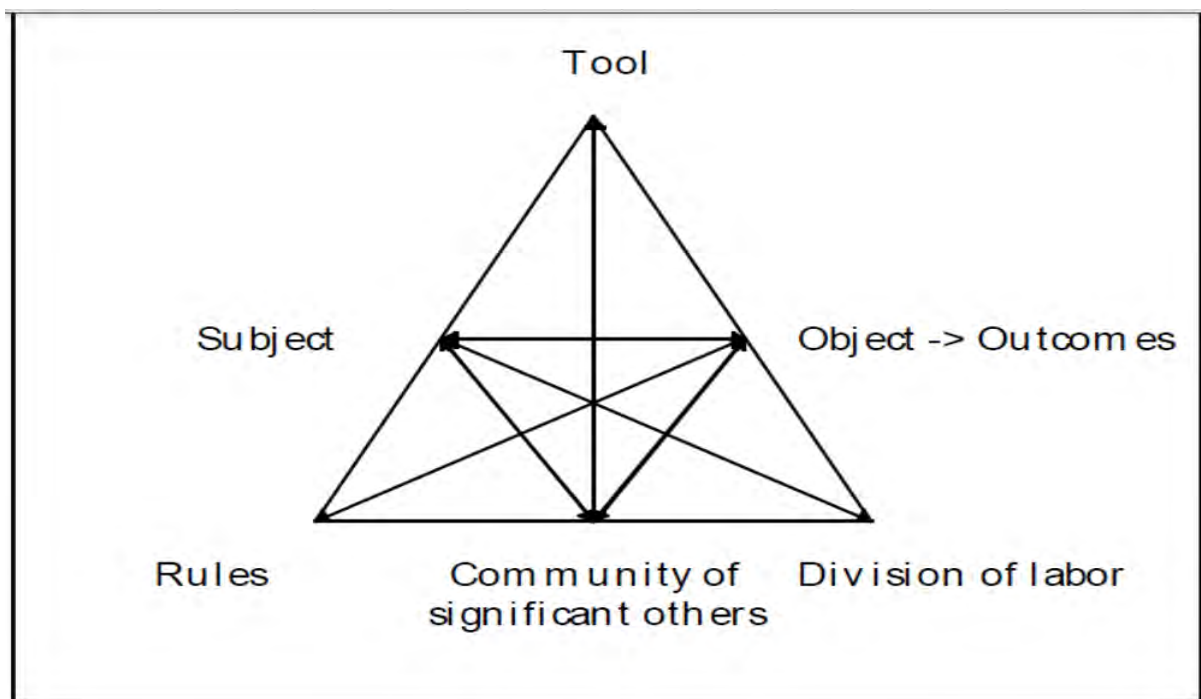


Figure 4.1: Model of an activity system (Engeström, 1978)

The **subject** can be described as the individual or subgroup whose position and point of view are selected as the perspective of the analysis (Engeström & Sannino, 2020). Cong-Lem (2022) states that the **subjects** are the individuals who perform the activity. According to Daniels and Warmington (2007), the **subject** refers to individuals, groups or perspectives/views. Daniels and Warmington (2007) further argue that the positioning of subjects with respect to each other within an activity has an implication on how they engage with the tools and objects. This could have potential implications for the regulation of the actions of individuals and groups by the rules, community and the division of labour (Daniels & Warmington, 2007). Yamagata-Lynch

(2010) defines the **object** as the purpose of the activity, that is the goal or the motive of the represented activity. Sannino and Engeström (2018, p. 45) define the **object** as the “raw material or problem space which the activity is directed”, and instruments assist with the transformation of the object into outcomes. It is the **object** that provides the activity with its identity and direction, and the activity is object oriented (Sannino & Engeström, 2018). Foot (2014) states that in order to identify the object of an activity it is important to carefully observe the diverse vantage points within the activity system. **Tools** (instruments and signs) are used for the purpose of turning the object into outcomes (Engeström & Sannino, 2020) and people engage with the world using cultural artefacts such as signs and **tools** (Engeström & Sannino, 2018). Yamagata-Lynch (2010) argues that artefacts that operate as **tools** are not given to the subject conveniently, and that there is no clear distinctive moment when an artefact is transformed into a cultural **tool**; however, a cultural tool is an artefact that has attained value within the activities of participants as compared to a temporary **tool** which is used to engage in an immediate activity (Yamagata-Lynch, 2010).

The **community** is defined as the “individuals and subgroups who share the same general objective” (Sannino & Engeström, 2020, p. 5). Cong-Lem (2022) states that the **community** comprises other groups which form part of the activity. Yamagata-Lynch (2010) states that the social group which the subject identifies with when participating in the activity is the **community**. **Rules** are defined as the “explicit and implicit regulations, norms, conventions and standards that constrain actions within the activity system” (Sannino & Engeström, 2018, p. 45). De Beer and Kriek (2021) define **rules** as the features which guide and govern activity systems. **Rules** are associated with norms and regulations which constrain or enable the activity’s performance (Cong-Lem, 2022). The **division of labour** is defined as the various roles the subject possesses (De Beer & Kriek, 2021). **Division of labour** relates to the way in which tasks in the community are shared (Yamagata-Lynch, 2010). Engeström and Sannino (2020, p. 5) state that the **division of labour** refers to the “horizontal division of tasks and vertical division of power and status”.

CHAT is a useful methodology to understand and describe human activities, viewing them as systemic and socially situated phenomena where “what takes place in an activity system ... is the context” so that “context is not just ‘out there’” (Nardi, 1996, p. 78). As a result, researchers in education have deployed CHAT in numerous ways. Murphy and Rodriguez-Manzanares (2008) found CHAT a useful tool for characterising contradictions after educators transitioned

to a virtual high school classroom. In another study, Hardman (2005) used CHAT to investigate pedagogical transformation in a rural school once computers had been introduced (Cliff et al., 2020). Humans have the ability to extend their effect on the environment and learn new mediated means to act and engage with new activity systems.

The cultural nature of the conduct by humans was highlighted by Vygotsky's student and collaborator A.N. Leont'ev, who established the notion of object-oriented activity (Norros, 2018). Leont'ev perceived activity as the societal unit of life of a physical and material subject (Leont'ev, 1978) and the idea of object orientation finds expression in Leont'ev's conception of the hierarchical structure of activity (Norros, 2018). Leont'ev was able to identify the levels of activity, action and operation (Leont'ev, 1978): the purpose of activity, which inspires society for the activity, defines activity. During the historical development of work, activity was divided into actions associated with situationally relevant aims and, further, condition-specific operations. The concept of object orientation of activity distinguishes CHAT from many other sociocultural theories (Del Río & Álvarez, 2007; Stetsenko, 2005; Valsiner and Rosa, 2007).

Double-stimulation as a concept has an ongoing presence in contemporary CHAT (Sannino, 2015b) and the term 'double-stimulation' refers to a variety of phenomena (Hopwood & Gottschalk, 2017). Double-stimulation can denote everyday practices used by people in everyday life to partake in difficult actions (Vygotsky, 1960/1997a, 1960/1997b, 1960/1997c, 1960/1997d):

For example, a knot in a handkerchief can resolve the conflict between remembering and forgetting. Counting to oneself can help spur people into action when jumping into cold water is conflicted with the motive to stay warm, and alarm clocks can assist the tired person to get out of bed. Here, knots, counting and clocks are culturally available artefacts used to gain control i.e. to accomplish volitional action. (Hopwood & Gottschalk, 2017, p. 23).

Sannino (2015) refers in such instances to the 'principle' of double-stimulation: how the behaviour of humans is regulated, with a specific connection to volition as a distinguishing feature of higher mental function (Hopwood & Gottschalk, 2017). In addition, though resting on the same foundation conceptually, is the use of double-stimulation as a base for formative intervention. This is mainly associated with the work based on the Change Laboratory (Engeström, 2007b; Penuel, 2014; Sannino et al., 2016). The Change Laboratory is a method in which formative interventionist researchers provide tools (such as concepts and representations of activity systems) to change the way individuals work on a topic. In this case,

double-stimulation is used as the foundation for efforts to provide systemic answers to ongoing contradictions, relating to the activity the theoretical idea of expanding learning (see the work of Haapasaari & Kerosuo, 2015; Hopwood & Gottschalk, 2017).

CHAT stresses the importance of contradictions as a cause for change and development (Nguyen, 2020). Engeström (2001, p. 137) defined contradictions as “historically accumulating structural tensions within and between activity systems”, contradictions express themselves in various forms such as divides, disturbances, tensions or breakdowns in the system (Engeström & Sannino, 2010). Contradictions, as highlighted above, can become driving forces for expansive learning if an object which is emerging is identified and turned into a motive (Engeström, 2001). Stated in another way, disruptions and contradictions in the system may be catalysts for solutions to problems, which result in changes at both individual and organisational levels (Engeström, 1999). Contradictions are also known as structural tensions that have built up over time. These contradictions can cause tensions, interruptions and fights, but they can also be viewed as sources of change or development if they are resolved (Gedera & Williams, 2013). According to Engeström (1987), four levels or layers of contradictions can be identified in the investigation of human behaviour. They are as follows:

Level 1: Primary inner contradiction (double nature) within each constituent component of the central activity.

Level 2: Secondary contradictions between the constituents of the central activity.

Level 3: Tertiary contradiction between the object/motive of the dominant form of the central activity and the object/motive of a culturally more advanced form of the central activity.

Level 4: Quaternary contradictions between the central activity and its neighbour activities. (Engeström, 1987, pp. 103–104)

According to Gedera and Williams (2013), primary contradictions occur inside activity system elements (for example, within the community). Secondary contradictions occur between activity system elements (for example, between the community and the subject), tertiary contradictions occur when activity participants are required to use an advanced method to achieve an objective (for example, when they are introduced to a new technology) and quaternary contradictions occur between the central activity system and outside activity systems (Gedera & Williams, 2013). Engeström (1987) states that contradictions are not just unavoidable aspects of activity; because of the contradictions of the preceding stage and form, new qualitative stages and forms of activity develop. These are manifested as invisible

breakthroughs. With regard to the activity, contradictions are “the principle of its self-movement and the form in which the development is cast” (Ilyenkov, 1977, p. 330).

In the context of this study, the contradictions emerged within and between activity systems (primary, secondary, tertiary and quaternary contradictions) (see Chapter 7). Contradiction is a fundamental philosophical concept. Many of the words that are incorrectly employed to describe contradictions are manifestations of the contradictions themselves (Engeström & Sannino, 2012). In their work, Engeström and Sannino (2011) discuss and highlight discursive manifestations of contradictions, namely dilemmas, conflicts, critical conflicts and double binds. With regard to these manifestations, their definitions and descriptions are as follows:

‘Dilemmas’ are traditionally studied in social psychology as means for understanding processes of decision making, moral reasoning, social representations and ideologies. Dilemmas characterize our everyday thinking and conduct. (Engeström & Sannino, 2011, p. 373)

‘Conflicts’ take the form of resistance, disagreement, argument and criticism (Engeström and Sannino, 2012, p. 373) ... ‘conflict occurs when an individual or a group feels negatively affected by another individual or group, for example because of a perceived divergence of interests, or because of another’s incompatible behaviour’. (De Dreu & Van de Vliert, 1997, p. 1)

‘Critical conflicts’ are situations in which people face inner doubts that paralyze them in front of contradictory motives unsolvable by the subject alone (Engeström & Sannino, 2011, p. 374)... ‘a critical conflict is a situation of impossibility or unintelligibility’. (Vasilyuk, 1988, p. 199)

‘Double binds’ are processes in which actors repeatedly face pressing and equally unacceptable alternatives in their activity system, with seemingly no way out. Such repetitive processes tend to get aggravated, to the point of reaching crises with unpredictable and ‘explosive’ consequences. ... A double bind is typically a situation which cannot be resolved by an individual alone. Thus, a discursive elaboration of a double bind typically involves an attempt at a transition from the individual ‘I’ to the collective ‘we’, such as ‘we must’, ‘we have to,’ loaded with a sense of urgency. (Engeström & Sannino, 2011, p. 374)

In addition, in this study, there were contradictions which emerged and manifested in various ways such as systemic inadequacies, system failures, paradoxes and disorders in the system. I could not find appropriate or adequate terminology in the literature to describe this phenomenon, and how some of the contradictions manifested. I then coined the term “*isiphithiphithi*” – a fifth manifestation of some of the contradictions which were surfaced in my study. *Isiphithiphithi* is taken from the isiXhosa language (which is also the language spoken in the catchment and my home language). *Isiphithiphithi* refers to complexity and rapid disorder, which cannot be easily managed and manifests as a problem which is very difficult to solve. *Isiphithiphithi* also refers to confusion, disorder and intersecting and oftentimes multi-

layered conundrums which occur because of certain actions of subjects in a particular activity system, or the level of complexity affecting the object of activity arising from a mix of concerns that are historical and contemporary as well as other factors related to resources or politics, governance patterns or ecological conditions. Systemic inadequacies, system failures, paradoxes, intersecting conundrums, and disorders are typical manifestations of *isiphithiphithi* in a given system. Resolution of *isiphithiphithi* requires all the actors influenced by, and actors catalysing the *isiphithiphithi*, to boundary cross and analyse the cultural history of the object of activity, and its relationship with the *isiphithiphithi*. As a result of the complex nature of *isiphithiphithi*, resolutions may not easily come, and the situation might remain the same, or even regress because of the multi-layered complexities and the justification surrounding the presence and prevalence of *isiphithiphithi*.

The word *isiphithiphithi* does not only describe the phenomenon mentioned above, but the actual word is also a form of onomatopoeia; in the isiXhosa language, the word *isiphithiphithi* is formed from the associated sound related to confusion, disorder and conundrum. The contradictions manifesting as *isiphithiphithi* are discussed in detail in Chapter 7.

4.3 Different Generations of Activity Theory

4.3.1 1st generation of CHAT

All the generations of CHAT emerged with their unique prime unit of analysis and the first generation of CHAT was centred on Vygotsky's work (Sannino & Engeström, 2018). According to Sannino and Engeström (2018), Vygotsky did not explicitly propose or conceptualise the activity as a basic unit of analysis, however, he did frequently write about "systems of activity" (Vygotsky, 1997). The CHAT was formed from a sociocultural theory of learning, so it is particularly suitable in a learning organisational context (Cliff et al., 2020). This first generation founded upon the work of Vygotsky developed the idea of "mediation" (Engeström, 1987) and "culturally mediated action" was the prime unit of analysis for Vygotsky's work (Sannino & Engeström, 2018). Cong-Lem (2022) states that the concept of mediation relates to the nature of processes of human psychological processes and predominantly the higher mental functions. Mediation is a foundational concept and principle in the first generation of CHAT (Figure 4.2), and signs assist with mediating of higher mental functions (Cong-Lem, 2022). The concept of mediation was cemented by Vygostky's (1978) work of "a complex, mediated act" triangular model; this model is frequently depicted as triangle comprising the subject, object and mediating artefact (Engeström, 1987).

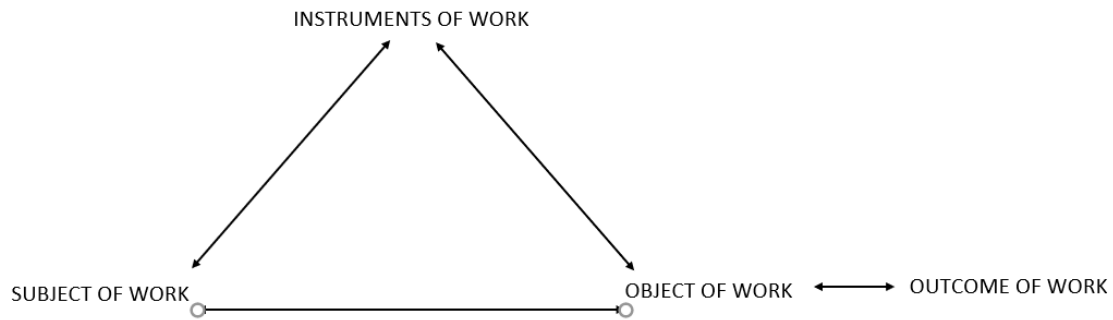


Figure 4.2: Mediated work action as a first-generation unit of analysis (Engeström, 1987)

Cong-Lem (2022) states that the interaction between the individual and mediating artefacts/tools and signs is an expression of mediated action. Vygotsky (1978) argued that signs do not exist in a tangible manner in the environment, yet their purpose is to serve as a by-product of the interaction of people with artefacts/tools to mediate thinking processes (Vygotsky, 1978). First generational CHAT arose as a product of Vygotsky's innovative pursuit in the arena of psychology in his time (Cong-Lem, 2022). Vygotsky's contributions are esteemed for their endeavours in innovatively redefining the "development of mind with the contingencies of history and sociocultural context" (Martin & Peim, 2009, p. 132). Even though Vygostky's initial work on activity theory featured psychological topics and investigations, other foundational concepts which developed and are associated with educational research comprised the zone of proximal development (ZPD), internalisation and perezhivanie (Cong-Lem, 2022). The ZPD plays an important part in this research. The ZPD is a concept used in the field of education. Usually referred to as the ZPD, it is a way of expressing the difference between what a learner can currently do and what they cannot do (Flair, 2019). The ZPD can be regarded as a bridge between the skills a learner has now and the skills they are required to have at a specific time in the future. In essence, the ZPD is the gap between current skills and the ones the learner wants to have; the larger the gap, the more skills need to be obtained before the gap is closed (Flair, 2019). Over time, the first generation of CHAT was limited because the prime unit of analysis remained focused on the individual (Engeström, 1987). However, this limitation was overcome by the 2nd generation, mainly inspired by the work of Leont'ev (Engeström, 1987).

4.3.2 2nd generation of CHAT

The development of the 2nd generation of CHAT is attributed to the work of Leont'ev, which emphasised the shared nature of human activity, and to the work of Engeström (1987) that assisted with the development of the activity systems model (Yamagata-Lynch, 2010). According to Engeström and Sannino (2020), agency was primarily an implicit concept in the 2nd generation of CHAT, and it was viewed as an expansive transition from isolated individual subjects engaged in specific tasks to collaborative and collected subjects participating in the transformation of the entire work activity. The expansive movement is the result of repeated disturbances and problems caused by historically accumulated inner conflicts in the activity system (Engeström & Sannino, 2020). The analysis of historically moulded contradictions in the work activity are an important aspect of second-generation CHAT studies. This necessitates the expansion of the unit of analysis to incorporate the collective activity system holistically (Engeström and Sannino, 2020). Engeström and Sannino (2020) state that in the second-generation discourse the activity system model is regularly used in an activity manner between the researcher-interventionists and the practitioners for the purpose of analysing the past, present and future of the activity (Engeström & Sannino, 2020).

Sannino and Engeström (2018) state that the development of the concept of activity, which is the second-generation unit of analysis, is credited to Leont'ev. "Activity is a relatively durable system in which the division of labour separates different goal-oriented actions and combines them to serve a collective object" (Sannino & Engeström, 2018, p. 45). The work of Leont'ev expressed how the vital differentiation between the action of an individual and the group's activity emerged as an outcome of the historical evolution of division of labour, even though he never graphically expanded Vygotsky's initial model into a collective activity system model (Engeström, 1987). The 2nd generation of CHAT encompasses the relations between the rules, community and division of labour, subject, object and mediation tool, "grasping the contradictions and by re-forging the activity to transcend the contradictions" (Figure 4.3) (Engeström & Sannino, 2020, p. 8).

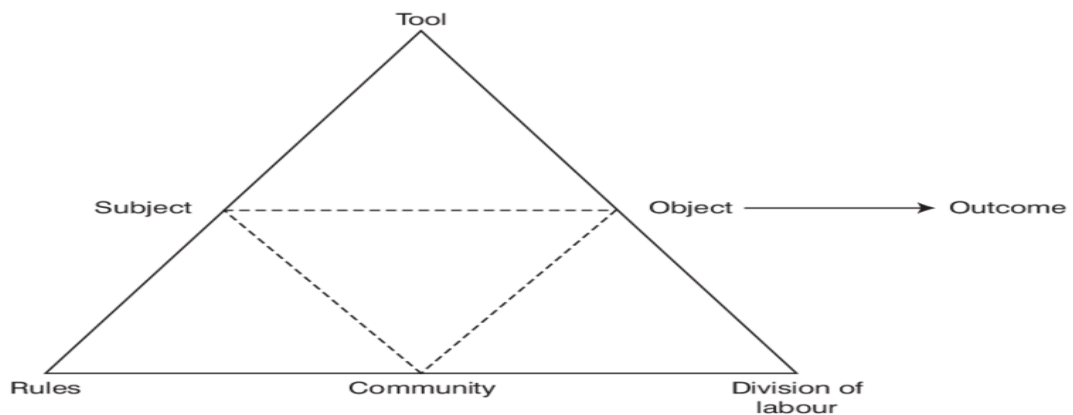


Figure 4.3: Engeström's (1987) diagram of second-generation CHAT

Power and agency are gained by individuals when they join their efforts and develop motive-goals which refer to a fusion of conscious goals of unique activities of individuals and the purpose of the complete collective activity (Engeström & Sannino, 2020). The Leont'ev inspired 2nd generation CHAT originated in German philosophy and the Russian school of psychology (Cong-Lem, 2022). This notion of “activity” has a long history of association with the works of numerous Russian psychologists and Leont'ev is acknowledged as the most predominant theorist (Cong-Lem, 2022). In Leont'ev's work, the object and activity are the foundational concepts. Furthermore, the object can be equally understood in a narrow and broad meaning (Cong-Lem, 2022).

4.3.3 3rd generation of CHAT

The third-generation model of CHAT was expanded to encompass a minimum of two interacting activity systems. This 3rd generation emerged and developed conceptual tools which could facilitate the understanding of dialogue, diverse perspectives and voices, and activity systems interacting in networks (Engeström, 1987). Engeström and Sannino (2020, p. 10) argue that “lateral interactions across the boundaries between participating activity systems” are fundamental in third-generation CHAT studies. This lateral dimension of expansive learning encompasses the development of novel social relations through debate, negotiation and collective experimentation (Engeström & Sannino, 2020).

The development of the 3rd generation of CHAT is credited to the works of Engeström and is a result of the efforts of Engeström to re-interpret and re-theorise Leont'ev's second-generation of CHAT geared towards the study of organisational change (Cong-Lem, 2022). When compared to the 2nd generation, the 3rd generation of CHAT is underpinned by an

interdisciplinary theoretical foundation, which includes Leont'ev's work and various other theories and philosophical traditions (Kaptelinin, 2005). In the 3rd generation of CHAT, an activity is always seen as being collective with the individuals participating in the activity sharing the object (Cong-Lem, 2022). For the 3rd generation of CHAT, the basic model is expanded to incorporate at least two interconnected activity systems (Figure 4.4) (Engeström, 1996).

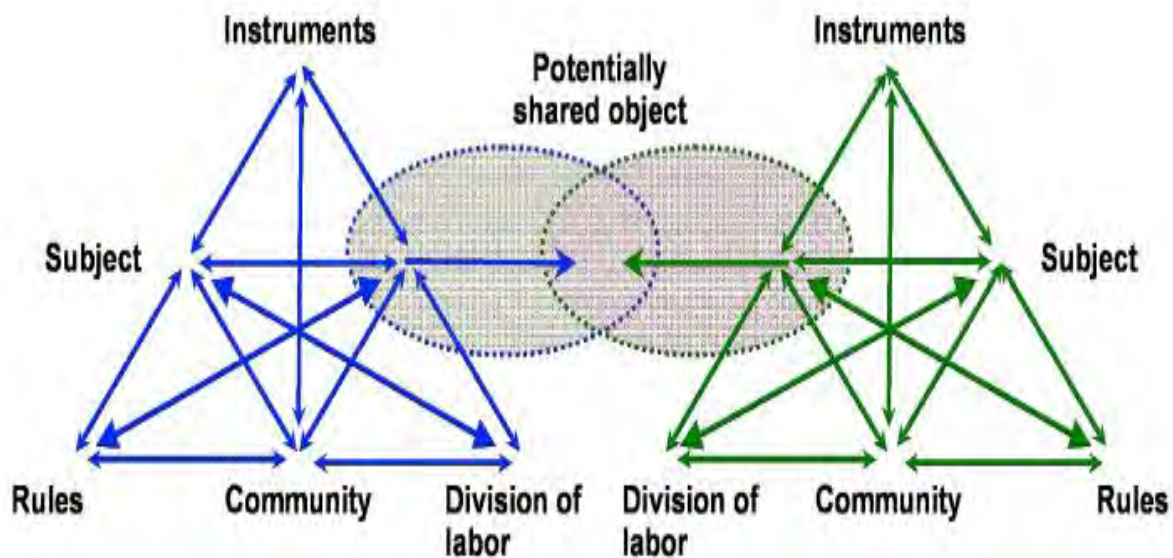


Figure 4.4: Two activity systems with a potentially shared object (Engeström, 2008)

Engeström's work on the 3rd generation of CHAT is drawn from a multidisciplinary approach (Cong-Lem, 2022) and agency is understood to develop when differences and complementarities of expertise and positions are recognised (Engeström & Sannino, 2020). The 3rd generation of CHAT has also emerged as a “productive analytical framework” (Cong-Lem, 2022, p. 1104) and it is also now accepted in numerous international contexts (Engeström & Sannino, 2020). In the third-generation CHAT, knotworking necessitates that participants recognise that there is no stability at the centre of initiative, control and power (Engeström & Sannino, 2020), including those reviewed by South African authors in section 3.6. The process of reconstructing the knots of collaboration is needed from time to time to accommodate the fluctuating needs of the object and the issue at hand when the centre does not hold. Transitioning from “compartmentalized bureaucracy and mass production to knotworking and co-configuration” poses both a risk and a possibility for practitioners (Engeström & Sannino, 2020, p. 10). Engeström (2001, pp. 136–137) explained that the 3rd generation of CHAT is underpinned by the following five principles:

The first principle is that a collective, artifact-mediated and object-oriented activity system, seen in its network relations to other activity systems, is taken as the prime unit of analysis.

The second principle is the multi-voicedness of activity systems. An activity system is always a community of multiple points of view, traditions and interests.

The third principle is historicity. Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history.

The fourth principle is the central role of contradictions as sources of change and development. Contradictions are not the same as problems or conflicts. Contradictions are historically accumulating structural tensions within and between activity systems.

The fifth principle proclaims the possibility of expansive transformations in activity systems. Activity systems move through relatively long cycles of qualitative transformations. As the contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms. In some cases, this escalates into collaborative envisioning and a deliberate collective change effort.

As Spinuzzi (2019) stated, 3rd generational CHAT has evolved significantly in its uptake. Yrjö Engeström, who developed and refined activity theory significantly to apply it to organisational learning, was perhaps the most prominent figure with regard to uptake. This framework provided the necessary tools to guide the activity systems' analysis, it assisted with capturing diverse perspectives and voices, and it provided a language to be used in contradiction analysis and modelling of novel solutions. With reference to the 3rd generation, Engeström (1996, pp. 132–133) states the following:

Questions of diversity and dialogue between different traditions or perspectives became increasingly serious challenges [therefore] [t]he third generation of activity theory needs to develop conceptual tools in order to understand dialogue, multiple perspectives, and networks of interacting activity systems.

The 3rd generation of CHAT proved to be very important in this research because when you look at the 3rd generation of CHAT concerning the object, the developmental contradictions within and between interconnected activity systems are focal points (Engeström, 2008). In the 3rd generation of CHAT, the unit of analysis is the interacting activity systems and the partially shared object as it changes via expansive learning processes over time (following the history of the object and the expansion of the object via the Change Labs) (Engeström, 2008).

Third generation activity theory expands the analysis both up and down, outward and inward. Moving up and outward, it tackles multiple interconnected activity systems with their partially shared and often fragmented objects. Moving down and inward, it tackles issues of subjectivity, experiencing, personal sense, emotion, embodiment, identity, and moral commitment. (Engeström, 2008, p. 10)

The expansive learning cycle involves boundary-crossing and horizontal sideways learning and this is a very important aspect for my research, because boundary-crossing plays a huge role in transformative learning, especially when numerous stakeholders are involved. Also, when you look at the 3rd generation of CHAT, agency is an important concept and is viewed as recognition and negotiation of the differences and complementary aspects (O’Leary, 2000).

Actions and expressions of transformative agency emerge when people are placed in demanding situations and are given an opportunity to analyse, envision and redesign their activity collaboratively, with the help of mediating conceptual instruments. Being inherently expansive, this kind of learning takes time and cannot be fully controlled by instructors or interventionists. This makes the formation of transformative agency a foremost challenge to analysts, organisers and facilitators of work-related learning. (Haapasaari et al., 2016, p. 259)

4.3.4 4th generation of CHAT

Over the last two decades, the 3rd generation of CHAT, which emerged as the work of Engeström and colleagues, has assisted by providing a sociocultural analytical framework to study the manner in which organised human activity emerges, including practices for aiding in the intervention and improvement of the activity of participants (Spinuzzi & Guile, 2019). It was in 2009 that Engeström put forth a suggestion to develop a 4th generation of activity theory (Spinuzzi & Guile, 2019). The work of Sannino (2020), Sannino and Engeström (2017) and Engeström (2018) highlight that the emergent CHAT 4th generation focuses on “heterogenous work coalitions” which are directed towards the resolution of the “wicked” problems of society, also named “runaway objects”, and the creation of sustainable alternatives to capitalism (Engeström & Sannino, 2020). To explain the transition between the 3rd and 4th generation of CHAT, Engeström (2009, p. 9) states the following: “Third-generation activity theory still treats activity systems as reasonably well-bounded, although interlocking and networked, structured units”. Engeström and Sannino (2020, pp. 11–12) explain this transition as follows:

A unit of analysis appropriate for the fourth generation cannot be constructed simply by adding more activity systems to the third-generation unit. A twofold qualitative shift is needed. First of all, the unit needs to be built around fateful objects that affect lives across boundaries. Secondly, we need to move from an emphasis on structural relations to an emphasis on processual relations, or from emphasis on space to an emphasis on time. Thus, fourth generation activity theory focuses on the multiple coalescing cycles of expansive learning involved within and across the activities involved, their relatively independent dynamics and their interdependency.

The four CHAT generations are still co-existing, however, facing the work problems in today’s world necessitates a serious engagement with the development of the 4th generation of CHAT (Engeström & Sannino, 2020). The 4th generation of CHAT’s work is founded on concepts and

instruments which emerged from the preceding generations. Analysts and practitioners need to be able to transition between the CHAT's 4th generation learning cycles and the interacting activity systems, because these two features are intimately connected (Engeström & Sannino, 2020). Runaway objects or challenges which pose grave threats to societies such as pandemics or climate change are dealt with by the 4th generation of CHAT; such issues cannot be resolved by an interventionist approach such as in the 3rd generation of CHAT (Cong-Lem, 2022). In view of such matters, the addition of more activity systems in the 4th generation is inappropriate and ineffective for the purpose of analysing the data. In this generation, consideration should be given to “the multiple coalescing cycles of expansive learning involved within and across the activities involved, their relatively independent dynamics and their interdependency” (Engeström & Sannino, 2021, p. 15). These complicated runaway objects which have wide-reaching societal consequences, link a great number of activity systems which transcend national borders (Engeström, 2009). These objects have a tendency of transcending “between the history of a specific activity, the history of a singular society, and the history of humankind” (Engeström & Sannino, 2020, p. 2). The 4th generation is still in its emergent form and only now has the process of development of methods and conceptual tools began to “analyse and foster these processes of generating dynamic social cohesion around a shared object among heterogeneous activities” (Engeström & Sannino, 2021, p. 19). Table 4.1 is an expression of the four generations of CHAT and their unique characteristics. Should my study expand to different catchments in future, then 4th generation CHAT might become useful.

Table 4.1: Four generations of CHAT and their unique characteristics

	<i>First Generation</i>	<i>Second Generation</i>	<i>Third Generation</i>	<i>Fourth Generation</i>
<i>Object and problem</i>	Challenge in individual learning or development	Collective developmental contradictions demanding an expansive solution	Developmental contradictions within and between interconnected activity systems	A critical societal challenge or crisis demanding a multi-level and cross-sectoral solution
<i>Unit of analysis</i>	Mediated action	Collective activity system	Minimally two interacting activity systems with a partially shared object	Coalescing cycles of expansive learning in a heterogenous coalition of activities facing a critical societal challenge

<i>Concept of learning</i>	Internalisation of given skills and knowledge	Expansive learning cycle generating what is not yet there	Expansive learning cycle involving boundary-crossing and horizontal sideways learning	Horizontal and vertical interplay between multiple coalescing cycles of expansive learning
<i>Concept of agency</i>	Agency as grasping the historically evolving nature and emancipatory possibilities of one's actions	Agency as expansive movement from individual subjects and their tasks towards collective subjects transforming their activity	Agency as recognition and negotiation of differences and complementarities	Transformative agency by double-stimulation
<i>Typical intervention</i>	Training aimed at emancipatory understanding and mastery of one's actions	Longitudinal process of collective analysis and redesign of the activity emergence of the Change Laboratory method	Change Laboratory and Boundary-Crossing Laboratory	Multiple interconnected Change Labs, from local to municipal, regional, national and international levels, with longitudinal follow-up and support

Source: Engeström (2020)

4.4 Transformative Agency, Expansive Learning and Activity in the Research

Virkkunen (2006) defines transformative agency as clusters of voluntary activities that vary from set restricting frames and contribute to the concrete change of specific situations. Sannino (2015) argues that these volitional actions always entail questioning and exploration of new possibilities. They typically commence with initiatives at the individual level and then expand towards collective actions. According to Haapsaari et al. (2014), transformative agency emerges and is sustained in collective change efforts and evolves over time, and this transcends mere individual initiatives and situational endeavours. Other authors who have discussed the process of expansion of transformative agency from circumscribed individual initiatives to shared collective endeavours include Olsson and Galaz (2012) and Westley et al. (2013) (Sannino, 2015). To elaborate on the point of expansion from the individual initiatives to shared collective actions, Haapasaari et al. (2016, p. 27) state the following, “Even though the first expression of transformative agency is initiated by an individual, it requires collaboration and collective agency in order to survive and expand”.

As stated above, surfacing and capturing the emerging transformative agency demonstrated in the activity systems was a vital component of this study, hence the use of the CHAT framework and the Change Labs. In formative interventions such as the Change Labs, the emergence and evolution of transformational agency is regarded as a crucial result (Haapasaari et al., 2016). Engeström (2011) identified five primary categories of participants' emergent transformative agency that are particular to and characteristic of Change Lab interventions, building on Sannino's (2008) original study. In Haapasaari et al.'s (2016) work, there is an adaptation of the original work to include a sixth category. However, Table 4.2 provides an overview of the seven types of expressions of transformative agency based on Engeström (2011), developed by Haapasaari et al. (2016) and adapted by Kachilonda (2015) and Jalasi (2016). These transformative agency expressions are important in understanding how people manifest their agency in certain contexts. For this study, the type of transformation agency manifested was through "*explicated new possibilities or potentials in the activity*", "*envisioning new patterns or models of the activity*", "*committing to concrete actions*", "*taking consequential actions*" and "*confronting and navigating power relations*" (discussed further in Chapter 8). The seventh transformative agency type was helpful in trying to explain how the learning actors began to transform their activity in a bid to work towards the object of co-management of water. This seventh expression of transformative agency, which was added by Kachilonda (2014) and Jalasi (2019), provided the tools to assist me in understanding how the learning actors began to voice the power they have with regard to the object and how they could work with different stakeholders to transform their activity in a bid to secure water resources for their villages.

Table 4.2: The seven types of expressions of transformative agency

Resisting	Change, new suggestions or initiatives directed at management, co-workers or interventionists
Criticising	The current activity and most often highlighting the need for change in the activity
Explicating	New possibilities or potentials in the activity related to past positive experiences as evidence of unacknowledged potentials or characteristics of the problematic object as a source of new possibilities and exciting challenges

Envisioning	New patterns or models of the activity, which can range from preliminary suggestions to the presentation of comprehensive models for the future
Committing	To concrete action to change the activity, which is typically manifested in the use of commissive speech
Taking consequential actions	To change the activity where participants of the interventions may perform consequential change actions within, between and after laboratory sessions
Confronting and navigating power relations	Participants recognise and navigate power relations and voice the power they have which can be significant in mediating new ways of doing things in the activity. Taking consequential actions (outlined above) or being able to commit to actions is often dependent on the transformative agentive capacity to navigate or negotiate power relations

Source: Based on Engeström (2011), developed by Haapasaari et al. (2016) and expanded by Kachilonda (2014) and Jalasi (2019)

According to Engeström et al. (2022), agency has quickly emerged as a central topic in education related research, however, agency theories used in educational studies are usually borrowed from psychology and sociology. Numerous theories related to agency tend to focus on the individual's overall capacity to act, and they fail to distinguish between reproductive and transformative actions (Engeström et al., 2022). To understand transformative agency better, it needs to be explained how it emerges and the overall process related to its formation. Sannino (2015) states that transformative agency which has its foundation in double-stimulation emerges from a problematic, polymotivated situation whereby there is an evaluation and interpretation of circumstances by people, after which they embark on decision making according to their interpretations and perform actions based upon their decisions. Sannino (2015, p. 2) argues as follows with regard to transformative agency and double-stimulation:

The principle of double-stimulation refers to the mechanism with which human beings can intentionally break out of a conflictual situation and change their circumstances or solve problems. Double-stimulation is essentially a process of reframing or reconceptualising the problem situation. Double-stimulation can be understood as a principle of transformative agency (Sannino, submitted for publication), according to which human beings, when dealing with conflicting motives, employ auxiliary cultural means to make decisions and turn these decisions into action.

According to Vygotsky's (1997) principle of double-stimulation, higher mental functions form as a process in which an individual or a group is faced with a paralysing conflict of motives, and this is denoted as the first stimulus (Engeström et al., 2022). During this process, the individual or group resolves the conflict through the identification of an artefact that has meaning, and it is turned into a sign, henceforth becoming the second stimulus (Engeström et al., 2022). What results is that the mediating artefact enables the individual or learners to redefine the paralysing situation and embark on volitional action to break out of it. This is important because learning challenges in the world today are without clear and obvious accurate solutions; complex issues such as poverty and climate change, as general universal threats and context-specific problems, are usually experienced as "paralyzing conflicts of motives" (Engeström et al., 2022, p. 2). According to Vygotsky (1978), the method of double-stimulation causes manifestations of vital processes in the behaviour of people of all age groups. Sannino (2015) argues that this principle of double-stimulation describes the mechanism by which people can deliberately break away from a situation of conflict and transform their circumstances or solve problems. In activity theory, double-stimulation is one of the primary epistemological principles of formative interventions (Sannino, 2011).

Expansive learning centred on the object (explained in section 4.2) and transformative agency can be pursued through formative interventions; this is achieved by mobilising procedures and analyses which are based on the epistemological principles of double-stimulation and ascending from the abstract to the concrete (Sannino, 2016). The resulting new concepts and practices developed through the process of expansive learning carry visions which are future-oriented and laden with initiative and commitment by the learning participants (Sannino, 2016). Frequently, transformative agency arises in a stepwise manner via manifold iterations of the double-stimulation loop (Engeström et al., 2022). Lotz-Sisitka et al. (2017) argue that researchers need to engage fully in the research and learning process in order to perceive transformative agency processes in community learning and that they establish methods and approaches for the observation of transformative agency. Engeström et al. (2020) state that the paradigm of double-stimulation provides a beginning point for a pedagogy of agentive actions and expanding possibilities.

Transformative agency emerges when people are confronted with concrete problematic situations, and it is analysed through the manifestations of the expressions of transformative agency (Engeström, 2011; Haapasaari, Engeström, & Kerosuo, 2016; Sannino, 2008; Vänninen, Pereira-Querol, & Engeström, 2015). The method of Change Laboratory is a formative intervention that generates transformative agency (Engeström, 2007b, 2015; Virkkunen & Newnham, 2013) through

identifying and solving the contradictions embedded in the elements of the activity system. (Lund, 2021, p. 2)

Sannino's proposed transformative agency by double-stimulation (TADS) is an emerging framework (Engeström et al., 2020). This TADS conceptual framework was applied and enriched by articles in a special issue of *Learning, Culture and Social Interaction*, titled 'The emergence of transformative agency and double-stimulation: Activity-based studies in the Vygotskian tradition' (Sannino, 2015). According to Engeström et al. (2020), an integral constituent of CHAT is this TADS framework of transformative agency. When situated individual initiatives become sustained collaborative endeavours that result in the transformation of collective activity systems, which is an expression of agency. The approach of the TADS is always the following: Agency for what? (Engeström et al., 2020).

Yrjö Engeström and Annalisa Sannino (2010), Heli Heikkilä and Laura Seppänen (2014), working within the tradition of cultural-historical activity theory, state that transformative agency is the most important outcome of expansive learning, especially in situations of complex change. Engeström and Virkkunen (2007, as cited in Heikkilä and Seppänen 2014) describe transformative agency as a person's capacity to make 'purposeful changes' to their work or shared activity. Engeström and Sannino (2010) and Engeström (2016) argue that observation of transformative agency is an important way of reflecting on the transformative potential of expansive learning. (Lotz-Sisitka et al., 2017, p. 901)

In order to better understand the role and importance of agency in expansive learning, it is necessary to acknowledge the agency that already exists within communities and to build on it through collaboratively creating new knowledge and practices that are conceptualised in the formative interventions (Mukwambo et al., 2023). As a formative interventionist researcher, this is important for my study because different activity systems will boundary-cross, collaborate and expand the learning, as they follow the expansive learning process in the Change Labs. Mukwambo et al. (2023) further state that is imperative to be explicit in embracing an intention to support the transformative agency of others, which encompasses the humble realisation that one's own transformative agency can be expanded in the process. Chapter 8 of this study highlights the process of the learning participants expressing their agency through the process of modelling solutions towards the contradictions expressed in Chapter 7.

4.5 Conclusion

This chapter opened with an introduction and an explanation of the theoretical framework which underpinned the study. The CHAT background and development trajectory was

provided to understand why this particular theoretical framework was used for this research, and why it was suitable for this type of work. The activity theory background was provided to understand the importance of using activity system analysis as a way of dealing with contradictions and modelling solutions. Also, in this chapter, the issue of contradictions was highlighted. The different types of contradictions were discussed, and the different manifestations of contradictions were explained. A highlight was the development of the *isiphithiphithi* manifestation of a contradiction which was developed in this study – it was important and helpful in terms of explaining the manifestation of contradictions as systemic inadequacies, systemic failure paradoxes and disorders in the governance system (see Chapter 7).

The different generations of the CHAT were provided, which ranged from the 1st to the 4th generation. The background and evolution of these CHAT generations were explained to explain the use of the 3rd CHAT generation in this study. The 3rd generation of CHAT consists of different activity systems (represented by triangles) with a potentially shared object or partially shared object; this is congruent with the idea of different actors who are pursuing a goal of co-management (Figure 4.4). The 3rd generation, which has developed over the previous 15 years or so, builds on the idea of multiple interacting activity systems focused on a partially shared object.

Third-generation CHAT was beneficial in understanding the activity systems which are present in the Living Catchment Project, because it allowed me to investigate the cultural history and contradictions of these activity systems: What is sitting behind each activity system? Why does that particular activity system have a particular view of water co-management? What is the history of that? How do they intersect, and what is the nature of the partially shared object as it relates to co-management? Getting an in-depth understanding of the different activity systems present in the study sites formed part of phases 1 and 2 of the methodology (see Chapter 5). Along with this, the issue of transformative agency was also explained – this is important because later in Chapter 8, the learning actors modelled solutions to deal with the various contradictions they chose. It was important to try and explain how the act of modelling solutions manifested as transformative agency emergence. The CHAT possesses the methodology and tools which could potentially assist in guiding the research and objectives of the LCP. The different activity systems in the LCP involved all the stakeholders involved in the respective catchments, who collectively came together to boundary-cross to learn how to

best engage in co-management of water catchments, towards a water secure future. This formative intervention research process is explained in the next chapter.

CHAPTER 5: METHODOLOGY AND METHODS

5.1 Introduction

CHAT provided a foundational theory to support this study. As mentioned in Chapter 4, CHAT was chosen for this study because of the repository of tools it possesses that aid in working through contradictions and its ability to allow learning participants, in the different activity systems, to acknowledge their agency and potentially transform their activity. As described in section 4.4, in formative interventions such as Change Labs the emergence and evolution of transformational agency is an important outcome. Change Labs were used in this study as hubs of learning where boundary-crossing, discussion and framing of solutions for water-related issues in the uMzimvubu catchment took place. As explained in-depth in Chapter 3, expansive learning was followed in this study. This chapter details the exact steps which were followed in the expansive learning cycle and the context in which the research occurred. This is important to highlight because this study occurred during the Covid-19 era and this had potential consequences for the research. However, a time plan and a methodological approach were developed before the data collection process began, to ensure that the research occurred according to the envisaged plan.

This chapter discusses how I engaged with the research, what processes I followed in order to generate data and how I analysed the information. This section will also explain how I engaged with the participants and provide explanations of the decisions behind particular processes I embarked on. My position in this research was that of a formative interventionist researcher. In the case of formative interventions, the design is driven by historically formed contradictions (Engeström & Sannino, 2011) in the learners' activities and is an outcome of their collective efforts to understand and face these contradictions and the problems they engender (Sannino et al., 2016). As a formative interventionist researcher who was part of the process (the LCP), my role was to intervene by provoking and supporting the process that must ultimately be led and owned by the learners (the actors in the activity systems in this case). While this may not seem different to any other form of action research, a distinguishing feature of formative interventions involving a researcher is the repertoire of conceptual tools developed and employed in the process, namely conceptual tools stemming from CHAT (Sannino et al., 2016).

As discussed in Chapter 4, the theoretical framework which I chose to study niche level innovations in the LCP (Chapter 2) is CHAT, supported by the VCF tool (discussed in detail in Chapter 3 from a theoretical point of view). In this chapter, I elaborate on the methodological processes that align with the theory. Using CHAT as a theoretical framework for niche level intervention, supported by the VCF too, was important for my study because it allowed me as a researcher to analyse the activity systems which were present in the uMzimvubu LCP context, and also allowed me to monitor and evaluate learning which had already and may have occurred during the learning journey. CHAT provided theoretical guidance as study questions were contextually finetuned, methods for collecting data were selected and designed in more detail and analysis was planned and conducted. Furthermore, this theoretical framework allowed me to understand my positionality in the study and provided me with a lens to approach the research. This methodological approach assisted me in positioning myself as a formative interventionist researcher in the project and provided me with tools to assist in expanding learning and evaluating the learning and new outcomes that emerged from a co-engaged learning process oriented towards co-management for improved water security, involving different stakeholders' activity systems in the project.

As indicated in Chapter 1, I set on a journey to explore learning in an expansive manner as related to co-management of water with the research participants. The research journey was not just focused on attaining or providing solutions for the catchment water security issues, but was founded upon the fostering of learning for all the stakeholders involved and understanding the value created throughout the learning process. Capturing the value of social learning was an integral part of the research process and that is why the VCF tool was used in this research. The framework is perceived as comprehensive because it enables the construction of value creation stories that reflect the shared history of a social learning space (Bertram et al., 2017) (see also Chapter 3). Cases, techniques, tools, stories, concepts and perspectives can be included in this history or repertoire (Wenger et al., 2011). I applied a monitoring tool during my time in the field, and I had to translate it into the Indigenous languages of the catchment so that the process yielded the best results.

It was evident during my research that I had to be flexible and in a constant state of reflection as the researcher because there were different types of stakeholders who participated in my research, and all brought a wealth of knowledge and variety. My role in the research was not to provide solutions or act as a service provider giving all the answers, but rather to assist in

fostering learning and creating an environment which was comfortable and respectable for all those wishing to learn. Expansive learning has the ability to transform and alter the culture in the catchment, creating a culture that can stimulate collective learning (Engeström & Sannino, 2010; Postholm, 2015). The tension and contradictions within and between factors in the activity system and between activity systems found in the catchment were the foundation for development and change (Postholm, 2015) (see Chapter 7).

This chapter discusses how I planned my research and why I set it up in the way I did. It also highlights how I dealt with issues of ethics and how I analysed the data and reached certain conclusions.

5.2 Methodological Framework

The research methodology, project design and methods were influenced and shaped by the following factors: the aim of the research (section 1.3.1), the objectives of the research (section 1.3.3), the guidance provided by the CHAT theoretical framework (Chapter 4) and the VCF (Chapter 3). The aim of the research was influenced by the work of the LCP and the importance of understanding water security at the catchment level (chapters 1 and 2) (niches). The work of the LCP is influenced by the Just Transitions Framework (discussed in Chapter 2), which has implications for regime, landscape and niche level innovations. This research was geared towards collective learning and information sharing in relation to water security and making people aware that they possess agency and that they play a critical role in altering the current norms when it comes to water management. The frameworks chosen for this research had to enable the above sentiment to become practical on the ground; hence, CHAT assisted with tools which would allow for the mediation of expansive learning and VCF provided the framework to gauge if such learning was occurring.

For the research, the different subjects (in activity systems) were brought together to collectively learn to understand the contradictions (tensions, conflicts, etc.) and confront them, in order to create a new shared object. Engeström (2010) states that in expansive learning, learners learn something that is not yet there; in the case of the LCP, that is essentially how different stakeholders in the catchments learnt how to co-manage water resources in a catchment collectively. In other words, the learners had to construct a new object and concepts for their collective activity and implement this new object and the concepts in practice. The research was divided into four phases (see section 5.2.1 and Figure 5.2 for more in-depth elaboration). The research phases were directed by the objectives and the overall aim of the

research (see section 1.3). The research phases were guided by the CHAT theoretical framework and the VCF tool, as these offered process guidance. This approach enabled me as a researcher to collect data in a theoretically guided manner, and this assisted me in planning the research process and informing my participants ahead of time.

Questioning and looking at the current trouble by mirroring experiences from the past is a key component of the first two expansive learning actions in the expansive learning cycle and had implications for the LCP, because it was essential to surface any underlying contradictions and deep-seated issues in and between the activity systems which may be hindering progress and the creation of the new object of co-management. As shown in Chapter 2 and 3, this involved a wider understanding of the project and its concrete manifestation in the uMzimvubu catchment case context. Following the expansive learning cycle, this proceeds by modelling the current activity and its inner contradictions, which allows the participants to focus their transformation efforts on essential sources of trouble (Engeström et al., 1996). The following step is the envisioning of the future model of the activity, which includes its concretisation by means of identifying ‘next step’ partial solutions and tools (see Figure 5.1 below). Subsequently, the stepwise implementation of the new vision is planned and monitored in the Change Laboratory (Engeström et al., 1996).

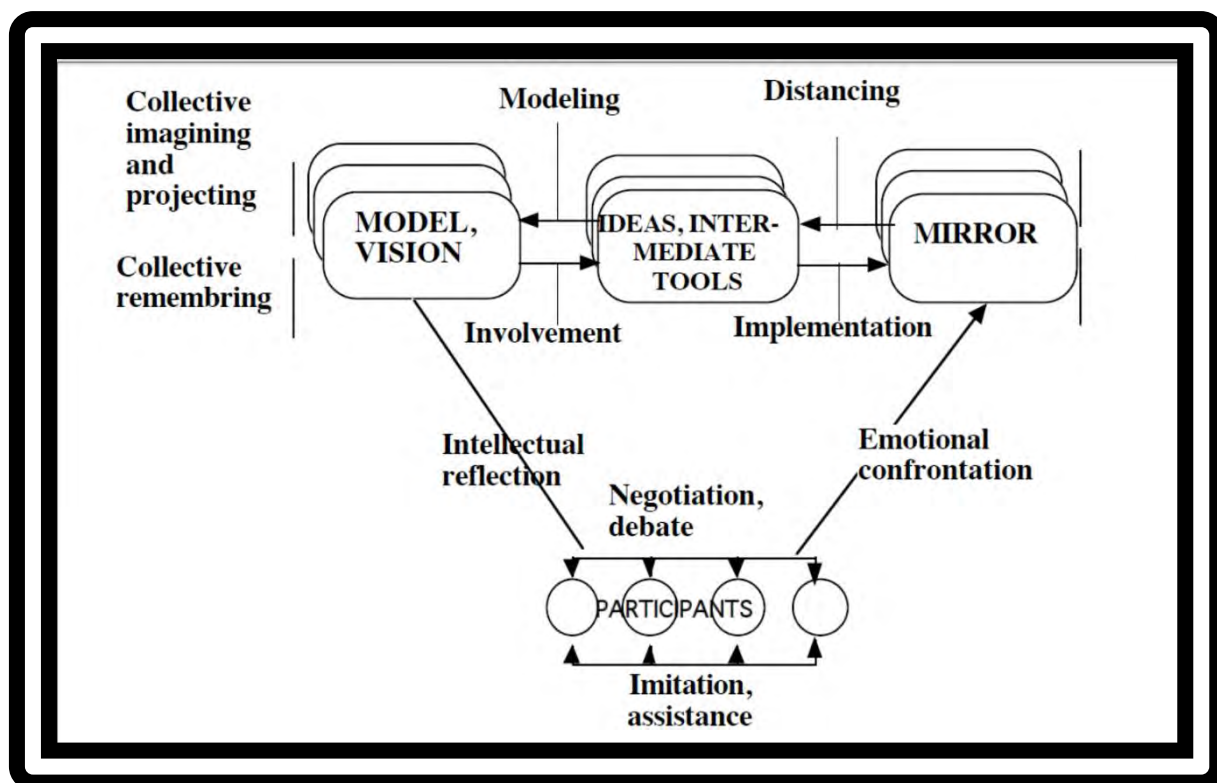


Figure 5.1: Socio-cognitive processes called for in the Change Laboratory (Engeström et al., 1996)

Engeström (1996) and Kärkkäinen (1996) state the following with regard to expansive learning in Change Labs: such a cycle of expansive learning induced in the Change Laboratory usually has a three to six months duration (involving on average 6–8 Change Laboratory workshops). The Change Laboratory textbook by Virkkunen and Newnham (2013) was a very useful tool because it helped me prepare for the Change Labs (theoretically and logistically) which occurred in the catchment. It also assisted me in a way to understand how I could present the contradictions to the group, and which processes I could follow to effectively present the data to the group. One cycle would lead to the next one, and within the cycles there would be smaller cycles of problem solving and learning.

5.2.1 Research design and phases

As mentioned above, the research was divided into various phases and the research design factored in the aim and objectives of the study, and the process was guided by the chosen CHAT theoretical framework (see Chapter 4) and supporting VCF tool (detailed in Chapter 3) (see Figure 5.2). **Phase 1** dealt with the development of understanding the activity systems present in the study site. In order to gain an understanding of the activity systems, I had to understand the cultural history of the shared object of the activity systems (Figure 5.3) – in this case the activity of water management (which may or not be leaning towards co-management); what the relations are in each activity system and why the particular activity system has an interest in the object of water management? I had to understand their “object motive” or what motivates the subjects to engage in the activity. I had to understand what contradictions were evident or emerging in and between the activity systems as this provides a source of learning as discussed in Chapter 3. Understanding the activity systems required an open process of questioning (the first phase in the expansive learning cycle), and the above-mentioned questions assisted in guiding the initial stage of the research (see outline instruments further on). Document analysis, field observations, interviews and focus groups were used for **Phase 1** research.

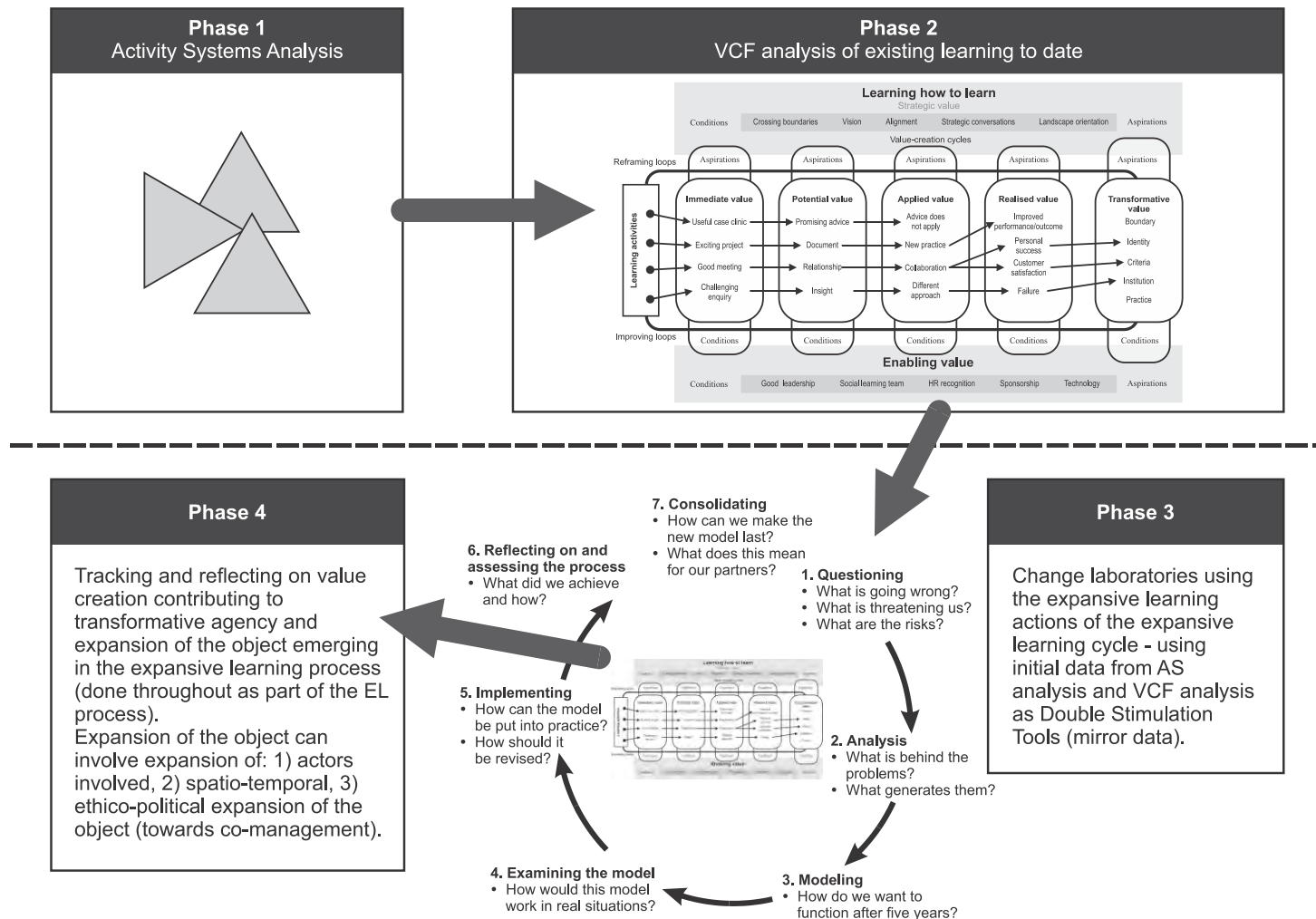


Figure 5.2: Diagram showing the study design and analytical framework working concurrently to a) set up the expansive learning processes based on cultural-historical activity system and VCF analysis (Phase 1 and 2) and engagement in and analysis of value creation

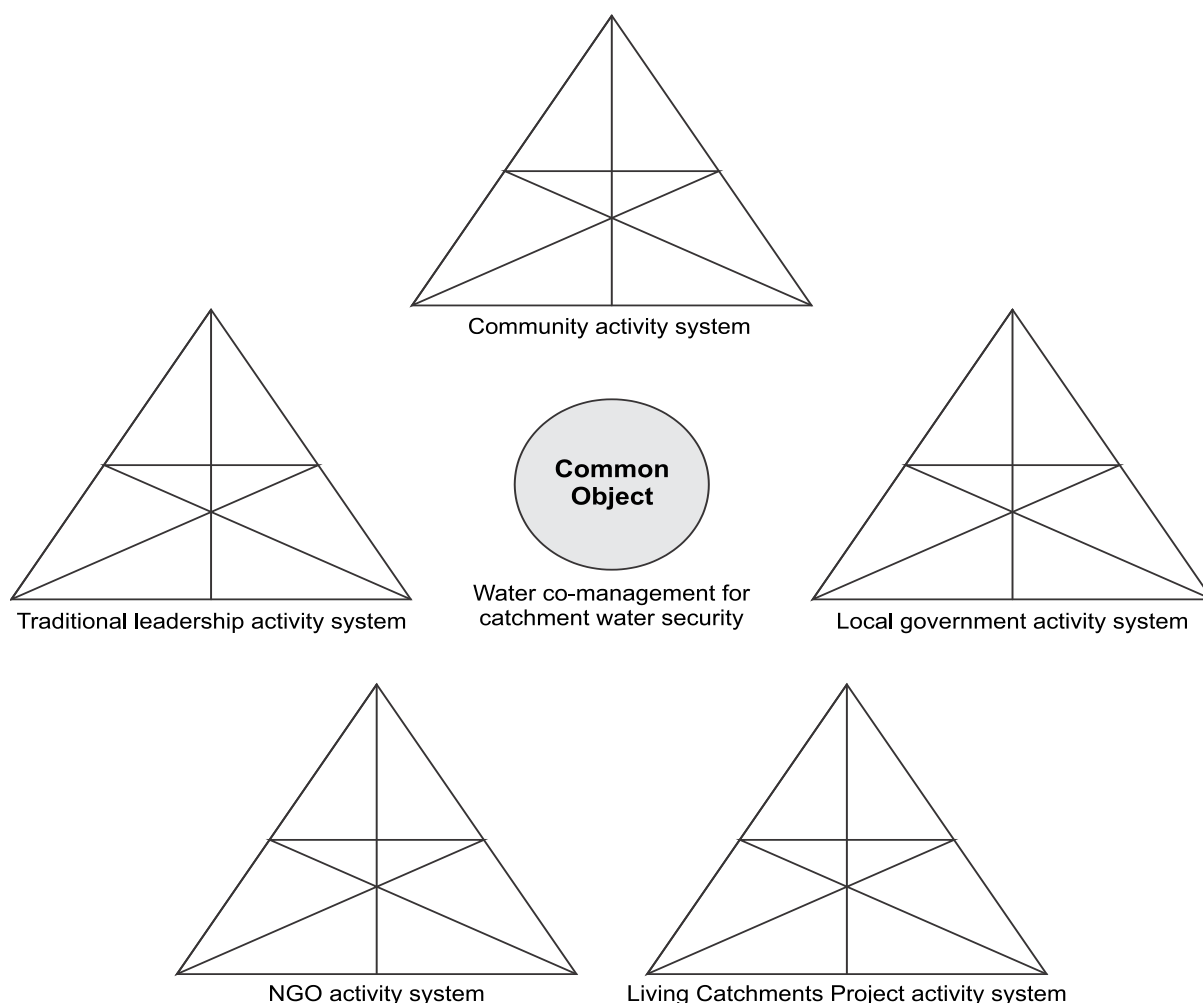


Figure 5.3: Activity systems present in the study and the shared common object

Phase 2 dealt with understanding what value had been created for the stakeholders involved in the LCP in terms of their prior learning, using the VCF. Following this, I used this analysis for further informing the contradictions analysis. I used the approach of constructing and analysing value creation narratives for these activity systems in terms of their past learning. **Phase 3** involved the analysis of the contradictions which surfaced from the initial questioning *with* the interacting activity systems concerned in order to prioritise contradictions to work on resolving, which leads potentially into modelling of solutions, and proceeds towards working on the new or revised object via the ongoing expansive learning cycle (which is not necessarily linear). The Change Laboratory method was mainly used in this phase (see below).

Seeing that the LCP is a relatively new endeavour, it was important for me as a researcher to have two views as I followed the methodology and embarked on research for the project: A-view and a B-view. This is the focus of the A-view: *how much evidence was present of co-*

management and expansive learning in the LCP at the start of the study (phases 1 and 2 of the research). This is the focus of the B-view: *how much evidence of co-management and expansive learning was present after the expansive learning formative intervention research process (phases 3 and 4 of the research).* The VCF tool aided in understanding if there was any value created for the people out of the social learning process involved in the LCP when the research process started (Phase 2) and following the expansive learning research process (Phase 4 of the research). **Phase 4** was concerned with the B-view (it drew on data from Phase 3 and 4). As mentioned above, this B-view was developed using the VCF and assisted me in understanding the value which has been created for the stakeholder activity systems, around the shared object of activity that emerged out of the expansive learning process.

5.2.1.1 Phase 1 research process

i. Desktop study, document analysis and workplan of the study

As mentioned above, phase 1 consisted of the following components: document analysis, field observations, interviews and focus groups. Before embarking on the study, I had to first gain an in-depth understanding of the LCP. I spent several months collecting all the information associated with the LCP; this included phone calls to the project inceptors requesting access to the project files, gathering the available readings on the project and researching the literature related to the LCP (see Chapter 2 for the project description). Another step I embarked on was introducing myself to the different stakeholders involved in the catchment, I did this so that a bond of trust could develop. In certain instances, researchers are perceived as outside forces who just come into a context and extract information and then disappear as soon as the process is completed. I had received advice on how to approach my research community and I had researched about the work they had done – this enabled me to gain more knowledge about my study site. As discussed in section 1.5, I explored material relating to the LCP, UCPP and the uMzimvubu catchment to augment my knowledge of the study site – this formed part of my document analysis.

Frey (2018) defines document analysis as a form of qualitative research that uses a systematic procedure to analyse documentary evidence and provides answers to specific research questions. Just like other methods of analysis in qualitative research, document analysis necessitates repeated review, examination and interpretation of the data to obtain meaning and empirical knowledge of the construct being studied. This took some months, because I had to read up on literature relating to the documents and to cross check if the information was still

valid and up to date. I had to call certain specialists who were informed about the LCP and UCPP and some members from the catchment community to gain more clarity and validation of the information I received. For the UCPP document review, I consulted with ERS (as the gatekeepers and knowledge brokers in the uMzimvubu catchment, and the key role players in the UCPP), because they developed most of the knowledge repositories for the UCPP and they were able to provide extra information to me. With regard to the LCP, I consulted various officials from SANBI and the WRC, because they were the project convenors and coordinate the LCP project, as explained in Chapter 1. Frey (2018) further states that document analysis can be done in a stand-alone study or as a constituent of a larger qualitative or mixed methods study, where it is frequently used to triangulate findings gathered from another data source (e.g. interview or focus group transcripts, observation, surveys). Documents can be used in triangulation to corroborate or reject, explicate or expand on findings from other data sources, which helps to avoid bias (Frey, 2018). In CHAT, document analysis helps to develop understanding of the cultural history of an activity. The documents I consulted for my analysis and review were as follows:

- South African National Biodiversity Institute (SANBI). (2020). A Theory of Change for the Living Catchments Project. A Report to the Water Research Commission.
- Department of Water and Sanitation. (2019). National Water and Sanitation Master Plan: Call to Action. Pretoria.
- CARE International and International Institute for Environment and Development (IIED). (2014). Participatory monitoring, evaluation, reflection and learning for community-based adaptation.
- South African National Biodiversity Institute (SANBI). (2020). The Living Catchments Project. Report on Deliverable 3.
- South African National Biodiversity Institute. (2019) Living Catchments Project Inception report.
- Department of Water and Sanitation. (2018). National Water and Sanitation Master Plan (Version 10.1).
- Water Research Commission (WRC). (2015). South Africa's Water Research, Development, Innovation (RDI) Roadmap: 2015-2025. WRC Report No. 2305/1/15.
- Matatiele Local Municipality. 2016. A strategic water factory to drive the green economy in the Eastern Cape.

- uMzimvubu Catchment Partnership Programme (UCPP), World Wildlife Foundation (WWF) and Environmental and Rural Solutions (ERS). (2019). Water Source Partnership (WSP) to safeguard and ensure effective management of the Eastern Cape and the Southern Drakensburg Water Source areas.
- uMzimvubu Catchment Partnership Programme (UCPP). (2016). Newsflash articles: 2016 to 2020 (ranging from article 1 to 23).
- uMzimvubu Catchment Partnership Programme (UCPP). (2014). uMzimvubu Catchment Partnership archives, 2014-2019. <https://umzimvubu.org/>

All of my work was directed by my time plan, which helped guide my data collection and methodology (Table 5.1).

Table 5.1: Proposed time frame, with activities and plan

Period	Activity	Materials/Plan
February 2021	Proposal and ethics acceptance	Liaise with Living Catchments management concerning travelling to study sites
March–May 2021 (Phases 1 and 2) June–July 2021 – Phases 1 and 2 Analysis work August–November 2021 (Phases 3 and 4) – Change Labs	Data Collection Process	Document analysis; activity system analysis, First VCF analysis; Change Labs workshops, focus groups and questionnaires
December 2021–January 2022	Liaising with participants about the future of their projects	Further consolidation and discussion about the models
January 2022–December 2022	Data analysis & Thesis Writing	Analysis of the entire dataset and producing a dissertation
January 2023–April 2023	Revising second draft of PhD	Incorporating Supervisor’s comments into draft
May 2023–December 2023	Working of final draft of PhD and submission of thesis	Amending appendices and references

i. Contextual analysis, field trips and uMzimvubu catchment activity systems

After my proposal was accepted and my ethics application was approved in February 2021, I was ready to commence on my field trip for data collection. However, I did not immediately jump into heading off into the field, rather I waited for the UCPP and ERS stakeholders to have

an open slot to assist me in my contextual analysis trip which was held in March 2021 in Matatiele. I carried on with my document analysis and further research in February 2021, until the day I had to go to the field. I already had a research plan which I had drafted with assistance from my supervisor, and it factored in possible disturbances caused by Covid-19 lockdowns (See Table 5.1 above). There were several times during the lockdown where measures hindered movement between places and limited the number of people that could gather in one place. Fortunately, when I went to the field for the first time, the restrictions had been eased. After liaising and confirming my travel schedule with my research participants and my supervisor, I had to book my trips from Grahamstown to Matatiele. For the first field trip to the study site, I travelled alone and spent two days in the catchment.

Understanding the activity systems necessitated that I understand the catchment context. I had only been acquainted with this catchment through books, journals, websites and conversations. Contextual analysis is imperative for a researcher if they seek to understand more about their study site. Before I could commence with my data collection and with the Change Labs, I had to be immersed in the catchment context to understand the context my research participants existed in. This contextual profiling trip emerged as a great benefit to my research process, and it assisted me in initially noticing potential contradictions which existed in the catchment. Svensson (2021, p. 24) states the following concerning contextual analysis:

The approach is compatible to all forms of knowledge as the aim of research, if the form fits the character of the research object. The seemingly obvious starting point in contextual analysis is from what is to be investigated, the research object, and from the view of the knowledge of the object, that is to be developed. Even if contextual analysis takes its starting point in the research objects, contextual analysis does not include all methodological considerations and choices that have to be made in a specific investigation, only principles for how these choices can be made.

The contextual analysis allowed me as a researcher to obtain a more holistic perspective of the catchment, which was augmented by both the document analysis and the field observation field trip. One of the characteristics of the contextual analysis approach is that it is both contextual and analytic in an integrated way. Contextual analysis commences from a preliminary delimitation of objects of research as a whole and proceeds with discerning and delimiting the main parts of the objects, and parts within the main parts (Svensson, 2021). This is the reason I had to factor in this field observation in my data collection, to not just understand the whole, but to gain an in-depth understanding of the parts which make the whole.

Day 1 of my field trip was eventful and assisted me in gaining clarity about the catchment and the catchment processes. The first meeting was held at the ERS offices in Matatiele, where I was welcomed by the staff. I introduced myself to the team and they accepted me as a researcher in their catchment and volunteered to assist where they could. This was my first time seeing the people I had communicated with on the phone. This was also my first time in the catchment. The aim of visiting the ERS team was to gain an understanding of the work they were doing on the ground and have interviews with the different personnel. I also had to listen to them to understand how they worked with the people in the catchment and what processes they followed. After the meeting, I spent some time with the staff member who was responsible for the spring protection work for the organisation; this gentleman worked with the community members to find new water sources and to protect already available springs. We had a conversation and I got to understand more about springs. The reason this was of importance to me was because springs play a crucial role in water provision in the catchment, and there was already a symbiotic relationship which had developed between the spring users (villagers in the catchment) and the science and research organisations located in Matatiele. Following our conversation, the gentleman, a colleague from a sister organisation (that works with springs too) and I set out on a long journey towards the village communities to view the springs which supply water. On our way to the villages, we picked up various team members from the Eco-champs group (young people trained to be stewards of the environment and biodiversity champions), who would assist in the process of capturing information about the springs. We then proceeded towards our intended destinations (see Figure 5.4 below).



Figure 5.4: Picture of the catchment taken from two of the villages where springs are located

As we travelled around the villages, I was told more about the springs and which villages they supplied. I also had the opportunity to ask questions of the group and also various individuals about water issues in the catchment and the role of springs in securing fresh water. Pertinent issues were raised during the discussions and interviews, and some contradictions seemed obvious which were later deliberated on and confirmed via the expansive learning process (see Chapter 7). The team also showed me the framework they used to determine if a spring was worthy of being protected and designated as a viable fresh water supply. I managed to see for myself the process of measuring the flow and assessing spring health (Figure 5.5), thus gaining some understanding of the tools in use. We finished working around 14:00 and we headed back to the office.



Figure 5.5: Eco-champs, LIMA and ERS staff members assessing spring health

Day 2 of my field observation consisted of an in-depth interview with the project coordinator at ERS, who was responsible for the oversight of the UCPP and related affairs. This interview was held at the ERS office in Matatiele. Below is an excerpt of the interview, which highlighted some of the points which were important for further design of my research:

Researcher: How did you get involved in the Living Catchments Project?

Knowledge Coordinator: We were part of the Research, Development and Innovation (RDI), and we were coordinating the RDI platforms for SANBI for two and half years. So, through that process, we continued working with SANBI, because they were going to upscale the project into the Living Catchments Project. They called for proposals and we applied.

Researcher: How was the uMzimvubu Catchment Partnership Programme started?

Knowledge Coordinator: The project began before I worked at the company, however I have some knowledge concerning its inception. Conservation South Africa (CSA) had requested ERS to do a profile of the catchment, like a 20- year strategy for the uMzimvubu catchment. After that was done, CSA and ERS, after some deliberations and consultations, decided to form a partnership. This was done back in 2013, and CSA took up the Chairing role and ERS became the Secretariat.

Researcher: In your own words and based on your understanding, what is the UCPP?

Knowledge Coordinator: I would say that it is a coalition of various stakeholders who have the same vision, which is to restore the uMzimvubu catchment.

Researcher: Who are the stakeholders involved in the UCPP?

Knowledge coordinator: I will not name them specifically, but I will mention them sector wise. We have national departments, then provincial, then local municipalities, district municipalities, then NGOs, civil society groups, then parastatals, then traditional authorities, community-based organisations, academic institutions. That is basically it.

Researcher: Do we have people who are involved in built infrastructure in the UCPP? I am asking because I want to get an overall picture of who is involved in water issues in the catchment.

Knowledge Coordinator: We have people who are responsible for water supply in the catchment and they are found in the municipality. They are responsible for all types of water provision in the catchment and they are found in our municipality.

Researcher: Will it be possible to get all these different stakeholders under one roof, so that we can come together to learn about water security and measures? How can these different stakeholders come together so that we can proceed towards the journey of learning and finding better water management strategies?

Knowledge Coordinator: The UCPP holds meetings every quarter, and we will be having a meeting in May. Since I am involved in the UCPP and I coordinate, we could have you speak at the platform and share your research topic and objectives. The people in the catchment are very welcoming and they would not stand against you speaking to them.

Researcher: Thank you very much for your time and providing me with knowledge and insight.

Knowledge Coordinator: It is a pleasure Mzukisi, I am glad that I could assist. I will send you the details of the next meeting and we will schedule you to speak.

The above extract from the interview provided insight into the landscape context, the catchment and the stakeholders and activity systems involved in the landscape. It was from this meeting that I received an invitation and a slot to speak at the UCPP meeting, thus enabling access to the research site. The above interview also assisted me in beginning to identify and understand the activity systems present in the catchment and to map them out. The field observations, interviews and group discussions assisted greatly in providing me with clarity concerning the catchment context. Building up trust at this point influenced the research process and eased me

into the process of gathering knowledge. As a researcher, one has to be transparent from the onset and be humble enough to learn, because when entering into the research process you are going into a territory where people already possess some types of knowledge; it may not be scientific, but it could be valid, and you need to be open to the possibility of learning new things.

After I departed from the catchment I then went back to Grahamstown. Before I departed for Grahamstown, I had backed up the videos, photos and interviews that I accumulated during the initial field observation trip. I then spent some time in analysing the material and reflecting on the journey that I had embarked on. As I went through the information, I had a better understanding of the catchment, and I realised what were some of the important issues which had to be captured and what was not necessary. I kept a journal and noted everything that was important from the trip and the contradictions which emerged. I then used the time before the UCPP meeting to transcribe notes and to deepen my literature review. I also used the time to understand more about my research topic and prepare for the presentation that I would give at the UCPP meeting.

The meeting occurred in May 2021, and I travelled alone from Grahamstown to Matatiele again. The meeting was held at 09:00, at Resthaven Bed and Breakfast in Matatiele. The meeting was held on a Tuesday because it was convenient for most of the community members, because on the other weekdays the different chieftaincies held local meetings at their respective villages. I arrived at the meeting and various stakeholders were present. Some of the team members from the SANBI, who led and coordinate the LCP, were also present. The meeting started and minutes from the previous UCPP meeting were read. The meeting was well attended, there were even virtual attendees, and people of all ages were present and participated in the meeting. The representatives of the LCP were offered a slot to speak about the project and to explain what it entailed. The project inceptors spoke about the role which the LCP plays in co-learning and social learning and that they had students involved in the project at the various catchments. I was then introduced and given time to speak about my research (Figure 5.6). I spoke and elaborated on the research and how it could potentially assist in co-learning and knowledge generation in the catchment. I highlighted that I was not there to provide all the answers, but rather my role was to facilitate learning and create an environment where we could all come together to discuss water security and collective work on providing solutions which were contextual and catchment based.



Figure 5.6: Presenting my research to the UCPP in Matatiele

After presenting my research and explaining what it entailed, I then explained that if anyone was interested in being part of the research, they could see me at the back and sign up (Figure 5.7). This meeting consisted of the various stakeholders, and it gave me an opportunity to talk to them and give them a chance to join my learning workshops (Change Labs). After the session, people came and signed up for the research with a good measure of enthusiasm. I had created a spreadsheet which consisted of names, contact details and designation. This assisted me in keeping communication with the people who signed up. I also received a spreadsheet with other contacts who were not present in the UCPP meeting but were interested or who might have an interest in the research. I coordinated the information into one Excel spreadsheet and backed it up. After I was finished with this engagement, I had a greater understanding of the activity systems (see section 6.3) and I also managed to further note some contradictions which had emerged during the meeting. The full list of the research participants who participated in the Change Labs were sorted according to the activity system they belonged. The list was as follows (initials used for the sake of protecting the names of the participants):

NGO activity system: C.J., S.M., N.M., T.S., A.S. and M.S.M.

Traditional Leadership activity system: T.K., S.N., N.M. and L.T.

Community activity system: T.N., M.L., S.M., N.T. and V.M.B.

Living Catchment Project activity system: Z.M. and K.S.

Local government activity system: Z.Z.



Figure 5.7: People signing up to join the research group (Change Labs)

5.2.1.2 Phase 2 research process: Introducing the study to the participants, background of the Change Labs and VCF narratives/stories (A-view of the study)

When I arrived back in Grahamstown, I went through the list of the contacts I had received from both the meeting and the UCPP coordinators. I made sure that all the contact information that I had received was valid and working. I began calling the research participants and sent them text and WhatsApp messages to see the number of people who would be interested in joining the Change Labs for the learning process. The people who were interested in joining the Change Labs ranged from the chiefs in the villages, community members in the various villages, NGOs around the catchment, university students who are also from the catchment, people who were involved in other organisations working in the catchment but not necessarily inside Matatiele, and people from the district and local municipality.

I then decided to speak to the people as I had said, so that we could check the different dates which would be relevant for the Change Labs. I spoke to everyone, and we agreed that we would have our first Change Lab meeting in June 2021. Our first Change Lab meeting was held in Resthaven BnB in Matatiele. This venue was chosen because it was the venue which was used during the UCPP meetings and central to most people. We confirmed the venue and we made sure that everyone was happy with the venue. Before I left Grahamstown, I sent various emails just to confirm the details of the participants again and to confirm that they

would be present at the Change Lab. This time I did not travel by myself but I travelled with a research assistant. The reason why I opted to work with the research assistant was because I had read numerous Change Lab related research and I gathered from their experience that if you wanted to be effective and capture information adequately you needed a research assistant. It is imperative to find someone to give you a second opinion, someone to help expose you to another perspective, someone preferably who will not get weary writing notes and someone who will also be able to understand the concept of expansive learning. Fortunately, I worked with a suitable research assistant, who already had been through the expansive process in her own research. This was beneficial to me, because it meant that I could concentrate on the process completely and could engage with the research participants without being distracted with note capturing and taking videos. In addition to writing down the minutes and capturing the notes, my research assistant played a crucial role in assisting me in reflecting on the learning journey and to check if there were any blind spots that I might have missed.

- Background of Change Lab 1 and value creation narratives

On 14 June 2021, the first Change Lab session was held at Resthaven in Matatiele, in the uMzimvubu catchment. We arrived at the venue, and it was set up in a manner which was in line with Covid-19 regulations. The room was sanitised, spacious and all health protocols were followed. Before the meeting began, the code of ethics and purpose of the research were given to all the research participants to read (see Appendix A). I explained the meaning of the ethics document and the reason for the meetings in English and isiXhosa. I did this so that everyone participated in the meeting of their own freewill with a thorough understanding of the research process. All the participants signed the agreements, which entailed all information concerning the research and the fact that the meetings would be both audio and video recorded (see in Appendix B).

The first session for the day included introductions from everyone around the room, explanation of the research aim and objectives, and embarking on the first VCF with the participants. I also had to do an explanation of the VCF in both English and isiXhosa, before the participants could embark on the process. It is important to clarify concepts at an early stage, so that quality output could be a reality. The data which was generated from the various expansive learning sessions was guided by inquiry questions which stemmed from the VCF tool and CHAT methodological framework (see section 3.5.1, section 4.3 and Figure 5.2). The VCF was used as a tool to understand the need state and the aspiration (Learning Action 1 in

the expansive learning process – see section 5.2.2.3 and Figure 5.8); it was a useful tool for this project especially for tracking emerging learning in the expansion of the object to co-manage the catchments better for a water secure future. For the VCF, value creation narratives were used; it is in the context of these narratives that one can appreciate what learning is taking place (or not) and what value is created (or not). They included both personal and collective narratives. The personal narratives refer to the experience of participants. The collective narratives relate to the social networks and communities in which people participate (Wenger et al., 2011); in this case, I focused on the activity systems. The VCF was used as a formative evaluation tool for expansive learning, and it helped to generate data on process outcomes, e.g. transformative agency of the research participants.

Stakeholder engagement, document analysis, interviews, focus group discussions and field excursions analyses were used to understand the activity systems and understand the cultural historicity of the object (water co-management), to track the value of past or prior learning and capture contradictions which existed or were arising in and between activity systems (see Chapter 7). This entire process was then further explained to the participants, so that they could have a full appreciation of the research process which would soon unfold.

As discussed earlier in Chapter 3, the VCF offers lenses to evaluate the value created for the stakeholders out of the social learning process. The lenses are as follows: **Immediate value:** What happened and what was my experience of it? **Potential value:** What has all this activity produced? **Applied value:** What difference has it made to my practice/life/context? **Realised value:** What difference has it made to my ability to achieve what matters to me or other stakeholders? **Transformative value:** Has it changed my or other stakeholders' understanding and definition of what matters? (Wenger-Trayner & Wenger-Trayner, 2014). There are also associated inquiry questions from the VCF which I adapted and used in my context and there are also change indicators and potential sources of data I used for my study site (Table 5.2).

Table 5.2: VCF narrative interview tool

<u>Questions</u>	<u>Response</u>
1. What meaningful activities did you participate in with regard to water management?	
2. What specific insights did you gain from this? What access to useful information or material did you gain?	
3. How did this influence your practice? What did it enable that would not have happened otherwise?	
4a. What difference did it make to your performance or your life? How did this contribute to your personal/professional development? 4b. How did this contribute to the goal of the organisation or your own activity (e.g. farming)? Qualitatively? Quantitatively?	
5. Has this changed your or some other stakeholder's understanding of what matters when it comes to water management and water security?	

Source: Wenger-Trayner and Wenger-Trayner (2014)

The stakeholders in the activity systems understood English, but most of them were isiXhosa and Sesotho first language speakers. As a person born and raised in the Eastern Cape, I was fortunate to be able to understand and speak the language spoken by the natives of the catchment. This provided me with an advantage in terms of translating and explaining the VCF in a language palpable to the participants. Using agricultural adjectives and examples was also a great learning tool to explain this framework. As mentioned above, the contextual profiling trip provided me with a good idea of the context of the catchment and gave me a common ground with the participants to access valuable information advantageous to the research. This trip also allowed me to understand the activities of the catchment and what was generally deemed as valuable by the communities of the catchment.

Forming part of the catchment community and appreciation of the uMzimvubu context allowed me to understand the catchment community better, hence, I attended the UCP meetings and other related uMzimvubu catchment meetings regularly. The formative interventionist role

assisted me to be entrenched in the catchment and understand the issues of water plaguing the communities. CHAT research considers culture and history with the goal of concept development (Engeström & Sannino, 2010). Concept-formation refers to the process through which researchers and practitioners create collective notions that serve as a driving force for progress (Postholm, 2015). The participants were given another opportunity to pose questions and comment on the VCF tool and the notion of value creation. After that step, they were given the VCF tool to fill in. The VCF tool had guided questions which related to the object of water management. The VCF was explained according to the different types of values which were expressed by Wenger-Trayner and Wenger-Trayner (2014). Every question which was in the framework was explained and interpreted. Each question was an indicator of a particular type of value, and the questions were streamlined to be able to express the learning outcomes (see Appendix C).

The information from the VCF forms, filled in by the participants, were then collected and scanned, so that they could be kept safe in the online research repository. The VCF tool in this first phase (see Chapter 6) assisted in evaluating the current state of learning about the shared object, however, the data from this phase also assisted in the development of mirror data. A formative interventionist researcher collects mirror data as part of the expansive learning process to assist learning participants in understanding their own activities (Cole & Engeström, 2007a). The VCF tool clarified the immediate, potential, applied, reframing and transformative value regarding water security and management (reported in Chapter 6). As a social learning evaluative tool, I could then understand the diverse ways of learning relating to water security and management which the participants found valuable in their own context. From this, I was also able to surface initial indicators of social learning (see section 6.4). People are learning all the time and as a formative interventionist researcher, I had to always be aware of this. The people involved in the Change Labs had already been, in one way or another, exposed to learnings concerning water resources and management of water. So, that is why it was important to identify where there had been learning value prior to the LCP. The participants were fortunate to be in a catchment where there was visible activity concerning the greater NRM, where some organisations had been in the catchment for a long time and were focused on collaborating with communities and also empowering communities in order to achieve certain NRM goals. The fact that I was able to receive such a wide array of participants and a diverse stakeholder group reflected the fact that the people in this catchment were already keen and willing to learn more about water co-management and water security. As noted in Chapter

1, this catchment is one of the SWSAs in South Africa, however, the people on the ground still struggle with water security and everyday access to water. The people in this community are very open to any sort of assistance and empowerment which would allow them to have more water provision and secured water resources. Upon receiving the value creation forms, I then had to analyse them to find the different types of sources of value which were present from the forms filled in by the participants. I then differentiated and grouped the sources of values according to the VCF matrix.

The first session was fruitful because the research participants engaged in deliberation on the importance of water management and the importance of their catchment in providing water for other places beyond the catchment – this helped us to explore the shared object of activity and also to map out an understanding of the activity systems involved, their learning and interests in the object of co-management of water resources (see section 6.3). The research participants were enthusiastic about the process because some of them were exposed to issues of water shortages daily (see chapters 6 and 7). The first VCF analysis essentially produced value creation narratives from diverse stakeholders. From this, indicators of value being created were derived which together with other ethnographic data from the workshops, and earlier field visits, were used to develop better understanding of the activity systems and the contradictions analysis for mirror data in the future Change Labs. What was important in this process of VCF analysis, was to establish whether there was already co-management emerging or not and the associated challenges.

5.2.1.3 Phase 3 research process: Embarking on the expansive learning process

Phase 3 of the research entailed building on Phases 1 and 2 which provided starting points for questioning at the first step in the expansive learning process (this included the VCF tool analysis and the activity systems analysis). This process eventually consisted of six sessions in total. The Phase 3 process followed the expansive learning cycle (briefly introduced in Chapter 1) which is a process which was formulated by Engeström (Figure 5.8). When the participants came back, I explained the cycle and what expansive learning entailed. After this explanation and telling them about the learning journey we would embark on, I gave everyone a chance to make comments and to pose any questions before we commenced further. The session proved to be interesting and thought provoking, because the participants admitted that they had not been previously exposed to such a type of learning and collective analysis of water issues in their catchment (see Chapter 6 for evidence).

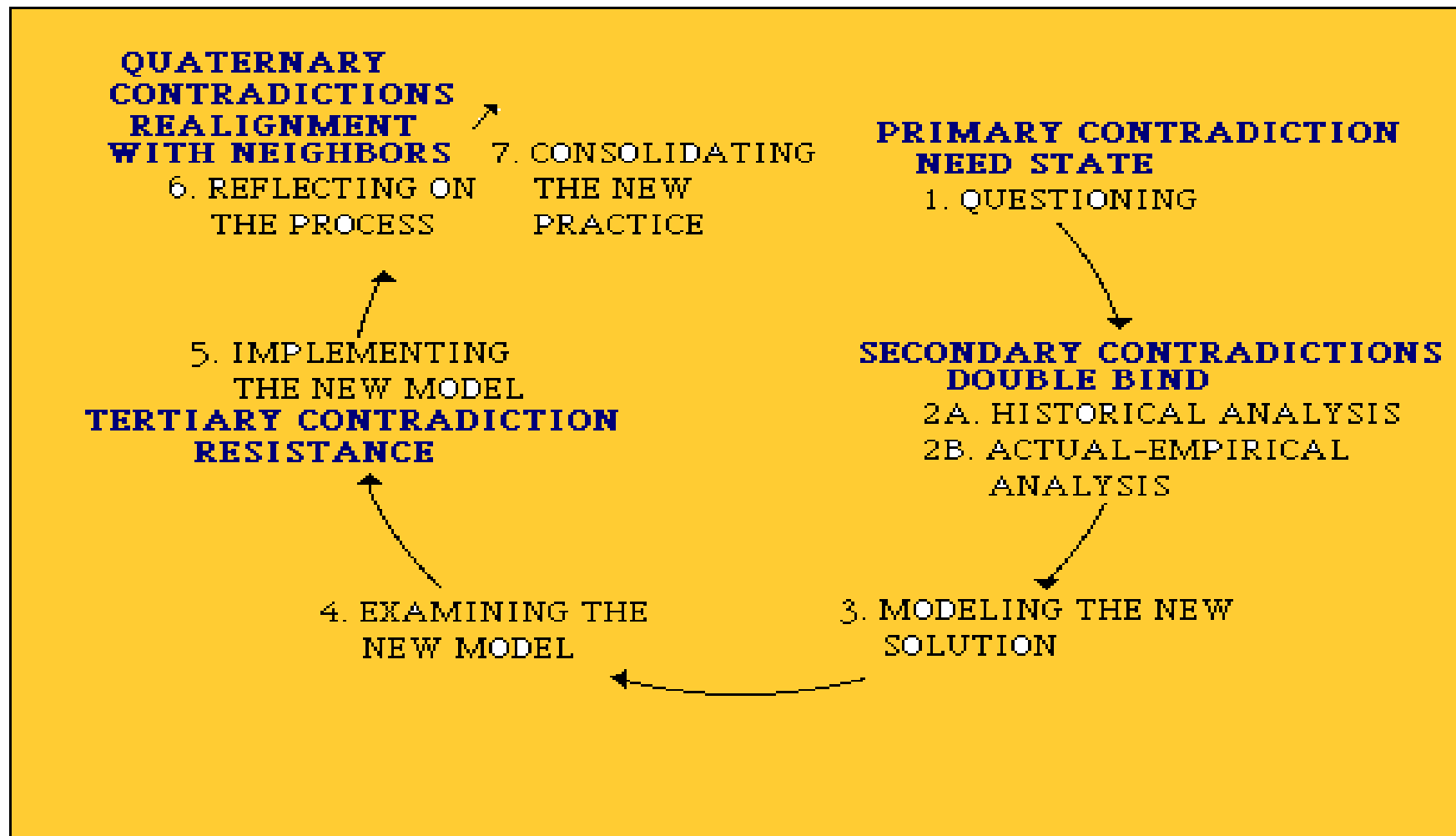


Figure 5.8: Expansive Learning Cycle (Engeström, 2003) with seven learning actions (1-7) that guide the expansive learning process.

Phase 3, at point 2A and 2B in the expansive learning process involved the analysis of the contradictions which surfaced from the initial questioning *with* the interacting activity systems concerned. This is to prioritise contradictions to resolve, which leads to modelling of solutions at point 3 in the expansive learning process, and proceeds towards working on the new or revised object via the ongoing expansive learning cycle (which is not necessarily linear) (Figure 5.8 above). The Change Laboratory method was mainly used in this phase. The Change Laboratory method in this evaluative formative intervention research was used to understand the contradictions and to work with participating activity systems to expand the object of activity in the study (discussed in section 5.2 and described in Figure 5.1). The Change Lab is used by a natural team or work unit, initially with the assistance of a formative interventionist researcher who assists with producing mirror data as a double-stimulation tool to catalyse deliberations and volitional action in the expansive learning process (Engeström et al., 1996; Engeström & Sannino, 2010).

In the case of my study, my role was that of a formative interventionist researcher, which essentially implies that I was assisting in the learning process and aided in the creation of a new object for the various activity systems. The methodology which I used in the Change Laboratory was based on the notions of re-mediation and dual stimulation, derived from the CHAT (see Chapter 4) (Vygotsky, 1978; Leont'ev, 1978; Engeström, 1987; Cole & Engeström, 1993; Engeström et al., 1996). One of the key reasons I chose the Change Lab is that work usually starts with the mirror of present problems which I presented based on the initial field-based engagements and VCF data through which I developed rich pictures of the activity systems with those that I engaged with and the contradictions emerging as stimulus material in the expansive learning processes in the Change Lab (explained above). The course of the Change Lab proceeded by tracing the roots of current trouble by mirroring experiences from the past and by modelling the past activity system (Engeström et al., 1996) (see Chapter 6).

In each Change Lab, I presented the mirror data that I had extracted from analysing the information I had collected and transcribed to the group. At the beginning of the Change Lab and the value creation process, we were fortunate enough to use a venue which had a projector and a place to plug in my computer so that I would not just speak about the contradictions, but also project them up on the screen so the participants could see the contradictions represented. With the help of my research assistant, I was able to have someone to note and capture all the mentioned important points which related to the contradictions. Some of the initial data

included pictures which were taken from the field. The pictures were extracted and provided captions which were in line with the pictures or provided some further explanation of the picture. This proved to be important as mirror data and it enabled the participants to speak freely concerning all the projected contradictions. I endeavoured to allow everyone to participate and comment on the contradictions, because the important thing about the expansive learning process is that it allows everyone in the group to have an opportunity to engage in the process (see chapters 6 and 7).

The Change Lab provided a setting for the learning participants in the uMzimvubu catchment to work through their problematic situations by analysing the contradictions involved in their contexts and modelling solutions. According to Virkkunen (2006, p. 49) transformative agency entails “breaking away from the given frame of action and taking the initiative to transform it”. The Change Lab method forms a complete conceptual framework and is an effective tool for collaboratively analysing and solving multidimensional problems (Lund, 2021). According to Engeström (2015, 2016), the development of transformative agency necessitates a process of expansive learning, and the notion of double-stimulation is critical for developing agency and consciously influencing behaviour (Engeström, 2009; Sannino, 2015).

The importance of expansive learning is the ability it provided to all the participants to engage with the contradictions and examine their agency. Therefore, questioning and continual revision of the status quo is at the heart of expansive learning. Participants were encouraged to comment on the highlighted or projected contradictions and to have conversations with the bigger group and among themselves to express their views on the projected contradictions and give their perspectives on the issues which related to water security. Step 1 and step 2 of the expansive learning cycle were very much linked and sometimes there were overlaps (see Figure 5.6). Some of the highlighted contradictions had been present in the catchment for an expanded period, so it was beneficial throughout the process to have people who were slightly older and had been involved in the catchment issues for some time and who had grown up in the catchment so that they could provide the cultural and historical contexts of the contradictions (Figure 5.9).



Figure 5.9: Chief T.K. speaking on the history of one of the contradictions in the catchment

This process allowed people to engage and it propelled discussions which stimulated learning. This also gave me as a researcher the confidence to know that people were not being passive, but were being active in the learning journey, because the contradictions which were raised were not merely theoretical concepts but issues which were apparent in their everyday lives and livelihoods. In addition to the highlighted contradictions, there was also time given to the participants to speak on any other contradictions which they felt were a problem in their area (relating to water issues). The duration of the Change Labs for this PhD was determined by various factors including study site visits, Covid-19 lockdowns, availability of the stakeholders involved in the project and engagement with the Living Catchment Projects management.

- Learning Action 1: Primary contradiction need state (Questioning)

The first Change Lab occurred after the lockdown restrictions were eased in June 2021. This Change Lab comprised representatives from the local municipality, the Congress of Traditional Leaders association, catchment dwellers, ERS, LIMA Rural Development Foundation, CSA, LCPs and a student who grew up in the catchment and studied environmental management. We then commenced on the learning journey by following the expansive learning cycle. I had already prepared some contradictions for discussion, which I had perceived during my

contextual profiling trips from the interviews, field observations and group discussions and from what I had learnt about the LCP in Bergville. These endeavours assisted with providing the context of the greater Living Catchments Project (in Bergville I received an opportunity to learn about the LCP project plans and partners), where I personally experienced the landscape and the people of the catchment (during field visits and spring hunting); gained insight into the UCP and various water programmes coordinated by the ERS (gatekeepers and knowledge custodians); and learnt about water issues and springs from catchment dwellers (through focus group discussions with the uMzimvubu catchment Eco-champs: youth who were part of the Presidential Employment Stimulus). The exact details of the endeavours which assisted and supported the process in Learning Action 1, the primary contradiction need state, are as follows (occurred from April 2021):

1. Individual Interview 1 with ERS project coordinator (Tsoanelo Shata)
2. Individual Interview 2 with ERS springs coordinator (Batho Mosuang)
3. Focus group discussion with ERS springs coordinator, LIMA representative and six Eco-champs (Batho Mosuang, Thabiso Erasmus, Zuko Kibi, Motobatsi Nthunya, Resisitsoe Mosua and Thankiso Chapi)
4. Change Lab group discussions
5. Field visits and observation
6. UCPP quarterly meeting
7. Living Catchments Project introduction in Tugela Catchment (Bergville)
8. Focus group discussions with community members (Amanda Kaluku and team)
9. Individual Interview 3 with LCP Cluster 1 leader (Dan'sile Cindi)
10. Individual Interview 4 with LCP Cluster 2 leader (Tanya Layne)
11. Individual Interview 5 with LCP director (Mahlodi Tau)
12. Individual Interview 6 with Eastern Cape DFFE provincial director (Nandipha Makwetu)
13. Individual Interview 7 with Eastern Cape DFFE deputy provincial director (Unathi Makati)
14. Individual Interview 8 with WRC and LCP coordinator (Shanna Nienaber)
15. Individual Field Interview community member (wattle harvester) (Mr
16. Semi-structured Field Interview (Zuko Fekisi and team)

The mirror data of the present and the past contradictions (including different factors affecting co-management of water resources and potentially jeopardising water security in the catchment) were presented. Contradictions: paralysis/conflict of motive. Double-stimulation tools were introduced to unlock the contradictions. These included:

- The ethnographic details of historical strategies of water management in the catchment.
- Technical data relating to water management in the catchment from the local municipality.
- Discussion of various laws and regulations (e.g. National Environmental Management Act, Public Finance Management Act, various water and housing policies) relating to water stewardship and governance.
- Presentation of the Expansive Learning Cycle.
- Explanation of the VCF tool and the discussion of the CHAT activity system analysis model.
- Video and audio recordings.

I used the projector which was available and the board as a mechanism to express the contradictions and the points which were raised during the meeting. There were two whiteboards adjacent to the protector where the research assistant could note down important matters which would emerge during the meeting. I presented the contradictions on a PowerPoint presentation, along with some photos that I had captured from the field; these were used as a mechanism to spur conversation and to commence the expansive learning journey. So, we as a learning group began questioning some of the water-related issues which were apparent in the catchment and which seemed to be prevalent for some time. The process of questioning took up some time because it allowed the participants to actually reflect on what was happening in their catchment and to also see what some of the things were that were actually hindering water security (see Chapter 7).

- Learning Action 2: (a) Historical analysis and (b) actual empirical analysis

Following the initial questioning, we then proceeded to the process of historically analysing the contradictions and subsequently looking at the actual empirical analysis. An advantage which was apparent in this group was the great range in terms of years and experience, and also the diverse stakeholders which were involved because this meant there would be a variety of opinions, views and explanations about why things were the way they are. The chiefs and the elders from the various communities provided some insight into what the catchment was

like years ago when they were growing up (see section 6.3.3). The organisations which work in the catchment also produced some scientific explanations of why things were the way they are. The young people and the university student who were from the catchment also produced certain views which related to the contradictions. The group received homework, which was to do an analysis of the activity system they formed part of, and to think of solutions relating to the water issues which were present in their own context. The session ended and the group collectively decided on the date for the next session. I then collected all the information from the session and backed it up. I then transcribed the notes from the audio and visual recordings and used the material to act as mirror data and a stimulus tool for the next session.

- Learning Action 3: Modelling the new solution (Change Lab 2)

The next session occurred in July 2021, at the same venue, and included modelling of the new solution. The research participants were acquainted with the expansive learning cycle from the previous sessions. This session included a recap of the previous sessions and a reflection on the process that had happened prior to this session. The participants were also presented with white paper, coloured paper, coloured pens, photographs of the contradictions, 3rd generation CHAT diagrams and a white board to further work on the potential solutions. The research participants were given an opportunity to comment and discuss what had happened and what they had learnt from the previous sessions, and how they approached their homework. The different participants at this point began to grasp what active activity system analysis entailed, because I had spent time explaining it to them (see section 7.3 on emerging agency). So, they were able to present solutions which were activity system based and which were related to a certain object. This process proved to be quite a fruitful endeavour and the participants appeared to work well with the activity system analysis – they expressed that the framework allowed them as community members to analyse the problems or contradictions which were found within their context in a systematic way, which was not too complex to understand, but was context specific and provided tools which one could use to solve certain issues. Below are some quotes related to the expansive learning process:

Researcher: How has explanation of the expansive learning process and the CHAT diagram assisted you in terms of understanding the challenges your community faces with regards to water management?

NGO activity system (Change Lab discussion): From my homework I decided to focus on the issue of funding with regards to water management. The Department of Water and Sanitation (national and provincial) and the local municipality policies have important policies and tools we

need to work with. My object is water management. My subjects are the water users, such as the communities, traditional leaders, political leaders, water steering committees and the municipality. The rules should incorporate spiritual, traditional and cultural rules, with technical and scientific rules. The division of labour should include NGOs, engineers, then technicians to artisans (to give information to community in simple terms).

Traditional leadership activity system (Change Lab discussion): As a chief in one of the areas in this catchment, this CHAT tool has the potential to assist me organising my thoughts towards solving problems I encounter in my area, because it assisted me in analysing problems and sorting them in a new way. With more practice and application, I can use this as a tool in my community.

The research participants decided to be separated into two distinct groups (based on contradictions they wanted to attend to): the groups consisted of various stakeholders from the different participants found in the catchment and also each group had chosen which contradiction they would like to look at relating to water management and water security (Figure 5.10) (see section 8.2.2). The groups received different colour papers, highlighters, sticky notes and markers, so that they could start on the process of modelling new solutions which they believed were relevant in the context of the catchment.



Figure 5.10: Research participants in group 2 modelling new solutions

This process was well received by the research participants because it allowed them to use the skill sets and knowledge they possessed and also it invoked within them and reminded them that they had agency, and that they were also agents of change in their respective communities

in the catchment. After this session, the research participants were given enough time to sit and use sticky notes and analyse their contradictions which they had now chosen. Some of the participants took it upon themselves to present to all the participants some solutions to a certain contradiction relating to water management, which they deemed as important and needed to be addressed. First and foremost, we went through the solutions which people provided relating to the specific context and how they used CHAT to try and get to answers relating to the contradictions that they felt they had agency over. This process allowed interaction among the group and it ensured that everyone in the group understood that they possessed the right to share their view, and that whoever spoke was respected, whether they had informal or formal education. We spent time deliberating the various solutions modelled by the participants and questioning the solutions they posed, and the agency they had in that particular context. This is a quote from a participant who worked on their homework, looking at waste as a hindrance to water management; this expresses how participants were working with the activity system framework to analyse their activity.

NGO activity system (Change Lab discussion): I decided to look at littering and waste management as the foundation of spring protection. The object is to successfully manage waste in catchment. Tools include the policies and regulations already mentioned. Including addressing the need for infrastructure for people to deal with their waste. Awareness and capacity development. Developing economies around waste. If waste has value, people will stop littering. Through recycling schemes, building capacity within communities to take advantage of these value streams. Subjects are spring users. Rules and regulations speak to tools again. Incentivize the waste economy, produce a feedback, ‘so how can we hold waste producers accountable for their waste?’ I am not talking about the spaza shops here, I’m talking about the big industries like your Coca Cola, Unilever, the guys where all this waste is coming from. How do we hold them accountable and how to allow for the feedback to come back into the community? Effective waste management structure, holding the mandate of institutions accountable for this waste. How do we pull the local and provincial municipalities into this to deal with this waste? From a community perspective, maybe we need leadership to take control and stipulate where waste is disposed and to put in place sanctions for littering, and other sites of disposal of waste. Nappies are a huge thing, leaders need to come together and develop a nappy protocol, ‘how to deal with nappies disposing of?’ The Department of Water and Sanitation, civil society (maybe soldiers and society) protecting the springs and for awareness. The Alfred Nzo municipal, the local Matatiele municipality, as the mandated waste authorities. The Individual, because we need to take it upon ourselves to address waste in these areas and it’s on our conscious. Local institutions. Create community forums to deal with this waste issue. Traditional authorities, they have the leaders of community they have authority and capacity to make decisions regarding this. And the corporates like Coca Cola, Unilever, the Pepsis, the Pick n Pay’s (because of nappies and plastic packets.) Division of labour, I was not entirely sure how to work with it, maybe we can discuss it together.

- Learning Action 4: Examining the new model (Change Lab 3)

The next session was in September 2021 at the same venue. It mainly involved research participants presenting to the rest of the bigger group the initial model which they had perceived could be used as a solution to the particular contradiction which they had chosen (Figure 5.11). Each group was able to choose a leader which would represent the distinct group and present what they had collectively chosen to be a solution. This was also a mechanism to propel collective learning because the solutions which were expressed by the different groups were very much catchment based and context specific – these were also solutions which the group could implement after the group had presented their distinct solutions (see Chapter 8). There was a time dedicated to asking questions concerning the solutions which groups had proposed and examining the solutions.

After the research participants presented the new model, time was allocated so that they could sit work on re-examining the model, taking into consideration the comments which they had received after they presented. The group then collectively decided what they would do with the models that they had created, and they discussed a time, place and way to implement the model.



Figure 5.11: A research participant presenting the group work related to the chosen contradiction

Table 5.3 below shows the questions which were used to guide the activity system analysis. These questions were contextually adapted for the study and were used to assist the participants in analysing the activity systems. The questions were translated into the language of the catchment, so that everyone could fully comprehend what was happening. I presented this activity system analysis guide to the participants again and handed it out to them so that they would be able to use it as they modelled their solutions. The Eight-Step Model of Analysis was helpful for the participants, even when they were modelling their solutions and implementing their project. I did not meet with the different participants for two months, as we had collectively agreed that they would require time to develop their model and test it on the ground. Providing this adapted model to the participants proved to be quite a fruitful venture, in that it was a good double-stimulation tool to spur learning and to help in formulating the modelled solutions. The participants did not only have tools to assist them with modelling solutions, but they actually learnt about the actual frameworks and theories of learning. This is the essence of learning, where the learning participants are not only told what to do but are equipped with tools which can help in enhancing their agency. When peoples realise their agency and are involved in defining areas or issues of concern, this potentially leads to sustainable outcomes and longevity of solutions. The question areas in Table 5.3 were used to guide more contextually specific or adapted interview schedules and focus group discussion protocols.

Table 5.3: Question areas that guided activity system analysis

The Eight-Step Model of Analysis		
Step	Activity System Component	Question To Ask
1	Activity of interest	What activity are you participating in when it comes to water management/water security?
2	Subjects	Who are the main people involved in carrying out this activity?
3	Community	What is the relational environment in which this activity is carried out? Who else is involved?
4	Object of activity	Why is the activity taking place? What is the object of interest? Why is this activity needed? By whom?

5	Tools	What approaches, tools, resources and ideas are being used to guide this activity?
6	Rules and regulations	What are the cultural norms, rules or regulations governing the performance of this activity?
7	Division of labour	Who is responsible for what when carrying out this activity and how are the roles organised?
8	Outcome	What is the desired <i>outcome</i> in carrying out this activity?
9	Challenges, disturbances, conflicts	Are you experiencing any challenges, problems, conflicts or disturbances while trying to engage with this activity? Elaborate on these?

Source: Adapted from Mwanza-Simwami (2001)

They also planned how they would move on to the next section of the expansive learning cycle, which included how they would implement the new model that they came up with. A WhatsApp group (Figure 5.12) was created during the session and the contact details of the various participants were shared among the participants so that they could communicate about the unique solutions they would come up with and how exactly they would implement their models.



Figure 5.12: List of some of the WhatsApp group Change Lab participants

Note: There were other participants in the group and the view of the total number is limited because a screenshot was taken of the group). Three of the participants did not have WhatsApp, so they were contacted through calls and short messages.

- Learning Action 5: Implementing the new model (tertiary contradiction resistance) (time between Change Lab 3 and 4)

In fulfilment of the next step in the expansive learning cycle, the different groups were given time to test and implement the solutions that they had come up with collectively. This was done outside of the Change Lab, during the time between September and November. There was constant communication between me as a formative interventionist researcher and the research participants, with the group at large and also with anyone else who was involved in the learning process, which included the LCP coordinators. The groups gave feedback regularly on the work which they were testing and implementing in their catchment (Figure 5.13). There were conversations occurring and an open line of communication was always available whenever they required my input as the researcher or if they wanted to speak to the research assistant.

The groups began testing and implementing their various solutions that were context specific. The time which the groups were given to implement the new models was two months. This is because the groups consisted of people who were already working, chiefs who had regular meetings in their respective communities and organisations that were doing work on the catchment landscape. We collectively agreed on two months, because everyone felt that this was sufficient time to implement the model and that it was feasible. They reasoned that the agency they had was sufficient to implement solutions properly if they were given two months. Also, during the time when the groups were busy implementing their solutions, there were preparations for the day when the participants would report on their solutions, within a larger group which consisted of some members of the UCPP. During this time, I was also giving feedback to the LCP coordinators concerning my research process, as they had an interest in the methodological approach I adopted. The groups decided that there would be a presentation of the testing and implementation processes, and time to reflect on the entire expansive learning process. We all decided on a time and a date when we would have the session to reflect on the processes and presentations of the models which by then had been implemented.

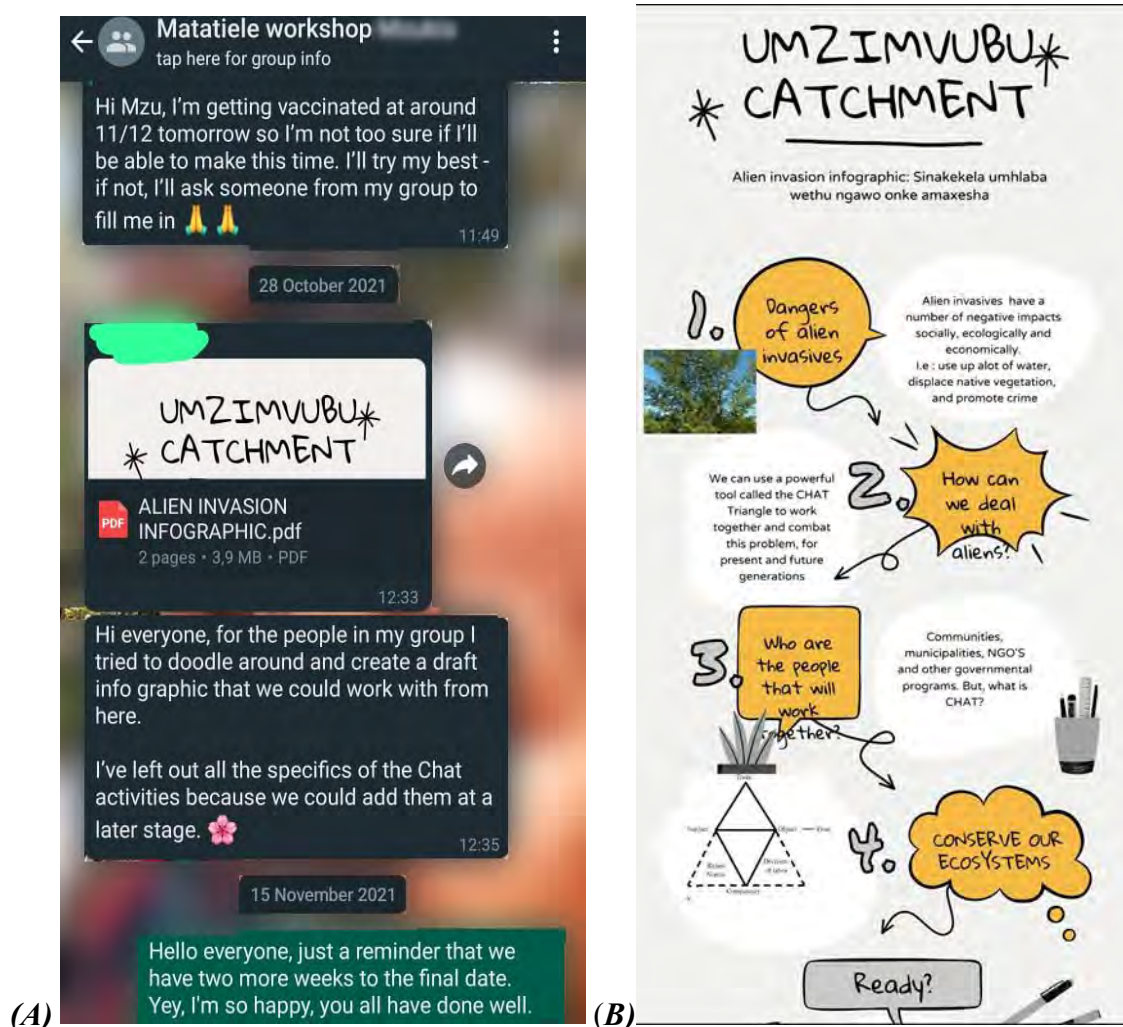


Figure 5.13: Evidence of communication in the WhatsApp group (A), including group data and development of infographic of alien invasion (B)

Change Lab 4: Presentation of modelled solutions by the two different groups

After the two months, in November 2021, the next Change Lab session was held again at the same venue where all the other sessions were previously held. This session included the reflection on the learning process which we had embarked on (see Chapter 8). It also involved the presentation of the models which the various groups had begun to test and implement in the catchment. Present were some members from the SANBI who led the LCP, other governmental departments, governmental parastatals, NGOs and various chiefs from the catchment (subjects involved in the various activity systems as elaborated on in section 6.3). The various stakeholders attending the presentation had an interest in the entire expansive learning cycle which the research participants had embarked on. They were also interested in the solutions which the research participants had begun testing and implementing, along with the expansive learning process.

The groups presented the solutions in an activity system analysis manner and they told us about the journey that they had undergone in implementing their solutions (Figure 5.14). They spoke about the challenges they experienced and how they overcame those challenges. The groups expressed the importance of the solutions they had modelled and the potential they had to change the catchment with regard to co-management of water resources (see section 8.3). At the end of the presentations, there was time for questions which were posed by various people from the catchments, some who were not part of the research process, but who wanted to come to this session to learn about the solutions and how they could possibly adopt them in their own contexts.



Figure 5.14: Model solution proposed by one of the Group 2 members

This session also included presentation of certificates. The certificates, which the research participants requested, would serve as a token of appreciation following their involvement in their entire learning journey (Figure 5.15). As a researcher, I deemed that it was necessary for the research participants to receive this certificate and the LCP coordinators also agreed because the learning process we had undergone formed part of the objectives of the LCP. In addition, the solutions which the research participants modelled were also helpful in achieving the objectives of the LCP. This was also an endorsement from SANBI, which is part of the LCP activity system which as a rule producing activity system (see Appendix D for an example of the presented certificate).

The research assistant managed to do a recap of the entire learning journey we had gone through (from June 2021 to November 2021) and explained again the importance of the expansive learning cycle. During this time, people who heard about the expansive learning cycle process we went through were interested in the process we undertook because they stated that it was the first time that different stakeholders in the catchment had come together and collectively learnt about water security and co-management. One of the chiefs in the area and a secretary of the Congress of Traditional Leaders had this to say about the expansive learning process we had embarked on (him included):

This was the first time ever that the actual water providers, the municipality, actually joined the conversations and explained the process of water provision for the catchment. As the chiefs who have been present in this learning process we are thankful for this process because it shows that our views and the communities' views are actually appreciated. This has showed that people who do not necessarily have the same type of formal academic training and skill sets, but have context specific and catchment based local ecological knowledge are actually recognised as important in the process of water co-management and seen as people who could add value in knowledge creation.

- Learning Action 6: Reflecting on the process

This was important to hear as a researcher and also to understand that the work which I had embarked on was not just theoretical but was action-oriented and could potentially affect processes on the ground. After the certificates were issued (Figure 5.15), we reflected on the entire process.



Figure 5.15: Chief T.K., Secretary of the Congress of Traditional Leaders (Traditional leadership activity system), receiving a certificate

Notes were taken during the final session; the notes included the reflection process we had embarked on, the messages delivered by SANBI personnel concerning the LCP and the way forward in relation to the expansive learning process and the modelled solutions. These notes were shared among the research participants so that they could see how they could partner up with other catchment stakeholders; in this way the journey which they embarked on could be more effective and applied in other catchment contexts. The research participants (Figure 5.16) then took the comments they received so that they could consolidate them into the new practices that they had come up with and so that they could actually use the points they had received in order to create new practices which were context specific. Also, of importance throughout this whole expansive learning cycle was that I made time for transcribing the recordings of each session, so that I could use the transcription notes to feed into the following section of my study.

5.2.1.3 Phase 4 research process: 2nd Value Creation Framework narratives/stories (B-view of the study)

Phase 4 was primarily concerned with the B-view, which focused on the evidence of value creation from the expansive learning process in terms of co-management and the expansive learning process itself, after I had concluded with my research process (it drew on data from phases 2 and 3). The B-view was developed using the VCF tool and assisted in understanding the value which had been created for the stakeholders in the activity systems, concerning the shared object of activity that emerged out of the expansive learning process. The fourth phase included filling in the VCF forms by the research participants who underwent the expansive learning cycle journey. The research participants were acquainted with the VCF now (because of prior exposure in Phase 2), but I elaborated again so that the participants were focused on precisely what was required of them. Phase 4 was deliberate in gauging what value had been created from the expansive learning process. Chapter 9 describes the types of value which the participants accrued from the expansive learning process.



Figure 5.16: Research participants at the end of the last session (including some of the presentation attendees mentioned above)

Table 5.4 below offers a summary of the methods, actions and data types used across the study. As described above, these evolved over some time across the phases of the study. For ease of reference, I also include an overview of the full corpus of data that was used for the phased analysis that is described above, with empirical details of the data shared in the process analysis in the following chapters.

Table 5.4: Summary of methods, actions and data types

Methods	Actions	Data Type
1. Activity system analysis	Document analysis, field observations, interviews and focus group discussions	Qualitative data sets, including interview transcripts, photographs, personal notes and videos DATA SETS: #2015 to 2021 uMzimvubu catchment newsflashes updates #4 hours of transcribed interview data #45 photographs from #4 days of fieldwork #5 pages of fieldnotes #10 minutes of video clips

2. Embarking on Change Labs and value creation narratives (Change Lab 1)	Introduction to research and explanation of the research process. Using the VCF tool to analyse existing learning to date	VCF questionnaires Value creation narratives relating to past learning DATASETS: #132 minutes of video clips #6 hours of transcribed Change Lab data #38 photographs from Change Lab session
3. Embarking on the expansive learning process	Follow the seven steps of the expansive learning cycles	Oral reflection from learning participants in response to interview questions, presentation of photographs, and observations from fieldwork DATASET: #100 minutes of transcribed data from interviews Change Lab video data listed above
4. Learning Action 1: Primary contradiction need state (Questioning)	Present images, photographs or videos of contradictions in the catchment	Written material, notes and interview data from document analysis and contextual profiling field DATASET: #120 minutes of transcribed data from interviews Change Lab video data listed above
5. Learning Action 2: (a) Historical analysis and (b) actual empirical analysis	Open space for cultural-history analysis of contradictions, through discussions, questions and probing based on literature	Written material from discussions, presentation notes and reflection notes DATASET: Change Lab video data listed above

6. Learning Action 3: Modelling the new solution (Change Lab 2)	Learning participants begin to develop models to work on the chosen contradictions. Learning participants begin to work in groups to create new models which can collectively try to resolve the common contradiction	Learning participants' activity system models, oral reflections and video recordings DATASETS: #29 Photographs #20 minutes of video recording #4 hours of transcribed Change Lab data #4 Images of activity systems developed by participants
7. Learning Action 4: Examining the new model (Change Lab 3)	Learning participants refine the model they have developed and take more time to analyse the contradictions	Refined activity system models, graphics and presentations DATASETS: #5 hours of Change Lab transcription #84 photographs from Change Lab session #42 minutes of video recording
8. Learning Action 5: Implementing the new model (tertiary contradiction resistance) (time between Change Lab 3 and 4)	Participants present their models to people in their contexts, to understand the feasibility and applicability of their models	Further refined activity system models, clearer solutions to contradictions and comments on their work by the community DATASETS: #4 hours of Change Lab transcription #80 minutes of video recording #49 photographs from Change Lab session #Presentations from groups #Reporting tool

9. Learning Action 6: Reflecting on the process	Open a space for learning participants to reflect on the entire expansive learning process. 2nd Value Creation Framework narratives/stories (B-view of the study)	Written reflections and oral reflections. DATASET: Value creation forms and narratives relating to new learning and potential new indicators

Source: Author

As can be seen from the above, the study produced a large volume of data that needed to be carefully managed according to the phases of the research process as it unfolded.

5.3 Managing the Data

5.3.1 Triangulation of data

Research triangulation refers to the process that assists in increasing the research credibility and validity. In simple terms, triangulation in research is aimed at validating the study results (Noble & Heale, 2019). Bans-Akutey and Tiimub (2021) state that triangulation at times uses mixed methods to attain the aim of validating the findings of the research. Triangulation provides the description of how the researcher uses the various approaches in the study to extract the much-needed information as well as analysing the findings in a critical manner (Social Sciences Research Laboratories, 2018), thus establishing validity and credibility. I used different data collection techniques in a bid to triangulate the data generated and to make claims. I presented evidence of how I sourced the data in different ways in order to enhance triangulation and the depth of interpretation. In my research, I was also intentional in using different data generation sources to ensure the trustworthiness of the research findings. Triangulation in research assists in the reduction of false or inaccurate conclusions or claims by drawing data from sources that have different potential threats to validity (Kachilonda, 2014).

The four-phased expansive learning process approach assisted in managing the datasets according to each phase. According to Engeström (2005), expansive learning relies on combined analysis and the practical change of current practices to overcome current conflicts which meant that I needed to manage the data generation and analysis in a related and unfolding manner. I also managed to share the data with my research assistant I was working with; this was done for the sake of data triangulation too, so that if there was anything which I had not

considered or anything which she felt was important to the research which was overlooked, this could be rectified.

5.3.2 Data analysis

As indicated above, the analysis occurred during the different phases of the research and this was done in order to present the mirror data for the subsequent step on the expansive learning process and learning actions. The data analysis occurred in a phased manner, guided by the research phases and the expansive learning process. As mentioned above, triangulation was employed as a strategy to improve the trustworthiness of the interpretations, and at the end of each phase I considered all of the data sets, and analysed them carefully to identify important mirror material for use in the next phase. As the data sets were voluminous, I also needed to synthesise the data so as not to overwhelm participants in the process. Following this I also systematically analysed the data to inform the reporting on the research process in the thesis, which is shared in the following chapters where details from the data sets are shared to provide substantive insight into the process of data triangulation. This was important to ensure both use of the data in the Change Lab process as it unfolded, but also to ensure a rigorous and careful description of the process with empirical validity and credibility.

I also engaged in another level of synthesis and analysis which was to report on key findings related to the research questions. The study had five main research questions (see section 1.4.2) and the first and second phase of the study answered the first three questions: a) Why is the LCP work important in South Africa; what is the value-add of the LCP in terms of advancing catchment co-management, and how can this value be enhanced via expansive learning for co-management? b) What are the current experiences of, and opportunities for, co-engaged expansive learning and co-management which exist in the LCP? What value has already been created in this area, if at all? What are the different catchment management activity systems present in the uMzimvubu catchment respectively? c) And what contradictions emerge within or between the catchment management activity systems that have potential to shape expansive learning and co-management? The analysis in Phase 1 focused on:

- Understanding the importance of the LCP and the reason for its establishment (and its implication for the Just Transitions Framework work).
- Exploring the various activity systems in the uMzimvubu catchment and identification of tensions and contradictions within and across the activity systems.
- Identification of value created through the use of the VCF tool.

Findings from the contextual profiling identified five activity systems where different stakeholders in co-management interacted within and across the activity systems (see sections 5.2.1 and 6.3). After embarking on the process of investigating the data associated with the different activity systems, I then developed research focus areas in relation to my research questions (1 to 3). Using the focus areas, I coded all the data from document analysis, field trips, interviews, workshops, meetings, focus group discussions and Change Lab discussions using colour codes for easy identification. The identification of the five activity systems helped me to categorise and code the learning taking place in relation to the partially shared object, and the activity systems and their dynamic elements as described by Engeström. The outcome of this analysis was the identification of the tensions and contradictions that were found in and between the activity systems in the uMzimvubu catchment (see section 7.2), which I then used as mirror data to establish the interventionist dialogue in the Change Labs (described in section 8.2).

The third phase of the data analysis focused on the process of engaging with the mirror data; this included the expansion through the Change Labs with the various representatives from the communities, traditional leadership, NGOs, municipality and LCP. The third phase answered the fourth and fifth research questions: d) How can an expansive learning process potentially contribute to value creation, collaboration, co-learning and co-creation of knowledge in and across catchment management activity systems among the interacting activity systems? e) What insights from this study can potentially contribute to the education system, the school curriculum and water policies of South Africa, as these are potential sources of sustainability of the formative intervention and evaluation findings?

The participants in the expansive learning process were requested to continuously reflect on the water co-management practices of the past, the present and also of the future. This process of constant and continuous reflection enabled the participants to explore the current contradictions, and in relation to their shared object (co-management of water), model solutions towards water security in the catchment. The CHAT enabled me to document and analyse all these processes through the activity systems analysis framework and the transformative agency perspective of CHAT (see section 4.4 for theoretical base and section 8.2 on practical application). After the analysis and reporting of the expansive learning phase, a third layer of analysis was undertaken in this study. In general, the cultural-historical approach to the data generation, the expansion of learning using data analysed and engaging with contradictions

entailed reflecting on past water management practices and present practices, and how these differ from the past practices. This process also included the interpretation of future water co-management practices where stakeholders were engaged with clarifying what they would want the future to look like and modelling of contextual solutions in aiding in the fulfillment of their goal.

5.3.3 Coding of data

Coding is an important tool in the process of transforming raw qualitative data into a communicative and reliable story. The basic purpose of coding is to study a cohesive portion of your empirical data – a word, a paragraph, or a page – and identify it with a word or brief phrase that describes its content (Linneberg & Korsgaard, 2020). Coding is crucial to qualitative analysis since it minimises enormous volumes of empirical material and makes data easily available for study, while also improving the quality of the analysis and findings (Linneberg & Korsgaard, 2020). In particular, coding in itself is an early form of analysis “in such a way that the ‘final’ conclusions can be drawn and verified” (Miles & Huberman, 1994, p. 11). In a bid to sift through the data generated, organise it and explore evolving relationships, I selected, collated, summarised, coded and sorted the data into themes, categorised and clustered it. This provided the foundations for the reporting in the empirical data chapters, chapters 6, 7, 8 and 9.

In the process of analysing how the various stakeholders interacted with each other regarding the object of water co-management, it was revealed that the stakeholders participated in five main activity systems in the uMzimvubu catchment. The concept of the activity system was used to analyse data and to continuously engage and re-describe the object of water co-management using CHAT’s unit of analysis framework. As an endeavour to understand the roles of stakeholders in the various activity systems and how they interacted with each other, I developed an outline of what stakeholders did in water co-management using thematic coding (for the identification of the different kinds of roles) and I interpreted this by using Engeström’s work (3rd generation CHAT). Using the relationship descriptors in the CHAT’s activity system, helped me to describe with greater clarity from an activity system’s perspective. This process enabled me to describe the activity systems and learning interactions occurring within and across the activity systems as well as emerging tensions and contradictions within and between these activity systems.

In order to sort the data and organise it, I used a four-phased approach in the study. Data was organised and coded based on the four different phases. In Phase 1, which had to do with the desktop analysis, document analysis and contextual profiling, the data was organised and classified into one category – it was all coded and kept under the theme of literature review and contextual profiling. The literature review data was sorted according to the various chapters of this study and organised in folders. For the second part of Phase 1, which involved all the interviews concerning the contextual profiling, the emerging data was sorted and coded. The interviews which emerged from this phase were also themed and organised. The quotes, data extracts, interview data and Change Labs data were index coded as follows:

1. Individual interviews: II
2. Focus group discussions: FGD
3. Semi-structured interviews: SSI
4. Change Lab discussions: CLD
5. Field interview: FI
6. Community activity system: (CAS)
7. NGO activity system: (NGOAS)
8. Local Government activity system: (LGAS)
9. Living Catchments Project activity system: (LCPAS)
10. Traditional leadership activity system: (TLAS)

In the case where there is a data extract from a particular activity system, their activity system code comes first, then the details of the type of interaction. For example: individual interview with a community member – CAS-II, or data extract from a chief during the Change Labs – TLAS-CLD.

For every Change Lab, there was an associated folder: Change Lab 1 to Change Lab 4. For Change Lab 1, I had data for the VCF stories, audio and video recordings and administration records (e.g. attendance registers) which were sorted accordingly. For VCF stories, I collected them and then coded them according to the activity systems that the particular participants were from. This also formed part of the A-view of the study. During the transcription period, the data was sorted according to the activity systems that the participants were part of, to enhance and deepen the analysis. The data was sorted and coded under the Change Lab 1 folder.

For the second Change Lab, some of the participants managed to do some initial modelling and analysis of the contradictions which they faced in their context, in relation to the object of water co-management. The information and the data which came from this process was sorted and coded accordingly. Other participants decided to speak and not produce modelled solutions, as they had not yet got a firm grasp of activity system analysis. Their proposed solutions were audio and video recorded. The information was also coded and sorted according to the activity system they were part of. The data was sorted and coded under the Change Lab 2 folder.

During the third Change Lab, the participants formed two groups, according to the chosen contradiction they felt they had agency over. The work for Group 1 and Group 2 was sorted and put under two distinct categories. The modelled solutions during the Change Labs, using the activity system analysis, were scanned and sorted according to the distinct groups. The explanations and discussions of the modelled solutions from the two groups were audio and video recorded. Between the third and the fourth Change Labs, there was the formation of a WhatsApp group, which was composed of the Change Lab participants, the research assistant and me. The data which came from the interactions between the participants, and between the participants and I, was kept under a WhatsApp folder. The data emanating from these interactions was coded. After the third Change Lab, the participants met of their own accord to discuss their new solutions, which they started to test and implement in their own context. The data was sorted and coded under the Change Lab 3 folder. The WhatsApp data was coded and placed under a sub-folder.

For the fourth Change Lab, the participants managed to present their proposed models. The modelled solutions had been initially tested and implemented during the time between the third and fourth Change Lab. One group even had a video as part of their presentations, and the other group developed a tool in addition to their presentation. The data was then sorted and coded according to the two distinct groups. There was also audio and video recordings during this session; it was also coded and categorised under the activity systems. Pictures of participants getting certificates were kept and stored under a separate folder. At the end of the Change Lab there was another VCF analysis done. This VCF analysis formed part of the B-view of the study under phase 4. The data from the value creation stories was stored and coded according to the activity systems. The data was sorted and coded under the Change Lab 4 folder.

5.3.4 Trustworthiness of the study

Reflecting on the process during my data collection journey allowed for reflexivity. Reflexivity was an important matter I had to engage with, as indicated by Mukute (2010), formative intervention researchers need to give a lot of attention to reflexivity, meaning they need to carefully track and monitor their own role in the research. In addition, they need to be able to contextualise and locate the research adequately in the field of study. This study was a water co-management study which occurred within the province I lived and grew up in. Secondly, I was a student who was supported by LCP and my research contributed towards their aim and objectives. It was important that I understood my role and positionality in the study and mindful of the two above-mentioned factors, so as to take full account of my role as a formative interventionist researcher. This involved facilitating learning about co-management of water and not influencing the expansive learning process by enforcing my perspectives, which came by association or training. I was also conscious of the power dynamics that existed in the research setting, and that existed between myself, as the researcher, and the participants who were involved in the research. According to Bryman and Bell (2007), the researcher must demonstrate that they have endeavoured to deal with this by giving the participants a voice in a way that is not mediated by their own interpretations. To do this I kept careful record of participants views' and shared these via thick descriptions of the data and the expansive learning process that was followed (see chapters 6, 7 and 8).

5.4 Ethical Considerations and Covid-19 Health Protocols

5.4.1 Ethics, consent and code of conduct

To ensure that the research was aligned with ethical guidelines, I prepared forms to gain participant consent, which explained the entire research process. I also prepared documents elaborating on the purpose of the study (see Appendix A and B). The documents carefully explained the code of conduct for the research and the ethics protocol to be followed. I presented the research and ethics protocol in a presentation to the participants, and explained it in English and in isiXhosa. The ethics included the rules which were to be adhered to during the research process. Participants were made aware that they were not obliged to participate in the research if they felt disrespected, violated or uncomfortable. Furthermore, the research protocols included the rules that I had to abide by, as a formative interventionist researcher. Lastly, the issue of audio and video recording was discussed and an agreement to proceed with recording was reached. The discussion on protocols was opened up after being presented, so

that we could negotiate the terms and conditions. The participants engaged in the discussion and showed awareness that they knew that they could remove themselves from the research at any time they felt like their rights were not being respected or that their dignity was being infringed upon. Reflecting on Berg's (1998, p. 47) statement:

The knowing consent of the individuals to participate as an exercise of their choice, free from any element of fraud, deceit, duress or similar unfair inducement or manipulation.

The research participants in the Change Labs were provided the ethics form, code of conduct form and research purpose form to sign if they agreed to be part of the research. There was time to discuss the forms, and everyone agreed to the stipulations in the various sections and signed them. The participants involved in the individual interviews, semi-structured interviews, focus groups and field interviews were told about the research and the processes involved in the research. The different forms were also kept on my cellphone, so that I could read out the code of conduct, purpose of the research and research protocol; I could not carry a laptop everywhere, as some of the places I conducted the interviews required hiking, walking and talking, therefore, a laptop would not be appropriate. I also highlighted that if they felt any discomfort during the interview, or they did not want to answer a question, they could stop the interview or choose not to answer any question. Where it was not possible to sign forms in the field, I recorded participants' consent. The importance of ethics and building a solid foundation of respect in the beginning of the expansive learning process is imperative for social learning purposes, because this allows inclusivity to be a reality, and also highlights to the individual participants that their views expressed are important.

The continuous support from the research participants and project coordinators involved in the UCPP was an indicator that the participants felt that they were being respected and that the work which we were embarking on was beneficial for their catchment. The research was also conducted in line with the principles of respect and dignity, which allowed everyone who was involved in the process to express their views without feeling belittled and enabled all voices to be heard. This approach was very beneficial for me at times, because if the research participants would arrive late for the meeting, they would inform me before time, and this showed the mutual respect between us. The participants assisted and ensured that the research went according to the structure that we had planned, and they were consistent and committed to the learning process which we all had agreed to be part of and contribute towards.

5.4.2 Covid-19, health protocols and reflexivity

Covid-19 protocols were also followed throughout the research process; from the beginning of the first phase, right up to the last phase of the research. Following Covid-19 health protocols allowed for creation of an environment which was sensitive to the lockdown stipulations of the country and enabled adherence to the health regulations, while also being able to learn and embark on our learning journey. Throughout the sessions, regular breaks were provided so that the classroom always had enough air circulation. Desks and other training equipment were sanitised before meetings commenced, and sanitisers were always available for use. The presence of the research assistant was beneficial for adhering to COVID regulations and administration purposes. Following the COVID regulations proved to be advantageous to us because during the study, no one contracted Covid-19 or became sick.

5.5 Conclusion

This chapter detailed the process I followed in fulfilling my project aim and objectives. It also elaborated on all the various phases involved in my research and how they related to the research questions. The importance of the CHAT framework and its analytical abilities were highlighted, especially in understanding the transformative agency of the participants. The role of the various techniques which were employed in the study to produce mirror data was explained, and how they aided in spurring on expansive learning. The expansive learning process was central in guiding the research and this chapter shows how it guided the study design.

The 3rd generational activity system was beneficial in understanding the activity systems present in the catchment, which potentially shared the common object of water co-management. Section 4.3.3 elaborated on the 3rd generation activity analysis and this chapter demonstrated how, and why, this specific generation of activity system analysis was followed. Phase 1 of the research assisted in analysing and understanding the various activity systems, because each activity system possesses a unique cultural-historical perspective of the object. Contextual profiling played a role in understanding these various activity systems and collecting of mirror data. The process of understanding the catchment context was an important step in the contradiction analysis which followed on later in the research process (see Chapter 7). Phase 2 of the research was supported by Phase 1, because through activity system analysis I was able to invite the affected stakeholders to the Change Labs and embark on the expansive learning process with them. Section 5.2.1 highlighted the various activity systems, which share

the potentially shared object of water co-management which were present in this study. The expansive learning cycle occurred in the Change Labs, which were held in Matatiele. The Change Labs followed the seven learning actions of the expansive learning cycle. However, for this study, the VCF was used as a tool to monitor if any learning occurred before the expansive learning cycle was embarked on (the A-view of the study). This was to understand the need state and current learning which may have or have not occurred before the formative intervention was initiated (see Chapter 6).

Phase 3 of the study entailed embarking on the expansive learning process in the Change Labs. As mentioned above, the expansive learning cycle was guided by the seven learning actions. The various Change Labs had various outputs that emerged from them (see Chapter 8). The learning did not only occur in the Change Labs, but also during the period between the Change Labs, and even after the Change Labs. The presence of diverse stakeholders had a positive influence on the expansive learning process because different knowledge systems were involved in working towards the shared object of water co-management. This led to cross-pollination among the activity systems and development of novel and context-specific solutions. Phase 4 dealt with the process following the expansive learning cycle journey, because it was concerned with monitoring of potential learning which may have occurred after the formative intervention, and possible development of new indicators of learning (see Chapter 9)

The LCP work covered four catchments, which had similar characteristics, sociocultural contexts, environmental features and landscape problems (see sections 1.1 and 1.2). These four catchments are at a niche level. The research process followed in this study could potentially be replicated in the other catchments, to enable collaboration and seek catchment context-specific solutions. This chapter also included details on the data generation, analysis and data management processes, issues of ethics, reflexivity and Covid-19 protocols because this research occurred during the pandemic. The next chapter will look at understanding the past learning value created for stakeholders in the catchment using the VCF. It also gives descriptions of the activity systems. The next chapter also covers the first phases of the study design and Learning Action 1 of the expansive learning process.

CHAPTER 6: UNDERSTANDING THE PAST LEARNING VALUE CREATED FOR STAKEHOLDERS IN THE DIFFERENT ACTIVITY SYSTEMS

6.1 Introduction and Background

Chapters 1 and 3 provided explanations of why expansive learning should be explored in this study and how it could influence the object of co-management in the uMzimvubu catchment. Chapter 4 detailed the background and importance of CHAT as a theoretical framework to underpin this study guided by the expansive learning cycle. Chapter 5 provided the detailed steps which were followed in this study and unpacked all the processes which occurred in the formative intervention. The formative intervention approach was founded on CHAT principles and 3rd generation activity system analysis was followed. Using the 3rd generation activity analysis assisted with understanding the various activity systems which shared the common object of water co-management in uMzimvubu and the cultural history of those activity systems in relation to the common object. The VCF as a supporting tool to CHAT sought to surface the different learnings which may or may not have occurred before the formative intervention. This chapter seeks to highlight the activity systems which were present in this study to understand what lay behind each activity system and which learning indicators were present before the expansive learning cycle process occurred.

This chapter explores the first learning action in the expansive learning process which involves identifying the need state, namely challenges associated with co-management of water. The data are drawn from phases 1 and 2 of the research, which entailed the contextual profiling and activity system analysis contributing to the need state questioning (Chapter 5). The chapter provides insights into the value created from prior learning for activity systems at the start of the study as analysed from data generated through document analysis, UCPP and LCP workshops, interviews and focus group discussions (described in Chapter 5). In this phase the VCF tool was used in the A-view of the study, to provide insight into the partially shared object. Three of the five research questions were responded to in this chapter and the evidence is provided. The research questions are as follows:

- Why is the LCP work important in South Africa; what is the value-add of the LCP in terms of advancing catchment co-management, and how can this value be enhanced through expansive learning for co-management?
- What are the current experiences and opportunities for co-engaged expansive learning and co-management in the LCP? What value, if any, had already been created in this area?
- What are the different catchment management activity systems in the uMzimvubu catchment? And what contradictions emerge within or between the catchment management activity systems that have the potential to shape expansive learning and co-management?

This chapter also explores why the various stakeholders in the different activity systems were interested in the object of water co-management and how they interacted with other role players in other activity systems. I had to embark on several interviews with the LCP personnel and analyse the project documents to answer the question of why the Living Catchments Project work was important in South Africa and what the value-add of the LCP project was in terms of advancing co-management in the uMzimvubu catchment. In this chapter, I describe how the various activity systems were composed, how the stakeholders in the activity systems interacted within and between activity systems, and the learning that took place in the activity systems. The data from the VCF tool assisted in understanding what value has already been created in this area, if any. The VCF was employed as a double-stimulation tool to spur expansive learning and to question the need state. The chapter will discuss how the VCF tool provided baseline data to gauge the learning which had already occurred in the activity systems (in relation to water co-management) and to surface gaps which the study could fill in relation to co-managing water resources.

6.2 Activity Systems in the uMzimvubu Catchment

6.2.1 Community activity system

According to Mbhele and Mubangizi (2023), although local residents in the uMzimvubu catchment are aware of catchment management and degradation, they perceive a lower level of local government involvement in water administration concerns. Furthermore, they believe that catchment management does not value their local administrative skills (Mbhele & Mubangizi, 2023). Power dynamics limited or restricted governance systems and rivalry over land resources all contributed to the marginalisation of vulnerable populations, resulting in insufficient and sometimes dangerous access to resources such as water (Mbhele & Mubangizi,

2023). The data from this study showed that the community played a crucial role in the management of water resources and that they had a desire to participate even more fully in securing water resources. The following elements of the community activity system were revealed by data produced in the context of the uMzimvubu catchment (see Figure 6.1).

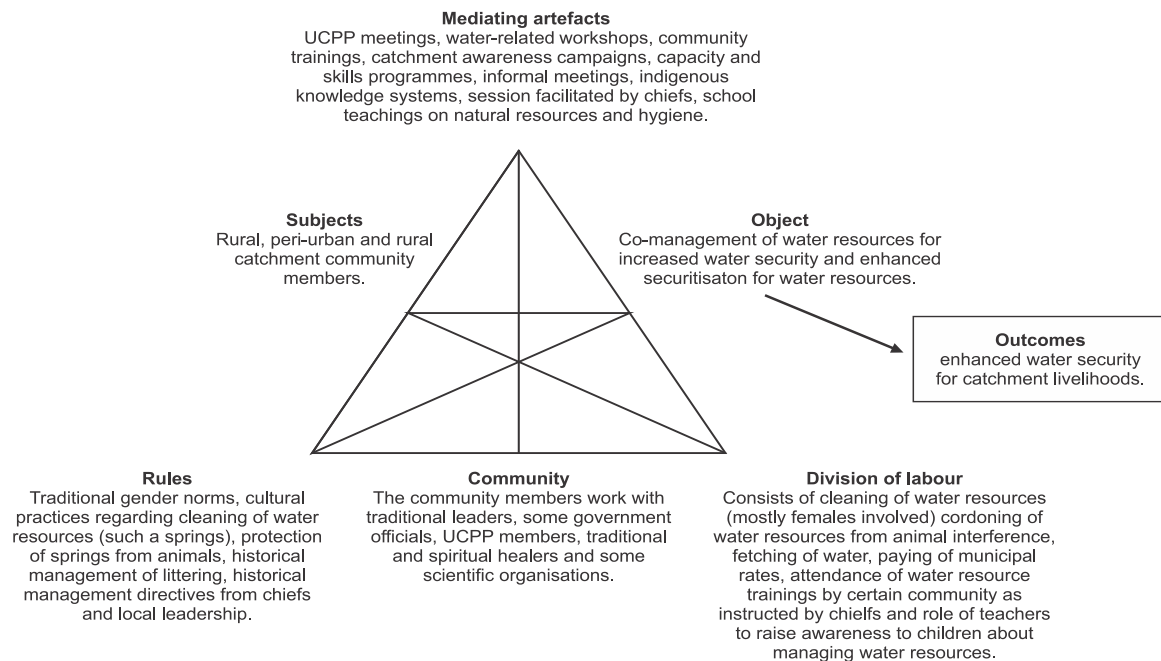


Figure 6.1: An illustration of uMzimvubu catchment community activity system

The uMzimvubu rural, peri-urban and urban catchment community members from the uMzimvubu catchment were the main **subjects** in this activity system. Their main **object** was securing and managing water resources in the local context. The **community** members worked with traditional leaders, some government officials, UCP members, traditional and spiritual healers, and some scientific organisations in their **community**. The following **rules** shaped their activity: traditional gender norms, cultural practices regarding the cleaning of water resources (such as springs), protection of springs from animals, historical management of littering, and directives from chiefs and local leadership. **Mediating artefacts** were UCP meetings, school teachings on natural resources and hygiene, water-related workshops, community training, catchment awareness campaigns, IKS, capacity and skills programmes, informal meetings, and sessions facilitated by chiefs. The **division of labour** consisted of cleaning water resources (mostly females involved), cordoning off water resources against animal interference, fetching water, paying municipal rates, attending water resource training by certain community members as instructed by chiefs and the role of teachers in raising awareness in children about managing water resources (Figure 6.1). The activity system was

dynamic and was shaped by changes over time; cultural influences and power relations are discussed further below.

Changes over time: Engeström (1996) states that an activity system is always learning and developing. Activity systems are regularly confronted with conditions in which their inherent contradictions are exacerbated, necessitating a qualitative rearrangement, or re-mediation, of the entire activity. The community activity system has undergone changes over time in relation to the object of managing water. There was consensus from the various data collection methodologies that people in the communities were not as responsible as in the past. The focus group discussions, interviews and Change Lab discussions had a mixture of community members from different age groups. The older people mostly expressed the issue of the youth not being as deeply involved in community resources management as they had been while they were younger (see data extracts below). The washing of nappies and the pollution of water resources was a common issue raised by community members of all ages. There already were platforms for learning in the communities and knowledge exchange avenues.

TLAS-CLD: As a community, we used to have a way of doing things in the past. We used to have certain rules relating to cleaning of springs and taking care of water sources. Women were given the task of cleaning the springs, mostly during the weekends. Women were also made aware that they should not wash clothes near the springs. Men also understood that they should not make the animals drink from the same sources of water humans drink from. These were the traditional things we were raised with and we were a clean and tidy people. I fear that this is slowly disappearing with the advent of technologies, new practices, disposable nappies and other things from the West.

CAS-CLD: Things have changed over time, in the past we were involved a lot with nature and we depended on our environment. That made us to be responsible with regard to taking care of natural resources.

Partnership formation: The UCPP provided a platform for various activity systems to interact and co-learn. This interaction included learning within the community activity system and across the activity systems. In addition to learning, these interactions included awareness raising, skills capacitating, access to markets for the community, service provisions, management of natural resources and protection of water resources. This community activity system has worked with NGOs, local government, scientific organisations, external funders of projects, tertiary institutions, research organisations and other government entities to help resolve the issue of water insecurity in the catchment (see data extracts below). In order to manage its water resources, the upper uMzimvubu catchment employed a variety of stakeholder engagement and discussion techniques, including traditional methods like

community meetings, iZimbizo, and municipal outreach programmes, as well as modern media outlets like radio stations, newspapers, and social media (Mbhele & Mubangizi, 2023). The UCPP was distinctive in that it had a Secretariat with administrative and coordination functions to keep in touch with its members, arrange meetings, and organise activities to improve the social-ecological health of the catchment (Snorek et al., 2022). The settlement of Matatiele, which is situated at the foot of the Drakensberg range, is where the Secretariat, which coordinates the UCPP, was headquartered. Conservation South Africa (CSA) and ERS, the two NGOs that jointly formed the UCPP and act as its Secretariat, received the smallest amount of funding from a parastatal and the WWF's Nedbank Green Trust to host events. Events in Matatiele included learning exchanges, general partner liaison, and quarterly meetings (Snorek et al., 2022):

TLAS-CLD: Before we met with ERS, we did not have much information with regard to water and natural resource management. We only knew what we were taught growing up. When ERS came to us, they helped us with new ways of doing things and they taught us new things. My community has really benefitted from the work done by the people at ERS and I have learnt quite a lot since I encountered them.

COMAS-CLD: As a community member, who has grown up in this catchment and stayed here, I just wish there were more learning exchanges with regard to water management. Growing up as a child here, we did not have much information about the dangers of wattle on water resources. For us, we saw wattle as a good resource to have during events such as funerals. However, I have seen how much wattle is a danger, because rivers which were flowing when I was young, which have wattle around it, are now dried up and this is a problem. I wish that people can be taught about the effect of wattle on our water resources.

Cultural influences and power relations: The community in the catchment had mixed feelings about the local government, which was the authorised water service provider. They had a positive view of the NGOs and the UCPP partnership. The community members travelled from numerous remote villages to attend UCPP meetings and similar engagements. This was evident in most of the engagements I had with the stakeholders in the activity system both young and old. The younger generation was generally not happy with the municipality's dealings with the community issues. The older generation, especially those in communal leadership, felt that their concerns were not being taken seriously by the local government. The two quotes below reflect the perspectives:

COMAS-CLD 1: This municipality is struggling with servicing the needs of the community. It mostly focuses on catering for the people who dwell in the urban areas and neglects the rural community mostly. I just wish they could partner up with NGOs and give them power to perform

some of the duties. NGOs do a lot of good work in the community and have good data about the community.

COMAS-CLD 2: I fail to understand why the municipality cannot attend to us as the community members in the villages. Our taps are broken, litter is all around, nappies are found all over the landscape. When we try and raise these things and report to the municipality, it is never resolved. I even do not like attending some of the meetings which are called by the government, because most times there is only talking and little action to resolve the matters we raise.

6.2.2 NGO activity system

Several UCP organisations tend to provide opportunities for collective action by directly connecting players within and outside the UCP to members in ways that strengthen the network and fulfil members' needs (Snorek et al., 2022). The UCP has mostly developed a diversified network based on transparency in correspondence and interactions, as well as trustworthiness among actors (Cockburn et al., 2019). In addition to ERS and CSA, LIMA Rural Development Foundation was also a key stakeholder in this activity system and a member of the UCPP. The LIMA Rural Development Foundation, founded in 1989, is a non-governmental, non-profit organisation engaged in a wide range of rural development activities throughout South Africa (LIMA, 2022). In this study, LIMA was a key organisation in attaining the objectives and was important in the provision of additional data with regard to the catchment. The following elements of the NGO activity system were revealed by data produced in the context of the uMzimvubu catchment (Figure 6.2).

The ERS, CSA and LIMA staff in the uMzimvubu catchment were the main **subjects** in this activity system. Their main **object** was the management of natural and water resources to secure resource livelihoods in the local catchment contexts. The **community** comprised the UCPP partners, government organisations and departments, villages, local and international partners, traditional leaders and research organisations. The following **rules** shaped the activity of the NGOs: local, provincial and national policies, organisational directives and mandates, scientific and research objectives and stakeholder liaising strategies. The UCPP meetings, skills and awareness training, auctions, NRM guides, invasive plant clearing guides, rural livelihoods capacity building training, rangeland management guides, community meetings, and community and school campaigns were **mediating artefacts**. The **division of labour** consists of organisational mandates, organogram directives, UCPP roles and responsibilities, community engagement guides, society and organisational working agreements, and local, provincial and national imperatives (see Figure 6.2). Like the community activity system, this

activity system was also dynamic and was characterised by changes over time, partnership formation and cultural and power dynamics as discussed below.

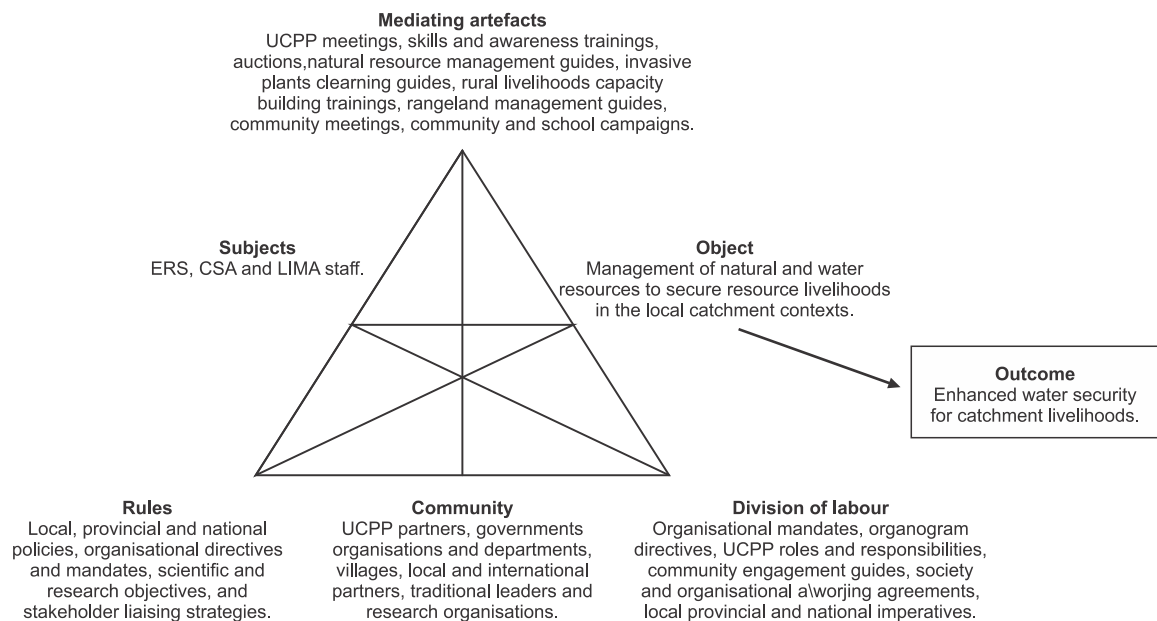


Figure 6.2: An illustration of the uMzimvubu catchment NGO activity system

Changes over time: There have been various changes over time in relation to the NGO activity system. The NGO activity system comprised participants of varying ages and educational backgrounds. The data generated showed that the activity systems in the catchment were involved in numerous and diverse programmes, especially in the rural context. The response below is an example of how the NGO activity system viewed their role in the catchment:

NGOAS-CLD: As NGOs working in this catchment, we cannot just sit and fold our arms. We have been in this catchment for many years and we are trying our best to do what we can. We have been trying to assist the people in this catchment by every means possible over the years and trying to implement change on the ground. However, the issue of funding and sourcing financial assistance is a big one for NGOs, but we have a responsibility to the people of the catchment, and we try to help however we can. We want to extend our help to as many places as we can, and we have had to change over time to be able to assist by all means possible. We have been working with different partners over the years. Our teams are also made of different types of people and ages, who have different expertise and backgrounds.

Partnership formation: Quarterly meetings, according to UCPP members, are an excellent method to convene, learn about what others are doing, meet new partners, and debate how to address catchment management concerns (Snorek et al., 2022). During meetings, members also share information about financing prospects, new and continuing activities, and develop

interpersonal contacts which contributes to the network's relationships between core and periphery groups, as shown in the extract below:

COMAS-SSI: The UCPP meeting help us to be updated with what is happening in the catchment. It has opened opportunities for us too, who are in the villages.

The NGO activity system plays an important role in facilitating and ensuring that partnerships are forged and maintained, as shown in the extract below:

COMAS-FGD: Growing up, I never knew what was the role of wetlands; for us as kids, we knew it as just a place where we could play and have fun. However, ever since the NGOs in this catchment have raised awareness about water resources, I know very well that wetlands are important in maintaining the water system in our catchment. Now, I even know that livestock should not graze around wetlands, especially during the Summer season, because of the viruses and parasites found there at that time.

As discussed in Chapter 5, the research participants for this study signed up during one of the quarterly meetings of this activity system. The NGO activity system also played a gatekeeper role and facilitated many of my meetings with the catchment dwellers.

Cultural influences and power relations: The study showed that most of the participants involved in this study who were from the catchment had a positive view of the NGOs and appreciated their contribution to the catchment. The NGOs are important in the catchment not just for knowledge sharing, awareness raising or skills development, but also as employment hubs, especially for the rural youth. According to the SANBI (2019, p. 1):

In the past five years, catchment partners' efforts have resulted in the replenishment of about 1.9 billion of litres of water into the system including the creation of about 600 Expanded Public Works Programme jobs and about 750 'Job Equivalent' incomes to more than 1 000 households. So far, a total of about 1 500 hectares of land have been cleared of the alien invasive plants and about 500 hectares of grasslands have been restored. The catchment also boasts a green economy youth investment programme known as Eco Futures, which has about 40 interns, and which links with Nedbank's 800 Youth Employment Services interns.

The issue of jobs is important in the catchment. Matatiele is surrounded by numerous villages and employment prospects are limited. The role of the NGOs in facilitating employment for the youth is important in the villages. One of the projects facilitating youth employment in the catchment and in other catchments was the Eco-champs project. I interacted with numerous Eco-champs who played a role as environmental monitors and data collection agents. Below are two perspectives from the discussion:

COMAS-FI: Before I got this job as an Eco-champ, I was unemployed, and I did not have any source of income. I applied and I have been on this programme for a few months now.

COMAS-FI: I have learnt quite a lot about the environment and I also facilitate knowledge interactions in my village. I also have an income now, which assists in helping my family.

6.3.3 Traditional leadership activity system

Traditional leadership is a strong feature of the uMzimvubu catchment landscape. During my research period, I interacted with five chiefs from the catchment. For my Change Labs session, I had four chiefs participating in the expansive learning process. However, only two of them received the learning appreciation certificates which were produced by the SANBI. This was because of commitment issues as a result of leadership responsibilities. Chiefs carry important roles in their communities including administration, leadership, cultural and spiritual matters and management of communities. Local management of community lands is traditionally under the jurisdiction of village chiefs and headmen (Freshwater Health Index, 2022). This is why the UCPP has been working towards collaboration with communities and traditional authorities to improve the catchment's social-ecological resilience. The Eastern Cape has several provincial departments with offices and field personnel in the region; CONTRALESA – Congress of Traditional Leaders, comprising chiefs from communal lands, is one of the relevant bodies in biodiversity intervention (uMzimvubu Catchment Overview, 2011). The Secretary of CONTRALESA, one of the chiefs from the catchment, was part of the study and also received the learning appreciation certificate. The following elements of the traditional activity system were revealed by data produced in the context of the uMzimvubu catchment (see Figure 6.3).

The uMzimvubu catchment chiefs, CONTRALESA, headmen and community elders were the main **subjects** in this activity system. Their main **object** was **the** management of natural and water resources and general administration for their communities. The **community** comprised community elders, community members, UCPP members, NGO project coordinators, schools, research entities, government and project inceptors. The following **rules** shaped their activity: CONTRALESA agreements and directives, provincial mandates, traditional leadership roles, cultural practices regarding the management of water resources, rangeland and NRM agreements, project agreement guides and local norms and customs. **Mediating artefacts** were UCP meetings, training and awareness campaigns, community meetings, NGO meetings with local leadership, and local and provincial meetings. The **division of labour** consisted of attendance of provincial CONTRALESA meetings, iZimbizo (a local term for traditional

gathering which leads to the resolution of certain matters), attendance of leadership capacity training, convening of weekly village meetings, village administrative roles and facilitation of community living.

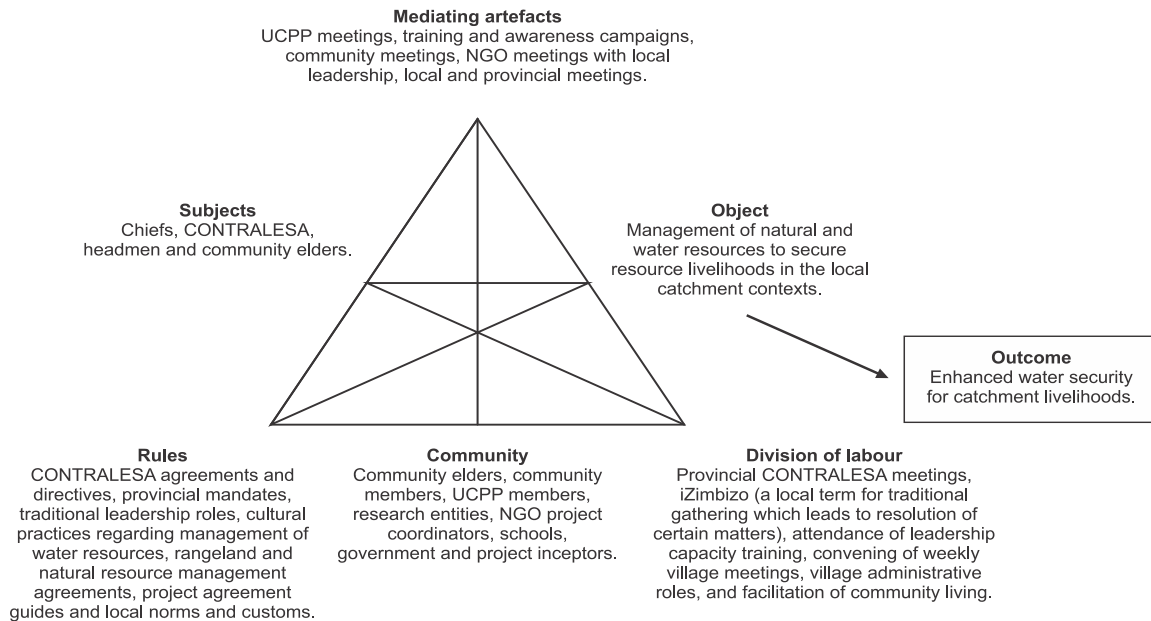


Figure 6.3: An illustration of the uMzimvubu catchment traditional leadership activity system

Changes over time: The government of South Africa recognises traditional leadership as a legitimate form of governance. In this study, it was apparent that traditional leadership fulfils several traditional roles in community living. These roles range from administrative, issue resolution, convening of meetings and issuing of permits, as indicated in the text below:

The Department of Traditional Affairs is mandated to oversee issues related to traditional affairs and support the development of stable and cohesive interfaith communities. The 2003 White Paper on Traditional Leadership and Governance sets out a national framework and the norms and standards that define the role of the institutions of traditional leadership in South Africa. It seeks to support and transform the institutions in accordance with constitutional imperatives and restore the integrity and legitimacy of traditional leadership in line with the African Indigenous law and customs subject to the Constitution. South Africa also has provincial houses of traditional leaders in the Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and North West. National and provincial houses of traditional leaders enhance the cooperative relationships within national and provincial governments. Local houses of traditional leaders deepen and cement the relationship between municipalities and traditional leaders on customary law and development initiatives. (South African Government, 2022, p. 1)

The views on traditional leadership varied especially between catchment dwellers in different villages. The focus group discussion I convened showed that there was no uniformity in terms

of the views on traditional leadership (see data extracts below). It was also evident that traditional leadership roles were held by individuals of diverse age groups; ranging from chiefs in their youth to older chiefs advanced in age. An important matter which emanated from the data collected was the issue of education and skills development for the chiefs. The three responses below express this sentiment:

TLAS-CLD: Mr Kuse, the chiefs in this area require education and skills development. It is known that chiefs are not quite keen to be educated and this is a stumbling block for the catchment progress. Not so long ago, we as the chiefs were approached by an organisation which wanted to undertake fracking in this catchment. Most of the chiefs were already swayed, and I too, was almost influenced. However, the leadership from ERS taught me about the dangers of fracking and how it would leave permanent damage to our landscape. I so wish that most of the chiefs could receive some education and continuous development.

COMAS-SSI: The younger chiefs need to be trained and developed. They need education and skills awareness. They are ignorant about certain things and as young people in those roles, they should be leading by example.

NGO-CLD: The chiefs play an important role in facilitating things in the catchment. We currently work with six chieftaincies and our relationship with them differs. There are usually issues with leadership roles when a chief we worked with dies. This can create an issue with working with that particular village of that chief who passed on.

Partnership formation: From the various catchment meetings I attended noted that the role of local leadership was highlighted. Even during the UCPP meetings chiefs and their regents were acknowledged. Various projects in the catchment had been established and there had been collaboration with the chiefs including cattle auctions, wattle clearing, catchment awareness campaigns and youth empowerment programmes. The Eco-champs were also posted in the villages and collected data and the chiefs had to be aware of the processes occurring in their jurisdiction. As mentioned above, the UCPP meetings were important in convening partnerships and welcoming any prospective partners who wished to embark on research or convene projects in the catchment. The traditional leadership activity systems also played gatekeeper roles in their respective communities. Partnerships between the NGO activity system and the traditional leadership activity system have also led to some fruitful outcomes as the data below show:

TLAS-CLD: As the chiefs in this area, we are responsible for overseeing cultural rites in our villages. One such cultural rite is the circumcision school process. This process requires us to have trees and to use them. We used to allow wattle to grow anywhere so that we could harvest it when we need it for this particular rite. However, after the NGOs taught us about the dangers of wattle,

we do not allow it anywhere our water sources. In my village, there is a designated area where it is allowed to grow so that we can harvest it for the circumcision rite.

Cultural influences and power relations: Culture played an influential role in the traditional leadership activity system. Traditional leaders play a role in safeguarding the cultural norms of a local context and protecting the interests of their villagers. In addition, the views of the traditional healers and herbalists featured quite strongly in this traditional leadership activity system. In as much as the local leaders have to accept new ways of doing things, they have to balance these ‘novel and foreign’ ways with culturally and spiritually accepted customs. During my data collection process, this tension was apparent:

TLAS-CLD: Some time back, I had a meeting with one of the local NGOs, to speak about spring protection. The NGO proposed a way to protect and clean our springs, which involves the use of chemicals. Now, as a chief, this put me in a dilemma, because the traditional healers view springs as an important medium for spiritual and healing purposes. The traditional healers believe that if chemicals or a foreign agent is introduced to the spring, it loses its healing and spiritual characteristics.

6.3.4 Local government activity system

Conflicts in the catchment typically surface as petitions and rallies against the local authority. Rural villages and the local water administration, which serves as the local government, clash regularly (Mbele & Mubangizi, 2023). Conflicts arise as a result of disagreements about meeting places, a lack of community engagement and unmet expectations from the local administration (Mbele & Mubangizi, 2023). During the data collection process, some negative perspectives towards the government activity system surfaced as indicated below:

COMAS-SSI: Our government is failing us in this catchment. This is true, especially for us in the villages. If it was not for the NGOs in this catchment, things would have been worse for us. They should just let the NGOs lead some of the community work and service delivery.

The other activity systems stakeholders were appreciative of the fact that the local government was present in the expansive learning process:

TLAS-CLD: I just want to extend my gratitude, as a leader of this community, to you my dear sister from the municipality. You have opened our eyes and shown us that there are many issues we are not aware of as the community, with regards to our local government, and even issues relating to governance.

The following elements of the local government activity system were revealed by data produced in the context of the uMzimvubu catchment (see Figure 6.4).

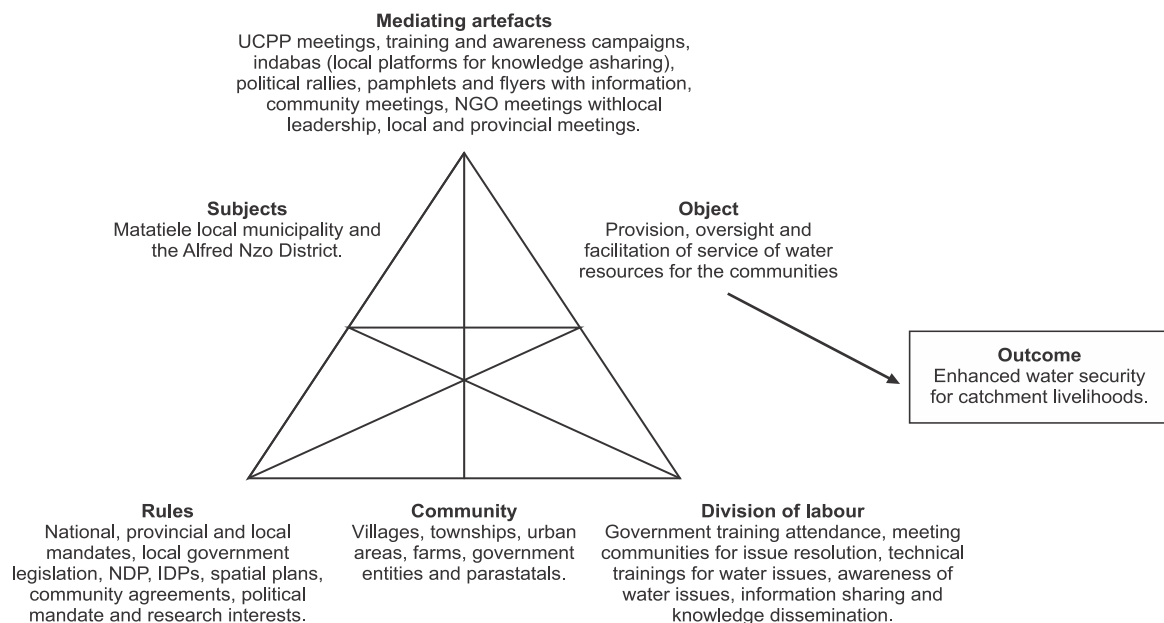


Figure 6.4: An illustration of the uMzimvubu catchment local government activity system

The employees of Matatiele local municipality and the Alfred Nzo District of Eastern Cape were the main **subjects** in this activity system. Their main **object** was provision, oversight and facilitation of services and provision of water resources for the communities they serve. The **community** comprised villages, townships, urban areas, farms, government entities and parastatals. The following **rules** shaped their activity: national, provincial and local mandates, local government legislation, NDP, Integrated Development Plan, spatial plans, community agreements, political mandate and research interests. **Mediating artefacts** were UCPP meetings, training and awareness campaigns, Indabas (local platforms for knowledge sharing), political rallies, pamphlets and flyers with information, community meetings, NGO meetings with local leadership and local and provincial meetings. The **division of labour** consisted of government training attendance, meeting communities for issue resolution, technical training for water issues, awareness of water issues, information sharing and knowledge dissemination.

Changes over time: There have been various changes over time, such as new leadership, different policies and changes in governmental structures in this activity system. This was influenced mostly by elections, the deployment of different leaders and changes in focus. Local government structures and leadership usually change after a certain period and this also leads to changes in personnel. The issue of change in local government leadership influenced service delivery and at times, water provision:

COMAS-CLD: Honestly, this matter of change in government inconveniences our community. In one case, we had a local government leader who was focused on increasing the quality of water

provision for our community and she was doing a good job. However, because of the issues of election, another leader was deployed and the former leader's water projects were no longer cared for or prioritised. A new issue was now prioritised because it resonated with the new leader.

Partnership formation: There was consensus in the data that the locals found it difficult to interact with the local government. Partnership formation between the local government activity systems had some tensions.

COMAS-CLD: When you go to the local government or you want to inquire as a community concerning certain issues, you will never get anyone to assist you. But come election time, they start being visible and doing things so that we can vote for them. After this, they disappear again.

The UCPP meetings were platforms for discussion and conflict resolution, and a space where partnerships could be established. I could not receive a stakeholder from the local government activity system during the UCPP meeting; I had to consult with ERS to get contact details for the local government. It took some convincing from my side to get local government support for my Change Labs. I eventually managed to get support after consulting with the municipal authority. Local government was reluctant to attend the meeting owing to how they were viewed by the locals and their busy schedule. These tensions were exacerbated by a lack of water and difficult terrain, making residents feel abandoned by the municipal and provincial governments (Mbele & Mubangizi, 2023). These tensions were also expressed during the Change Labs as the other activity system stakeholders continuously expressed their grievances and sought explanations from the local government activity system:

LGAS-CLD: You know, working for the government is quite difficult. People are generally not happy with the municipality and they think government officials do not do their mandated work.

LGAS-CLD: Some tensions arise because local people do not understand that we are also controlled by policies and legislation. There are certain service delivery issues we cannot resolve not because we do not want to, but because we are limited by policies governing our work. This is quite an issue in this catchment.

Cultural influences and power relations: Policies relating to governance and the catchment's political culture (such as changes in leadership, party policies, and focus of new government leadership) play a vital role in influencing the local government activity system. The national and local elections influence service delivery priorities. The community and traditional government activity systems share a common grievance: they do not feel heard by the local government activity system. At a time when there were droughts and climate change effects

were felt there was a perspective that the local government activity system should be doing more to resolve water resource issues. The uMzimvubu catchment's water resources had declined significantly as a result of numerous forms of watershed degradation and invasive alien plants. The region had seen a gradual drop in rainfall over time, resulting in regular periods of severe drought and the quantity of springs and streams that produce groundwater had decreased dramatically, as discussed in Chapter 1 (Mbele & Mubangizi, 2023). The response below adds perspective to this issue:

TLAS-CLD: I have requested numerous times to meet with the municipality to resolve some of the water issues in my village. I do not necessarily need money from them, but I have some plans to help mitigate water insecurity in my village. I am part of the leadership in the village and I have experience with working with issues of water. I just need an audience with them.

6.3.5 Living Catchment Project activity system

The uMzimvubu catchment is one of the four catchments involved in the LCP, as discussed in Chapter 1. There have been various meetings and gatherings in the catchment featuring the Living Catchment Project coordinators and their partners (see Chapter 1). The SANBI, the leading partner and coordinator of the LCP, state the following:

The South African National Biodiversity Institute has successfully convened a number of partners to consolidate gains made in investing in ecological infrastructure under the stewardship of uMzimvubu Catchment Partnership at the Catchment-Based Indaba on Ecological Infrastructure in Matatiele, Eastern Cape, 21–23 October 2019. The Indaba was held under the theme of ‘Amanzi aphuma apha’ (water comes from here) to inspire action and change from the role players and to mobilise investment towards the uMzimvubu River Catchment. This Indaba is one of the ongoing catchment-based initiatives aimed at creating focused dialogues on issues pertaining to securing ecological infrastructure for guaranteed security of water in South Africa. South Africa is a water-scarce country with an annual rainfall below the global average. (SANBI, 2019, p. 1)

In addition to this Indaba, SANBI also hosted two more Indabas, in November 2021 and October 2022, in the Tugela and Olifants catchments respectively. These Indabas involved all of the Living Catchment Project catchment conveners (from the four different catchments), catchment dwellers, LCP students, government entities, private companies and Eco-champs. The following elements of the LCP activity system were revealed by data produced in the context of the uMzimvubu catchment (see Figure 6.5).

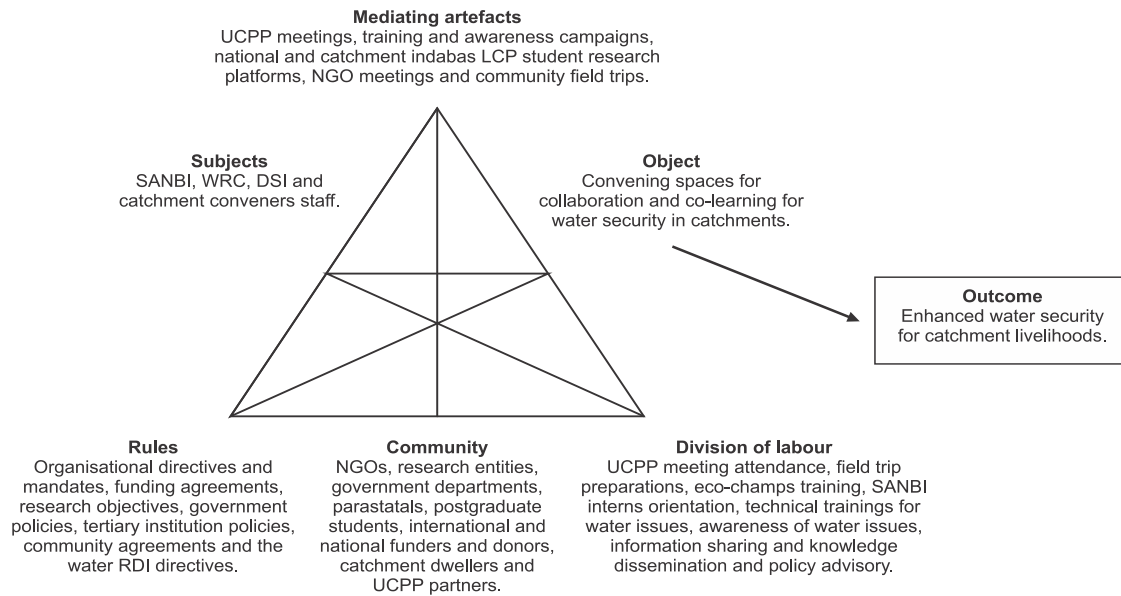


Figure 6.5: An illustration of the LCP activity system

The SANBI, the WRC, the DSI and the Catchment Conveners were the main **subjects** in this activity system. Their main **object** was convening spaces for collaboration and co-learning for water security in catchments. The **community** comprised NGOs, research entities, government departments, parastatals, postgraduate students, international and national funders and donors, catchment dwellers and UCP partners. The following **rules** shaped their activity: organisational directives and mandates, funding agreements, research objectives, government policies, tertiary institutions policies, community agreements and the Water RDI directives. **Mediating artefacts** were UCP meetings, training and awareness campaigns, national and catchment Indabas, LCP student research platforms, NGO meetings and community field trips. The **division of labour** consisted of UCPP meeting attendance, field trip preparations, Eco-champs training, SANBI intern orientation, technical training for water issues, awareness of water issues, information sharing, knowledge dissemination and policy advisory.

Changes over time: Chapters 1 and 2 explained in detail the work of the LCP. This activity system convened various learning experiences across the different catchments. This activity system also worked with the catchment conveners in the four catchments to create platforms for co-learning and collaboration for water security. The catchment conveners in the various catchments were as follows:

1. ERS (Environmental and Rural Solutions) – uMzimvubu catchment
2. ERS (Institute for Natural Resources) – Tugela catchment
3. K2C (Kruger to Canyons) – Olifants catchment
4. LL (Living Lands) – Berg-Breede catchment

As detailed in Chapter 1, the LCP's primary goal is thus to create more resilient, resourced and relational communities at both the catchment and national levels. It is capable of drawing on the best that research has to offer in the process of governing the equitable, productive, and sustainable use of water resources and ecosystem goods and services (SANBI, 2021). The intention of the Living Catchment Project activity system is expressed as follows:

The project intends to create more resilient, more resourced, and more relational communities with the ultimate vision to strengthening of an enabling environment for catchment governance and the integration of build and ecological infrastructure in support of water security, economic development and livelihood improvement. (SANBI, 2021, p. 1)

Partnership formation: As discussed in Chapter 2, the fostering of partnerships was an important element for the Living Catchments activity system as one of the key tenets was to ensure that collaboration occurred between various stakeholders in the catchment. However, collaboration in this activity system did not only occur outside but was also an important element within the activity system. This activity system consisted of diverse actors within the subjects' group. These actors were from different organisations and represented diverse organisational cultures. Students in the LCP were also from different universities and had to work with the LCP coordinators in a bid to support them in achieving their LCP cluster mandates. The LCP coordinators had diverse roles within this project and the various student researchers added value to their clusters (see chapters 7, 8, 9 and 10). The work and research done within the clusters had one key intended objective:

Strengthening of an enabling environment for water governance and integration of built and ecological infrastructure to support water security, economic development and livelihood improvement. (LCP Theory of Change, 2020)

In essence, all of the work and research, collaboration, co-learning and partnering had to work towards this common aim. I conducted several interviews with the LCP personnel and below are some insights:

LCPAS-II (1): Collaboration is a key tenet of my job description for this project. It is my duty to assist catchment conveners to convene spaces for collaboration and co-learning in their respective

catchments. My job requires that I have good communication skills because I work with a diverse array of stakeholders.

LCPAS-II (2): My work is directed more towards organisational learning and social learning. So, I have to work and navigate in that space for the LCP. One of the LCP students works with me and I mentor her, as her research is directed towards social learning. I also have to engage with the catchment conveners.

Cultural influences and power relations: From the meetings I attended (UCPP meetings, Indabas, LCP meetings and TIPC meetings) it was clear that the project coordinators were cognisant of the role of traditional leadership in catchments. During these events and meetings traditional leaders, traditional/spiritual healers and cultural knowledge holders were given a platform to voice their perspectives with regard to water management. The stakeholders involved in the LCP were also encouraged to pay attention to these traditionally marginalised voices. This was a migration from the traditional method of conducting research, as indicated by Reason (1994):

In traditional research, the roles of researcher and subject are mutually exclusive: the researcher alone contributes the thinking that goes into the project, and the subjects contribute the action or contents to be studied. (Reason, 1994, p. 42)

Awareness of their position of power and continuous reflection on their positionality assisted the LCP activity system to be better able to hear and accept traditional voices in the catchment who would not otherwise have been recognised in water management. Below are some views from two stakeholders who engaged in traditional culture and spiritual roles:

COMAS-SSI (1): I am very thankful to the LCP team for inviting me to this engagement. As a traditional healing practitioner, I extract a number of my remedies from nature. Therefore, it is important that my view is captured in engagements relating to natural resource management because I am also a user of the resources. It is also important that I, together with other traditional healing practitioners, be taught about environmental management, since we harvest our plants from nature.

COMAS-SSI (2): The platforms which we have been given to learn are very dear to me. Such learning exchanges, like the one you are hosting, has allowed me to engage with other participants I would not have otherwise engaged with. I have grown up in this catchment all my life and I can tell you that I have learnt a lot, since being in contact with these other knowledge practitioners. I have also shared what I know with them.

6.4 Reviewing Existing Learning Among the Water Management Activity Systems

In order to fulfil the second objective of the study – *Review and evaluate existing learning in the different activity systems found in the LCP in the uMzimvubu catchment* – I drew on the VCF as a tool to establish what value had or had not been created for activity systems so far through learning and co-management in the catchment and consider how this may inform the analysis of the contradictions (Phase 2). This process involved various techniques, as elaborated on in Chapter 5, to provide baseline data and to gauge any potential learning which might have occurred after this research. Value creation played an important role in the expansive learning process to aid understanding of the shared object. The VCF tool needed to be interpreted and translated into a language easily understood by all of the stakeholders in the activity. This assisted in coming to understand the object of co-management and its formation as a partially shared object over time (history of the object). The following response indicates a participant's experience:

TLAS-CLD: You have explained the concept of value well to us. The everyday examples you used to explain the notion of value and the Value Creation Framework tool has made us to grasp these concepts better. In fact, we have an understanding of the concepts you have raised, it came across better when it was translated and interpreted to us in simple terms.

6.4.1 Immediate value: indicators of activity/interactions

Three indicators were identified:

1. *Training programmes*
2. *Workshops and meetings*
3. *Forums and partner engagements*

The first sources of value I looked at were the immediate value sources and to identify this type of value I looked at indicators of activity and interactions. Some of the answers given by the participants were quite similar. Hence, I had to understand the commonalities in the answers so that I could group them. I then also had to check where there were different answers so that I could capture them. Through this process, I identified evidence of indicators of activity or interactions which were present.

6.4.1.1 Indicator 1: Training programmes

The first indicator identified was related to training programmes as indicated in the section above. The evidence of this included spring water management and awareness training. There had been several training and awareness programmes on the protection and the management of springs in the uMzimvubu catchment and there were many sources of inquiry and funding which were vested into spring water management. Even during my contextual profiling trip, I received more information about spring water management and awareness training. These were important in the catchment because of the underwater reserve. Evidence for the training programmes is shown below:

COMAS: Attended a session about how to clean standing water, since we use rainwater stored in tanks.

COMAS: I was taught how to preserve water and even harvest water.

TLAS: Training on the importance of having clean water for fish farming.

Another source of immediate value was the water working session which aimed to supply communities with water. This was mostly a government effort to train their employees who were involved in water provision in the communities. A participant highlighted that this was very important in terms of training them and making them aware that the people on the ground were desperately in need of water and that they needed to understand the importance of helping them:

NGOAS: Ecological Infrastructure Workshop in Matatiele and engagement with community about water provision.

COMAS: I had a meeting with ERS, where I learnt about springs and how to manage them. We have two of them in my village.

Another source of evidence was the Amanzi for Food learning programme. This programme started at Rhodes University and contains training and awareness about the importance of preserving and taking care of water to grow food, and for people to have sufficient food and water resources. The evidence from the data also showed the importance of training on rainwater harvesting and water preservation. People in the catchment mostly kept Jojo tanks in their homes to harvest rainwater, because the municipal water supply was erratic in the area. So, when they had opportunities to learn about rainwater harvesting and water preservation they would always listen attentively. Some of the responses were:

NGOAS: Amanzi for food facilitated TOT (training of trainers) course/learning.

COMAS: I participated in various water project implementations, which were led by Matatiele Advice Centre and Rural Advice.

6.4.1.2 Indicator 2: Workshops and meetings

Extracts from the data presented below provide evidence of this indicator focusing on water project implementation meetings with communities. This activity was common among the answers given in the group. The responses below show how the workshops and meetings were beneficial to people from the different activity systems:

LGAS: I attended water project implementation meetings and learnt new things.

TLAS: I have attended various water working sessions on how to supply water to the communities.

COMAS: Water working session for community's water supply assisted me.

The UCPP quarterly meetings also provided evidence. These meetings had been held for several years and had been a source of learning. They were attended by various stakeholders from all over the catchment. In these meetings numerous people learnt about the importance of water management and other NRM programmes as these responses show:

NGOAS: I attended the UCP quarterly meetings and the Indaba which was held in Matatiele.

LCPAS: I attended the UCPP quarterly meetings and Ecological Infrastructure Indaba in Matatiele.

Further evidence was provided by the Ecological Infrastructure Workshop about water security. This workshop was one of the central ways of ensuring that people on the ground understood that ecological infrastructure was important for preserving and maintaining water supply. The responses below express the importance of ecological infrastructure workshops and meetings:

COMAS: I have attended an Ecological Infrastructure Workshop in Matatiele and also through local informal engagements with the communities.

TLAS: I had a meeting with ERS on how to take care of springs and manage them. This was beneficial for me and my community.

6.4.1.3 Indicator 3: Forums and partner engagements

The third indicator identified was related to forums and partner engagements. The evidence for this included the Eastern Cape water caucus for river management and other forums related to water security. This initiative was heavily geared towards local governments and community

groups; it was a good source of learning and training for the leaders involved in the communities in the catchment. The data extracts below show the importance of forums and partner engagements:

COMAS: I attended an Eastern Cape water caucus event teaching about taking care of rivers.

NGOAS: I work with a project which deals with the application of the freshwater index.

6.4.2 Potential value: indicators of knowledge capital

Five indicators of potential value were identified:

1. *Purification of water*
2. *Ecological infrastructure*
3. *Management of water*
4. *Ecological system*
5. *Collaboration and engagement*

Identifying potential value involved surfacing indicators of knowledge capital and how this shaped the formation of the partially shared object and initial understanding of the object at the A-view (or point A of the study), which aligns with the potential value. Knowledge about water security and water resources generated knowledge or ideas or any sort of inspiration which could be used for the co-management of water resources. There were five indicators of knowledge capital from the VCF analysis.

6.4.2.1 Indicator 1: Purification of water

The evidence from the data (extracts below) includes awareness of the importance of cleaning the environment and rivers and the importance of buying purification chemicals to purify rainwater harvested. This was important because the person, upon hearing that they could store their water in a reservoir, also had to get information about how to clean standing water and remove bacteria. The data extracts below show members of the community and traditional activity systems learnt about the importance of purifying water for health reasons:

COMAS: I learnt that there are certain chemicals I can use in order to remove bacteria or diseases in standing water.

COMAS: I learnt that I have to ensure that the environment is clean and that I am dependent on it for water resources.

TLAS: I learnt that we can get diseases from the stored/standing water, so it is best to boil the water or use the pills to treat the water.

6.4.2.2 Indicator 2: Awareness of ecological infrastructure

Evidence from the data showed that ecological infrastructure was critical in a freshwater system in the catchment. The participant understood that it was important to make sure that they were well aware of the ecological infrastructure because it would allow them to have a supply of water and purify their water sources. The quote below is evidence of this awareness of the importance of ecological infrastructure:

COMAS: I learnt about the driving forces of change in freshwater systems in catchment and that there are critical ecological infrastructure.

6.4.2.3 Indicator 3: Management of water

In the data extracts below there is evidence that learning about recycling and re-purposing of used water was important. Further evidence was a participant receiving an idea to embark on research relating to water management, as shown below:

LCPAS: I received an idea to conduct research on water management.

The participant was able to use the knowledge they received to register for a degree relating to water management because of the information they received. Managing water emerged as an important theme in assisting people to take care of water resources in their own contexts and for their communities. Other evidence of the importance of learning about managing water resources is presented below:

COMAS: It taught me to recycle water and re-purpose used water for other purposes.

TLAS: It taught me and gave me a new idea to change the way we do things as leaders, and to be hands on and lead by example.

TLAS: It has assisted me by contributing to my knowledge of water use in farming and communal land management in general.

6.4.2.4 Indicator 4: Awareness of the ecological system

After receiving the information, a participant had an idea to establish a water project steering committee to guide water-related projects. This participant from the NGO activity system stated the following:

NGOAS: An idea I had was to do water awareness and form a water project steering committee. This would help guide water-related projects with regard to planning and implementation.

One of the participants received information about ecological systems and this allowed them to deepen their understanding of water resources. The other evidence from the data was the understanding that fish were important in freshwater systems. The quotes below show how some participants learnt about the importance of understanding the ecological system:

TLAS: I learnt about the importance of fish in water and the water system as a whole.

COMAS: I received knowledge of various water schemes.

6.4.2.5 Indicator 5: Collaboration and management

Upon receiving knowledge on how to manage water-related issues as a traditional leader a participant wanted to lead by example. This was also important because traditional leaders played a huge role in the catchment and they were involved in most of the decision-making processes. Therefore, for the traditional leader to receive water-related knowledge is always a good thing. Collaboration between different stakeholders potentially yields to effectiveness of water-based initiatives. This was also another important point which came out of the analysis because it expressed the importance of collaboration and laid a foundation for people to work together and to do things as a collective rather than concentrate on individual efforts. The quotes below present evidence of the importance of collaboration and management:

LGAS: It gave me an awareness about the importance of partnering with other stakeholders in the catchment, and to emphasise on the whole rather than the sum.

NGOAS: I received an idea to embark on a water awareness project steering committee that will guide water-related projects.

6.4.3 Applied value: indicators of changes in practice

Four indicators of applied value were identified:

1. *Conservation and purification*
2. *Partnership building*
3. *Monitoring*
4. *Communication and education*

The indicators of change in practice reflected the applied value which the participants had applied from the different learnings about water security they had received. These indicators

tell us how the stakeholders in the various activity systems had already used the knowledge they had attained from various learning sources to work towards the shared object of water management in the catchment. This shows how the shared object had been worked on by the participants in the catchment in the A-view of the study. The different indicators also reflected the diversity in which people use knowledge or learning in their own contexts. There were different ways in which people used their potential knowledge to apply it to their unique scenarios. These indicators also express the differences in the context of the participants or the stakeholders involved in the Change Labs; diversity is always an important trait in research and it is always appreciated as it gives a wider scope in terms of looking at things.

6.4.3.1 Indicator 1: Conservation and purification of water

Evidence from the data with regard to the conservation and purification of water included using water sparingly and not opening taps unnecessarily. Another participant learnt about the importance of buying drums to store water to supplement the already existing water storage at home. The responses below indicate participants' sense of the importance of understanding and having knowledge about the value of water and applying those learnings practically in everyday life:

COMAS: I use the chemicals in my water at home and also gave my neighbour the same advice.

COMAS: It helped me because I do not have to flush the toilet at night, or I do not open water unnecessarily in the shower or let water run as I brush my teeth.

TLAS: I ensure that leaking taps are fixed, and I do not allow water to just run if I am not using it.

COMAS: I acquired drums to store water and bought water tanks to add to the water storage at home already.

COMAS: I used the knowledge to check where water comes from, and how to protect springs.

6.4.3.2 Indicator 2: Partnership building

Partnerships are very important because what needs to happen is that the villagers need to understand that they possess agency and that they are able to assist and work hand in hand with the government to better manage water resources. Evidence from the data included establishing grazing associations to improve the management of the village. The grazing association was important because it looked at issues of NRM and also looked at water management. The traditional leader understood the need for people who could assist and help manage the communal resources:

TLAS: It assisted me to establish a grazing association so that I do not do everything by myself as a chief.

Establishing partnerships with different stakeholders in the catchment to secure water services also emerged from the data. This is related to issues of protection of springs and checking of water source alternatives. Springs were very important in this catchment and when participants were active and applied the knowledge they had received to work with particular springs that would yield long-term benefits for water security and the catchment. The importance of fostering partnerships was clearly seen:

NGOAS: It helped in planning the catchment work better and more effective. Helped me foster partnerships which help meet my organisation's objectives.

TLAS: I was able to provide some guidance to the government, on how we can pipe water to 23 villages within 12 months.

6.4.3.3 Indicator 3: Monitoring

One participant's company used the learning and knowledge to hire interns to collect data and close data gaps. This was also an expression of how knowledge could be used to create value for people on the ground and how knowledge applied could be relevant to the everyday lives of people. The new learning assisted in monitoring:

NGOAS: After applying what I had learnt, it became apparent that there were substantial gaps. A sister project was able to disperse Yes4Youth interns to assist in doing water quality collecting data (mini-sass, Ph, etc.).

6.4.3.4 Indicator 4: Communication and education

Communication and education were imperative in assisting with the provision of guidance for water officials in the villages. In addition to this, another participant held meetings with their community to communicate the importance of looking after springs. The knowledge of water also played a part in another participant's work environment. The need for people to be educated about water issues and why it was beneficial to communicate their learnings with others emerged from the data:

TLAS: Provide guidance for government officials on water issues in the villages.

COMAS: I have meetings with my community, and I communicate with them about the importance of taking care of springs.

NGOAS: I also used the knowledge to write scripts about the water knowledge I acquired.

COMAS: I have made meetings with my community to them about the importance of keeping the springs clean.

6.4.4 Realised value: indicators of performance improvement

Three indicators of realised value were identified:

1. *Improved availability, water use and management*
2. *Personal, professional and organisational development*
3. *Improved living standards and living conditions*

The indicators of performance improvement, which align with realised value, were also analysed and they are presented above. These indicators are an expression of how the stakeholders in the activity systems realised the value associated with working towards managing water resources. These indicators express the value created in working towards the partially shared object at the A-view of the study. There is notable diversity in how the various stakeholders' performance improved and how this was expressed in their unique contexts. The performance improvement also covered a wide array of issues ranging from village life, village leadership, and personal and home improvement to organisational improvement and issues related to learning in science.

6.4.4.1 Indicator 1: Improved availability, water use and management

Evidence of this includes how people in their own spaces were able to experience increased water capacity and a decrease in water tariffs and how they now had better quality water. What also emerged from the data was that the newly acquired knowledge about using chemicals to purify water saved time, as compared to the practice of boiling water. The data extracts below show that some participants experienced improved availability of resources, saving time and paying lower water tariffs, because of applying the water knowledge they had received:

COMAS: I use this chemical to clean my water and it saves me a lot of time, while in the past I used to spend time first boiling water.

COMAS: Ever since I realised that my water usage has decreased, and I pay less for water at home. At work, I am more aware when people misuse water and I try intervene.

TLAS: There was an increase water storage capacity at home and more available water. Increased in water storage for the participants in the community projects, in the village who are farmers.

6.4.4.2 Indicator 2: Personal, professional and organisational development

One participant was nominated as a community achiever after applying what they learnt. It was very interesting to know that from learning about water and applying knowledge about water issues, a person could get to a point where their work changed, and they could even be nominated for community achievement. This was very inspiring for me as a researcher. The quote below shows what happened with the participants who applied what they had learnt:

TLAS: I was nominated as achiever of the year in the City Press newspaper, in 1995. This was associated with the water scheme to improve the living standard.

Another piece of evidence which came up was how a municipal technician stated that she was more satisfied and now enjoyed the work she did when she needed to supply communities with water. So for her, it no longer became just a tick-box exercise or just another way in which she fulfilled her job, but it was something she had become better at doing. Another participant was able to assist their organisation to perform better. The responses below show how personal, professional and organisational development occurred in the lives of some participants:

NGOAS: I helped to put LIMA (uMzimvubu catchment organisation) on the map in the uMzimvubu catchment and reinforced LIMA's reliability. It also made me realise my role within the greater UCPP team.

LGAS: I have become much more satisfied in my job (water service technician) and there has been improvement in my job.

Another participant concluded that they had become a better researcher because of the information they had received about water services and how they took that information and used it in their workplace as well as studying for their postgraduate qualification. Collaboration emerged as a way to help the project work better and improve communication with colleagues:

NGOAS: The process and the project relied on me getting information from community members, so I have learnt that collaboration is important, and it must not be a tick-box exercise.

LCPAS: The process taught me to have a better way of communicating and working with colleagues.

LCPAS: I became a better researcher, and I focus on water services and the associated impacts which trigger water provision.

6.4.4.3 Indicator 3: Improved living standards and living conditions

A senior community member assisting in improving the living standard in his community and being recognised for this achievement. Another participant realised that their use of water

decreased, and they were paying less for water at home after applying what they had learnt about water management:

TLAS: As a leader, the knowledge helped me to combine councils to work together to assist the villages.

TLAS: I was nominated as community achiever of the year and the water scheme I was involved in helped in improving the living standards of my community.

There were not many indicators for assessing success and transformative value. This is because most of the knowledge that people had received from different learnings in the past was associated with applied value and realised value: they could not be described as having transformative value. Transformative value plays a huge role in agency allowing people to change the way they do things because it enables them to get to a point where they understand that they can actually bring about change in their communities. Evidence suggests the value achieved could be seen as the realised value gained from the knowledge people attained :

NGOAS: I made contact with specialists in the water sector, and I started working with communities in the communities to secure water.

COMAS: It helped me to have healthier and bigger fish.

6.5 Conclusion

The chapter began by introducing the purpose of exploring the expansive learning process and reviewing the importance of past learning in the value created for stakeholders in the different activity systems. The different activity systems were detailed, along with their various activity system elements. With regard to the activity systems, the various activity system elements were provided along with the changes over time which occurred in the activity system and the various partnerships which formed. The contextual profiling trip, augmented by the desktop analysis and literature review, was instrumental in understanding the various activity systems which were present in the study. The Change Labs provided a platform to surface the existing learning present in the diverse activity system with regard to the shared object of water co-management. This existing learning revealed that there was awareness of water issues in the catchment and that there were various platforms and programmes dedicated to training catchment dwellers on water resource matters.

The chapter further detailed the various types of value emanating from previous learning in the catchment and explained the different types of value offered. Indicators of the value were

provided, and evidence of those indicators was shared. The past learning was considered important because it provided a starting point to understand the learning journey we undertook. Table 6.1 below is a summary of the type of value that had already been created by co-learning in the catchment at the start of the research, based on the indicators of value identified. Table 6.1 also shows for whom the value had been created, by activity systems. This offers the A-view findings in the study, showing that value had been created for a diversity of activity systems as identified at the start of the research.

Table 6.1: Value indicators present before embarking on the expansive learning cycle (A-view)

Type of Value	Indicators of Value	Responses (From Questionnaires)	Activity System
1. Immediate value	Training programmes	1, 2, 6 and 7 3 4 and 5	<i>Community</i> <i>Traditional Leadership</i> <i>NGO</i>
	Workshops and meetings	1 2 3 and 6 4 and 5 7	<i>Local government</i> <i>NGO</i> <i>Community</i> <i>Traditional Leadership</i> <i>Living Catchments Project</i>
	Forums and partner engagements	1 2	<i>Community</i> <i>NGO</i>
2. Potential value	Purification of water	1 and 2 3	<i>Community</i> <i>Traditional Leadership</i>
	Awareness of Ecological infrastructure	1	<i>Community</i>

	Management of water	1 2 and 4 3 5	<i>Community</i> <i>Traditional leadership</i> <i>Living Catchments Project</i> <i>NGO</i>
	Awareness of Ecological system	1 2 and 3	<i>Traditional leadership</i> <i>Community</i>
	Collaboration and engagement	1 2	<i>Local government</i> <i>NGO</i>
3. Applied value	Conservation and purification	1,2, 4 and 6 3 5	<i>Community</i> <i>Traditional leadership</i> <i>NGO</i>
	Partnership building	1 and 3 2	<i>Traditional leadership</i> <i>NGO</i>
	Monitoring	1	<i>NGO</i>
	Communication and education	1 2 and 4 3	<i>Traditional leadership</i> <i>Community</i> <i>NGO</i>
4. Realised value	Improved availability, water use and management	1 and 2 3	<i>Community</i> <i>Traditional leadership</i>
	Personal, professional and organisational development	1 2 and 3 4 and 5 6	<i>Traditional leadership</i> <i>NGO</i> <i>Living Catchments Project</i> <i>Local government</i>

	Improved living standards and living conditions	1 2 and 4 3	<i>NGO</i> <i>Traditional leadership</i> <i>Community</i>

The table above shows that certain value indicators were present before the expansive learning cycle was embarked on. This represents the A-view of the study. The four types of value identified were immediate value, potential value, applied value and realised value. Each type of value was supported by certain value indicators, which emerged from the various activity systems. In the case of immediate value, three value indicators were identified and all the activity systems were affected by the indicators. The potential value manifested in five value indicators and again all five activity systems were affected by the indicators. From the immediate and potential value types it can be seen from the table that the work which had been occurring in the catchment had an influence on the different activity systems and the learning could have potential benefits if acted upon. For the applied value type, four value indicators were identified, while only three of the activity systems were affected. This is a possible expression of developing agency amongst some of the stakeholders, showing that some of the learnings about water resources co-management only exist as an idea at the awareness stage. For the realised value type, three indicators were identified, and all of the activity systems were affected. Interestingly, the *personal, professional and organisational development* value indicators affected most of the activity system, and this is because of the personal and professional (community-based) aspects of this value type.

This chapter centred on past value creation for the stakeholders in the catchment. As mentioned in Chapter 1, one of the key aspects of the LCP is to enable collaboration, co-learning and co-creation. Questioning in Learning Action 1 of the expansive learning cycle allowed me to identify what the need state, or current state of co-learning in the catchment was.

The following chapter details the past contradictions which were surfaced during the research and why they matter; moreover, how they came to be and why they came to be. It elaborates on Learning Action 2 in the expansive learning cycle which sought a deeper understanding of the current need state in the catchment, through enquiry into contradictions, which, as mentioned in Chapter 3, could be seen as a source of expansive learning.

CHAPTER 7: SURFACING AND DELIBERATING CONTRADICTIONS INFLUENCING THE OBJECT OF CO- MANAGEMENT

7.1 Introduction and Background

As highlighted in Chapter 4, CHAT stresses the importance of resolving contradictions and developing solutions relating to the contradictions. Contradictions related to the object of water co-management were surfaced and analysed collectively. Chapter 5 detailed the process that was followed in surfacing, discussing and analysing the contradictions. Contradictions were an important source of learning in this formative intervention because they allowed the activity systems to be aware of certain issues relating to water co-management, and importantly, to discuss their cultural and historical contexts. The CHAT provided tools to engage and resolve contradictions, and to understand how they are manifested. As this was a niche-level innovation study, a new term, *isiphithiphithi* was coined in a bid to explain the contradictions which emerged and manifested in various ways such as systemic inadequacies, system failures, paradoxes and disorders in the system. This *isiphithiphithi* manifestation was used in conjunction with the other discursive manifestations of contradictions and was beneficial for the contradiction analysis in this chapter.

As detailed in Chapter 5, I used documents, field visits, VCF data and focus group discussions to identify some of the contradictions which seemed prevalent, and which were present in the catchment. I conducted this analysis to understand which were the most prevalent contradictions which could spur learning during the Change Labs. The process of analysing the contradictions was lengthy and time-consuming, but I needed to take this time so that I could understand and see what was important to people when it came to real issues concerning water management. Contradictions, as a fundamental principle of activity theory, aid in identifying tensions and conflicts that arise in learning contexts (Gedera & Williams, 2013).

7.2 Activity System and Contradiction Analysis

In the uMzimvubu catchment, five contradictions were surfaced. The contradictions occurred within activity systems and between activity systems. The contradictions were related to a) springs, b) wattle invasion, c) raw sewerage and pollution, d) water access and e) grazing of

livestock. With regard to the spring contradictions, conflicts and tensions emerged within the community activity system, and between the community activity system and the NGO activity system. With regard to the wattle invasion contradictions, the tensions and conflicts occurred within the community activity system, and between the community activity system and the traditional leadership activity system. Concerning the raw sewerage and nappies contradiction, the tensions and conflicts emerged between the local government and community activity systems. With regard to the water access contradictions, the tensions and conflicts occurred between the local government activity system and the community activity system, and between the local government activity system and the traditional leadership activity system. Lastly, with regard to the grazing of livestock contradictions, the tensions and conflicts emerged between the community activity system and the traditional leadership activity system. The subjects involved in these various activity systems are detailed in section 6.3.

The contradictions which were surfaced were historically and culturally rooted in the catchment, therefore, it was important to hear the voices of the older representatives in the catchment. As indicated in Chapter 4, in this study, 3rd generation CHAT was used, because there were interactions between various activity systems which were involved in the potentially shared object. In this section, I endeavour to detail the contradictions within and between the activity systems and map them out to express the tensions and conflicts at specified points of the activity systems.

7.3 Emerging Contradictions

This section includes the contradictions, the associated images representing the contradictions and the extracts from the Change Lab learning discussions which form part of the expansive learning cycle. The different stakeholders played a crucial role in bringing various views and different types of knowledge concerning the contradictions to the fore – in the process, learning collaboratively about the issues concerning water. The contradictions highlighted gaps in learning and knowledge, but possible solutions were also discussed by the participants. As the discussions continued, not only was there a historical and cultural analysis of the contradictions, but the modelling of solutions was also already taking place. Furthermore, this process expressed the understanding of the object at the A-view of the study, as discussed in the previous chapter. Below are the different contradictions which were highlighted as revealed in discussions which emerged during Learning Action 2 in the expansive learning cycle.

7.3.1 Springs [Contradiction in the rules of springs management within the community activity system, and between the community activity system and the NGO activity system, reflected in the undesirable state of springs in some villages in the catchment]

- “People were washing clothes in the springs and in other springs there was littering.”



Figure 7.1: People washing clothes near a spring site

The uMzimvubu catchment is densely populated, with many springs serving as the only supply of potable water for remote settlements. Many of the springs have been acquired and safeguarded as sources for local reticulated water delivery schemes, sometimes without the authorities' approval (ERS & CSA, 2011). The situation in the uMzimvubu catchment, and other catchments, has attracted various funding agents to assist with water co-management and establishment of partnerships for water security. Nedbank is one such agency which has partnered with certain stakeholders from the UCP to assist in working towards the object of co-management of water in the catchment. Nedbank (2020, p. 10) reported the following:

In 2019 Nedbank took its partnership with WWF-SA to the next level by entering into a five-year, R25 million water source area conservation partnership. The focus of this programme is on the protection and development of effective water ecosystems that consider the need to protect South Africa's essential water source areas, while at the same time supporting communities that rely on these areas for their livelihoods. The new partnership prioritises support of water security, reducing land degradation and improving local economic opportunities for rural communities in the Eastern Cape, which is home to the second-largest water source area in SA. The hope is that, over the five years of the partnership, the project will come to showcase the value of a water source partnership model and deliver valuable learning and insights that can be replicated nationally. ... We funded the rehabilitation of a spring in the uMzimvubu Water Catchment in the Eastern Cape that will ensure a reliable source of water throughout the year for more than 500 people in a nearby village.

During my field trips, UCPP meetings and observation of the catchment, I had seen how springs are important to the people of the catchment. As mentioned in Chapter 5, I had been on the “spring hunting” excursion with the Eco-champs and had various discussions with them. These

Eco-champs were natives to the catchment and had relayed to me the importance of the springs for water provision in their villages. The Eco-champs took me to several spring sites in the catchment and many of these springs were located at high altitudes above the villages. The Eco-champs also expressed how working with ERS had taught them about the protection of springs, measuring the flow rate of springs and checking for the water quality of springs. The partnership between the community, NGOs and funders led to job provision, skills provision and spring awareness for the Eco-champs and subsequently their communities. Regarding this partnership to protect the springs in the catchment, the Mail and Guardian (2021) reported as follows:

Part of the partnership is a World Wildlife Fund Nedbank Green Trust project that recently started the construction of 18 spring capture systems. These will provide clean water to 600 households in 12 villages. This initiative is managed by Christopher Jackson, of the LIMA Rural Development Foundation, in collaboration with Environmental and Rural Solutions and Conservation SA. Jackson says the project started with young people from the area gathering information about the springs from which people collected water for drinking and household use. This included the amount of water coming from the springs and the level of contaminants such as E coli and dung. Together with engineer Mahabe Mojela from Environmental and Rural Solutions, the project adopted a smartphone app to capture relevant data.

Increasingly, groundwater extraction is becoming important to meet the demands of rural communities in the uMzimvubu catchment, although knowledge about the number of wells/springs and their volumetric capacities is lacking (Freshwater Health Index, 2022).

The above-mentioned information expresses the importance of springs in the catchment and the commitment from various partners to help in the co-management of water sources. However, springs are and have always been in the villages. The springs have been managed by the community activity system through various rules rooted in culture and history. The resources (finances, chemicals, skills, training and infrastructure) emanate from the subjects in the NGO activity system. The spring management contradiction emerged as these two activity systems interacted while working on the common object, which was the co-management of water resources in the catchment. The research interactions below revealed more information about the contradiction:

Researcher: What are your thoughts with regard to spring management or protection in the catchment?

NGOAS-CLD: When people think of protecting the environment, they always think of doing this in a manner which excludes human beings. We always think of fencing off the humans, so that they cannot access the resource. We need to manage those resources in a way that communities can still

use those resources. When we see people washing clothes at spring sites, it merely shows that people do not have access to water, and the springs are the only source of water they have. What this means is that we need to manage the springs, so that it does not get contaminated, so that we can be able to use the resource again.

COMAS-CLD: The people in these villages are passionate and want to learn. We were not taught about taking water seriously, hence even our springs were not really protected. Since we as this generation, have now been taught about understanding of protecting the springs and the importance of conserving water bit by bit, we are learning. We were now even taught about the dangers of alien trees on water resources, and we were engaged, and that opened our understanding more and more. Another issue is that back in the days, you would never see children's diapers, but in these current days, these pampers nappies are being thrown everywhere, even near water sources. The older generation, even though they had no skills, they were neat as compared to this generation. As people of the land, we need to learn to preserve water. Even though we all used springs back then, it was the women's responsibility to go out on a weekly basis and clean the springs in the early morning before the sun came up. They understood that we could not have that green thing (algae) found in the springs.

Researcher: Why do you think that springs in the catchment are not in a desirable state, has anything changed? If yes, what has changed?

TLAS-CLD (1): When we were growing up in this catchment, many years ago, we had received teachings about protecting natural resources and not harvesting them. During our school days, we were taught about hygiene and that we need to protect things around us. These teachings, and our traditional teachings and knowledge are important and helped us safeguard our natural resources in the past. We were taught about being clean. Even the Protea tree, we were taught not to harvest it, because it is one of the most important trees around here. People are not made aware of these things we were taught about. We were told that springs have to be cleaned and must be in a healthy state. We need to go back to those things we were taught to us in school. Springs were used as a source of water, especially during dry seasons and Winter, and not just for us alone, but for animals too.

TLAS-CLD (2): When we were growing up, at our springs, we understood that springs were both for animals and us as humans. When it came to the washing of clothes, women would just draw water from the springs, and do the washing aside from the spring and not at the spring site. Then at the spring site, we would create a fallow at the bottom, so that the water would collect at the bottom and the livestock would be able to drink. Now there is a new model which has emerged from ERS, which includes having a tap at the spring. I have seen a number of them, and it is quite good.

7.3.1.1 Primary contradictions in the community activity system

From the data above, it is evident that there are contradictions within the various elements of the community activity system related to springs. A primary contradiction within the subjects of the community activity system was surfaced from the research interactions presented above. Some of the subjects in the uMzimvubu catchment stated that the issue of spring protection was often done in a way which excluded the villagers where these springs were located. This

issue of protection of springs requires engagement with the villagers, and to precisely understand their perspectives on the various springs in their villages. With regard to spring management, certain subjects in the community activity systems had been at the forefront of the protection of the springs, even though they did not reside in the villages where the springs were located. The quotes below show how people from the uMzimvubu catchment deemed spring protection as important because they were valuable in water provision for communities:

TLAS-CLD: It would be good to have the people who want to assist in protecting the springs engage in us so that we can tell them which springs we want protected. The ones which we feel are of value as the community.

COMAS-CLD: Some of the springs are located far from our village and high up in the mountains (even though they are in our vicinity). However, we do have some springs near us, which could be beneficial if they were protected.

This contradiction manifested itself as a dilemma. The subjects who tried to assist with the spring protection and the catchment dwellers who did not live in the villages sourced funding to protect the springs in a bid to ensure better water security for the villagers who resided near the springs. The funders or sponsors of the spring management programmes had a specific criterion regarding the types of springs they should manage, and sometimes these were not the specific springs which the community required assistance with. The dilemma manifested because of different evaluations of the value of certain springs. This dilemma occurred because the subjects felt that their “voice” (opinions and perspectives) on the matter was not heard. As mentioned above, in the past, environmental protection was largely focused on natural resources and performed in a manner which excluded human beings. This contradiction presented itself as a dilemma for the subjects in the community system who were bringing the funds, because they wanted to assist the community as best as they could, but they had to abide by the policies of the external funders. This influenced the agency of the largely rural subjects in the community activity system because they had been introduced to a system where foreign stakeholders would invest in protecting and fencing off the resources from potential users.

As mentioned above, this was not always so, because the subjects in the villages understood the value and the importance of natural resources in securing their livelihoods. This has had a spillover effect on the springs. Springs were maintained, cleaned and preserved by the villagers in the past, as they were a key source of water provision. With the advent of taps and the introduction of Western products, the rural subjects in the community activity system are no longer as greatly dependent on the springs and many of them do not understand their value in

the context of water security. This is expressed by littering around the springs and washing clothes by some subjects in the community activity system. However, with the changing climatic conditions, droughts in the Eastern Cape and decreasing water availability in the country and the catchment, the importance of healthy springs with good water quality is a key theme.

Another contradiction within the division of labour element of the community activity system was surfaced from the research interactions. Within the community activity system, there were customs which were associated with water-related labour in the community. However, there were tensions in the role of labour relating to springs between the older and younger community members. During the Change Labs' discussions, there was a sense of wanting to migrate back to the traditional and cultural rules and customs of spring management by the older subjects in the community activity system. This was met with some hesitancy by the younger subjects, as this division of labour included some gender roles involved in cleaning the springs weekly. This contradiction manifested as a conflict. The younger community members understood the perspective of the older community members; however, they disagreed with them and were not willing to return to the previous ways. The younger generation disagreed with the older generation about how the labour should be divided regarding the cleaning and maintenance of the springs. This conflict was reflected by the poorly maintained springs and the general state of the health of the springs. This point was expressed in the following quote:

COMAS-CLD: I understand what the elders are saying, however, times have changed now and we are living in a new era. Women are also working and have to provide for their families. It does make sense why it would be that women are the ones who clean the springs because they are the ones who collect water from water sources.

Closely aligned with the division of labour were the contradictions in the rules of the community activity system. There were tensions and conflicts relating to adherence to cultural rules and customs regarding spring activity. These mainly surfaced through the issue of hygiene around the springs and the rules relating to non-littering around springs. In addition, during my data collection, a common theme which surfaced time and time again was the issue of some people allowing livestock to drink at water sources which humans use. From the data extract below, there were traditional rules which governed the issue of water delineation boundaries, this was established to determine points near the water sources where livestock could drink. Livestock shepherds' non-adherence to these rules about preventing their livestock from drinking from the springs directly is a source of tension and conflict. This contradiction was

manifested as a critical conflict. The issue of shepherds bringing their livestock to these springs is because of the issue of unavailability of water sources because of several issues in the catchment, such as drought, limited water sources, etc. This then causes these shepherds to have limited alternatives with regard to water sources for their livestock and they are faced with internal doubts and issues which they cannot necessarily resolve by themselves. This in turn leads to tensions and conflict because of non-adherence to the rules. This issue is expressed by the quote below:

TLAS-CLD: People who rear livestock have to be made aware about the delineated points where their livestock can drink water. We know that springs are important sources of water for us and the animals, especially during dry seasons. Awareness and training are key, if we want to preserve our springs and ensure that they are in a good quality.

Another primary contradiction that surfaced through the data was in the mediating artefacts in the community activity system. There were tensions in this activity system about the issue of the importance of hygiene being taught in schools. This theme of education about hygiene is believed to have been vital in the past and it was seen as a mediating artefact expressed through teachings in schools. From the data, there appeared to be a disconnect between contemporary cultural teachings and hygiene, and the older subjects believed that there should once again be an emphasis in schools educating people about hygiene and that would spill over to environmental hygiene. What was apparent was the fact that society needs to be made aware of IKS, as this knowledge has developed over the years and is culturally and locally appropriate. Furthermore, this traditional knowledge can assist in safeguarding the springs in the catchment. This contradiction is manifested as a double bind. The teachers in the schools in the villages teach according to a syllabus given to them. This means that they cannot just teach about any topic they see fit. Spring health and general hygiene are critical in the context of the villages; however, the schools in these villages are under the jurisdiction of the Eastern Cape Department of Education, which is under the umbrella of the Department of Basic Education – the national body vested with authority. It is this body which determines the content taught at these schools and the teachers have to adhere to the syllabus given to them. Figure 7.2 offers a summary of these primary contradictions.

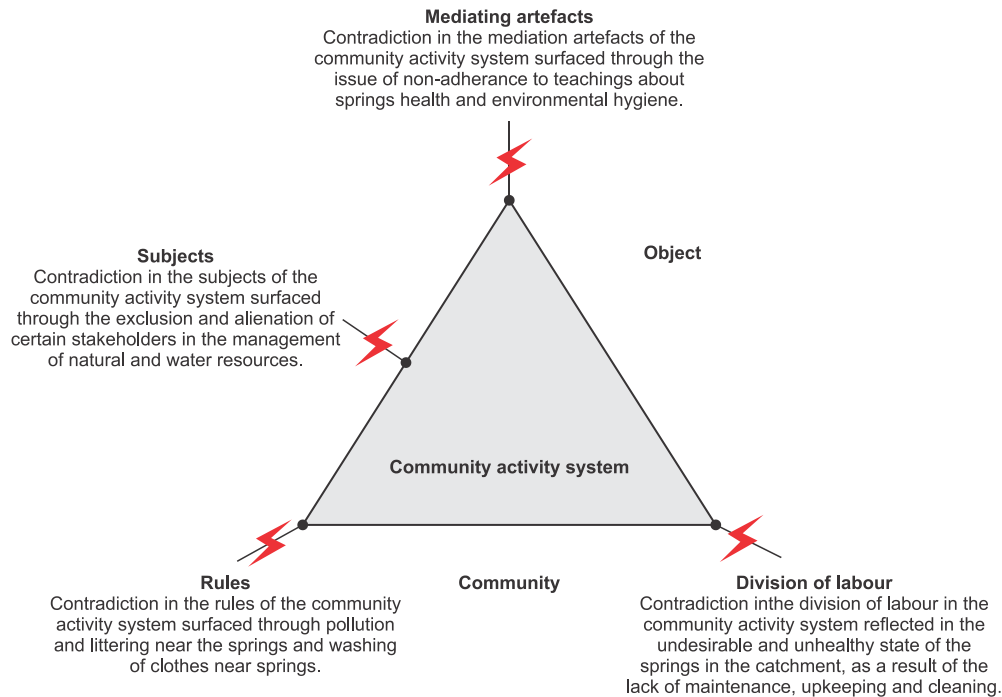


Figure 7.2: Primary contradictions within the elements of the community activity system

7.3.1.2 Quaternary contradictions between the community activity system and the NGO activity system; tertiary contradictions between tools of NGO activity system and rules of the community

As introduced in Chapter 1, CSA has led a process to build a 20-year strategy to conserve the vulnerable uMzimvubu catchment in collaboration with ERS, since 2011 (UCPP, 2015). Collectively, the UCPP partners have had a considerable impact on many elements of catchment management in the area. Over the course of three years, they have invested more than R50 million in projects in the subregion (UCPP, 2015). In terms of investing in the catchment, the NGO activity system has invested substantially into the catchment over the years, and it has shown commitment to bettering the livelihoods of the subjects in the community activity system. However, funding is usually accompanied by terms and conditions, and this is usually the point of tensions and conflicts, leading to the quaternary contradictions reflected between the community activity system and the NGO activity system. The first quaternary contradiction was reflected by how the rules governing the funding agreements of the NGO activity system affected the object of water co-management in the community activity system. This conflict manifested as a dilemma. This is because the NGOs have to abide by specific rules to operate and protect the springs (funding agreements, government policies,

organisational obligations, etc.). However, the NGO activity system was limited in carrying out its mandates to assist the communities, and in turn, this negatively impacted the community activity system to manage their water resources to secure water availability. The data extracted from the quotes below expressed how the rules in the NGO activity have limited the protection of springs which were of value to the community activity system but did not meet the rules governing the protection of springs in the NGO activity systems.

Researcher: What are some of the issues constraining the effective management of springs in the catchment?

NGO-II: Sometimes when we get funding, the funder has a checklist, which details certain characteristics of springs which qualify for protection and maintenance, such as flow rate of water in the spring, position of spring, etc. These checklists have been developed for a certain reason, understandable so, however, at times, they disqualify springs which communities view as important. However, since these springs which are perceived as important by the communities do not meet the requirements, they are not invested in and maintained.

LCP-II: The issue is not that we do not want assistance with our springs from the NGOs, the issue is that sometimes, not all of the stakeholders involved in the springs are consulted, therefore this can lead to tensions and conflicts with regards to springs. Springs play different roles and have diverse values for people in the catchment. Springs go beyond the provision of water for the community, they possess healing and spiritual qualities. Therefore, sometimes traditional healers or other people rooted firmly in culture do not want certain springs touched or contaminated by external factors.

Another source of tension and conflict that surfaced through the research interactions was that of the tertiary contradiction between the object of the NGO activity system, the community element, the subjects and the rules in the community activity system. The NGO activity was invested in the object of co-managing water resources in the catchment because the stakeholders in the NGO activity system were also residents of the catchment and therefore had a vested interest in ensuring that springs were protected. However, within the community element of the activity systems, there were subjects in conflict about the approach and tools (techniques and materials) used by the NGO activity system to work towards the object of their activity. The stakeholders in the community activity system who practised their religion and required the springs for healing and cultural purposes were against any introduction of foreign elements (chemicals) in the springs, as they believed this would affect the healing and spiritual powers related to the springs. This contradiction manifested as a conflict. The NGO activity system used Western scientific methods to purify, maintain and protect the springs. This activity system had a vested interest in protecting these water sources, as this would lead to

increased water security in the general catchment, not just in the villages. However, the perspective and modus operandi of the NGO regarding springs are in direct conflict with certain members of the community system who did not just see the springs as water sources, but of healing and spiritual importance. Below is a quote from one of the interviews I conducted:

LCP-II: I always try and conscientise new or potential partners in the catchments to understand the catchment context. People want to come to the communities to try and help, but they do not understand the people in the catchment and the rules they live by. One cannot just come in a catchment and try to do things without consulting the community. Stakeholders need to learn the following issue if they want to sustain or introduce new things in the catchment: do not just do things for the people but do it with the people.

Another contradiction which emerged was between the tools of the NGO activity system and the rules of the community activity system reflected by the non-acceptance of tools of the NGO activity system and damage of the equipment in some springs. This contradiction manifested as a conflict. Even though certain subjects of the community activity system did not verbally state their disagreement, they used their actions to express how they felt. This manifested conflict was quite complex because the tools used by the NGO activity system are associated with Western (foreign to the villagers) science and are important to ensure that funding is sustained. Also, the tools of the NGO activity system determine which springs are protected, and sometimes these are the springs which some of the subjects of the community activity system do not want “touched” or “corrupted” because of the rules of the community activity system. The quote below shows how the contradiction manifested as a conflict:

NGO-CLD: Sometimes, we will bring resources and begin working on a certain spring, in order to maintain it or increase its quality. However, in some places, we find the work we have done demolished or the equipment taken away. It appears to us that the communities do not want us to work there and we are trying to help because we have funding and we have a mandate to assist communities in accessing healthy water.

Figure 7.3 below offers a summary of these contradictions.

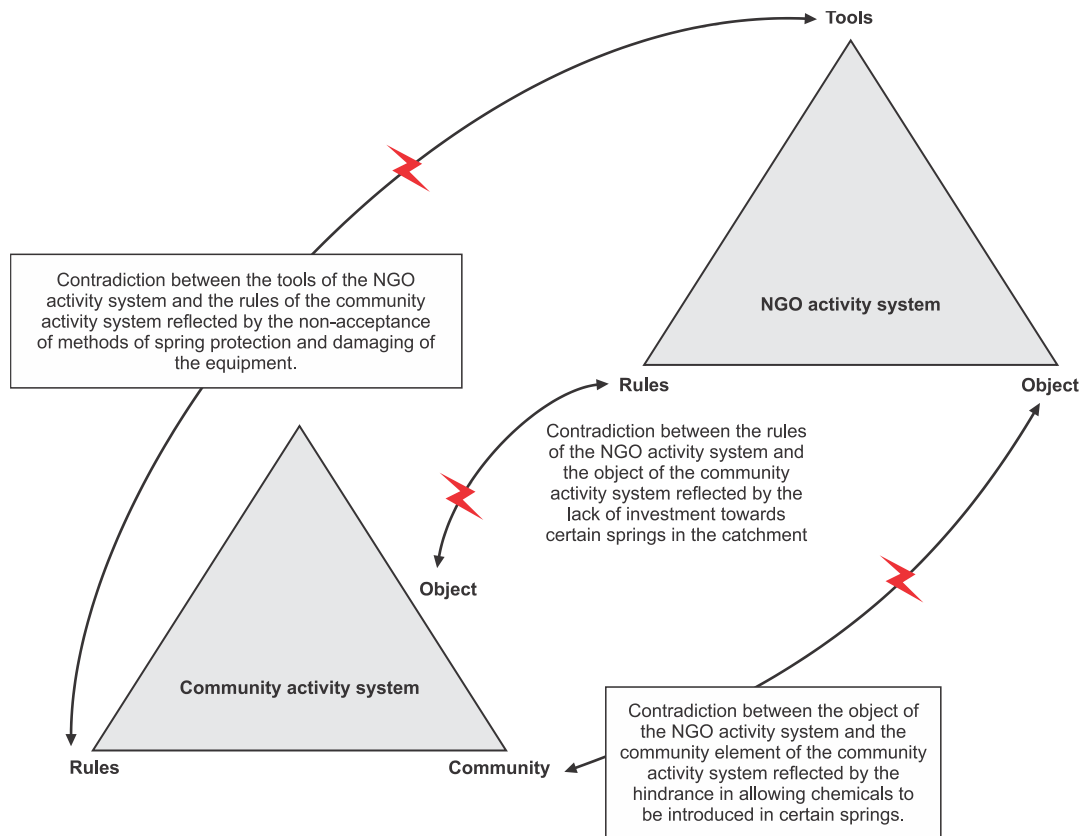


Figure 7.3: Quaternary contradictions between the elements of the community activity system and the NGO activity system; tertiary contradictions between tools of the NGO activity system and rules of the community

7.3.2 Wattle invasions [Contradiction in wattle management within the subjects of the community activity system, between the subjects and the object of the community activity system, between the community activity system and the traditional leadership activity system, and between the community activity system and NGO activity system reflected in the degree of wattle infestation and extensive presence in the catchment]

- “Wattle is growing everywhere, it is competing with the indigenous plants, the animals cannot eat it and it affects our environment.”



Figure 7.4: One of the uMzimvubu villages with wattle in the background

In my research collection process and excursions in the catchment, I observed large tracts of wattle stands in the landscape. During the UCPP meeting I attended in May 2021, wattle management was one of the points in the day's proceedings. During that meeting, the DWS, LIMA and other parties prepared presentations about wattle invasion focusing on what is currently being done to manage wattle infestation in the catchment and other areas and what could possibly be done. Wattle invasions raised several contradictions discussed below.

7.3.2.1 Primary contradiction in the community activity system (within the subjects), and secondary contradiction between the subjects and object of the community activity system

The data extracted below revealed a primary contradiction in the subjects of the community activity system with the presence of black wattle in the catchment. This is because it related to certain subjects in the activity system using wattle for fuelwood, as a building material, for household purposes and other livelihood needs. However, some of the other subjects reported that the black wattle had changed certain elements in the landscape, jeopardising the efficacy of certain water sources and compromising grazing land. Chapter 1 provided the background and information about the black wattle invasion and its implications for water security. However, the potential and current threats of black wattle to the catchment were in direct conflict with the livelihood needs of the catchment dwellers. This contradiction manifested as a dilemma because the subjects of the community activity system had to make a decision to either protect their environment (from further invasion of wattle) or to secure their livelihood needs. This was a primary contradiction in the subjects of the community activity system.

Furthermore, from the quotes below, there appeared to be an awareness of the black wattle encroachment in the catchment, but the presence of the black wattle in the catchment seemed to create benefits which were important for communal livelihoods. This then led to a secondary contradiction when focusing on the object of water co-management; the contradiction was between the subjects of the community activity system and the community activity system's object of co-managing water resources. This secondary contradiction manifested as a critical conflict. The subjects in the community activity system found themselves in a situation whereby they had to prioritise taking care of their immediate and daily livelihoods over protecting the water sources. The subjects found themselves in a difficult situation because of economic and employment issues, and this caused inner tension and conflicts because the situation they faced seemed insolvable.

Researcher: As people who live in the catchment, what is your perspective on black wattle?

COMAS-CLD: In my village (Mafube), when we grew up, we knew that there was a place where black wattle was planted. This just confuses me a bit at times. This wattle was planted by our grandfathers, especially the black wattle. The dense, black wattle. Then there is the wattle which naturally grows along the rivers, not planted by anyone. This creates a problem in the village because when they think of wattle, they cannot even differentiate between the types of wattle. To some of the villagers, wattle is a source of living and it is also an energy source. We need to make people understand and make them aware that there are different types of wattle, and that we cannot allow wattle to just grow by the rivers.

COMAS-FCD 1: As a person who grew up in this catchment, I remember when people would go to the wild and harvest the black wattle. They would plant the black wattle in their areas for shade, fuel wood and other everyday purposes. They harvested and planted the black wattle in their immediate vicinity to avoid travelling long distance to cut it.

COMAS-FCD 2: We have lots of wattle in my village. The villagers say that the wattle helps with events and especially at funerals, as fuelwood. Furthermore, the villagers want the wattle for building material. The people, however, want assistance in managing the wattle, they do not want it completely eradicated. The chief in my area stated that the black wattle has taken over many places in the catchment, because most of the areas which were water sources are dried up, or areas of grazing have been encroached into, and wattle has grown there and covered the area over the years.

COMAS-FCD 3: The people need to be trained on how to harvest or cut wattle; some sort of skill has to be given to them because the way they cut the wattle seems to aggravate the growth and it reappears faster. As a person who has been exposed to training about black wattle, I can tell you that people do not have the capacity to cut wattle. They need personal capacitation and skills development with regards to wattle harvesting.

Figure 7.5 below offers a summary of the contradictions.

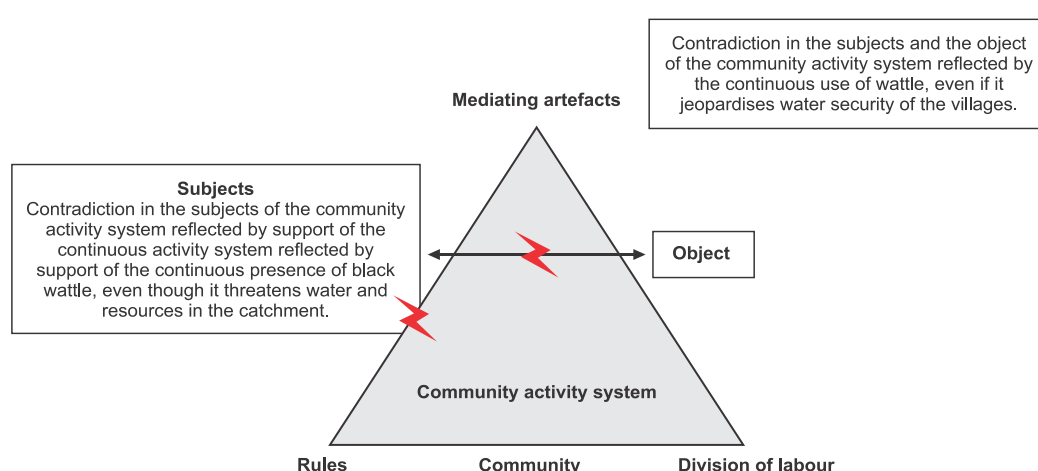


Figure 7.5: Primary contradictions within the subjects of the community activity system and secondary contradiction between the subjects and object of the community activity system

7.3.2.2 Tertiary contradictions in the rules of wattle management between the traditional leadership activity system and the community activity system

The quotes from the research interaction shown below surfaced a contradiction in the rule element of the community activity system and the traditional leadership activity system. The actors in the community activity system reported a history of black wattle harvesting in the catchment. The stakeholders even possessed an Indigenous name for the act of collecting or harvesting black wattle. In addition, the harvesting of black wattle was reported to provide economic benefits for some catchment dwellers. As there had been some engagements between the different stakeholders in the catchment, there was some awareness raised about black wattle, leading to the formulation of new rules and customs. As the traditional leadership activity system had interacted with the NGO activity system, chiefs and leaders in the catchment had received projects relating to black wattle clearing and management and had also been given some responsibility in this regard. However, not everyone in the catchment was made aware or taught about the dangers of black wattle invasion.

From the data it was evident that some catchment dwellers still abided by the older rules relating to black wattle. This surfaced a contradiction in the rules of the community activity system and the rules of the traditional activity system. This contradiction manifested as a dilemma. This was because the users of the black wattle required the wattle to feed their families and fulfil their roles as the providers, but at the same time, they needed to abide by the updated rules which did not serve their intentions and cultural and social duties. During the field interview I had, the gentleman was carrying a saw and going towards the black wattle forest patch to harvest, because in the rural catchment context, it is customary (a rule) for the man to provide for his family. For this gentleman, the harvesting of the black wattle near his village was a means to provide for his family. The quotes below show the complexities related to wattle management and the perception of various activity systems regarding wattle.

Researcher: Have there been or are there any measures to manage black wattle in the catchment?

COMAS-FI: I have never really had any teaching or awareness about black wattle. All I know is that we grew up harvesting this black wattle. The isiXhosa name we have for black wattle is 'idywabasi'; so, when you needed wood, we say we are going to 'edywabasini', meaning you are going to harvest black wattle. The wattle is very helpful in making ends meet. As you can see now, I am about to cut and harvest some wattle for someone who needs it. People call me and place an order for black wattle wood, and I deliver.

COMAS-FCD: In my village, the chiefs and leadership do have some rules in place to try and control the black wattle. If a person wants black wattle, they can place an order or buy it. This is a rule which has been placed by our chief to try and control the spread of black wattle in our area.

TLAS-CLD: I am the chairperson of the Indigenous forum in my area, and in the area, there was a Working for Water Project happening right above our area. The project custodians came to me and said ‘chief, you are the one who is supposed to be removing and dealing with the wattle here, but you have let it grow’. After having the meetings with that project, I requested that they teach us about areas where we could keep the wattle because we need them during November/December, for our traditional circumcision schools and we need the wood to cook when we are there, because this has been our custom for many years. We had to come to a point of agreement, and we cleared the wattle which was close to water sources and we allowed it to grow where it was controlled, so we could still use it for our traditional purposes. However, another issue erupted, because of this wattle removal, people began harvesting the proteas for household and cultural purposes, because they said that the wattle was now too far from them. As we were taught more and more about this issue of wattle and the importance of not harvesting the proteas, the people realised that it was illegal to cut the proteas and that they had to harvest the wattle in only those designated areas.

COMAS-CLD: You know what, even in my village, there is a huge open space where wattle is protected and you cannot harvest from there. But there is a time when the chief will announce that for certain days, the wattle can be harvested. This helps with controlling the wattle population and goes hand in hand with our cultural norms.

TLAS-CLD: This is why we need to give thanks to ERS, and their partners LIMA and CSA. Ever since they started working on this landscape, we have learnt quite a lot and we can now differentiate between the different types of wattle. As the Secretary of CONTRALESA, I have worked with these organisations and they have assisted my villages in terms of water awareness and the dangers of having wattle close to water sources. Since then, our water quality has improved, we produce more water than before, our animals are healthier and grass is appearing in places which were formerly degraded.

Figure 7.6 provides a summary of these contradictions.

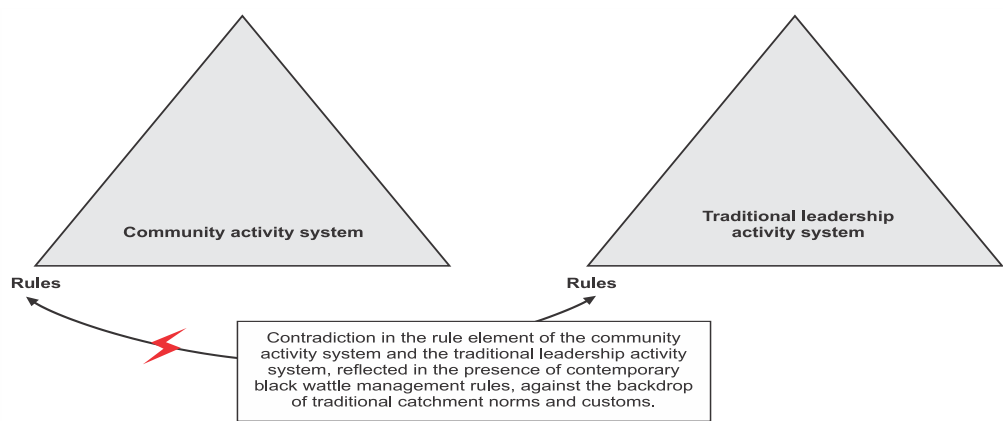


Figure 7.6: Tertiary contradictions between the rule element of the community activity system and the traditional activity system

Another tertiary contradiction surfaced between the NGO activity system's object and the community activity system's subjects. The desire to clear wattle to work towards the object of water co-management was met with resistance by certain subjects of the community activity system. Although some subjects in the NGO system fell within the community activity system, they possessed limited power or agency to change the status of the black wattle presence, because they were located in areas close to urban centres. This contradiction manifested as a critical conflict. The object of the NGO activity system was to try and manage water resources, however, they were met with resistance by some subjects of the community, and this led to a paralysis of potential good works. The non-removal of the wattle has had some detrimental consequences for the villagers. The following quotations revealed the different insights shared by the actors in the two activity systems:

Researcher: How do you think black wattle should be managed, or do you think it should be managed at all, in the uMzimvubu catchment?

NGO-FI: The issue of black wattle is an issue close to my heart. For us as an organisation wattle management involves negotiating with the communities. We negotiate with them about how much black wattle should be cleared and which areas can be left for harvesting. It is a mixed bag of issues though. In some areas, we are told not to touch the black wattle by the community and we cannot do anything. In some areas, especially in the mountains, the communities reach out to us to help them clear the wattle.

COMAS-FCD 1: Black wattle has brought a change in the landscape over the years, in my village, the fields where people used to plant have been taken over by black wattle. Grazing fields for livestock have been encroached by black wattle. Even places which were open for building have been taken over by black wattle, and in some places, there is limited yard space and limited playing fields for the children.

COMAS-FCD 2: Black wattle also aids in criminal activities, especially in the face of cattle theft in this catchment. If black wattle is allowed to grow, thieves hide the cattle in the black wattle. The victims will think that their cows have already been moved to Lesotho or Qumbu by the criminals, but the cattle are hidden in the black wattle stands close to the village.

COMAS-FCD 3: The black wattle projects from ERS, Department of Environmental Affairs and the awareness of black wattle by the municipality has assisted us in this catchment to a certain extent.

There were diverse views from the subjects in the community activity system concerning the presence of black wattle in the catchment, especially in the villages. The data extracted above expressed how black wattle was perceived as a nuisance and a threat to the community by others but appreciated by some communities. The black wattle effects went beyond

jeopardising water security, it also influenced community safety. The pursuit of the object of managing water resources in the catchment by the NGO activity has raised awareness and influenced certain stakeholders in the subject element in the community activity system. This presented some potential evidence of the role of learning and awareness raising, and how it could influence a change in perspective. During my interviews, I also observed that the Eco-champs' attitudes towards learning and training were positive. From the quotes below, some of the Eco-champs suggested training, awareness and learning about black wattle for the communities:

(COMAS/NGO-FI) Eco-champ 1: People should be trained on how to cut black wattle. Personal capacitation is very important in this regard. This is a skill individual should possess.

(COMAS/NGO-FI) Eco-champ 2: Actually, everyone should receive personal training on how to harvest and cut black battle, because the way they cut or harvest is encouraging the re-growth of this species in this catchment.

Figure 7.7 offers a summary of these contradictions.

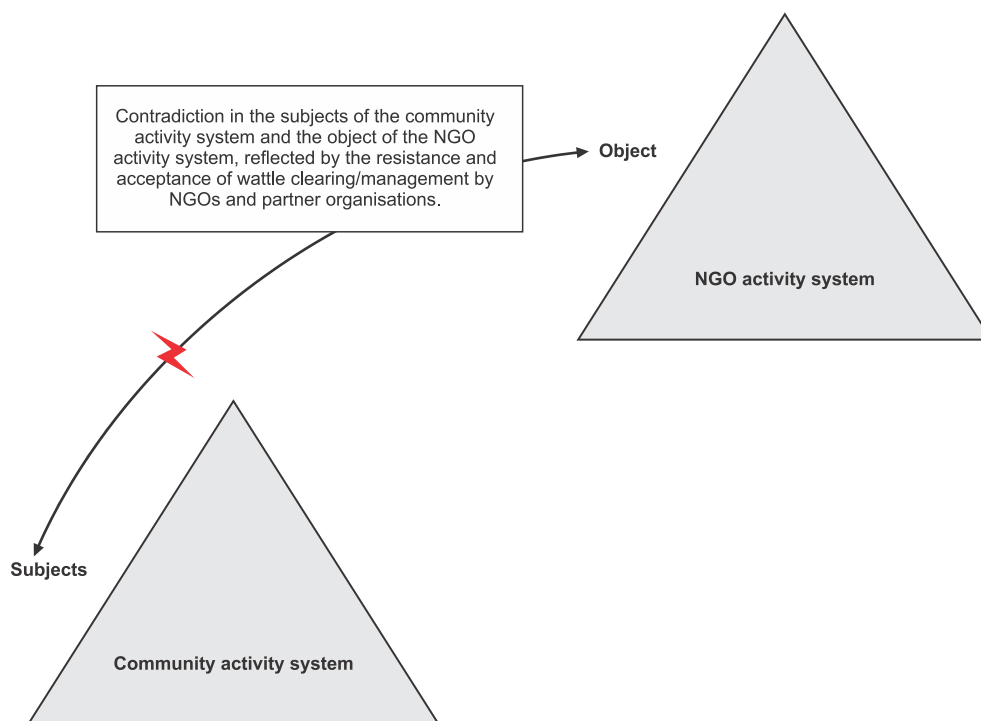


Figure 7.7: Tertiary contradictions between the subjects of the community activity system and the object of the traditional activity system

7.3.3 Raw sewerage and stream pollution [Contradictions in the rules governing service provision in the local government activity system, and in the rules regarding littering and nappy disposal in the community activity system]

- “Raw sewage leaks into a stream near my settlement, it is said that is due to ‘broken pumps’. It affects us.”



Figure 7.8: Litter in a stream in the uMzimvubu catchment

The uMzimvubu River is no different from other rivers in that it is polluted by human activity. I observed pollution in the catchment during my field trip through the different villages in the catchment. I did manage to make notes of the pollution in the landscape. During the various field trips, I took some time to ask participants who were accompanying me about the pollution. Below are some of the interesting insights/responses from the contextual profiling trip and data collection trips in the uMzimvubu catchment:

NGO-FCD: You see where those cows are, that used to be a wetland, but people began dumping and it is just polluted. Now cows feed by that rubbish and are in contact with that polluted water.

NGO-FCD: Pollution is a major problem in this catchment. I am currently working on a waste management project in the catchment. Pollution and the spread of disposable nappies is a problem in this catchment; in rivers, springs, streams and some water sources you find nappies and pollution.

This raised insights into secondary contradictions between the local government and community activity systems, and secondary contradictions between the rules and tools.

7.3.3.1 Secondary contradictions between the local government and community activity systems and secondary contradictions between rules and tools

The quotes below surfaced the contradiction in the local government rules and how the policies governing municipal expenditure tended to affect the ability of the local municipality to provide services for the catchment inhabitants (see Figure 7.9), especially the ones in the rural contexts. Not everyone in the catchment was aware of the government spending rules which governed how local government should spend their allocated budgets. For the local inhabitants, if there

was an issue, the assumption was that the municipality, as the designated authority, should resolve that issue. If the issue was not addressed, the community assumed that the municipality was not attending to its duties. Below are the interactions between the various activity systems with regard to the issue of service delivery in the uMzimvubu catchment:

Researcher: I have noticed littering and pollution across the catchment, what can you tell me about this issue?

LGAS-CLD: As a municipal water technician for this area, I can tell you that this is an issue. National government allocates funds, and we sub-allocate funds for the various wards. According to law, we cannot just take money from one ward and spend it on another, even if a severe issue which requires immediate attention erupts. This creates a problem because people see us as the municipality as not caring for them. If there is an issue of sewerage leaks in one village, and there is not budget to deal with that from their financial allocation, we cannot take it from another village's budget, even if that village has surplus funds and could help the other village with the problem. Allocation of resources and budgetary constraints play a huge role in the municipal handling of the issue.

TLAS-CLD: We are tired of attending these meetings with government officials. We even attend the IDP (Integrated Development Planning) meetings and they have not helped us, even though we voice our issues. How I wish the municipality can change the way they work and start serving the people of this catchment.

LGAS-CLD: Another issue is that people at times do not listen, especially when we engage them as the municipality. We told the people who were vendors about the proper disposal of their used cooking oils, but they did what they wanted, they threw the used oils in the drains and as a result that blocked the city drains. Now because of that blockage, the sewer would just erupt where there are openings and the entire town would be filled with sewer. Then the people would complain after we had issued a warning about the issue of disposing of used cooking oils and food in the drains.

NGOAS-CLD: We also need to remember that the systems in Matatiele are limited. When this town was built, it was not supposed to support the large population which is present currently. So, the population has grown tremendously, and the system cannot support the population effectively.

During the Change Lab in June, the water technician from the local government activity system introduced and made the actors in the other activity system aware of policies, especially the Municipal Finance Management Act (MFMA). The National Treasury (2023, p. 1) states the following concerning to the MFMA:

The National Treasury has played a pivotal role in the introduction of financial management reforms across government since 1994 and in local government since 1996. The cornerstone of the reform initiative has been implemented through the Municipal Finance Management Act No. 56 of 2003 (MFMA), which became effective in July 2004 and supported by the annual Division of

Revenue Act. ... The MFMA aims to modernise budget, accounting and financial management practices by placing local government finances on a sustainable footing in order to maximise the capacity of municipalities to deliver services to communities. It also aims to put in place a sound financial governance framework by clarifying and separating the roles and responsibilities of the council, mayor and officials. ... The MFMA is required by the Constitution, which obliges all three spheres of government to be transparent about their financial affairs.

However, from the quotes above, it was apparent that the issue of pollution was not solely because of the local government activity system's shortcomings. It was apparent that the issue was multi-layered in the catchment and could not be solved by the actions of a single activity system.

The contradiction manifested as *isiphithiphithi*; a Xhosa word that best expressed the complexity of this contradiction. I used this concept because CHAT theory and the English language do not have an adequate description for this manifestation. This manifestation reflected the complexity of the governance in the area and the overall systemic failure. *Isiphithiphithi* in this regard, also related to rules of governance which were incompatible with the reality in the catchment (issues, problems, etc.), and could not solve the problems on the ground. *Isiphithiphithi* also related to the issue of ignored wisdom, which led to the exacerbation of problematic situations. The lack of adherence to instructions provided a temporary solution, but the outcomes of the non-adherence resulted in the breakdown of the whole system. The issue of awareness is important and community members need to be made cognisant of the rules which the local government activity has to abide by. For some actors in the different activity systems who were present in the Change Labs, when they were made aware of the rules of the local government activity system, I observed that their perspectives and attitudes towards their local government activity system changed. From the quote below, it was also apparent that some subjects in the community activity system empathised and recognised the work of the local government and that there were some issues which could hinder service provision, emanating from the very communities they were endeavouring to assist by providing services.

COMAS-FCD: The government does try to assist in fulfilling their duties. With regards to waste management, the municipality has set dates for waste collection. However, sometimes when the garbage is left outside, dogs do come and try to find food in the waste. Next thing the waste is everywhere and the environment is polluted.

Figure 7.9 offers a summary of these contradictions.

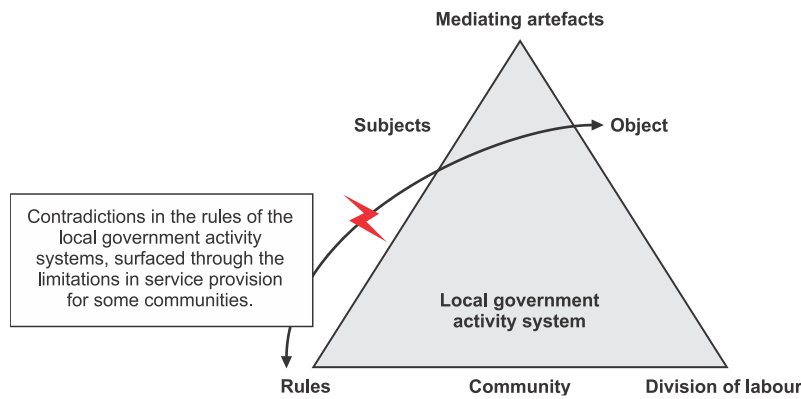


Figure 7.9: Illustration of secondary contradictions in the local government activity system

The quotes below also surfaced the contradiction in the rules concerning waste disposal in the community activity system. The tensions and conflicts related to nappies that were hindering the community activity system from attaining the object of co-management of water. The rules concerning nappy disposal were difficult to abide by because the communities did not always have the necessary infrastructure. However, the inability to abide by the rules of nappy disposal was leading to pollution of the water sources. This contradiction manifested as a double bind because the people responsible for the littering felt helpless and could not solve this problem on their own. Such manifestations were reflected because the perpetrators did not have sufficient power and resources to fix this issue, and they ended up damaging their environment. At the same time, their temporary solution was affecting the object of co-management of water resources, because the disposable nappies ended up damaging their water sources. The interactions between the researcher and the various activity systems below surfaced the contradiction in the rules concerning waste disposal in the community activity system:

Researcher: What do you think is causing the pollution and waste in the landscape?

NGOAS-CLD 1: Honestly speaking, in Matatiele, there is not really that much of raw sewerage, the issue which is quite prevalent is stream pollution. Especially the issue of nappies being thrown all over. We have begun having discussions with the Living Catchments Project about factoring waste management into the water management agenda because that is an issue plaguing our catchment. We have waste issues in our streams and everywhere.

NGOAS-CLD 2: The issue of waste is a national and international issue, it starts right at the top. Why are producers producing items which cannot be recycled? Why are the consumers disposing of these products in the streams and in the landscape? Why are those mandated to manage the landscape allowing waste to plague the areas?

COMAS-FCD: On the waste management project that I am on, I have been doing surveys about pollution and waste in the catchment. People in the rural areas are complaining that they do not have services for nappy disposal. They say such services are only for the residents in the urban areas. Most people state that they do not have alternatives to disposal nappies and that is why they use them. Since people are devoid of nappy disposal services, they resort to digging holes to dispose the nappies or they just find a place to throw them away at. Hence these nappies end up in water sources.

COMAS-CLD: Back in our days, we used to dig holes for any waste. We always had animals in mind, so we did not want them to eat waste. We would dig a huge hole, then when it was filled, we would close it up. Today I see that the municipality has instituted the use of these public dustbins so that nappies can be thrown in there, because they have seen that these nappies cause blockages. I think we should be educated as the communities about waste disposal, especially the proper disposing of nappies, so that they not just end up in places where they are not supposed to be.

TLAS-CLD: I also think that a change in lifestyle has contributed to this issue. Things were better when there were the reusable nappies. Ever since people started using disposable nappies, these issues have emerged, unlike back then when people used reusable nappies.

These water sources are still an important source of water provision for numerous villages in the catchment, especially in the wake of water insecurity plaguing the catchment. This was a secondary contradiction in the catchment because the rule element of the community activity system was influencing the activity relating to the fulfilment of the object of the same activity system. Related to this contradiction, was the issue of the contradiction between the rules and the tools of the community activity system with regard to waste management. The community had a set of rules which were designed to control and manage waste, however, not everyone was adhering to these rules. The lack of adherence to the tools and the rules with regard to the waste was affecting large parts of the villages and compounding the already existing issues. This contradiction manifested as a critical conflict because subjects in the activity system had to dispose of the diapers, but there were certain internal and external issues which limited them from adhering to these rules. The tools to dispose of these nappies also at times proved problematic, because of the dogs that ended up searching the dustbins and caused littering in the community. Figure 7.10 offers a summary of these contradictions.

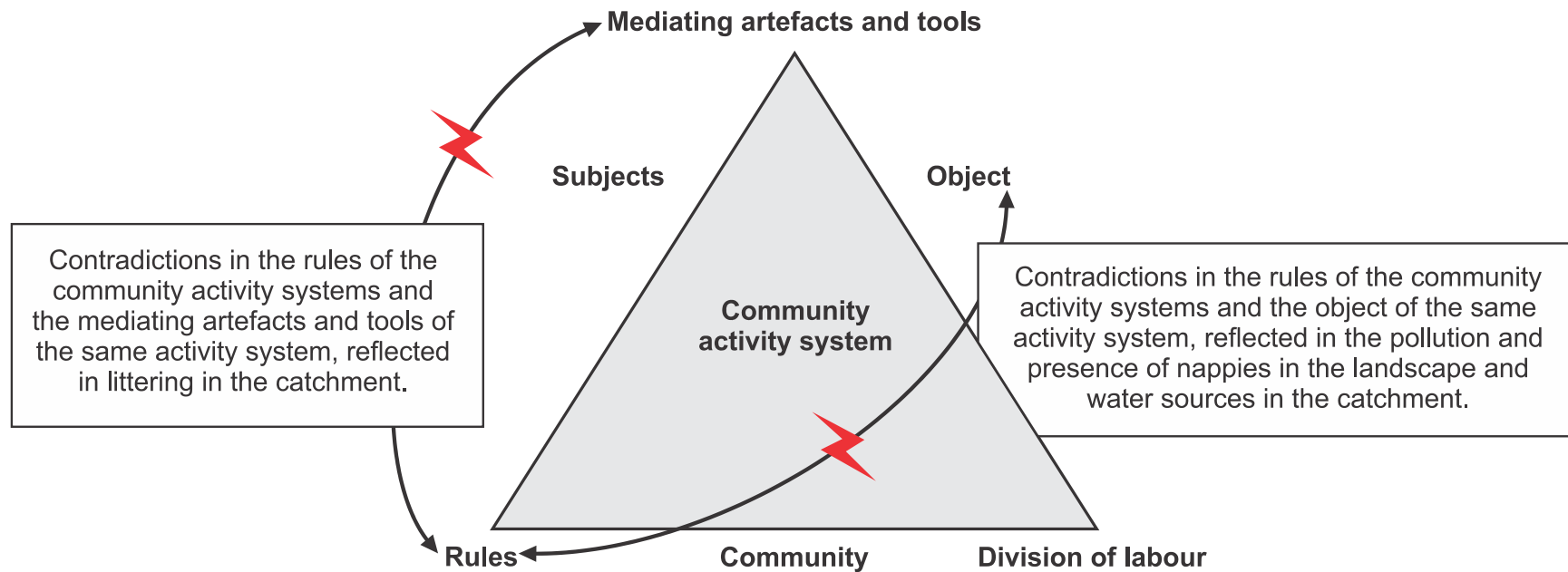


Figure 7.10: Illustration of secondary contradictions in the community activity system; and secondary contradiction between rules and tools

7.3.4 Access to water [Contradictions between the rules governing water access and service in the community activity system, and the rules governing water supply by the community members in the local government activity system, affecting the shared object of co-management between the two activity systems]

- “We struggle with water access and sometimes we go without drinking water, yet we have water by the mountains.”



Figure 7.11: Community members fetching water from the village tap

The contradictions which were surfaced in this section are related to the issue of governance and water supply management in the local government activity system, and the rules which caused tensions in water access in the community activity system. The extracts from GroundUp (2020) and Mbele and Mubangizi (2023) below provide further information for the contradictions:

Though R254 million was allocated for two projects to provide water for 17 villages in Matatiele, Eastern Cape, there is still no water in the village taps.. In one project, a multi-million-rand tender to install water for nine villages was awarded to six contractors in 2010. Ten years and R88 million later, taps are still dry in eight of the villages. ... In Pholile, villagers fetch water from a river two kilometres away. ‘We normally come here in the morning at 4am,’ says 16-year-old Leboh Moloedi who has the chore of fetching water as she lives with her 74-year-old grandmother and is the eldest of three siblings. As you can see we are sharing water with animals [cows] and this is not healthy, but we do not have a choice,’ she says. She says the village did not receive a water tank during the COVID-19 lockdown, but she saw on television that other villages had received tanks. Moloedi says the 20-litre bucket she uses is heavy for her. ‘At least I will only come twice today. We are trying by all means to save water because this place is far,’ she says. ...Margaret Morhele, who was born in Pholile and is now 42, told GroundUp: ‘We have never had clean water. To us, this water is ‘clean’ since we only have this source. Someone like you will never drink this water. (GroundUp, 2020)

Water governance in the Alfred Nzo District, which are a part of the uMzimvubu-Tsitsikama Water Management Areas (WMAs), pose a threat to water availability and use. Water governance requires

significant financial investments, involves public commercial, and non-profit actors, and is crucial for addressing development needs. (Mbele & Mubangizi, 2023, p. 1)

7.3.4.1 Primary contradictions in the rules governing water access in the community activity system

The Change Labs were an important platform to discuss these issues relating to this contradiction, because it was a space open for co-learning, collaboration and awareness raising. The tensions experienced were not a result of the local governments' shortcomings, but conflicts within the community activity system. This contradiction manifested as a double bind. The lack of adherence to the rules relating to water access was causing tensions and had a paralysing effect on the municipal workers and other subjects in the community activity system. This was expressed by a quote from the municipal worker who was mandated to provide water, but their municipal services were hindered by the communities they were trying to help. This led to the "what can we do because we have tried to help?" effect, which was an expression of a double bind. This unique contradiction was a good point for collaboration because the two activity systems found a point of unification instead of disagreement.

The issue of illegal water connections was a point of contention and conflict within the community activity system because some stakeholders desired convenience to the detriment of other community members. Rules to govern water access were in place to protect the community's interests, but certain members of the community chose to bypass the rules, therefore putting the community activity system's ability to work towards the object of water co-management at risk. The quotes below surfaced the tensions faced by the subjects of the community activity system because of non-compliance to water access rules reflected by criminal activity and illegal water connections.

Researcher: As residents in this catchment, what are your perspectives about water access?

LGAS-CLD: As a municipal worker, I must say that we face complex issues when it comes to this issue of supplying communities with water. During the time of COVID-19, we had a programme of bringing water tanks to the community to aid with water supply, however, within no time, those tanks were stolen in the communities. When our water trucks came to fill the tanks with water, there were no tanks, and in the meantime, residents are still complaining about accessing water. In another village, they had contacted us and said they want water; we came to an agreement that they would get a 5000L water tank and we would bring the water truck. We worked well with this village and they would inform us when their tank was running out of water. In other areas where there are water schemes and we provide tanks, they get stolen in the communities. The communities then complain that we are not supplying water as the municipality, whereby we have, it is just that there are illegal connections in the villages. When we try to go and help these communities at other times,

especially with the boreholes, we soon find out that those boreholes have been vandalised and the engine has been stolen. This makes us work backwards, because we have to start from scratch and buy the boreholes, and that delays in water provision.

COMAS-CLD: This is true, in my village, we were supplied with two water tanks and a borehole. Within a short period of time, they stole those two water tanks, and shortly after, they came for the borehole and even its engine. So most of the time the municipality does assist, but the resources are stolen within the community.

TLAS-CLD: I want to understand, from the municipality's perspective, what should we do concerning the issue of illegal water connections. This is a big problem, especially in the villages around me. Fortunately, we agreed as a village that no illegal connections should happen, and they listened. But now the people in the villages adjacent mine are doing this and we are being affected. I have reported this matter countless times. What should I do, because this is hindering water provision?

TLAS-CLD: Another challenge with water access is that of people wanting convenience; they want water coming from the comfort of their homes, so they end up with these illegal connections. When water is connected at a village, there are engineering principles and systems applied, so when villagers perform illegal connections, they disrupt water supply to everyone else, because the water pressure decreases and it will not reach the other villages. According to the law, a chief, Councillor or Induna has the right to cut off an illegal connection when they see one. As a water technician in the municipality, I am empowered by the above authorities to stop any illegal connections which has been reported to us; this is for my safety and to ensure that the relevant authority covers me.

TLAS-CLD: This is such a huge issue for people in this catchment. In another village, this man had illegal connections and as the cattle were passing by his house, the sleigh cut the connection and the water was flowing uncontrollably for about a week. As tribal authorities, we need to collaborate better with the municipality and find dates where we can patrol around the villages and stop these illegal connections, before we run out of water.

Figure 7.12 provides a summary of these contradictions.

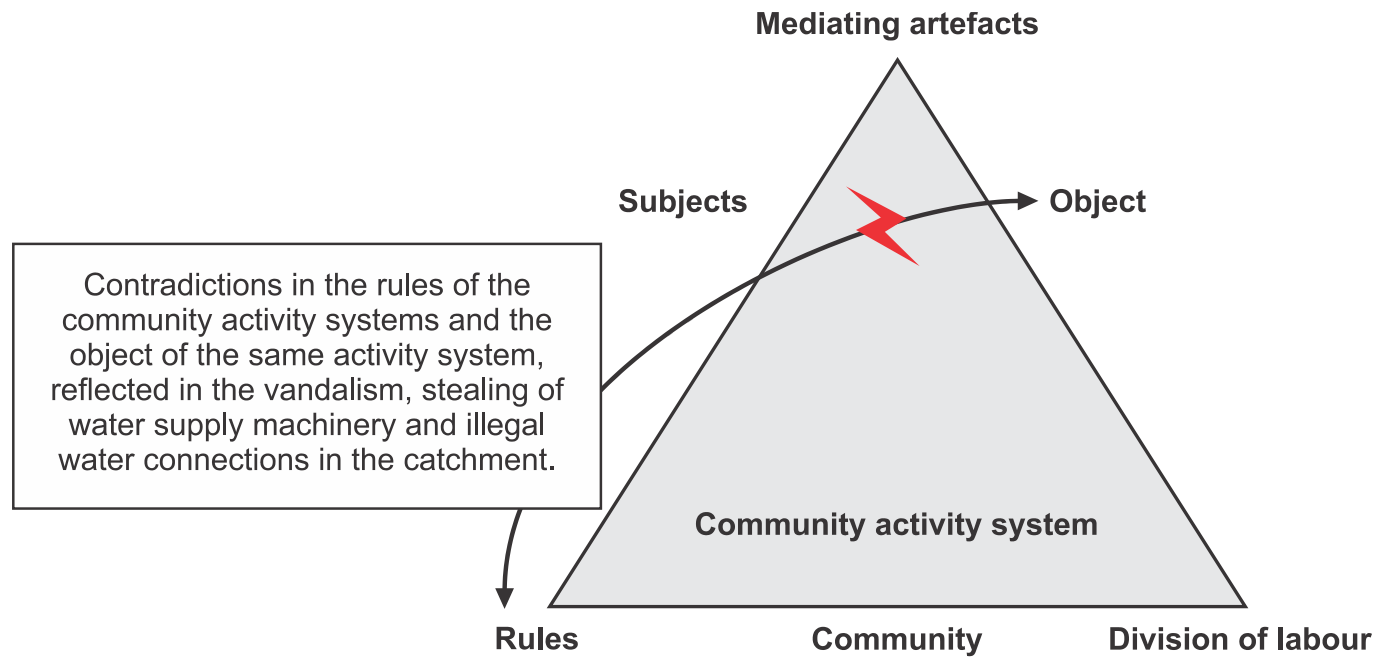


Figure 7.12: Illustration of primary contradictions in the community activity system

7.3.4.2 Quaternary contradictions in the rules governing water service providers, who are within the community element of the local government activity system

The quaternary contradiction that surfaced in the quotes below and supported by the article extract by GroundUp in 2020 was that of non-compliance to tender and water supply rules, exhibited by the water service providers sanctioned by the local government activity system. In addition, this lack of adherence to agreements by the water service providers resulted in tensions between the community activity system and the local government activity system. This contradiction led to hindrances in the ability of both activity systems to fulfil their mandate of co-managing water resources; an object they both shared. This contradiction manifested as *isiphithiphithi* because it showed how the system was failing to provide its mandated services and invariably resulted in the community's inability to access water resources which were due to them. This *isiphithiphithi* expressed the failure of the local government activity system to fulfil their role, how it affected the entire system, and the multi-layered nature of the complexities involved.

Besides corruption and lack of service delivery by the appointed water service providers to the communities, there appeared to be another secondary contradiction which was between the rules and the community within the local government activity system. This contradiction had a layer of political interference and corruption in the local government activity system. The community members of the local government system had to abide by the policies and guidelines which they received, after being appointed as a service provider. However, it appeared that there was no adherence to these legally instituted rules, which could potentially be a result of corruption in the system or a source of corruption because money was taken out but no service delivery (delivery of water services) to the community activity system was actioned. This contradiction manifested as *isiphithiphithi*. This again was a result of a failing system, which appeared to lack accountability, monitoring and ethical oversight. The non-adherence by the service providers was not just affecting service delivery, but it was also a moral and ethical issue because the lack of performance of their mandated duty was causing injury, sickness and discomfort to the catchment dwellers. The quotes below suggest that political feuds have in the past prevented the community from accessing water due to them. However, from the Change Labs discussion, it was also evident that the community activity system did acknowledge their agency, reflected in the fact that they would prefer windmills because these mechanisms would assist the community in working towards their activity and goal of attaining water security. This potentially demonstrated that communities need to be

consulted by other activity systems, especially when working towards a shared object. Communities need to be allowed to make their own decisions and exercise their agency. Evidence for the quaternary contradictions was surfaced from the quotes below:

Researcher: What are some of the external challenges which the community has faced with regard to water access?

COMAS-CLD: In my village, we have underground water sources, springs, and we even supplied water to the Bergford dam. There is still an opportunity for water harvesting in my area, Mafube, but the issue is that the windmills are badly damaged, and the boreholes are just sitting there. When it comes to us accessing water, numerous people from my village always go to the municipality to complain about water provision. We have all these boreholes located in the village, however, we have no water, because of damaged infrastructure.

COMAS-CLD: This issue, I feel as member of this catchment, is politically driven. When a person is running for the Councillor position, they will cut off water connections so that it appears that the current Councillor is inept. They will organise people to damage infrastructure and the community suffers because of a political feud.

COMAS-CLD: To the municipality technician among us, I suggest that we should be consulted as the village and that we collaborate on this water provision issue. Honestly speaking, the municipality should stop giving us boreholes, because they run on diesel, they are stolen and are expensive to maintain. Rather, get us windmills, because they are cheaper to maintain, they are reliable (as long as there is wind) and they are too big to be stolen.

TLAS-CLD: Another is that the municipality needs to stop this thing of using tenders to get service providers to deliver fuel to our communities. People from outside the area will get tenders for fuel provision and some have never delivered the diesel for the machinery. Our people are suffering tremendously while corrupt people are benefitting financially.

Figure 7.13 offers a summary of these contradictions.

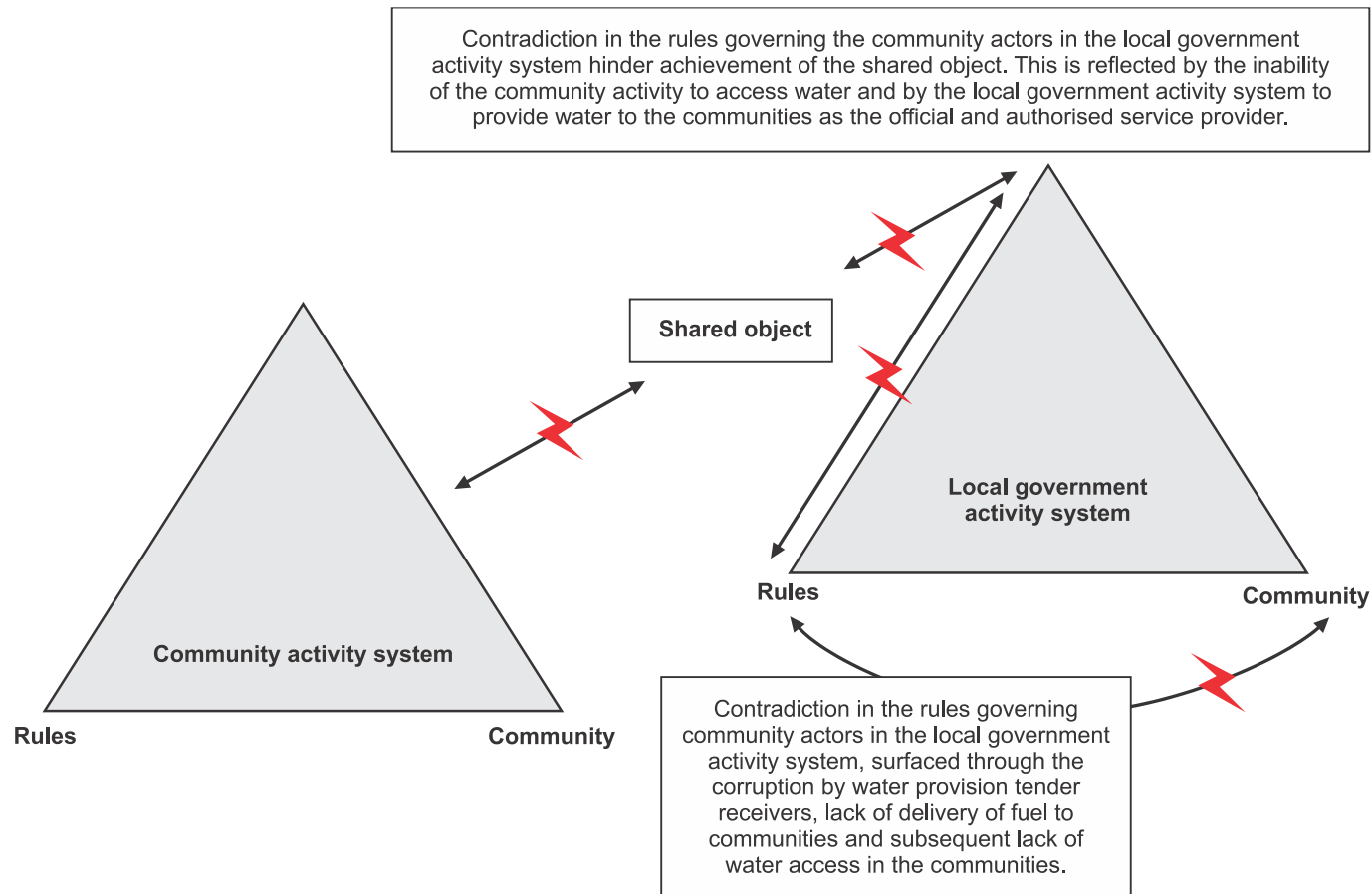


Figure 7.13: Illustration of quaternary contradictions between the local government activity system and the community activity system

7.3.5 Grazing of livestock by the wetlands [Contradictions in the mediating artefacts and subjects within the local government activity system, and the shared object between the local government activity system and the community activity system]

- “Our livestock graze by the wetland area because of fodder, but we are told that we are told that they destroy wetland-based species especially cranes and amphibians.”



Figure 7.14: Wetland area in the uMzimvubu catchment

This section will surface the contradictions relating to wetland management and reflect on other catchment activities which jeopardised the well-being of wetlands in the catchment. During my contextual profiling trip and field excursions I was shown various areas which used to be healthy wetlands but have since dried up. Some of these wetlands were polluted and littered with garbage. I also managed to see some healthy wetlands across the landscapes which were in a healthy state. Wetlands in the uMzimvubu catchment are important water sources for livelihood activities and livestock, especially during the dry and Winter seasons.

7.3.5.1 Tertiary contradictions between the traditional leadership and community activity systems

From the data, contradictions surfaced and were found in the local government activity system and the community activity system. The tertiary contradictions surfaced in the mediating artefacts and the subjects of the traditional leadership activity system. This contradiction manifested as a double bind. This is because some of the subjects of the traditional leadership activity system were under pressure to meet the housing needs of the villagers and just gave away empty or vacant land, not knowing that those were wetlands. This led to issues during the rainy seasons and the people who were looking for help found themselves with another problem, flooding and destruction of their property.

The lack of awareness and training given on wetlands appeared to affect the ability of the local chiefs to fulfil their work of governance and fulfilment of the object of water co-management. This contradiction, reflected in the lack of awareness of the roles of wetlands, resulted in the

chiefs issuing land in areas which were wetlands. This manifested as a dilemma because the chiefs made decisions based on what they thought was correct. However, this same act led to compromising the community activity system's ability to meet their object of water co-management. This contradiction was reflected in the expression of different views by the community activity subjects; other actors required land to build, and other actors needed the wetlands to be protected for the sake of water security in the catchment. Wetlands are important in the object of water co-management, and community actors who were aware of the role of wetlands wanted the protection of the wetlands. The quotes also provided evidence of the readiness of the community actors to learn and be made aware of environmental issues. Furthermore, the chiefs, who were part of the subjects in the traditional leadership activity system conflicted because of wetland activities. As seen above, some chiefs issued land to villagers without undergoing due diligence and this appeared to degrade the wetlands and even put the communities in a position of decreased levels of water security. There were rules which chiefs had to adhere to before issuing land and it appeared that there were some chiefs who were not following the land-issuing policies/customs. From the data extracts below, it would be necessary to have training, awareness raising and co-learning regarding wetlands in the uMzimvubu catchment:

Researcher: This is a matter which was raised in several of my engagements, what are your views, with regards to wetlands?

TLAS-CLD: Now this is an issue which our people need to be taught on. This matter is so important that I even went to the Head of Department of Human Settlements in East London, to request an intervention. People are just building on any open land they see vacant, and some have built on wetlands, because at that time there was a drought and the land was dry. In other villages, the wetlands have become places where horses and cattle just graze without being policed. This could be well managed if our wetlands can be demarcated and protected, because this would also boost tourism and also protect our natural resources.

NGOAS-CLD: I actually understand your perspective, Sir, there is a time for everything. Wetlands need to be grazed at a specific time, because that above-ground biomass, the grass, needs to be managed and brought to an acceptable level. However, in Summer, there should be no grazing in the wetlands, because that is when the amphibians are breeding and when the cranes are always present. Also, if your livestock graze in the wetlands in Summer, they will be susceptible to parasites and will most likely contract liver flu. In Winter, there are less parasites, the livestock can graze by the wetlands.

COMAS-CLD: We need to be educated about these things. We need to sit down in such environments and be taught about issues in our catchment. I have learnt today, I did not know about

some of these things I am hearing. However, I want to know, is it legal to start a fishing economy in wetlands, can I introduce fishing there?

COMAS-CLD: I am not sure, but I do not think it is legal. Wetlands are highly viewed in South Africa; they are seen as our water buffers; they clean our water and are our natural water reservoirs. And anyway, setting up fish farms in wetlands would be quite a difficult endeavour.

NGOAS-CLD Let me come in, when you look at environmental laws and regulations, wetlands are considered as water courses. Therefore, you cannot just embark on any activity on a wetland; you will need an environmental authorisation to do anything relating to wetlands.

Researcher: Just to step back a bit, where was government when the people built on wetlands?

TLAS-CLD: I think that tribal authorities are the ones who give people access and permission to dwell on these wetlands. There is a gap between human settlement (government) and the custodians of the villages (the tribal authorities). There is a disconnect between the two agencies.

TLAS-CLD: The other issue relating to the wetlands is that people are desperate. Another chief gave people land to an area, which was vacant. The problem is that he did not know that the area is a wetland, but because there was a drought of about years, it seemed like a good plot. Now this chief was just eager to get quick money by giving the sites to desperate people because there was some funding for housing. However, he did not even consult any engineers, who could have alerted him about the area and its state as a wetland. We as tribal authorities need to be educated about proper governance, water issues and integrity, because the people who will mostly suffer are there people who have now built there and cannot go anywhere. Growing up in this catchment, we knew that when there were rains, that area would be heavily filled with water, so now imagine if heavy rains come down, what will happen to those people?

COMAS-CLD: I must admit that I also need training and awareness concerning wetlands. I had some views on wetlands, but from these learning workshops (Change Labs), I have realised that my perceptions on wetlands are incorrect. I have always wanted to introduce fish into the wetlands so that I can have some economy using farming, but I have now come to understand that wetlands have their unique species and that those species need to be protected and preserved.

Figure 7.15 provides a summary of these contradictions.

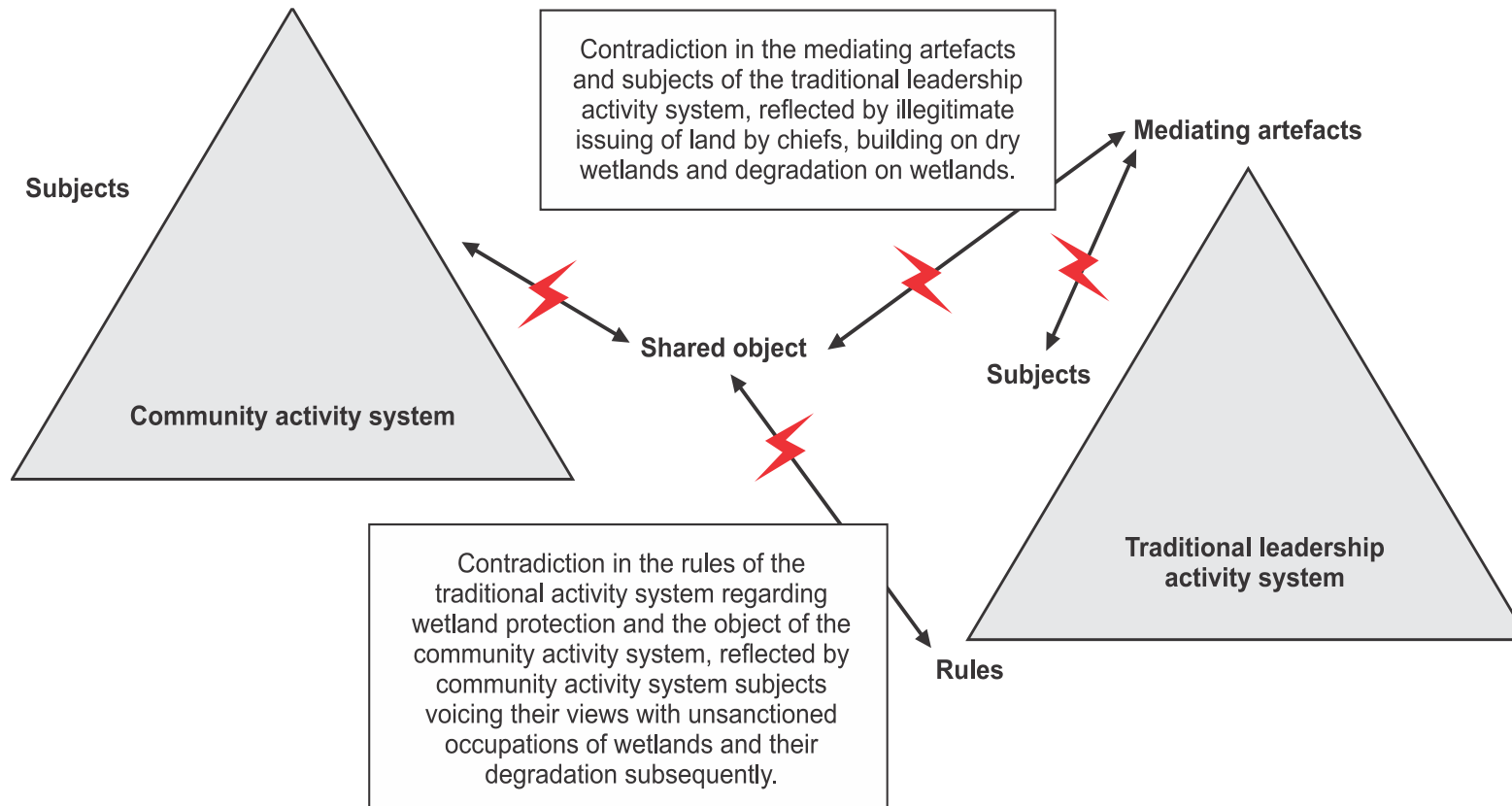


Figure 7.15: Illustration of quaternary contradictions between the traditional leadership activity system and the community activity system

7.4 Conclusion

This chapter began by providing the background of contradictions and why they were important as sources of learning. I also looked at the process of investigating the contradictions which persisted in the catchment and what process I followed to surface those contradictions. I also provided evidence of the various contradictions which were persistent in the catchment and how I presented them to the different stakeholders. This step was carefully elaborated on in the chapter because it allowed for the full participation of the stakeholders. The diversity in the age group was another strong factor which produced a good explanation of the history and culture of the contradictions which were situated in the catchment. The contradictions were important sources of learning and discussion, leading to a richer expansive learning process. The analytical tools offered by CHAT allowed me as the formative interventionist researcher to analyse how the contradictions had manifested in the uMzimvubu catchment context. The contradictions from the study can be summarised as follows.

Springs mirror data: there were primary contradictions within the elements of the community activity system. There were also quaternary contradictions between the elements of the community activity system and the NGO activity system. Lastly, there were tertiary contradictions between the tools of the NGO activity system and the rules of the community activity system. With regard to the wattle invasions mirror data, there was a primary contradiction in the community activity system (within the subjects), and secondary contradictions between the subjects and the object of the community activity system. There were also tertiary contradictions in the rules of wattle management between the traditional leadership activity system and the community activity system.

Raw sewerage and stream pollution mirror data: there were secondary contradictions between the local government and community activity systems and a primary contradiction between the rules and tools of the community activity system.

Access to water mirror data: there were primary contradictions in the rules governing water access in the community activity system and quaternary contradictions in the rules governing water service providers, who were within the community element of the local government activity system.

Grazing of livestock by the wetlands mirror data: there were tertiary contradictions between the traditional leadership and community activity systems. In addition to the contradiction

analysis, the manifestation of the contradictions was provided and highlighted. The next chapter provides the solutions which emerged from the Change Labs in response to the contradictions which were surfaced.

Being a strategic water source area, the uMzimvubu catchment plays an important role in supplying its inhabitants and other areas with water. However, since some of the contradictions associated with the provision of water manifested as dilemmas, conflicts, critical conflicts, double binds and as *isiphithiphithi* in this study, new, context-based and innovative solutions had to be developed. The following chapter details the process of developing the solutions. The solutions were related to the contradictions detailed in this chapter; however, the activity systems chose to develop solutions to the contradictions they felt they had agency over. Agency is an imperative tenet in this study, and the following chapter details how the activity systems used the educational/learning tools they were exposed to, to transform their activity in the uMzimvubu catchment. This is an important feat, especially in the context of the LCP, Just Transition and the greater innovations discourse. The next chapter therefore focuses on learning actions 3 and 4 of the expansive learning cycle.

CHAPTER 8: SOLUTIONS EMERGING FROM THE CHANGE LABS

8.1 Emerging Transformative Agency in the Expansive Learning Process

The previous chapter provided the details of the contradictions which were surfaced during the contextual profiling process, activity system analysis, desktop analysis and the literature review. Chapter 6 provided a picture of the activity systems present in the study and how they related to the shared object of co-management of water. In addition, Chapter 6 expressed the learning which was present in the various activity systems regarding water co-management. As detailed in Chapter 5, the expansive learning process was followed, and the learning participants were exposed to the activity system analysis as one of the mechanisms to use to resolve contradictions. This chapter details how the learning actors began to adopt the activity system analysis as a tool to work on their chosen contradictions and then model the solutions. The modelling of the solutions via activity system analysis was a gradual process and occurred between the period of June and November, in and out of the Change Labs setting. The learning actors began to use what they received in the intervention during the Change Labs, along with what they had previously learnt about water co-management, to model solutions they deemed suitable for their catchment, i.e. the uMzimbvubu catchment.

This chapter elaborates on the emergence of the transformative agency of catchment participants, considering the object of co-management of water resources. The chapter addresses the third research question: *How can an expansive learning process potentially contribute to value creation, collaboration, co-learning and co-creation of knowledge in and across catchment management activity systems among the interacting activity systems?*

The Change Labs in this study were designed to support expansive learning and to surface the potential transformative agency expressed by the actors in the various activity systems involved in the object of water co-management. Transformative agency, as will be shown in this chapter, was catalysed using double-stimulation tools such as the VCF tool, pictures offering mirror data of contradictions and activity system maps that were presented. An indicator of transformative agency expressed by the actors in the different activity systems was their voluntary participation in the Change Labs, especially because some of the participants had to travel far to participate in the Change Labs as indicated in this quote:

TLAS-CLD: Mr Kuse, please do forgive us if sometimes we arrive a bit late. Some of us here do not have cars and are dependent on public transport. The public transport for us people living in the villages is quite tricky because the vehicle needs to have a certain number of people before it can move. We do wake up early and try to get the earliest vehicle to get to this water learning workshop, but sometimes things get out of hand, and unfortunately, there is not much we can do. But we are committed to be here to learn about these water issues.

Various actors in the subject element in the community activity system were situated in remote villages of the catchment, yet they displayed a desire to actively participate in the Change Labs, as some of them were keen to find solutions to water issues occurring in their own contexts. Historically, communities have been excluded from the management of water resources, hence the adoption of IWRM in South Africa (see section 1.2). With this view in mind, I endeavoured to create a platform for learning which could accommodate all the activity systems and be empathetic to the needs and characteristics unique to each activity system.

8.2 Demonstration of Emerging Transformative Agency from the Various Activity Systems

As stated above, some of the participants had begun modelling solutions regarding the contradictions we had engaged with in the previous Change Lab using the double-stimulation tool of the activity system maps. This formed part of learning action 3. The models emerged from actors in three of the five activity systems. The models were related to the various issues that the participants felt needed attention in their own contexts and workspaces. This modelling is part of the expansive learning process and was a demonstration of the agency of the Change Lab participants. Haapasaari et al. (2016) state that agency is regarded as a key attribute of humans in CHAT. However, rather than traits, properties or capabilities, agency is examined in terms of actions. Individuals' transformative agency can be defined as breaking free from a given frame of action and taking steps to transform it, as discussed in Chapter 4.

Below, I explain in detail the various proposals that were worked on by some of the Change Lab participants. The expansive learning cycle possesses steps to guide and direct the learning during the Change Labs, however, it can happen that certain steps overlap, which is what a formative interventionist researcher needs to be aware of. Participants used the activity system maps as double-stimulation tools; these were catalytical for further dialogue and solution modelling in the Change Labs. This assisted the greater learning group to engage with their catchment issues in more detail as elaborated below.

8.2.1 Demonstrated expansive learning in the activity systems, reflected by modelled solutions of individual participants in their activity systems

Figure 8.1 below is a presentation of one of the participant's modelled work – to work towards the **object** of successful waste management in response to contradiction 1 (management of springs) as discussed in Chapter 7. This was done before the Change Lab, and it was brought into the Change Lab. Figure 8.1 shows that the participant used the activity system mapping process as a double-stimulation tool to articulate proposed model solutions for others to discuss. The participant was within the NGO activity system in the uMzimvubu catchment. For the **mediating tools**, the participant proposed: incentives, awareness, employee assistance programme development, rules and regulations, waste management infrastructure, engaging stakeholders and green economy. The **community** in this rendition of the activity system included: DWS, civil society, individuals, traditional leadership, Alfred Nzo District municipality, Matatiele local municipality, local institutions and corporates. **Rules** included: local nappy protocols, sanctions for littering and designated waste disposal areas/units. The **subjects** were: spring users, producers and mandated institutions. The participant did not include the **division of labour**.

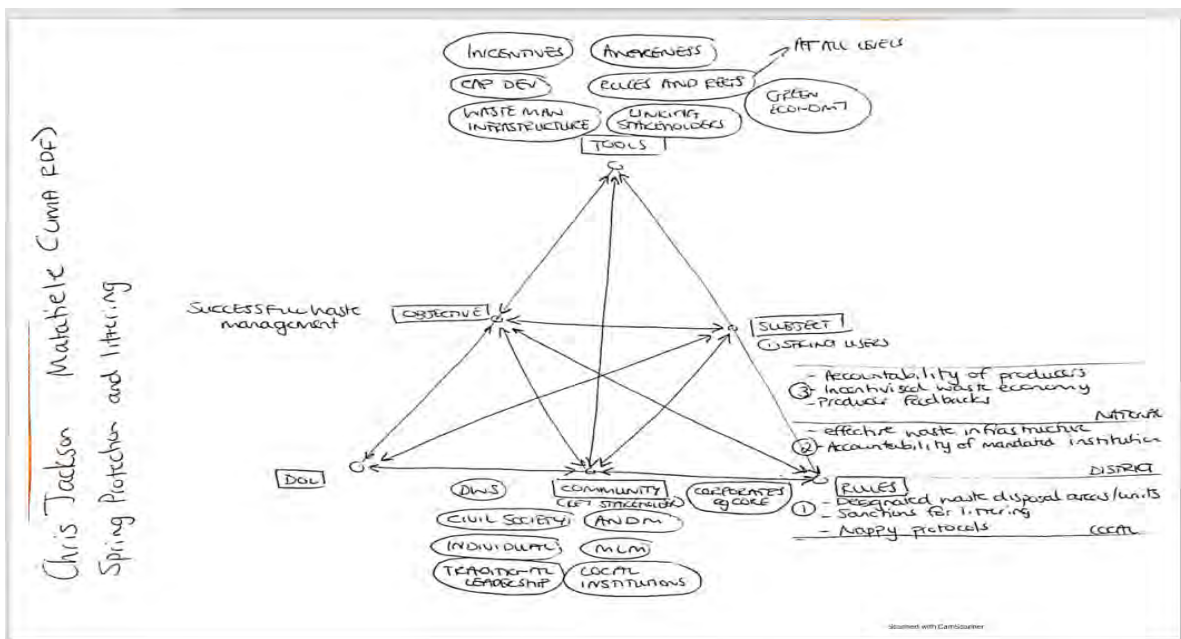


Figure 8.1: Modelled solution to littering working towards the object of successful waste management in the catchment

The agency which was displayed by this participant was “explicating new possibilities or potentials in the activity”. This participant had been involved in working with this community and had overseen some projects. The participant had tangible experience from working on the catchment grounds. The problem of littering and stream pollution was the first stimulus, and

the activity system model was the second stimulus to assist the participant in modelling solutions relating to effecting waste management. The participant used the activity system framework to model solutions geared towards the problematic object of waste management and to envision potential solutions related to the object-related challenges.

During our Change Lab, we discussed the modelled solution with the rest of the participants; we expanded our learning by engaging with this proposed model and offered suggestions collectively on the model, as discussed in sections 8.2 and 8.3. First, however, we also considered other proposals for waste management solutions.

Figure 8.2 below is a presentation of another participant's modelled work, to work towards the **object** of behavioural change, with stakeholder engagement for waste management to respond to the issue of littering in the catchment and near streams. The participant was also within the NGO activity system in the uMzimbvubu catchment. The *mediating tools* proposed were: clean-up campaigns, community surveys and water awareness. The **community** included: nappy factories, CSA, Ndakeni and Thaba Chicha villages and the Mvenyane area females and youth. **Rules** encompassed: policy, norms and traditions concerning the washing of laundry in the rivers, bathing in the rivers and drinking from springs (humans and livestock). The **subjects** included: the traditional leadership and the Matatiele local municipality. The participants included clean-ups with the community campaign facilitated by the CSA, a springs protection guide and waste management as part of the **division of labour**.

The type of agency expressed was “explicating new possibilities or potentials in the activity”. The participant used the activity system analysis to explain how the system could potentially work when the object of waste management was worked towards. The participant went a step further than the previous participant and detailed the division of labour if the model was implemented. An interesting factor about this participant was taking the next step in the activity system analysis – working towards the object to have specific outcomes. This detailing of the work was an expression of how the participant not only wanted to work towards the object but how the system could potentially stimulate action and increase stakeholder engagement.

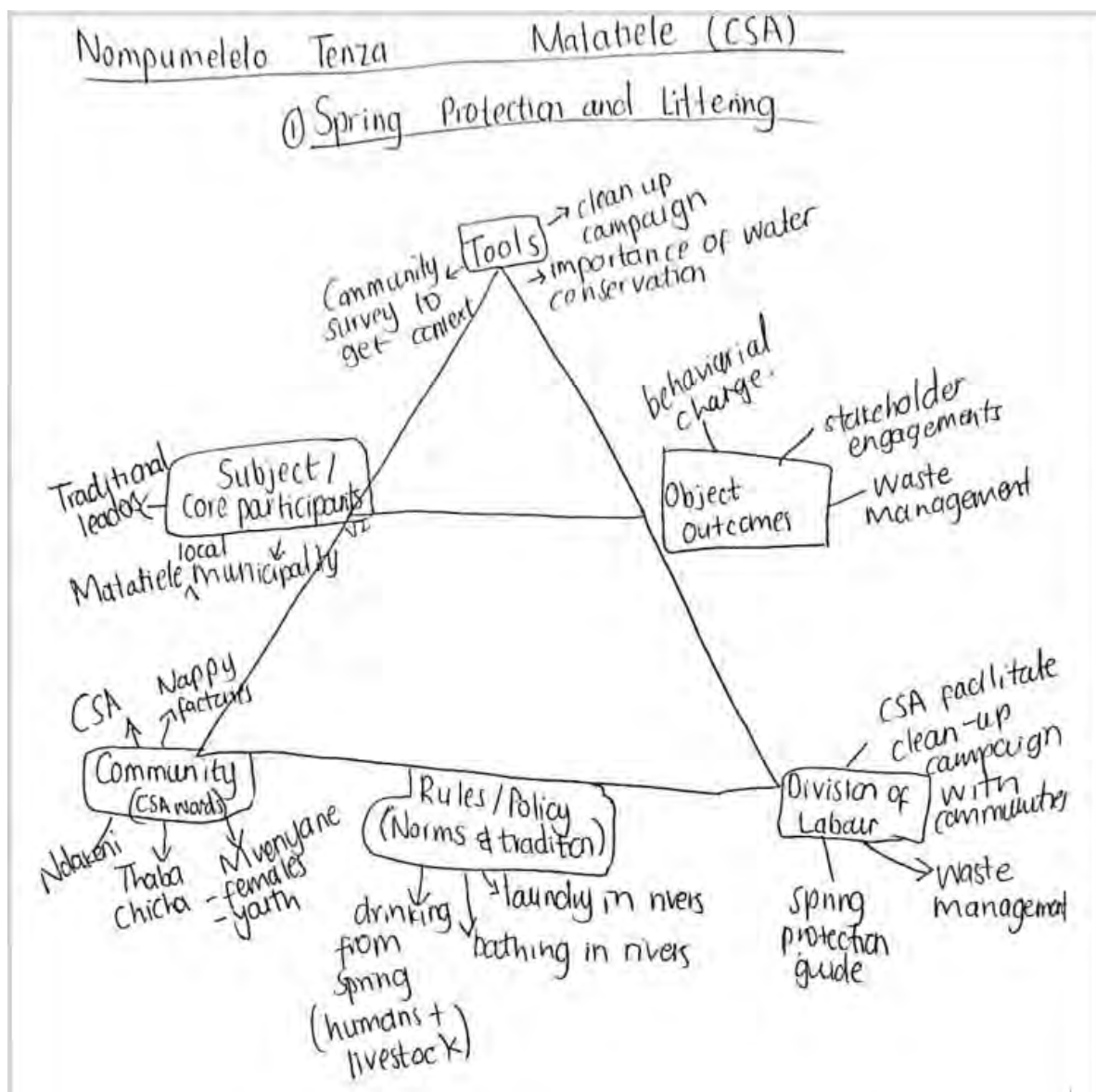


Figure 8.2: Modelled solution to littering working towards the object of behavioural change in waste management in the catchment

Figure 8.3 below is a presentation of another participant's modelled work, to work towards the **object** of water access for the community, in response to contradiction 4: access to water. The participant was within the traditional leadership activity system in the uMzimvubu catchment. For the **mediating tools**, the participant proposed: awareness raising and spring training. The **community** included: the community leaders and the actual communities (villages). **Rules** included: an official designated to water management in the village. The **subjects** included: all the people involved in spring activities. The actor in the traditional activity system used his native language, isiXhosa, to elaborate on the subjects entailed. As the researcher, I am a first language isiXhosa speaker, and the isiXhosa text means "all of the people who engage in spring

activities”. The participants included women as the designated spring cleaners in the community.

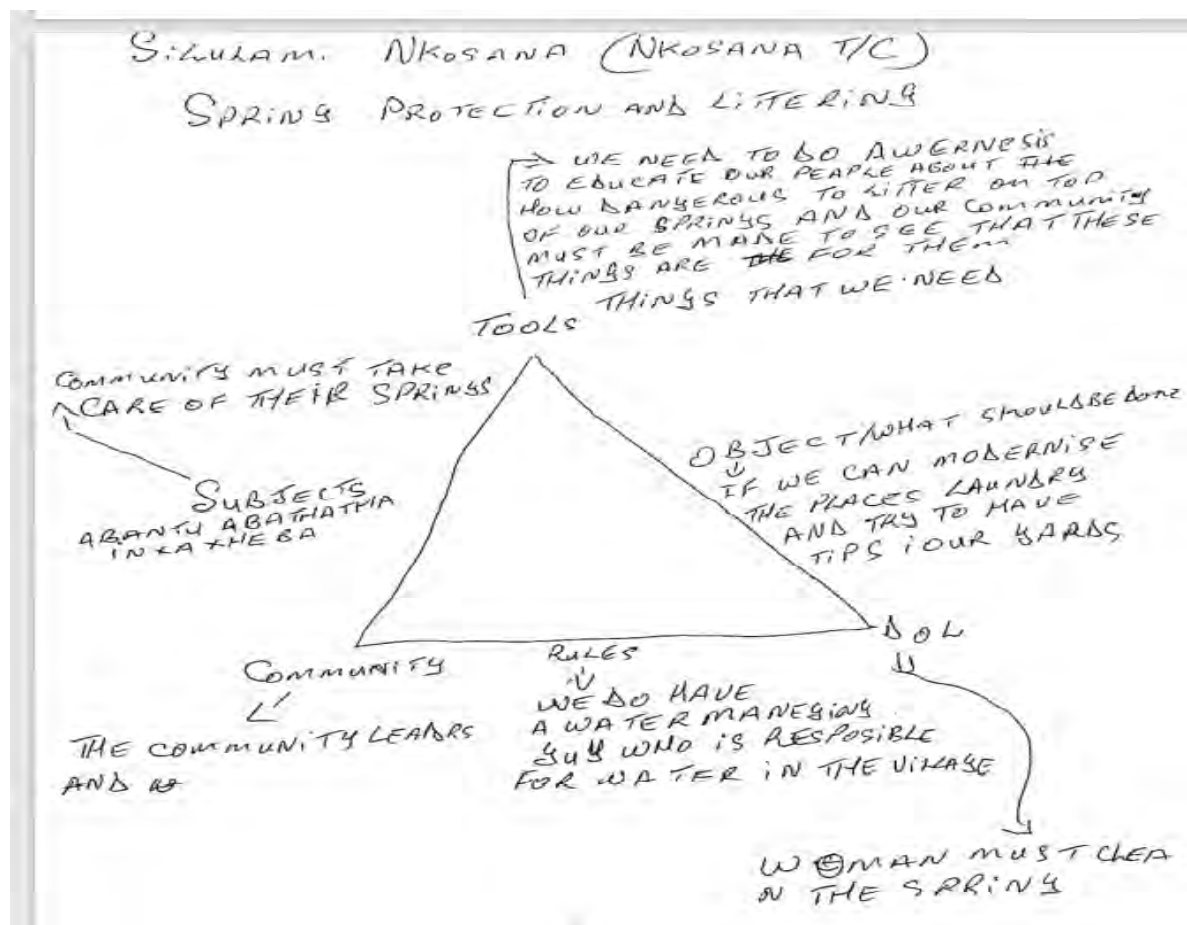


Figure 8.3: Modelled solution to water access and springs contradiction

The participant expressed the “criticising the current activity” form of transformative agency, because he highlighted the need for change in the activity while acknowledging the current failures in the system. This participant used the activity system to model solutions relating to his community, however, compared to the two previous participants, the analysis was not as advanced. A possible hindrance to a more elaborate activity system analysis was the language barrier.

Figure 8.4 below is a presentation of another participant’s modelled work, to work towards the **object** of managing waste for spring protection, in response to the first contradiction which deals with stream pollution. The participant is within the NGO activity system in the uMzimvubu catchment. For the **mediating tools**, the participant proposed: awareness campaigns by municipalities, government departments and NGOs. The **subjects** included: community, people, animals and plants. The **community** included: waste management

associations and environmental officers/practitioners. The **rules** included: individual responsibility for springs, washing away from springs, littering in designated areas and placing waste in holes. The participant did not include the **division of labour**.

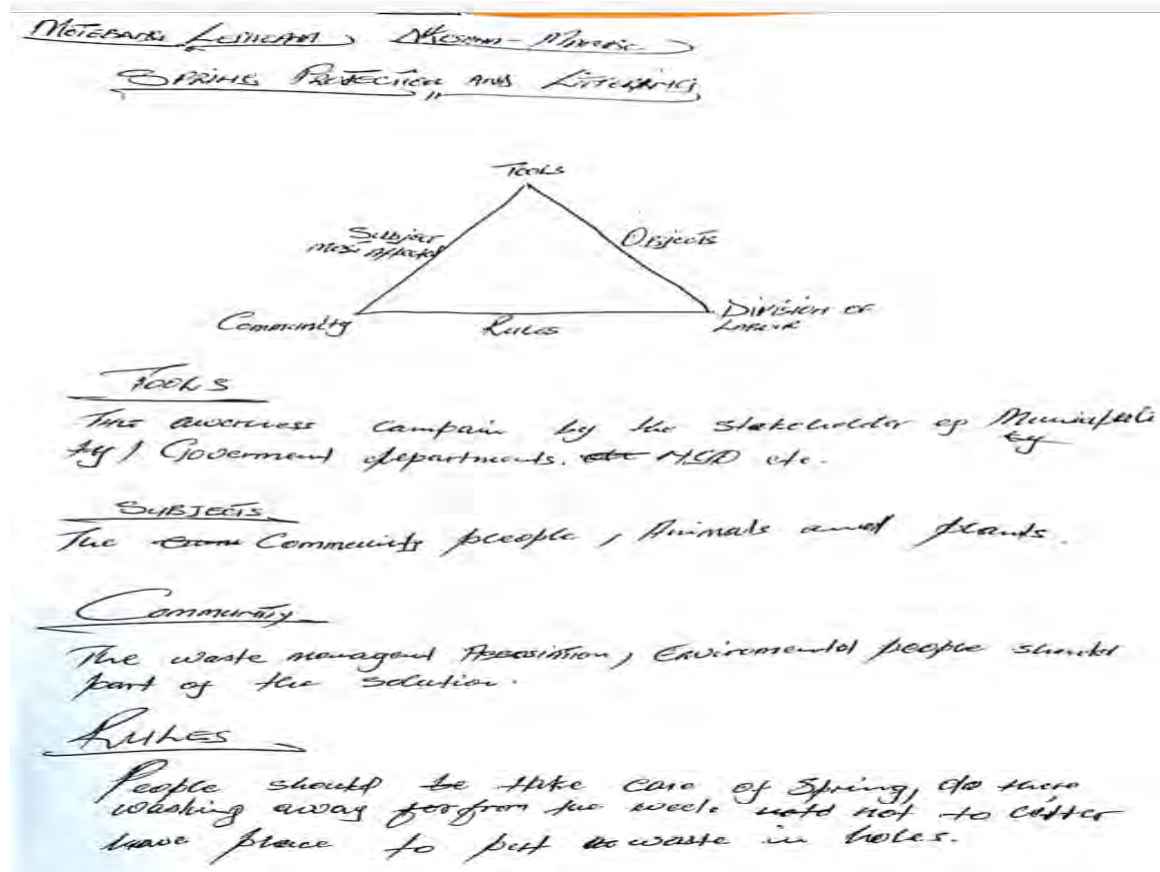


Figure 8.4: Modelled solution to littering working towards the object of successful waste management in the catchment

It was evident from the modelled solutions by the actors that the issue of managing waste and spring protection was a contradiction they wanted to engage with. This was an expression of transformative agency demonstrated by the learning participants in the activity systems. This type of agency falls under the category of ‘envisioning action’, it entails the following:

[It] is characterized by envisioning new possibilities and potentials in the activity, relating to past positive experiences, and characterizing the past problematic object as a source of new possibilities. (Haapasaari et al. 2016, p. 242)

The participants demonstrated that they were able to use and construct double-stimulation tools to expand their learning and begin to express their interests in change which offers evidence of transformative agency formation. The participants’ modelled solutions were an expression of

how they were in the initial phases of learning about modelling solutions using the CHAT activity system as a double-stimulation tool.

A key component of the Change Lab was to collectively interrogate the modelled solutions and engage with elements that the other participants may have missed out on during their modelling. This step was key in leading to the next step of working on chosen contradictions, influenced by the realised agency of the various activity systems and modelling the solutions based on the collective agency within the formed groups. This is discussed next.

8.2.2 Emerging agency demonstrated through group formation, contradiction analysis and initial modelling of solutions

After engaging more with the contradictions, the participants decided to focus on two contradictions that they could work on. The participants wanted to collaborate and to narrow down the contradictions to those they felt they had the agency and power to work on, rather than concentrating on different solutions, of which there were many, that they had limited agency over. The first group decided to work on the contradiction related to wattle invasion (contradiction 2). The second group decided to focus their attention on the contradiction related to water access (contradiction 4). The two groups were composed of the following participants and their respective activity systems:

Group 1: C.J. (NGOAS), S.M. (NGOAS), A.S. (NGOAS/COMAS), M.L. (COMAS), Z.M. (LCPAS) and K.S. (LCPAS).

Group 2: T.S. (NGOAS), M.S.M (NGOAS), T.K. (TLAS), N.M. (TLAS), N.T. (COMAS), Z.Z. (LGAS) and L.T. (TLAS/COMAS).

More time was given in the session to allow the groups to convene in a working space to model the solutions they had concerning the contradiction they chose. The participants self-organised to work on one of the contradictions which they deemed relevant for the uMzimvubu catchment. The activity system participants decided of their own accord that they would merge and form two groups after extensive deliberation during the Change Labs (Figure 8.5). The formative interventionist researcher's role was to facilitate the expansive learning process and to allow the learning actors to self-regulate as they worked towards the intended object. The Change Lab offered the formative interventionist researcher and the learning participants a platform to experiment with solutions as they engaged with contradictions, using double stimulations tools to help them unravel the diverse layered issues they faced.



Figure 8.5: Two distinct groups (Group 1 and Group 2) working on the chosen contradictions

The two groups were composed of diverse participants, and this was healthy for the power dynamics and co-learning. The decision taken by the participants to narrow the focus to work on two contradictions was an indicator of their self-reflection and it showed that they understood that they possessed agency and that they could be the agents of change in their particular communities (see Figure 8.6). Figures 8.7 and 8.8 (A+B) are evidence of how the learning participants began the journey of modelling their solutions within the Change Lab (Group 1 and Group 2's work, respectively).

This was the initial modelling of solutions during the Change Lab, which built on the work done before by individual participants as shown above. This process of working on the contradictions and allowing the learning participants to engage with the contradictions was a way of making them aware of the agency they possessed. These two groups did not just form physically, but there was also a formation of collective knowledge in each group because the different stakeholders all had something to contribute towards their group.



Figure 8.6: Group 1 working on their chosen contradiction using the CHAT framework as a double-stimulation tool

Group 1 chose to model solutions for the wattle contradiction which was highlighted in Chapter 7 (Figure 8.7, below). Group 1 worked towards the **object** of eradication of alien invasive plants. The group worked towards this object for water restoration, to sustain livelihoods, and to have a productive landscape and functional ecosystem. Group 1 was composed of subjects from the different activity systems which were surfaced in the research as discussed in Chapter 5. The members of Group 1 varied in age, race, background and profession. In their activity analysis, Group 1 decided to include the DFFE, civil society, businesses and the Forest Stewardship Council as part of the **division of labour**. For the **rules**, this group decided to focus on national policies, NRM principles, traditional customs, monitoring principles and principles to empower the communities in the catchment.

For the **community**, implementers, commercial farmers and local people were included. For the **tools**, usage of alternative fuel sources, a combination of government, community and corporate clearing strategies and awareness about sustainable harvesting were suggested. The modelling of this solution was expressed as an “envisioning new patterns or models of the activity” type of transformative agency. The solution was composed of preliminary suggestions on how to deal with the successful eradication of alien invasive plants through the presentation of a semi-comprehensive model for the future. It was also interesting to note that the modelling of solutions using the double-stimulation tool of activity system analysis became more

sophisticated when the participants merged to form the group, compared to modelling the solutions individually, as discussed in section 8.2. However, there was still some room for improvement, as Group 1 still struggled with understanding and demarcating the **subjects** in this modelled activity system. In engaging with this group, in the change as a collective, it was also interesting to hear how they constantly reflected on the wattle contradiction, and how it manifested as a dilemma and in some cases as a critical conflict, as discussed in section 7.3.2. This was expressed by the participants who stated that the wattle was beneficial for building, fuel and livelihood purposes; however, it had negative consequences, such as the depletion of water resources, aiding in criminal activities (discussed in section 7.3.2.2) and invasion of land.

Figure 8.7: Initial modelling of solutions to wattle invasion contraction by Group 1, in the Change Lab

Group 2 decided to model solutions for the access to water contradiction, which was highlighted in Chapter 7. Group 2 worked towards the **object** of communication for water access. The reason the group worked towards this object was to ensure that there was effective communication between the community and the municipality regarding issues of access to water services. However, before embarking on the activity system analysis to model the solution, Group 2 first wrote out the issues concerning the object of water access (see Figure 8.8 (A) below), and through their analysis, it was surfaced that poor/lack of communication between the municipality and the community was an underlying factor influencing water access. Group 2 was also composed of subjects from the different activity systems which were surfaced in the research, as discussed in Chapter 5.

The members of Group 2 varied in age, race, background and profession. This diversity was key in assisting with surfacing dilemmas and conflicts which had manifested in this catchment, because of the issue of poor communication. Some of the issues which were highlighted by Group 2 relating to the access to water contradiction, included lack of/poor communication between municipalities and community, overlooking of cultural considerations in the springs protection approach, mismanagement of funds, lack of transparency and poor understanding of funding for work scope. Solutions which were highlighted included establishing a memorandum of understanding (MOU) between the community and the municipality to facilitate channels for knowledge exchange. This should be accompanied by participation by stakeholder groups and establishment of platforms enabling growth.

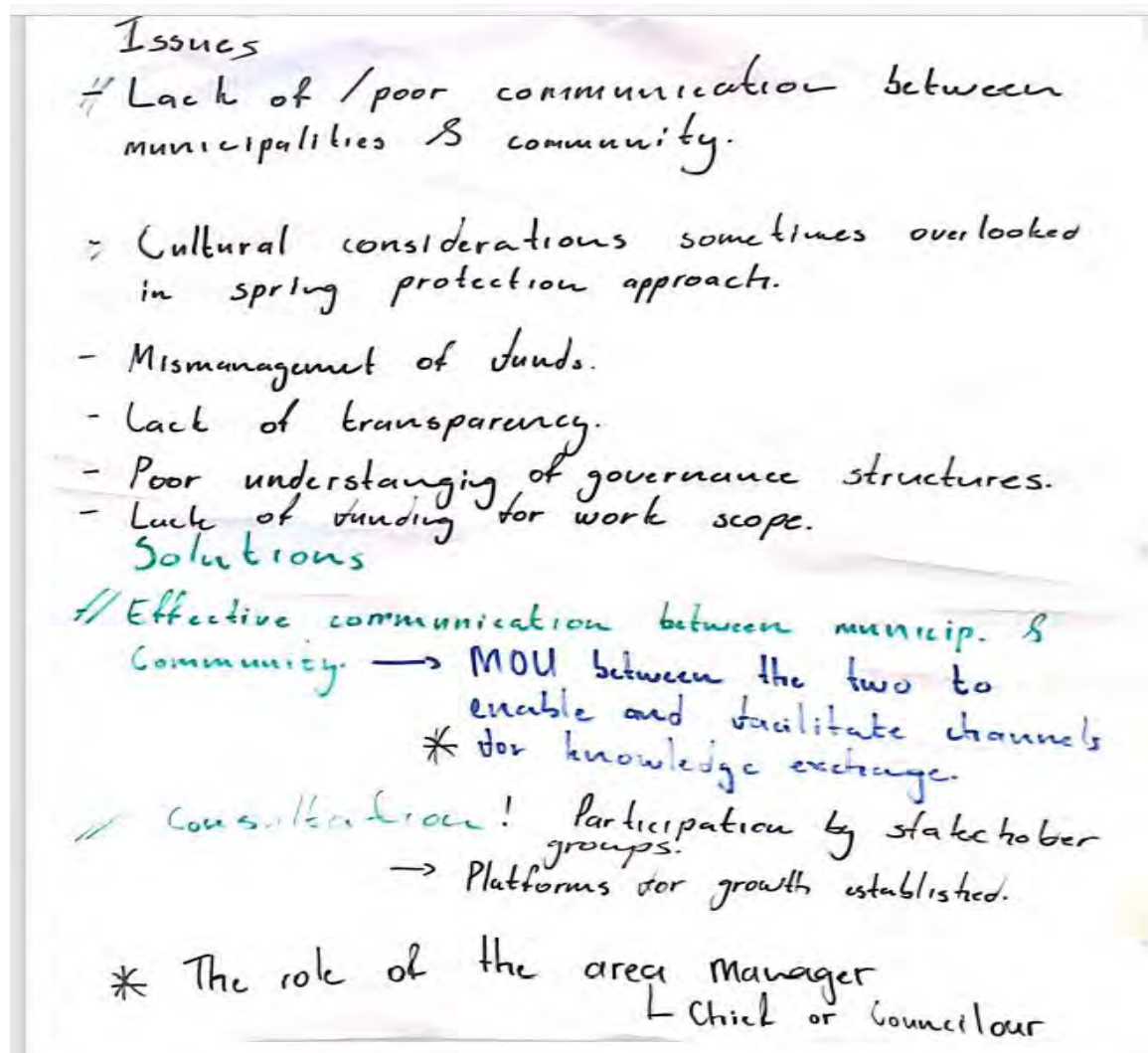


Figure 8.8 (A): Issues with regard to the object of water access identified by Group 2

Figure 8.9 (B) below expresses the activity system modelling that Group 2 worked on; their modelling was also more sophisticated compared to the individual models presented in section 8.2. The **rules** included the MOU, quarterly meetings, tribal committee reports and relevant acts and legislation. The **community** was composed of political leaders, traditional leaders and committees. With regard to the **division of labour, tools and subjects**, Group 2 was unclear, as this was the first time that they had used this double stimulus tool together, to try and work towards their intended object. Even though Group 2's activity system model was not as sophisticated as Group 1's, they had decided to first write out their issues and solutions (as a second stimulus), as an expression of their agency towards solving their contradiction. The type of transformative agency which was expressed by Group 2 was "committing to concrete actions aimed at changing the activity". The type of agency expressed was manifested by the group's commitment to working with the municipality to address the issue of poor communication, to

commit to quarterly meetings to resolve any water-related issues, and to even develop and sign a co-developed MOU between the two parties.

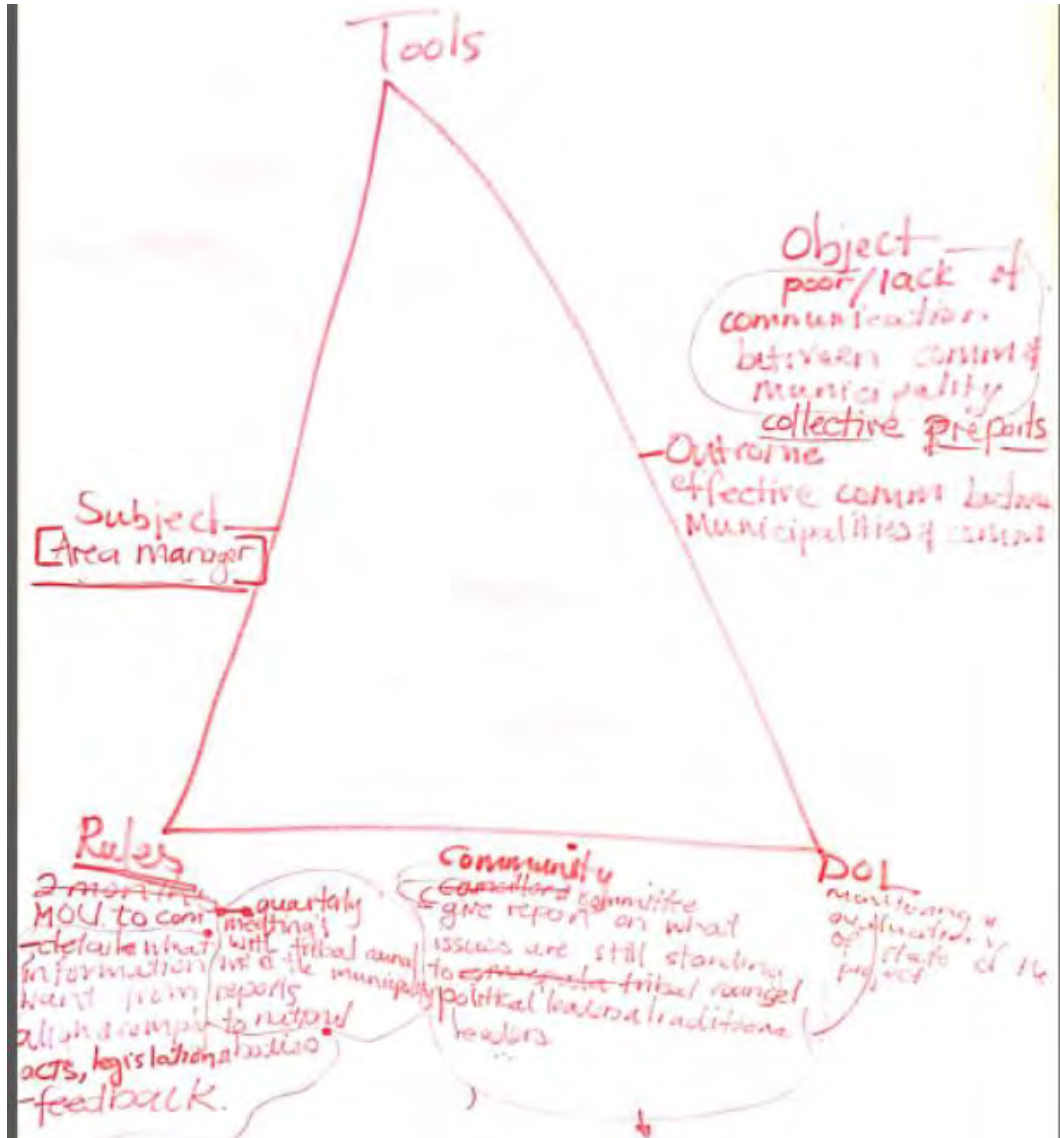


Figure 8.9: (B) Initial modelling of solutions to access to water contraction by Group 2 in the Change Lab

8.3 Presented Modelled Solutions As an Indicator of Developed Agency

The final Change Lab was held in the uMzimvubu catchment on 29 November 2021. This final Change Lab had an array of stakeholders and it was also well attended, as explained in Chapter 5. This workshop also provided me with an opportunity to recap the entire research journey we

had embarked on, not only to the participants but also to other stakeholders who had been coming to observe what was happening in the Change Labs over the previous months of learning. I used this opportunity to teach everyone about the different frameworks which had been used in the learning journey, to get to the point where we were. I also managed to explain to everyone the differences between the different frameworks I had used and the importance that each tool played in the study.

The participants had an opportunity to present their research journey and the projects which they had embarked on. These presentations were models of the solutions which the participants came up with and it was a time for them to reflect on the value they got from the learning journey. Through the presentations, participants reflected on the expansive learning process and the value they had received from the Change Labs, and how they were exposed to ways of learning together through the Change Labs. The expansive learning journey was not for the participants to be only interested in the learning process, but I had a responsibility as a formative interventionist researcher towards the participants to assist them in understanding the agency they possess in analysing their own contradictions and to realise how much learning is occurring not just in the classroom but also outside of the classroom. This was also helpful because it gave the participants the tools to continuously engage in learning and to assist other community members with learning even if it was outside the classroom.

The important thing about the final Change Lab was to see the value which the participants accrued from the entire learning journey, not just from the words spoken, but also from the modelled solutions they presented. The expansive learning process enabled the participants to model solutions and to use the CHAT framework as a double-stimulation tool; this was an indicator that participants understood the concept of activity system analysis and that they could use it for planning and practice towards transforming their newly shared activity. After the presentation of the various projects, the learners expressed the importance of expansive learning and how the engagements in the Change Labs altered the way they approached contradictions. Another common theme which emanated from this engagement was how the participants testified that they received tools to co-manage resources as a collective. In addition to receiving tools, the participants stated that they found their agency during the learning process and they felt that they were now custodians of water in their communities. The projects that the participants had embarked on were expressions of how they had already begun to be catalysts for change through learning about water issues in their communities, and how they

engaged people in the catchment to speak about solutions relating to co-management of water resources.

8.3.1 Group 1 modelled solution

The first group chose to model a solution which deals with managing wattle invasions in the catchment. Wattle invasions were identified as one of the key contradictions which were leading to water issues in the area, as discussed in Chapter 7. The participants decided to work on this contradiction and model solutions which would apply to the catchment. Group 1's project was titled: *Turning issues into assets: Using commercial strategies to clear alien invasive plants in the uMzimvubu catchment* (Figure 8.10).



Figure 8.10: Group 1's cover of the modelled solution they presented

This group highlighted that there were various ways in which wattle clearing in the catchment was currently being approached, which were as follows: (i) government-funded clearing, (ii) corporate funding and (iii) commercially driven clearing. The group prepared a presentation with the solutions they saw fit for the catchment. The group further stated that all the above-mentioned approaches had their pros and cons, therefore a blended approach was best (Figure 8.1). The full presentation is attached in Appendix E of this study; however, I have included some inserts as evidence of the modelled solution.



Figure 8.11: Discussion of the solutions discussed by Group 1

The group developed a model which they believed would assist their communities and alleviate wattle invasion. They had developed this model as a collective and wanted to work with the diverse stakeholders in the catchment. The modelled solution presented was to be adopted as a management approach and used at the various catchment levels. Below is a quote from group 1's modelled solution:

Group 1 speaker: Some of the areas in our catchment are under threat from many drivers of degradation. People often blame people, cattle, erosion, development, but the problem is wattle. Where do we intervene in tackling this issue? Firstly, we need to integrate clearing into local management plans. Secondly, we can utilize wattle to stimulate local green economies.

Group 1 used the CHAT framework to model their solution. By now they had been working consistently with the CHAT framework as a double-stimulation tool, and they used the activity system analysis to guide their process of modelling solutions towards the issue of wattle invasion, building on the first iteration (Figure 8.). The adoption and adaptation of modelling according to the activity system analysis was an expression of the transition from 'envisioning agency' to the category of 'committing to actions' agency (Figure 8.2). Furthermore, this was also an expression of expanded learning, as the participants adopted a new framework that they were introduced to in the learning process, to develop and model solutions which were not there previously. The type of transformative agency expressed was "committing to concrete actions aimed at changing the activity". Commissive speech acts have a time and place component (Haapasaari et al., 2016). This agency can be explained as committing to modify the activity by taking specific, new steps, as indicated by the quote below:

Group 1 speaker: We have been working in this community and we have seen the impact of wattle on the ground, however, we are aware that wattle also supports people's livelihoods. There is a project we started with the community to turn wattle into coal, which is helping to generate income for people in the catchment. The solution we are proposing can assist in clearing the wattle and lead to livelihood security. It is a blended approach.

The **object** of Group 1's activity was wattle biomass as a resource for productive livelihoods while eradicating wattle for healthier landscapes, water replenishment, productive lands and reduced crime. The **mediating tools** the group presented included training (technical, financial and business), market links, community support and finances for resources such as bank loans, donor funding and income. These tools would assist in charcoal production and payment for ecosystem services such as water, carbon and biodiversity. The **subjects** included community-based small businesses. The **rules** encompassed the Forestry Stewardship Council (socially, economically and environmentally sustainable), landowner/leadership (clearing bylaws, approval of sites, local culture and traditions) and government institutions (mandated support, policy enforcement and incentives for positive behaviour). The **community** element was composed of Avo Vision (business in a box and capacity development), Forestry Stewardship Council (accreditation, value-add and compliance), entrepreneurs, landowners/leadership (for approval, support, community communication and guidance), civil partners and Inhlabati (market link and logistics).

The **division of labour** included operational support, technical support, day-to-day monitoring and compliance. This model developed by Group 1 was a result of collaboration between actors in different activity systems working towards a common object. The group had decided that they had existing partnerships, skill sets and agency which was sufficient to assist them in working towards the object of commercially driven clearing of wattle in the uMzimvubu catchment. The quote below summarises the reason for group 1 choosing to work on this specific contradiction:

Group 1 speaker: Through using this framework, as a group we first looked at the challenges in our catchment. We then decided to look at the issue of wattle. We looked at some already existing strategies which have been started by implementers, but also look at some opportunities for us to tackle wattle. We live in a strategic water source area, which is a very special place. We only occupy roughly 10% of the land surface in the country, but we provide approximately 60% of South Africa's water. There are many activities threatening our catchment and its ability to provide water. Our rivers are brown because of the sediment deposited from our landscape and being exported to the ocean. We identified wattle as a major contributor to this degradation. Our group decided to address the issue of this thirsty alien plant.

Lets CHAT

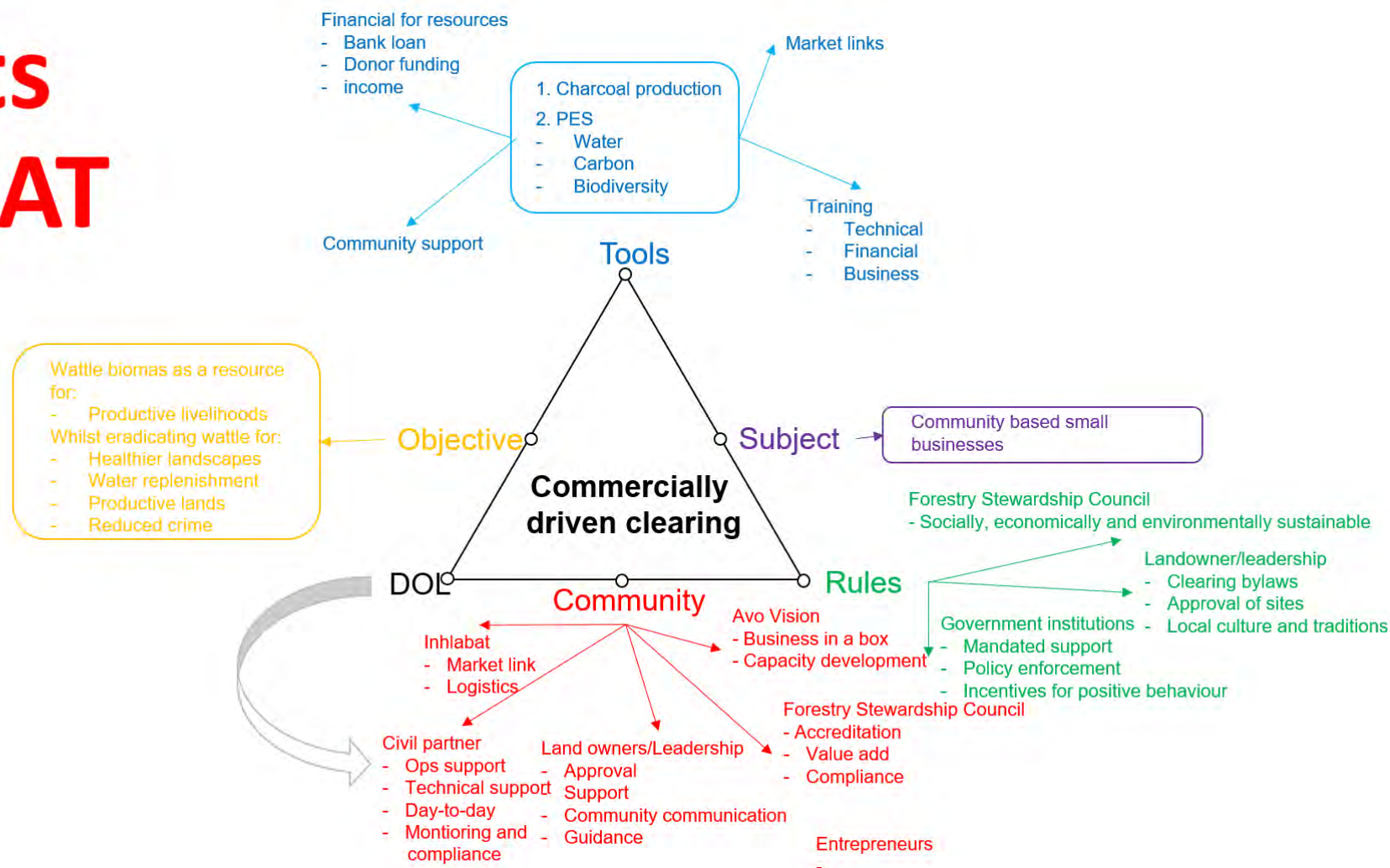


Figure 8.12: Group 1's modelled blended approach towards the commercially driven clearing of wattle in the uMzimvubu catchment

The activity system modelling became more sophisticated as the group worked with the double stimulus tool. The double stimulus tool enabled the participants to realise the importance of dealing with the contradiction of wattle invasion, however, it also highlighted the need to make people aware of the dangers of wattle. In modelling the solutions, they also prepared a video in conjunction with the PowerPoint presentation, so that the people attending the presentation could have a visual of the current state of alien invasive clearing in the catchment, and the potential for enhanced water security and potential job creation by using the approach they modelled. The video showed the current work being done in the catchment, using a commercially driven approach, and how this approach could yield potential benefits if upscaled and supported. This solution received good feedback from many of the catchment stakeholders in uMzimvubu; the activity system analysis of the solution which the group presented was adopted by key stakeholders to potentially use to inform their wattle-clearing projects. The extract below expresses the response from one of the LCP activity system coordinators who sat in during the presentations:

LCPAS speaker: You guys are boundary spanners. As a collective you are truly boundary spanners, because you have your conveners, your implementers and your facilitators, you even have your funding mechanisms. Indeed, you are game changers.

NGOAS speaker: The tools you have provided can actually add to the range of tools which are present in our catchment.

LCPAS speaker: This is one of the reasons the LCP exist; it is for such social innovation.

8.3.2 Group 2 modelled solution

The second group chose to model a solution which dealt with managing the communication (tools) about water resources and infrastructure between the communities and the municipality in the catchment. Lack of monitoring and broken water infrastructure were identified as two of the leading issues in the area when it came to water security, as related to the fourth contradiction (water access) discussed in the previous chapter. The participants decided to tackle this contradiction and model solutions which would apply to the catchment. Group 2's complete presentation is attached as Appendix F. Group 2's project was titled: ***Enhancing water security collaborations between communities and municipalities***. Using their expertise and the agency they possessed in the group, they developed a water reporting tool unique to their context, which could be used by the inhabitants of the uMzimvubu catchment (Figure

8.13). When it came to the issue they wanted to address, this was the statement made by Group 2's speaker:

Group 2 speaker: Water security is a serious concern for a growing number of communities within our area. Oftentimes the task of ensuring that communities have a safe and adequate supply of water is left to our municipalities alone. This is not entirely sustainable given our ever-growing communities and ever-more diverse water supply opportunities and needs. The bottom line: Communities need to play a larger supporting role in ensuring the water security needs are addressed.

Traditional Authority Date Submitted				
Village and ward Number,				
Infrastructure Type	Municipal	Communal (Community Owned)	Private	Not Sure
Infrastructure Significance; i.e. How does the community rely on this particular infrastructure?				
Observation Made				
Observer details				
Photographs captured? Attached?				
Reported to Municipal Technician?	Yes	No		
Technician name and contact details?				
Report Outcome;				
Was the issue addressed? Yes?				
Proposed Intervention, If not addressed				
Proposed persons or group to assist Name, contact details, credentials.... Support needed?				
Resolution				

Figure 8.13: Tool for reporting water issues in the catchment developed by Group 2

The tool developed by Group 2 was to be potentially used by different communities to express and report any related water issues present. The tool would facilitate the safekeeping of water resources in the catchment and ensure that the Matatiele local municipality would be made aware of any discrepancies and technical failures related to water infrastructure. The tool was developed to be translated into local languages so that people would be able to read and act on it. Related to the reporting, the tool includes community location, dates, the damaged infrastructure being reported, observations (with pictures as evidence included), the date and time of consulting with municipal officials, and the proposed intervention and possible date of resolution. When deliberating and discussing the proposed reporting tool, the group further reiterated that because of the dynamics and complexity of the catchment, the tool would be

further refined to suit the context. Figure 8.14 also shows the modelled solution to assist in securing collaborations between communities and municipalities, and the parameters in which the model would operate in the catchment context. Like Group 1, they continued to use the CHAT framework as a double-stimulation tool to conceptualise alternatives to the contradiction they were dealing with.

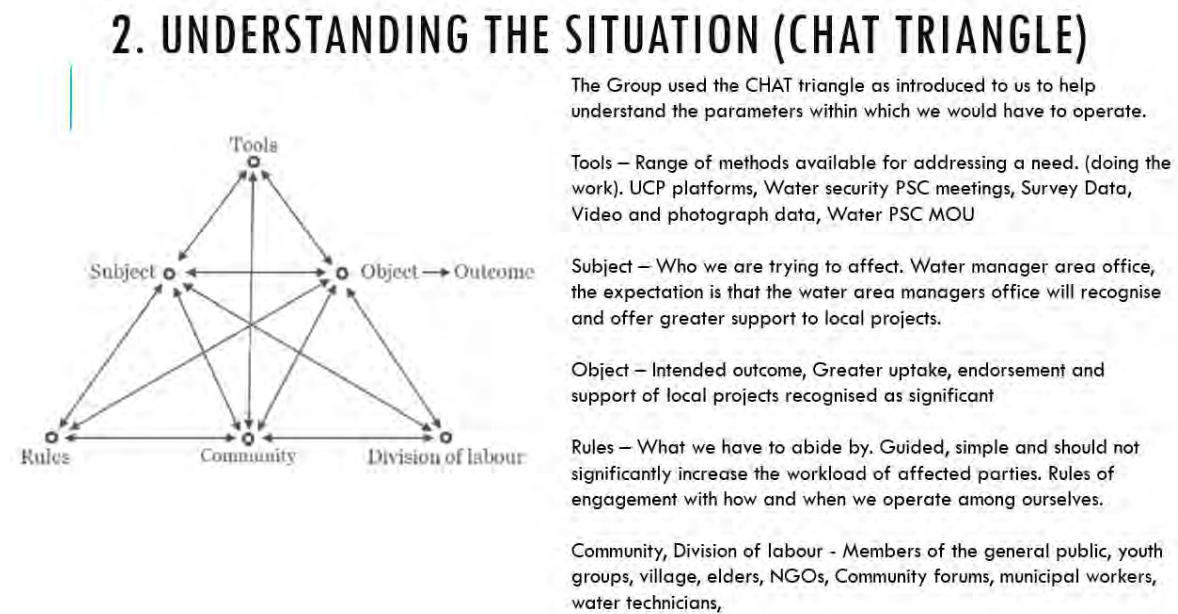


Figure 8.14: Group 2’s modelled solution for managing communication (tools) about water resources and infrastructure

The **object** of Group 2’s activity was greater uptake and endorsement and support of local projects recognised as significant. The water manager area office and locals were the **subject**. The **mediating tools** included UCPP platforms, water security project steering committee meetings, survey data, video and photograph data and a water project steering committee MOU. The **community** involved the members of the general public, youth groups, villages, elders, NGOs, community forums, municipal workers and water technicians. The **division of labour** for the activity system included the customs and duties associated with water access and management for the above-mentioned community. The **rules** were guided and simple and should not significantly increase the workload of affected parties. Rules of engagement included how and when actors in the activity system operated among themselves. This solution also received good feedback from many of the catchment stakeholders in uMzimvubu. This group had received advice from diverse catchment stakeholders concerning the tool which they developed (see extracts below). Some advice included further refinement of the tool so that it could be exported to other catchments. The feedback on the tool included the following

comments from the NGO activity system's and community activity system's external actors who were invited and were present during the presentations:

NGOAS speaker: Thank you so much for developing such a tool. When I first saw it I thought to myself, 'Oh my, not another tool'. However, the great thing with your tool is that it has a governance component to it and it belongs to the water security project steering committee. As Chief Kualu pointed out, this is the first time I am sitting with the district municipality and they are listening to my water issues.

COMAS speaker: The tool could be changed into a digital tool, so that it could reach a greater audience in the catchment, or it can be turned it into an App, so that it could also feed into the municipality's database.

NGO speaker: So, to state again, as the other people said, this tool is not replacing the water services authority, but we are trying to stop gaps, so that people do have water 24/7, not just two days of the week. And then looking at the technicians and telling them 'It's not working, it's not working' and blaming someone else. This endeavour is about taking things into our own hands and seeing what we can do to fix it.

The type of transformative agency expressed by group 1 was "confronting and navigating power relations". The reason is that the presentation was attended by subjects from the five different activity systems, as discussed in Chapter 5, and the participants recognised and understood the importance of navigating power relations, as it was foundational to facing the contradiction of water access. In addition, not only had these participants designed this modelled solution, but they had used the two months between the fifth and sixth Change Labs to test it out in their unique contexts. This enabled the participants in group 2 to voice the power they had and the power their modelled solution potentially had in changing the issue of water access in the catchment – this highlighted how their power could be potentially significant in mediating new ways of doing things in the activity. It was also apparent that this group became more sophisticated in modelling solutions using activity system analysis. The double-stimulation tool (activity system analysis) assisted the group in facing their problem (first stimulus) of water access, by modelling a unique catchment reporting tool, and then helping to organise and order the activity and the specifics required to action the solution.

8.4 Conclusion and Discussion of the Impact of the Solutions and Community Participation

The chapter detailed the process of presenting the modelled solutions and what occurred during the final Change Lab. It was also important to look at the impact of the modelled solutions which were presented by the participants on the ground. The solutions were not just an

academic exercise or theoretical expression of frameworks but were practical ways of changing real issues on the ground and highlighted the importance of expansive learning research. These solutions also expressed the importance of amalgamating various types of knowledge and the practical implications of collaboration and co-learning. The two solutions were a true reflection of an attempt to co-manage water resources in the catchment. The collaboration by the various stakeholders and the knowledge exchanged during the Change Labs were important expressions of the expansive learning which took place in the catchment. This entire learning process was a first in this catchment and that is why a certification process was initiated. The certificate awarding was a way of saying that this journey that I undertook as a researcher was a collective effort and the knowledge which emerged from the learning exchanges did not just belong to me, but to everyone as participants in this learning journey.

As mentioned in the previous chapters (4, 5, 6 and 7), this research process followed the expansive learning cycle; the importance of following this process was to investigate the contradictions which existed in this particular context and to develop solutions which would be practical and impactful. In order to come up with solutions which would be sustainable, a proper analysis was needed and therefore, there was a need to employ a research process which the participants could follow to collaborate and learn.

The expansive learning cycle in this study was as follows: *Step 1* was questioning (What is going wrong and what is threatening us?) and *Step 2* was the analysis (What is behind the problems and what generates them?). These steps were collectively taken at the beginning by the research participants and these questions continued to be posed, even when they chose a contradiction to work on and modelled the solutions. When the participants saw the questions, they realised their agency and the ability they possessed to answer these questions. *Step 3* was modelling (How do we want to function after five years?), and *Step 4* was examining the model (How would this model work in real situations?). The research participants understood from the beginning that the work we were doing was rooted in theory, but it had pragmatic and real consequences on the ground. Steps 3 and 4, therefore, guided the participants in understanding that the modelled solutions must be contextually applicable and solve the issues relating to water resources which plagued their catchment.

Step 5 was implementation (How can the model be put into practice and how should it be revised?). This step was achieved when we assessed the proposed initial solutions which were presented by the participants during the Change Lab which occurred in September 2021. This

questioning played a role in preparing for the final Change Lab and presentation of the final modelled solutions which occurred in November 2021. Sections 8.2.1 and 8.2.2 provided evidence for this step, as they included the initial modelling of the solutions and activity of the participants in the Change Labs and outside the Change Labs. Below is a quote from one of the participants from the community activity system:

COMAS-CLD: We are thinking of inviting other stakeholders for our final presentation. The reason is that this work involves the people of our catchment and we will be working with them, as we will be developing and implementing our model. We can invite other people involved at the leadership level and coordinators of the catchment projects.

Step 6 involved reflecting on and assessing the process (What did we achieve and how?). This step also included the segment where my research assistant and I recapped the entire learning journey and the participants' presentations. The participants' presentations of their modelled solutions played an integral part in this step, and this is why after their presentations there were questions raised and reflection on their undertakings. Some of the participants from the NGO and LCP activity system asked the following questions:

NGOAS: Why did you choose to use this framework to work on the issues?

LCPAS: What are the challenges you encountered while working with the communities, in trying to develop and implement the model?

Step 7 was consolidation (How can we make the new model last and what does this mean for us?). This step was a continuous one, which began with the Change Labs and continued for several weeks after the Change Labs had ceased. I still managed to communicate with the stakeholders on the WhatsApp group concerning the refinement of the group models. Below are the extracts from the WhatsApp group's engagement after the groups presented their models (Figure 8.15 A+B).



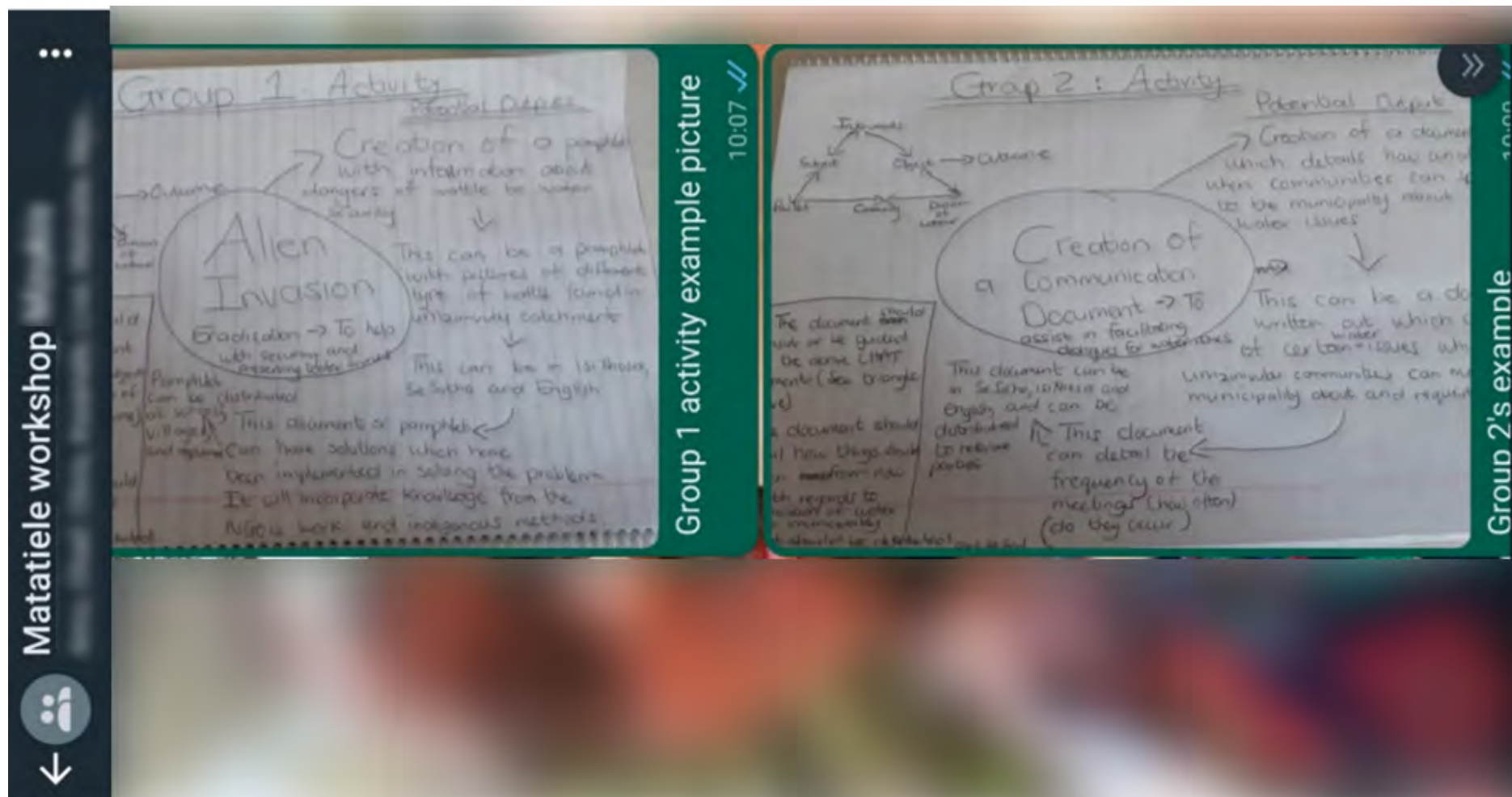


Figure 8.15: (A+B) WhatsApp group extracts, regarding the implementation of the groups' modelled solutions

The solutions which were proposed during the participants' presentations sparked some interest from the diverse stakeholders who were present during the presentation. After the presentations, the various uMzimbubu catchment stakeholders had ideas on how the modelled solutions could be refined. The inputs were received by the two groups, respectively. An idea to compress the study, show the research process and present the modelled solutions in a booklet was raised by the members of the catchment. This idea to develop the study into a booklet form for the catchment was so that people could access the research and understand the gist of the research. This booklet would be available in English and isiXhosa, which were the languages which were used in the study and are widely spoken in the uMzimbubu catchment. Following the last step in the expansive learning process, a final VCF was undertaken to monitor and evaluate if there was any potential learning after the formative intervention. Any learnings which emerged from the study could potentially add to the LCP knowledge database, hence it was important to feature in the monitoring and evaluation of the study. The first VCF assisted in developing the A-view of the study and gauging the learning which occurred before the intervention. The next chapter deals with evidence of value creation post the research process I undertook; in essence, the B-view of my research.

CHAPTER 9: EVIDENCE OF VALUE CREATED FROM EXPANSIVE LEARNING

9.1 Introduction and Background

Chapter 6 focused on understanding the past learning value created for stakeholders in the different activity systems. With the assistance of the VCF tool, I reviewed the existing learning among the water management activity systems. As mentioned in Chapter 1, the LCP work is coordinated by various catchment conveners, positioned in the four different catchments. These catchment conveners, alongside other bodies, were chosen as partners because they had been involved in working in the various catchments. As collaboration is an important part of the LCP, it was important to partner with these conveners and build on the existing work which they had already established. Project Chapter 6 also detailed how there had been various sources of learning regarding water co-management in the uMzimvubu catchment, and this was expressed through various indicators of value. These indicators of value are important in expressing the fact that there was prior learning occurring in the catchment and that there was a pre-existing flow of knowledge between the different activity systems.

In this chapter, the focus is on the evidence of value created from the expansive learning process. In this chapter, the focus will be on phase 4, which was concerned with the B-view of the research process. The B-view focused on the evidence of value creation from the expansive learning process in terms of co-management and the expansive learning process arising from the research process (it includes data drawn from phases 3 and 4). This B-view was developed using the VCF and assisted in understanding the value which had been created for the stakeholders in the various activity systems around the shared object of activity that emerged out of the expansive learning process. The views and perspectives of the participants or the stakeholders who were involved in the Change Labs and expansive learning process are provided. An analysis of the types of evidence of value which emanated from the final VCF of the expansive learning process is also provided. The VCF tool assisted in understanding if there was any value created for the people from the expansive learning process, to inform the LCP work and the greater TIPC work. The chapter also includes a conclusion which explains why it was important to evaluate the value created via the entire expansive learning process.

9.2 Evidence of Value from the Expansive Learning Process

In this section, the focus is on the evidence of value created from the expansive learning process. This process looks mainly at phase 4, which was the B-view of the research process. There was an analysis of the final VCF questionnaire, which was done at the end of the expansive learning process. This VCF engagement occurred five months after the beginning of the expansive learning process because the first Change Lab had occurred in June 2021 and the last one was in November 2021. As previously mentioned, the VCF tool was used to evaluate if there was any social learning which had occurred from the expansive learning process and to gauge if the stakeholders gained anything of value from the process we had embarked on five months ago. As shown in chapters 7, 8 and 9, the focus of the expansive learning process, undertaken in the Change Labs, was on the object of co-management of water resources, and how the actors in the various activity systems would collaborate, co-learn and focus their activity in attaining that goal. Sustainable water management approaches necessitate broad community acceptance of changes in policy, practice and technology, which necessitates an engaged community. A vital first step in developing an engaged community is identifying community knowledge about water management, a problem that has received little attention in studies (Dean et al., 2016).

The analysis included evidence of immediate value, potential value, applied value, realised value and the transformative value which emerged from the expansive learning process. Once again, the participants were not forced when it came to filling in the VCF questionnaire, it was a voluntary process. It was very important in my research that the participants exercise their agency and that they realise that this process requires honesty and complete transparency. The analysis of value is also important for the greater LCP because part of their objectives include creating platforms which engender collaboration, learning and transformation of values. As discussed in chapters 7 and 8, knowledge and understanding of water concerns in the community are seen as essential ingredients in resolving water-related challenges (Distanont et al., 2018). The evidence below provides the bigger project data which shows how the expansive learning process informed their learning and provides recommendations for other catchments.

9.2.1 Immediate value from the expansive learning process

The expansive learning process generated immediate value as shown in these three indicators:

1. Methods and tools to support reflexive learning
2. Grounding learning in real contexts and contradictions
3. Building relationships across boundaries to solve common problems

As part of the expansive learning process, a key component was reflecting on the learning journey we had embarked on as a collective. I also included myself in the reflection process because I did not just facilitate learning, but also gained new information I did not previously have. As stated in Chapter 1, I have an Environmental Science and Physical Geography background, and had not been previously immersed in a context of collaboration and co-learning with other stakeholders to work towards a common object.

More evidence from the participants in the diverse activity systems is provided in the section below, as surfaced by the VCF tool. The VCF tool also assisted in the process of reflection, because for the participants to fill in their answers in the VCF units of analysis columns, they had to first reflect on the process. Being critical of one's assumptions is the key to changing one's taken-for-granted frame of reference, which is an essential feature of learning for adapting to change (Mezirow, 1997). Reflection and learning are inextricably linked, and reflections are critical in integrating theoretical and practical competencies as well as raising awareness about implicit norms and conventions (Mezirow, 1997; Schön, 1983). With reference to transformation and reflection, Mezirow (1997) states:

Transformations in frames of reference take place through critical reflection and transformation of a habit of mind, or they may result from an accretion of transformations in points of view. (Mezirow, 1997, p. 7)

The quotes below are expressions of some of the key insights which emanated from the analysis, as stated by the stakeholders. Some of the answers were repetitive, and in such a case a quote reflecting that theme was expressed.

9.2.1.1 Indicator 1: Methods and tools to support reflexive learning

It was interesting to note that some of the stakeholders found value in learning about CHAT and that the theory informed them about modelling solutions to problems they faced. This expressed that communities can be exposed to learning theories and that they are capable of learning and using formal educational theories to inform their practice. Below are the extracts from the participants with regard to learning from the VCF forms:

COMAS: Learning about CHAT has helped me and the Change Labs have taught me how to bring solutions. (1)

NGOAS: I had the opportunity to learn about CHAT, and it can assist in fostering collaboration in the catchment. (2)

NGOAS: It enlightened me with CHAT theory, this was so useful to extend on my knowledge in knowing the tools that incorporate community and stakeholders. This was important to me as I am currently introducing myself to the social aspect at work. (3)

LCPAS: Particularly useful was the introduction of the activity triangle as a means of understanding and breaking down a problem. (4)

9.2.1.2 Indicator 2: Grounding learning in real contexts and contradictions

Another interesting indicator of immediate value was reflected in how some of the stakeholders felt that they had learnt about water issues in their own catchment context and how things really work, instead of basing their views on assumptions. This is why it was important to have different stakeholders' boundary crossing and relaying their unique perspectives. The expansive learning steps which included the cultural and historical analyses also assisted the participants in understanding that contradictions do not occur in a vacuum, but they are situated in particular contexts. The quotes below indicate the importance of grounding learning in real contexts and contradictions:

TLAS: The presentation of the contradictions, and the cultural and historical analysis discussions on water supply issues opened my eyes and made me realise that the municipality faces certain challenges, but they do want to serve the catchment. (1)

NGOAS: I have received incredible information which has led to me getting a holistic understanding of water security issues in our catchment. (2)

9.2.1.3 Indicator 3: Building relationships across boundaries to solve common problems

Further evidence of immediate value was found in building relationships across boundaries to solve common problems. Here, it was good to see that some of the participants understood that the municipality was trying to do some work to alleviate water issues, but that challenges emanating from communities hindered the municipality in executing their duties. Other participants saw this entire expansive learning process as good exposure to social learning. It was good to know that this platform brought these diverse types of values to the participants. The quotes below summarise the importance of the Change Labs in aiding collaboration,

boundary crossing and fostering a sense of community, as we endeavoured to work towards the common object:

LCPAS: Having all the stakeholders together, trying to work together to solve a common challenge really helped everyone understand the individual perspectives of each group, as well as their priorities. (1)

NGOAS: The biggest gain from the workshop was the strengthened ties formed between the participants as well as having lines of communication opened. This has helped by enabling interactions between the groups extending far beyond those required by the initial work scope. (2)

NGOAS: As a project implementer based in the upper uMzimvubu catchment, the learning workshop was a highly valuable learning experience. It provided a unique opportunity for us as a range of stakeholders to tackle a longstanding problem in a unique and new way. (3)

9.2.2 Potential value from the expansive learning process (indicators of knowledge capital)

The expansive learning process generated potential value as shown in these four indicators:

1. Diverse perspectives and importance of relationships and communication
2. Knowledge of activity system analysis and activity systems involved in the modelling of solutions
3. Map of identifying value created and knowledge of research approaches to co-management
4. Knowledge of cultural histories of catchments and knowledge of own agency for change

9.2.2.1 Indicator 1: Diverse perspectives and importance of relationships and communication

Dean et al. (2016) state that individual-level knowledge of water is crucial for a variety of reasons. For example, in this study, identifying the strengths and weaknesses in community knowledge about water serves as an important foundation for initiatives aimed at increasing knowledge. There were multiple learnings which proceeded from the expansive learning process according to the quotes below. Most of the output was associated with ideas, new knowledge, insights and plans. This was a first step towards a positive direction because it expressed that people actually managed to learn something valuable enough to inform and potentially influence their practice, as indicated in the quotes below:

NGOAS: The water security workshop was a refreshing and a good learning experience. I think the exciting part about it is that we were able to learn from one another more rather than the usual of having a facilitator or lecturer stand in front and give out information. (1)

COMAS: The ideas amongst different groups of ages, occupation and interests made this a diverse workshop even though we were all brought together by one common ground which is water. (2)

9.2.2.2 Indicator 2: Knowledge of activity system analysis and activity systems involved in the modelling of solutions

From the quotes below, it was deduced that the learning process could potentially assist in the creation of documents, awareness campaigns and learning material which would raise awareness concerning water issues in the catchment. The modelled solutions which involved the creation of the framework or reporting tool were also a candidate to be potentially used in certain catchment projects and in some spring projects. The tool was created by the learning participants in the activity, and it would make sense for it to be used in water projects in and around the catchment. The importance of activity system analysis and expansive learning to inform practice on the ground is highlighted in the quotes below:

TLAS: This expansive learning process you have introduced to us is important for capacity building, especially for the local leadership. The activity system analysis is particularly useful for us, especially the part about rules. I liaise with some people who are even older than I am and have been in this catchment longer, and the activity system analysis helps in collecting their old knowledge and the rules they lived by earlier and sorting them out. I want to introduce you to other parties which work in the catchment, so you can talk about your research methods and the expansive learning tools. (1)

LGAS: I have taken the lessons from these Change Labs and the expansive learning cycle, and I will implement them in our land management plan. I have learnt to consult with communities before working on a landscape. (2)

TLAS: I want to create a water learning document for all traditional leaders, so they can be better equipped like I am. Also, water security committees need to be formed in each village.(3)

LGAS: I want to create a document which will help me communicate with communities, regarding municipal water provision. (4)

LCPAS: The group which created the water reporting framework tool has produced a tool which we will use for our springs project. (5)

The expansive learning process seemed to have also influenced the nature of working more collaboratively for some of the stakeholders because they stated that the learning process we

undertook was essential if they wanted to experience success. In addition, the stakeholders also stipulated that they now had accrued knowledge of how to infuse collaboration in their projects, so that co-management of the catchment could be a reality.

9.2.2.3 Indicator 3: Map of identifying value created and knowledge of research approaches to co-management

Another potential value of the process was that some stakeholders were even considering using the VCF tool for their work practice. This was an interesting outcome because it expressed that even the tools used to facilitate learning could be potential learning material. Another poignant potential outcome was the idea that my research process could influence another student's academic approach and the community's water issues. The CHAT framework provided tools to deal with tensions and contradictions, and this approach influenced another person's thought processes about dealing with multi-stakeholder engagements. The importance of using CHAT and VCF as educational tools to model solutions is indicated below:

NGOAS: I have adopted the VCF as a tool I will use in my future work engagements. (1)

LCPAS: The water issue reporting framework tool is powerful for assisting communities and municipalities to collaborate, therefore we will use this tool for our WRC Spring for Life project. (2)

COMAS: I want to create adverts for people on spring management because people are careless about springs in the catchment. (3)

9.2.2.4 Indicator 4: Knowledge of cultural histories of catchments and knowledge of own agency for change

Water is a vital resource that is essential for both survival and economic development. In general, the natural sources of water on which all humans rely are classified as air, water (rain), surface water and groundwater (Distanont et al., 2018). The importance of water learning is important and not just for select individuals or people who have the privilege of attending formal school. The Change Labs included participants who did not necessarily have formal education or professional Western training in NRM. In addition, to assist in understanding the object, the catchment dwellers also demonstrated agency by signing up for the Change Labs, in a bid to work towards the object of water co-management in their catchment. These actors were primarily from the community activity system, and they were critical in providing the cultural and historical context of the catchment. The data extracts below show how the expansive learning process benefitted the different activity systems in their various contexts:

LCPAS: This meeting equipped me with ideas on how to deal with these tensions and uncertainties not only in academic situations but also in situations where there are multiple stakeholders present. This will assist in even dealing with water management issues in my own community. (1)

NGOAS: The expansive learning process has taught me to look solve issues in a co-defined way; I will integrate research tools and frameworks in my organisational planning. (2)

COMAS: Amongst many other things, a few things which I learnt during that time stood out to me. The willingness to show up for the landscape they live in will forever be one of the things I saw and one which was a highlight. I think there is something truly phenomenal about individuals taking agency in their hands and working together towards a common goal. (3)

9.2.3 Applied value from the expansive learning process

The expansive learning process generated applied value as shown in these two indicators:

1. Solving complex and real-life problems
2. Development and use of new tools to transform the shared activity (research tools to engage with tensions and uncertainties)

As noted in chapters 1 and 2, the demand for effective and comprehensive water resource management is driven by critical challenges which necessitate collaboration at all levels of society, from government agencies to local communities. This manner of operation can assist in dealing with water changes and water management to decrease the level of harm to the country's economy (Bunclark et al., 2011). To understand the applied value, it is imperative to engage the data to see how the participants in the expansive learning process began to practically apply the information they had received and co-developed. The quote below reflects how the participants began to transition towards the category of "taking action agency"; this agency is demonstrated by "reporting having taken consequential actions to change the activity in between or after the laboratory sessions" (Haapasaari et al., 2016, p. 242):

NGOAS: As I am part of the conservation impact team at work I am making sure that the impact in water sources from springs to streams that work is being done at both communal and organisational levels to protect springs and to preserve water as it is a precious resource. Thank you to Mzukisi for bringing this to our sweet Matat (Matatiele) and for highlighting important principles in our minds regarding water security in the catchment. We appreciate your skills and time.

9.2.3.1 Indicator 1: Solving complex and real-life problems

The expansive learning process had actionable repercussions and was not just a theoretical exercise. Quote 1 and Quote 2 are expressions of how the process was able to provide

applicable tools to solve a real-life community problem; it was encouraging to see how what was learnt in those Change Labs could find expression in a community matter:

TLAS: I have utilized CHAT as a tool to improve communication with certain stakeholders in the Moshesh Traditional Council. The theory has helped us. (1)

COMAS: Particularly useful was the introduction of the activity triangle as a means of understanding and breaking down a problem. (2)

Quote 3 is a practical expression of how dialogues between stakeholders can solve issues and remove barriers created by unfounded notions. The municipal stakeholder was now practicing effective community assistance, because she learnt and understood the background of the complainants from the Change Labs, and could now sympathise with them because of the historical and cultural analyses of the water provision contradiction, as indicated below:

LGAS: Ever since I attended the Change Labs, I have learnt how to communicate with the communities (villagers, councillors and chiefs), and I am well able to deal with the water service complaints which come to the municipality. (3)

9.2.3.2 Indicator 2: Development and use of new tools to transform shared activity (research tools to engage with tensions and uncertainties)

The tool was not just a theoretical endeavour, but it was developed in the context of the communities and their needs. Quotes 1 and 2 below symbolise how the participants who created the tool found agency within themselves to develop a tool to assist the catchment communities:

COMAS: Rural households did not have a medium to report the water issues, now we have created a tool for them to use. (1)

TLAS: We created a tool that the public will use the tool to capture and record challenges with their water infrastructure and then use said records to communicate their grievances with authorities that may be able to help them. i.e. municipalities and NGOs. (2)

This research was centred on co-learning, so it was good to know that other academics found value in this work and could apply it in their various scopes of learning. Quote 3 below is an expression of how this expansive learning process was able to influence research agendas and academic agendas:

LCPAS: I have used the expansive learning resources and tools for my data collection for my master's thesis and will continue using them at engagements that I may come across-related to

water management or catchment management. Some of these engagements are riddled with tensions and uncertainties and therefore it will be beneficial to have in my practice. (3)

9.2.4 Realised value from the expansive learning process

The expansive learning process generated realised value as shown in these two indicators:

1. Transformation of responsibility in the professional, organisational and community context
2. Increased awareness of collaboration for boundary-crossing purposes (for formulating new solutions)

Distanont et al. (2018) state that managing water resources is a difficult endeavour. There is no single model that is adequate for all scenarios; rather, there is a spectrum of approaches for diverse contexts. The management of water resources in each community differs according to its geographical and socioeconomic aspects. Each community has its distinct method of managing its water resources in accordance with its geographical context and style of life. Furthermore, a variety of factors influence the success of water resource management (Distanont et al., 2018). This section is an analysis of the potential realised value from the participants in the learning journey. Realised value has to do with how the learning participants have changed in capacity and how they or others realised it (Wenger-Trayner & Wenger-Trayner, 2014). I surface indicators of realised value as found in the data. The quote below shows how a learning participant found value in co-learning:

NGOAS: The second thing I learnt is how important co-learning is for a progressive society with the resources and the burning need for change. Through the workshop, I saw how intentional and sincere everyone was because they wanted this change for themselves and it wasn't shoved down their throats.

9.2.4.1 Indicator 1: Transformation of responsibility in the professional, organisational and community context

Co-management was an important theme in this research, and it was a positive outcome to have a participant in the Change Labs given a role as an active part of managing water resources in their village because it showed that learning can inform change and bring practical value to stakeholders involved in the expansive learning process. Quote 1 is an expression of how the learning journey was able to shift a person's role in the context of their community and to bring value to issues of water management:

TLAS: have improved to be a knowledgeable person in my community. The George Moshesh Traditional Councillor consults with me on water security issues in our village. (1)

Before the expansive learning process began, there was some tension between the community activity system and the local government activity system. However, as we followed the expansive learning steps, it was evident that there was a lot of miscommunication and misinformation between these parties. This again shows the importance of boundary crossing and how this research has contributed to better working relations between municipal and community participants. Quote 2 is another expression of realised value in the organisational context:

LGAS: I have become a better water Technician at the municipality because the expansive learning process helped me to sit with the communities and learn from their perspective. (2)

9.2.4.2 Indicator 2: Increased awareness of collaboration for boundary crossing purposes (for formulating new solutions)

Local implementers played a crucial role in the catchment, and for them to understand that collaborative efforts and co-learning could assist in them managing the catchment with the communities, expresses that the expansive learning cycle had a degree of success in the catchment. Quote 1 and Quote 2 are also evidence of realised value from stakeholders who were local implementers, and who felt they had become better professionals and were now better able to execute their institutional mandates as a result of the learning journey:

NGOAS: This learning process assisted me, as a part of a local NGO in the catchment, to be in a room with different stakeholders who have different perspectives about water security, and that has heightened my knowledge as a local implementer. (1)

NGOAS: a) As an implementer it helped me grow into this new role and developed me as a professional. b) Helped gain recognition of all the strides and advances that my organisation has made towards improving water security within our catchment. (2)

Reflection was imperative if indeed we were to embark on a journey of co-managing our water resources. Realised value is not something which can be easily surfaced in a short space of time; hence the responses were not as many. It would take further reflection to express how the other participants have demonstrated any realised value at all. However, as a researcher, I also had to learn the skill of reflection after numerous months of reading and fieldwork, because it did not come naturally. Quote 3 highlights the importance of reflecting and appreciating the value of multiple perspectives:

LCPAS: A personal outcome has been to be able to reflect better in situations and look at situations (especially those riddled with tensions) from multiple perspectives. (3)

9.2.5 Transformative value from the expansive learning process

The expansive learning process generated transformative value as shown in these two indicators:

1. Relational approach – more democratic and collaborative
2. Valuing water as a foundation of life

9.2.5.1 Indicator 1: Relational approach – more democratic and collaborative

Transformative value has to do with how the process has changed or transformed how the learning actors work and perceive things (Wenger-Trayner & Wenger-Trayner, 2014). The expansive learning cycle took approximately five months and the VCF sessions were well spaced out. However, it would have been beneficial to have had another VCF at the official end of the LCP. I state this because this research has implications not just for academia, learning studies, water issues or educational purposes alone, but by association with the LCP work, it will feed into the WRC national agenda and the DSI strategies which relate to water management innovation. The evidence of transformation was essential in determining the efficacy of the interventions because it assessed if there had been any change in values, and if the process had changed or transformed how people worked and perceived things. This is indicated in the quote below:

NGOAS: Finally, I learnt how important it is to have as engaged a facilitator as the participants. I really saw through Mzu's (Mzukisi Kuse) qualities of facilitation that the trajectory of the sessions were emotion-evoking but in a good way. In the way that cultivates a need for change through agency which was given. I learnt a lot about the power of togetherness and doing things in a team for the better of natural resources and the landscapes we live in. (1)

9.2.5.2 Indicator 2: Valuing water as a foundation of life

The two quotes below provide interesting viewpoints and perspectives from stakeholders who held a certain degree of power in managing water issues and implementing communal projections, especially those related to NRM. Quote 1 is an indication from a municipal stakeholder of how they would alter the way they worked in relation to water provision for their communities, and how they would go beyond the scope of their work to try to attend to communal water issues. This indication of realised agency and a change of values is shown by the quote below:

LGAS: I have planned and scheduled to visit villages who are struggling with water provision because I have learnt that from the Change Labs that WATER IS LIFE. (1)

Quote 2 shows a transformation of the status quo because the stakeholder realised from the learning journey that collaboration was essential to project sustainability and efficiency. This change of value will hopefully influence the stakeholder's colleagues and could potentially alter the modus operandi of their institution, as indicated in the extract below:

NGOAS: As a local implementer, I will co-work with different stakeholders and collaborate with them, because success is allowing people to come with their own solutions. (2)

9.5 Conclusion

Chapter 9 dealt with the evidence of value created from the entire expansive learning process. The chapter opened with excerpts from the different participants with regard to their experience during the entire learning journey. Following this was the evidence of value created which was captured using the VCF forms and elaborations. The lessons from this research project were positioned within a greater work relating to water security, hence learning was important. In a study by Wyrozebsk and Pawlak (2021), they reported that the collection and application of lessons learnt play an important role in project knowledge management. Their study further reiterated the significance of gathering and storing lessons gained and, as a result, learning from them to implement process improvements. The indicators of value, the value types and the new indicators are provided in Table 9.1. These new indicators express that there was a potential expansion in the learning of the participants as they resolved the contradictions and demonstrated transformative agency.

Table 9.1: New indicators of value from the B-View of the study

Type of Value	New Indicators of Value	Responses	Activity System
1. Immediate value	Methods and tools to support reflexive learning	1 2 and 3 4	<i>Community</i> <i>NGO</i> <i>Living Catchments Project</i>
	Grounding learning in real contexts and contradictions	1 2	<i>Traditional Leadership</i> <i>NGO</i>

	Building relationships across boundaries to solve common problems	1 2 and 3	<i>Living Catchments Project</i> <i>NGO</i>
2. Potential value	Diverse perspectives and importance of relationships and communication	1 2	<i>NGO</i> <i>Community</i>
	Knowledge of activity system analysis and activity systems involved in modelling of solutions	1 and 3 2 and 4 5	<i>Traditional Leadership</i> <i>Local Government</i> <i>Living Catchments Project</i>
	Map of identifying value created and knowledge of research approaches to co-management	1 2 3	<i>NGO</i> <i>Living Catchments Project</i> <i>Community</i>
	Knowledge of cultural histories of catchments and knowledge of own agency for change	1 2 3	<i>Living Catchments Project</i> <i>NGO</i> <i>Community</i>
3. Applied value	Solving complex and real-life problems	1 2 3	<i>Traditional Leadership</i> <i>Local Government</i> <i>Community</i>
	Development and use of new tools to transform shared activity (research tools to engage with tensions and uncertainties)	1 2 3	<i>Community</i> <i>Traditional Leadership</i> <i>Living Catchments Project</i>
4. Realised value	Transformation of responsibility in the professional, organisational and community context	1 2	<i>Traditional Leadership</i> <i>Local Government</i>
	Increased awareness of collaboration for boundary-crossing purposes (for formulating new solutions)	1 and 2 3	<i>NGO</i> <i>Living Catchments Project</i>

5. Transformative value	Relational approach – more democratic and collaborative	1	<i>NGO</i>
	Valuing water as a foundation of life	1 2	<i>Local Government</i> <i>NGO</i>

Following the second VCF process, it was evident that there were now five types of value types present after the expansive learning process. Before the expansive learning process, there were four types of values present, namely immediate, potential, applied and realised value. Following the expansive learning process there was the addition of the transformative value type with the new associated value indicators.

After the expansive learning process, there was immediate value present and new associated value indicators. Methods and tools to support reflexive learning, grounding learning in real contexts and contradictions, and building relationships across boundaries to solve common problems were the new value indicators present. These value indicators affected four of the five activity systems with the local government being the absent activity system. Diverse perspectives and importance of relationships and communication, knowledge of activity system analysis and activity systems involved in the modelling of solutions, the map of identifying value created and knowledge of research approaches to co-management, and knowledge of cultural histories of catchments and knowledge of own agency for change were the new indicators of the potential value. All the activity systems were affected and influenced by these new indicators. This was a potential indicator of how the learning actors had received some ideas, knowledge and concepts which they could apply in their unique contexts with regard to water co-management.

Solving complex and real-life problems, and the development and use of new tools to transform shared activity (research tools to engage with tensions and uncertainties) were the new indicators of applied value. Four of the five activity systems were represented in this applied value type, with the NGO activity system being absent. This was a potential indicator of the activity systems moving from knowledge and learning to applying that knowledge and learning in real practical contexts. Transformation of responsibility in the professional, organisational and community context, and increased awareness of collaboration for boundary-crossing

purposes (for formulating new solutions) were the new indicators of realised value. Four of the five activity systems were influenced by this indicator, with the exception of the community activity system. Realised value usually manifests after some time, because it is usually realised after the new learning/knowledge has been applied. This was one of the reasons why there were only two indicators of realised value.

This addition was a potential indicator of the expansion of the learning which occurred with regard to the object of water co-management. Relational approach – more democratic and collaborative, and valuing water as a foundation of life were the value indicators relating to transformative value. Only the NGO and local government activity systems were influenced by these indicators. These two activity systems were vital in the day-to-day provision of services for the catchment, so the potential transformation of their activities could be beneficial for the uMzimvubu catchment. In the previous VCF, value indicators were absent, because there was no transformative value present. The evidence accumulated in this chapter has the potential to influence the work of the LCP at a national level and the TIPC work at an international scale. As I am a student in the LCP, the work and lessons I surfaced through this study have the potential to influence various sectors and policies. The quote below, from the LCP director, summarises the potential significance this study could have:

LCP-II: The literature will also be an important outcome for us as the project and we need the students' work to also inform this. We encourage that our students take the knowledge they have acquired to write journals, articles and simple materials in order to be read by our partners in the governmental space. We also have encouraged our students to write peer-reviewed articles about their research and publish them into journals, so that people are acquainted with the work of the Living Catchments Project. Our hope with this is that other stakeholders can learn from the work which our students have done on the catchment and that they can apply the lessons learnt in their context. We want the work of the students to influence policies, conversations and spur change in catchments.

The next chapter deals with potential contributions this study has made and how the findings emerging from the study could potentially assist the work of the LCP and even add to the repository of citizen science tools. The methodological approach followed in this study could possibly assist other niche-level innovation studies. This study could potentially assist other types of work which are Just Transition-oriented because collaboration and surfacing the stakeholders' agency were foundational concepts in this study.

CHAPTER 10: POTENTIAL CONTRIBUTIONS EMERGING FROM THE STUDY

In this chapter, the emphasis is on the contribution that I, as the researcher, made towards the LCP, and how my research has assisted in advancing or fulfilling some of the Living Catchment objectives. As stated in the previous chapter, the LCP is positioned in four catchments and my research was situated in one of those catchments. The learnings from the uMzimvubu catchment are important because they can influence the other catchments and bring insights. Another thing which is important about my research is that I, as a formative interventionist researcher, was strategically positioned to help facilitate learning – in addition, at the time of the study, I was also one of the Living Catchment students who was supported by the project. Therefore, I possessed a unique positionality – being a formative interventionist researcher and assisting in facilitating learning, but also being a LCP student – this put me in a unique position because both I and my work could add value to the greater project objective, which was to assist in capacity building and advancing research.

Adopting the position of a formative interventionist researcher was important in this research because colonial research methodologies tend to be primarily extractivist in orientation. They have left most communities with detailed diagnoses of problems but with few emerging co-engaged ways that are able to collaborate with communities to achieve alternative futures (Mukwambo et al., 2023). Adopting the formative interventionist approach assisted me in constantly reflecting and orienting myself as a researcher in the new research space, as I had previously been involved in more “hard-science” research approaches, which most often are characterised by extraction of information, independence and no collaboration with communities. The formative interventionist research role helps one to be aware, to accept and to understand their positionality within the research space. Pesanayi (2019, p. 118) argues as follows with regard to the formative interventionist researcher positionality, the power dynamics and collaboration in the formative interventionist approach:

The formative interventionist research approach does not attempt to have the researcher pretend not to be influential in the research process or outcome as research participants are interventionists in their work practice with the researcher collaborating as a formative interventionist researcher.

Therefore, my work, especially as a researcher positioned within the LCP was also fulfilled in that my research as a PhD scholar adds to the greater knowledge of the LCP – being entrenched in and exposed to the project invariably resulted in the mobilisation of my capacity pragmatically. As I embarked on the research journey and facilitated the Change Labs, my capacity to facilitate learning improved and I was able to use a theory to meet project objectives practically on the ground. This chapter outlines my exact contributions to the LCP and how my research has assisted in the fulfilment of the objectives of the endeavour.

10.1 Contribution 1– Provision of a Robust Social Learning Methodological Approach

In my research, one of the outputs which I provided was a tool for robust social learning, especially in the LCP context. This tool has assisted in advancing a methodological approach towards social learning for the LCP, which can be potentially scaled up and used in similar contexts. What I mean by methodological approach is that my research followed a certain method which was informed by educational and learning theories and aligned to guidelines which were underpinned by robust and established methodological frameworks. The methodological approach I followed enabled collaboration (an objective of the LCP) among the different activity systems, and it exposed the learning participants to new frameworks which were potentially beneficial to their contexts, as indicated by the quote below from the LCP activity system:

LCPAS-CLD: Attending the water management workshop has provided great insights into how I viewed collaboration, seeing members from different community levels and sectors learning together in coming up with solutions to better manage water security was an eye-opener into seeing the impact the society can make if they integrate their knowledge together toward achieving the goals to sustainable water management in support of livelihoods in the catchments. The workshop also provided an opportunity to be introduced to the Value Creation Framework (VCF) which has made me refocus the framework, especially on the practicalities of using the tool. The learnings on the VCF were taken and are now applied to evaluate most of the events occurring within the SANBI Biodiversity Mainstreaming Directorate, this has been a valuable tool in tracing the value of social learning and in strengthening reporting by including personal feedback from the audience in most events attended.

In addition, this methodological approach which I developed through combining CHAT and the expansive learning process and the VCF, has the potential to add to the already existing repository of citizen science tools in the LCP. This is because this tool follows a methodological approach which if translated properly and explained explicitly, can lead to catchment communities facilitating and capturing their unique social learning journeys as

shown in the study. In this regard, the methodological approach I used has the potential to have a positive impact, as indicated in the quote below:

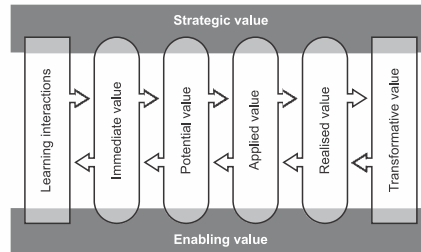
LCPAS-II: As SANBI, we are doing this work for the Department of Science and Innovation and we are working with the Water Research Commission. The Department of Water and Sanitation have a water and sanitation master plan and this master plan is a road map towards a water secure future. This plan puts forward intervention options that the country needs to embark on in order for us to be a water secure country. In this master plan is the Water Research, Development and Innovation (RDI): this RDI is set to promote water governance and collaboration. So that is why it is important to promote water governance in these catchments we work in and stop working in silos. Therefore, the recommendations that are going to come out of the LCP, from the students will feed into the Department of Water and Sanitation master plan, because they are practical and feasible recommendations, not just based on theory, but based on the actual work on the ground. And we are hoping through the Water Research Commission, because they are an entity of the Department of Water and Sanitation, we can take these recommendations, develop them and feed them into the Department of Water and Sanitation. So that's how we will then be able to influence that roadmap for the policy work of the department through our friends at the Water Research Commission. The WRC has a vested interest in the students' work, because they are funding the students and that is why we are confident that the research will not go to waste, but it will feed into that roadmap.

From the above extract, a robust methodological approach towards social learning has the potential to add to the greater body of water security research. In particular, this study sought to surface that the expansive learning process strengthens collaboration and transformative agency, co-management among and across activity systems, especially to include the marginalised voices. The approach I followed has the potential to be replicated and be used in the other catchments involved in the LCP, so as to also surface the potential, dormant or unrealised transformative agency among stakeholders in activity systems involved in the object of co-management. As indicated in Chapter 3, this approach is showing potential for advancing agency in Southern African NRM contexts (Baloi, 2017; Jalasi, 2020; Kachilonda, 2014; Mentz & De Beer, 2017; Mukute, 2010). This study adds to this body of work, with specific application to the LCP. My study adds to the general use of CHAT to guide the expansive learning process by also including VCF evaluation approaches.

Since social learning plays a considerable role in the LCP, it was important that I develop this approach, especially since this project was situated in socio-ecological systems. The methodological approach which I advanced has the potential to assist other ventures which are similar to the LCP or ventures with similar objectives; they can draw upon my methodological approach from my study and adapt it to their unique contexts (see Figure 10.1). The other

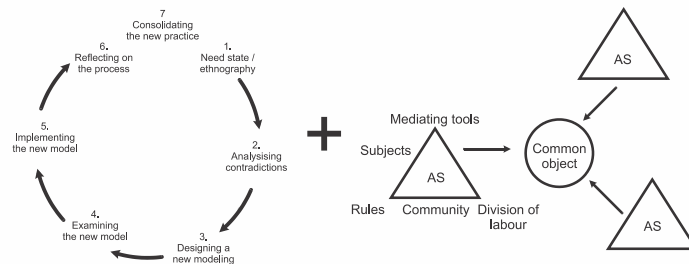
catchments which are part of the LCP may benefit from such an approach since they are similar to uMzimvubu and possess similar characteristics.

Phase 1: VCF 1



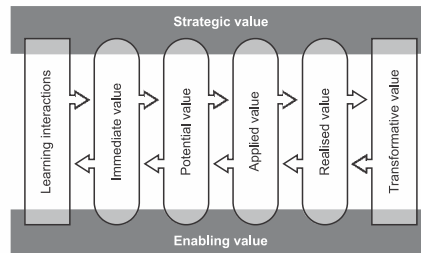
- Assists in surfacing mirror data for the expansive learning process.
- Helps in establishing baseline data with regards to the knowledge of the object.
- Assists in surfacing information about what the expansive learning participants deem valuable in their context, and reflects cultural historical nuances relating to the object of activity.

Phase 2: expansive learning process



- Assists in collaboration, co-learning and boundary-crossing to mine agency in all voices related to activity.
- Through third-generation CHAT and activity system analysis there will be awareness and understanding of how the different activity systems interact in relation to the object.
- Assists in the provision of a unit of analysis for the activity systems engaged in the object.

Phase 3: VCF 2



- To evaluate and assess what type of learning has occurred via the expansive learning process.
- It tracks if there has been any new knowledge generated.
- Assists in understanding the types of value(s) accrued by the learning participants in the activity system(s).
- From the baseline data in VCF1 and the activity in the expansive learning process, VCF2 can assist in tracking and assessing if there was any demonstrated transformative agency, and to what extent.

Figure 10.1: Social learning methodological approach developed from this study

As the LCP approaches its end in November 2023 (an extension to the original end date), this tool could be added to the project outputs related to Cluster 1 and Cluster 2 because this methodological approach contributed towards collaboration, co-engaged solutions formulation and transformative learning. This approach was threefold, namely Phase 1, Phase 2 and Phase 3. Prior to Phase 1, contextual profiling and activity system analysis was important. The contextual profiling was to understand the context and the characteristics of the landscape, and this was coupled with a desktop analysis and literature review. The activity system analysis was important for knowing the various stakeholders and activity systems involved in the object. This also had the potential to surface any previously marginalised voices and include them in the planned or intended activity. Phase 1 then occurred, as described in Figure 10.1 in detail, and proceeded to Phase 2. Phase 2 involved embarking on the expansive learning cycle which contained seven steps and ongoing activity system analysis with an emphasis on contradiction analysis and engaging with them to catalyse expansive learning and modelling solutions. Change Labs were the platform used for the expansive learning process, with double-stimulation tools used to spur on further learning with the formative interventionist researcher facilitating the learning. Phase 2 occurred as explained in Figure 10.1 and then proceeded towards Phase 3. In Phase 3, potential knowledge products were created (new tools), as the learning participants modelled solutions to the contradictions they chose to focus on. This also included understanding if there was any value accrued from the process and to what extent. Phase 3 was also important for reflection on the learning process which transpired; both for the learning participants and the formative interventionist researcher.

This tool/methodological approach provided a coordinated way of assessing and generating co-learning and collaborative and co-engaged research which involved collective learning for transforming catchment activities relating to water co-management and security, guided by theory and rooted in catchment reality and experiences and then evaluating these again. This methodological approach is not just profitable to the LCP, but also to learning because it is unique in its approach and context and contains certain qualities which are particular to catchment contexts, especially South African rural village contexts. Some of those qualities highlighted by this approach include the convening of a safe learning space while co-developing solutions for water co-management. This safe learning space entails embracing other types of knowledge, in addition to Western scientific knowledge, which are valuable in collectively co-managing water resources in a holistic and sustainable manner. These unique types of knowledge tend to be specific to certain cultural norms and societal principles;

therefore, embedded in this approach was the ability to analyse cultural and historical idiosyncrasies pertaining to water co-management. Below is a quote from the data to highlight the importance of the above-mentioned point:

LCPAS-II: The kind of conversations and collaborations which happen on the catchment platforms, are all that is standing between us and Fascism. That is my extreme way of explaining the importance of our work. The truth is, we do not know how to do this, and this is why there these catchment platforms. We do not know how to secure our water resources for our future. We do not know how to take care of our catchments in the face of a continuously changing landscape; social, ecological, political. We do not know, nobody knows. And unless we deliberately learn together in a way that fosters democratic principles of participation, we will not know, because no one person is ever going to know. We can just all bring our individual perspectives, based on our expertise, such as traditional leaders, municipality natural resource managers, etc. Each person will have their perspectives and experiences, and if we do not collaborate and co-learn, we will not be able to have good quality conversations and to learn how to take care of our catchments.

This tool/methodology is therefore of potential significance because it can draw from a diverse pool of cultural and historical resources from diverse stakeholders relating to water knowledge which is what transpired during my Change Labs. This is very important because as people work towards resolving a contradiction, it is important that the solutions are not only co-developed, but there is a need to consider the historical and cultural nuances of that particular context where the contradiction exists (see section 6.3). In addition, this tool has highlighted the importance of a multi-voiced approach towards dealing with issues of water co-management; this was achieved by working with different stakeholders which resulted in diverse voices, opinions, perspectives and outlooks about the contradictions relating to water resources (see section 7.3). This is why this methodological approach was vital, because when we work collectively, it is only then that participants can co-develop sustainable solutions which are culturally and historically rooted, and also scientifically applicable. The multi-voice approach is important, because those with formal or Western education can merge their knowledge with those who might not have formal education, but who are literate and possess local ecological knowledge and IK, enabling enriched ecologies of knowledge. This methodological approach I developed drawing on CHAT and VCF, has highlighted the fact that no single type of knowledge is better than another, and that the absence of formal education does not necessitate illiteracy about natural resources management. Co-engaged research can only be a reality when people converge in a safe environment, knowing that their knowledge is respected, having a belief that their opinions are valued and knowing that their perspectives

are taken seriously, whether they are formally or informally educated/trained. As stated by a participant from the community activity system:

COMAS-CLD: Attending the water management workshop has provided great insights into how I viewed collaboration, seeing members from different community levels and sectors learning together in coming up with solutions to better manage water security was an eye-opener into seeing the impact the society can make if they integrate their knowledge together toward achieving the goals to sustainable water management in support of livelihoods in the catchments.

From an interview with an employee from the DSI, a subject in the Living Catchment Project activity system, the importance of social innovation and of working with communities on the ground was reiterated:

LCPAS-II: The DSI sees the Living Catchment Project as another intervention option that's promoting innovation. As the LCP, we are promoting what they call social innovation. The DSI does not only work with artificial intelligence related innovation, but other forms of innovation, hence they are promoting our social innovation work. Social innovation creates a space where everyone has an equal voice; platforms where we give our traditional leaders, communities, policy practitioners, implementers, etc., an equal voice and a say in matters. A platform like the UCPP is an expression of that social innovation we are promoting, because people have a voice. We need to respect the voice of traditional leaders, the voice of communities, and we need to make sure that we take that voice from our communities and traditional leaders, and infuse it into our plans into our strategies for this social innovation.

10.2 Contribution 2 – Provision of a Tool to Evaluate Social Learning and Assess the Zone of Proximal Development

The second contribution I made towards the LCP is that I potentially helped the project by demonstrating how to use a tool which assists with the evaluation of social learning endeavours. The tool which I used is the VCF and I followed these consecutive steps; I embarked on a prior contextual profile trip to grasp what people in the catchment view as valuable, I adapted the questions in the VCF used to capture learning (qualitative and quantitative data) and I translated the tool to the language used in the catchment. The VCF tool was used to evaluate if there was any social learning relating to the co-management of water resources which happened before we embarked on the Change Labs and if there was new learning after we embarked on the expansive learning journey. The VCF tool also gave an understanding of the partially shared object at the A-view/Phase 1 of the research. In conjunction with the tool, I highlighted inferences and insights relating to learning about the importance of contextual profiling and the significance of explaining the notion of value in a language which was understandable to the catchment context. Translating the VCF to the most comprehended language also assisted

in the production of better-quality data, because participants were able to grasp the framework inherently, as shown in chapters 6 and 9. With this tool, I could better understand what participants had previously learnt previously and where they wanted to be in terms of their learning journey. In essence, the tool assisted in assessing the role of expansive learning in moving the participants from one point to another (expansion of the object of activity), where the participants desired to be. This concept of the gap between one point and another desired point, in terms of learning, is termed the ZPD, as discussed in Chapter 4 (Flair, 2019). Assessing the ZPD was imperative for fulfilling the learning objectives of the LCP, because it offered a practical way to demonstrate how much learning had occurred in the project, what type of learning had occurred and what conditions were met to enable that learning. The ZPD differs for every learning participant, this is because of each individual's natural aptitude and acclimation to the educational environment. The ZPD also varies for individuals over time (Flair, 2019). Vygotsky said that the ZPD is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky, 1978). Engeström's work sets the ZPD as a change in the shared object of activity, i.e. it is a collective ZPD. My study dealt with collaboration between different stakeholders to collectively work on the shared object of water co-management.

There are important highlights that emerged from this research, and the LCP should document these learnings for their reporting purposes. According to Wenger-Trayner and Wenger-Trayner (2020), in order for learning to make a difference it has to flow through the enter dimension of the VCF. This means that social learning does not only occur within the value creation cycles, but it occurs when value flows between the cycles, and is therefore translated into new forms along the process. This is because the value of an interaction is equally what it creates and the manner it unfolds into something different beyond that interaction (Wenger-Trayner & Wenger-Trayner, 2020). According to Wenger-Trayner and Wenger-Trayner (2020), the notion of flow is important for theorising social learning as value creation, but it also has practical consequences for being good at social learning. Therefore, for the participants in the various activity systems, it was important for them to be good at producing, recognising and translating value between the different value cycles in the framework, so that their activity could potentially lead to having a positive effect on the world (Wenger-Trayner & Wenger-Trayner, 2020). As a formative interventionist researcher, it was important that I assisted in

facilitated these flows to foster, accelerate and optimise learning during the Change Labs, which were learning spaces (Wenger-Trayner & Wenger-Trayner, 2020).

Related to flows is the concept of learning loops. Loops can manifest in various ways, such as a piece of data, a testimony or a video of a new practice (Wenger-Trayner & Wenger-Trayner, 2020). According to Wenger-Trayner and Wenger-Trayner (2020), loops are fundamental in social learning spaces, because they bring something back that needs attention. There are two types of loops; short loops and long loops. Long loops occur when there is a flow between the different cycles, and then a return back to the original cycle where the flow originated from (this occurs in the context of a network or social learning space) (Wenger-Trayner & Wenger-Trayner, 2020). In this study, an example of a long loop is when one of the chiefs learnt about the importance of clearing black wattle (immediate value). He then applied the information he learnt and realised that it was benefitting his community (through increased water availability, healthier cows, etc.) (applied-realised value cycles). He then came back to the learning space and spoke about how this knowledge benefitted him so that the information he presented could be of immediate value to someone potentially. A short loop on the other hand is a loop that flows between two value cycles; it is usually iterative, resulting in a circular back and forth between two cycles (Wenger-Trayner & Wenger-Trayner, 2020). An example of a short loop in the study includes the flow between the applied value and the realised value, which was expressed when the chief received knowledge of wattle clearance and then applied the information. After realising that the application of the knowledge was beneficial, the chief kept on cycling between applying and realising value cycles, because as he applied what he learnt he realised it led to benefits – he then applied the information again and it realising it worked again.

Another example of a long loop from the study is when a practitioner from the NGO activity system was made aware of the importance of springs in the uMzimvubu catchment for spiritual and cultural reasons, and not just for drinking purposes (immediate value). This awareness made the practitioner aware of the importance of communicating and collaborating with village dwellers with regard to spring protection, as the springs are found in their localities. The practitioner then applied this information by working with the villagers and hearing from them about which springs should be protected and why chemicals should not be introduced into the springs, as they are foreign objects which would taint the “cultural and spiritual” purity of the springs (applied-realised value). The NGO activity system practitioner then came to the Change

Lab and presented this learning he received and told us that it was important for external stakeholders coming into the uMzimvubu catchment to be cognizant of cultural and spiritual nuances. The information he presented could potentially be of immediate value to someone. Another example of a short loop is when the technician from the local government activity system applied the information that she had received from the Change Labs about working more collaboratively with the chiefs in the villages to assist in water services provision and stopping illegal water connections (applied value). The water technician applied this information in her work context, and this has made her more effective which fulfils her because she is bringing change on the ground (realised value). She applied what she had learnt, and realised the value it has brought to her personal and professional development (cycling between applied and realised value).

The importance of understanding the collective ZPD of stakeholders in the various activity systems was an important step in my research, because I was able to provide feedback to the LCP about the role of expansive learning in mobilising the capacity of the catchment participants and sharing indicators of expansive learning that deepens ways of thinking about learning in niches in Just Transitions. Figure 10.2 showed the initial value indicators which were presented in the VCF analysis (A-view); the participants had to work through the surfaced contradictions related to the partially shared object. From my research and the methodological approach I undertook, the ZPD is expressed by the indicators from the VCF which showed how participants moved from one type of value to another after embarking on the Change Labs journey, and also how they attained new skills, new ways of thinking and new learning perspectives as they acted as part of a collective, to collaborate and co-engage with diverse stakeholders to formulate sustainable water management solutions. As the participants journeyed through the expansive learning, they had to work through the surfaced contradictions (see Chapter 7), this enabled them to express various expressions of transformative agency, and led to the development of new indicators present after the expansive learning process (Figure 10.3).

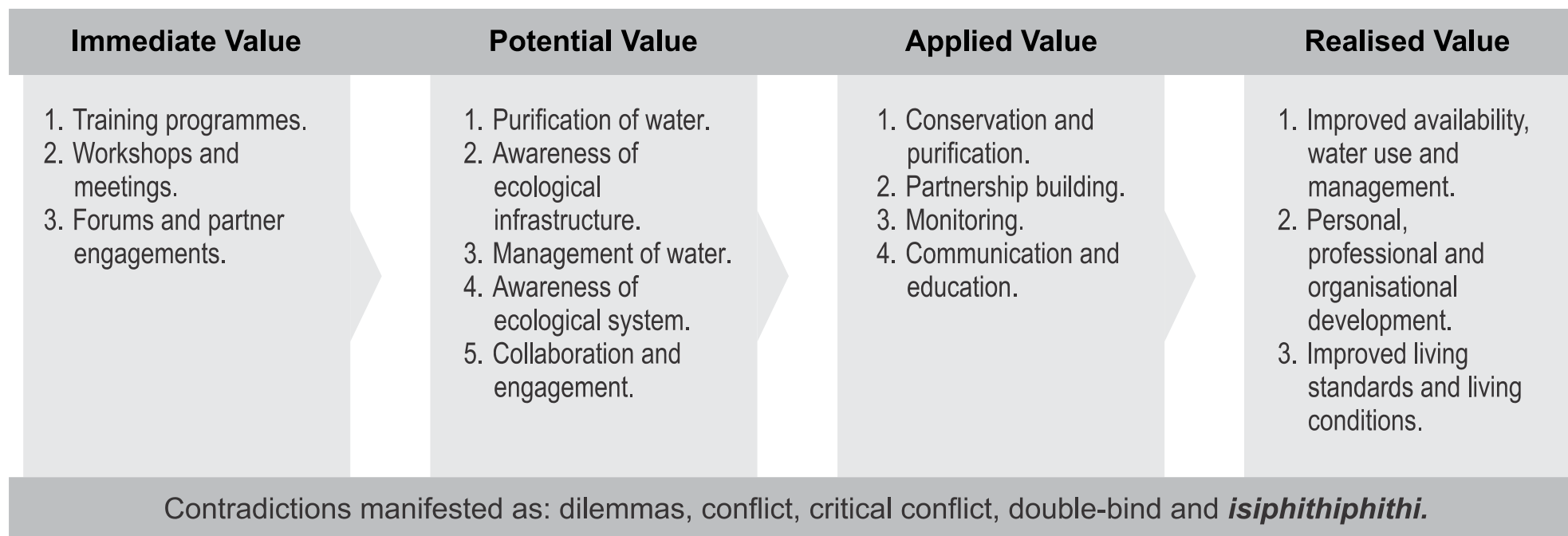


Figure 10.2: VCF 1 with indicators for the value types, and manifestation of surfaced contradictions

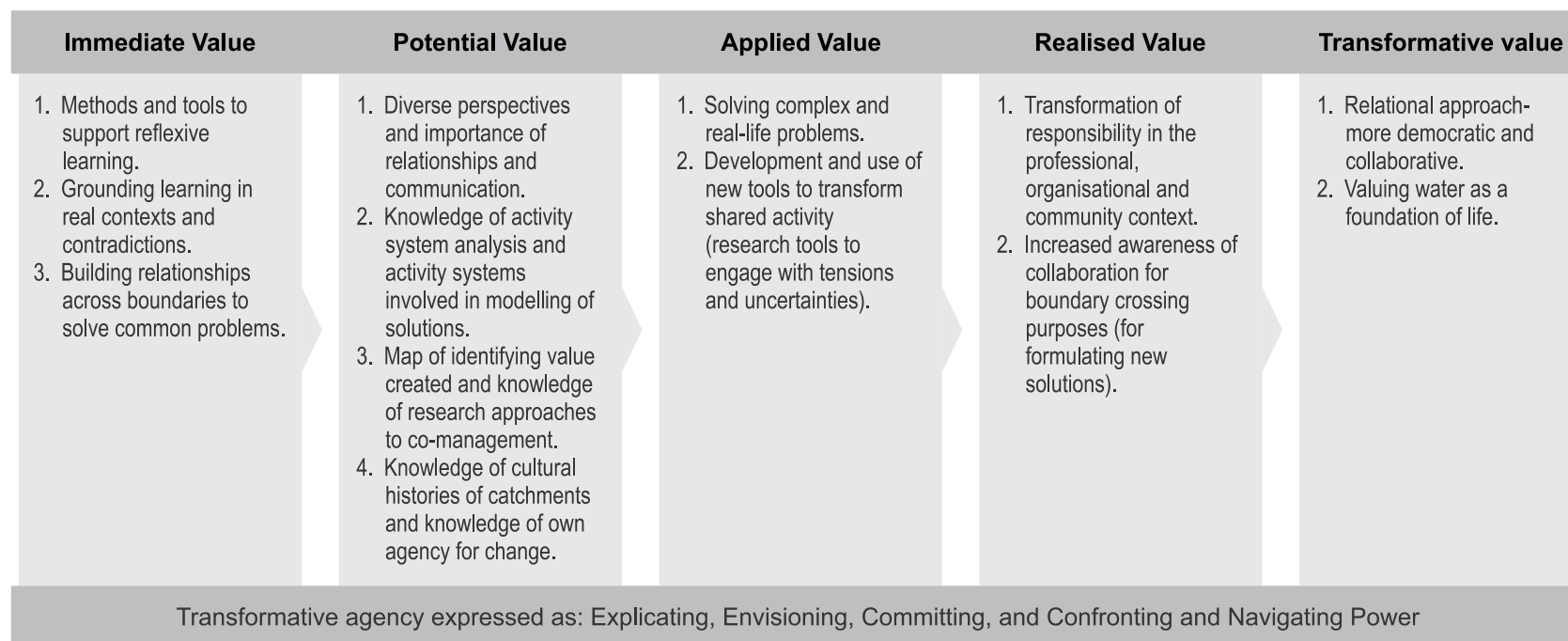


Figure 10.3: VCF 2 with new indicators for the value types and transformative agency expressed after the Expansive Learning Process

When analysing Figure 10.2 and 10.3, there was a shift in the indicators in the various value creation cycles. The immediate value before the expansive learning process was related to training programmes, workshops and meetings, forums and partner engagements. However, after the expansive learning process, the participants found that the educational/learning theories presented to them were beneficial and that they could also use the activity system analysis to solve the contradictions they face in their lives. This shows that the expansive learning context was important in fostering a learning environment and providing learning tools for the participants in the different activity systems. The Change Labs brought immediate value by bringing different stakeholders together to boundary-cross and to share their different perspectives. This led to an important mental shift during the expansive learning process, as the participants from the different activity systems were made aware of the contexts of other role players in the catchment and the challenges they face in pursuing working towards the partially shared object of water co-management. Lastly, collaboration and boundary crossing were important elements in this study. The expansive learning process played an important role enabling collaboration and boundary crossing, and this was demonstrated by the shift in indicators from the participants in the different activity systems.

There was also a shift in indicators in the potential value cycle before and after the expansive learning process. The previous indicators in Figure 10.2 are related to issues of being aware and managing water as a resource and understanding the ecological infrastructure. However, in Figure 10.3, the indicators are related to attaining knowledge which goes beyond understanding water as a “physical resource” but understanding the cultural history lying behind co-managing water resources in the catchment, modelling solutions with regard to water issues and the importance of collaboration to collectively resolve water-related contradictions. This shift in indicators expressed that the participants in the activity system accrued potential value from the expansive learning process and this potential value could possibly be applied one day. Lastly, it was interesting to note that collaboration was expressed before the expansive learning, and this speaks to the fact that there had been work which was done on the ground and that collaboration was not a new concept to everyone in the study.

In looking at the applied value cycle, there was an interesting phenomenon which was apparent before and after the expansive learning process. The indicators from the VCF before the expansive learning was mostly related to “individual” contexts and had more of a localised benefit. However, through analysing the data after the expansive learning cycle, the new

indicators for applied value had a leaning towards collective actions and group activities. After the expansive learning cycle, the indicators show how collaboration and boundary crossing enabled the move from mostly “I” to “We” or “Us”. This is a potential indicator of the awareness of collective transformative agency. Chapter 8 provides details of the formation of two groups in the Change Labs and the collective move towards resolving the surfaced contradictions and modelling of new solutions. This, however, is not to say that there was no collective work done in the catchment before, but the new indicators from the study express that there was a higher expression of collaboration between the different activity systems to work towards the partially shared object.

With regards to realised value after the expansive learning cycle, there was a shift in the indicators. This was interesting because realised value only occurs after new knowledge has been applied. The indicators of realised value show that the learning participants were learning in the Change Labs and they embarked on a process of applying the knowledge they had acquired. Looking at the indicators of realised value before and after the expansive learning process, it is interesting that there was a transformation of responsibility in professional, organisational and community contexts, and this is because this study had an interest in transformation and transforming activities. Furthermore, these new indicators show that the participants in the traditional, NGO and Local government activity systems accrued realised value from the expansive learning process, and these above-mentioned role players are key stakeholders involved in the provision of water services and leadership in the uMzimvubu catchment.

Transformative value was very important for this study and the objectives of the LCP. The work of the LCP and the TIPC at large is to convene learning spaces which enable collaboration, collective learning and transformation. Transformative value is associated with transformative agency. From the new indicators emerging from the study, it was apparent that there were no indicators of transformative value from the VCF before the expansive learning cycle, but there were new indicators of transformative value after the expansive learning process. As highlighted in Chapter 9, transformative value has to do with how the process has changed or transformed how the learning actors work and perceive things (Wenger-Trayner & Wenger-Trayner, 2014). The Change Labs took approximately five months and during this time, there was intentional cross-pollination of diverse perspective, ideas and contextual knowledge among the various activity systems. This resulted in the formation of relationships

and collaboration between the activity systems, and this raised the awareness of how different activity systems operate and increased the level of empathy among the participants. In a bid to enable collaboration and foster a safe learning space, the Change Labs assisted in bringing diverse perspectives about the issue of access to water, which was not the same for everyone in the different activity systems. Hearing about the struggles of water access from some of the community activity system subjects encouraged some subjects in the different activity systems to understand their privilege concerning access to water, and to appreciate the value of water as foundational life.

This information can be extracted and used in other similar communities of practice or learning endeavours involving participation, because the value creation stories indicated what is of value to learners and what it is that can transform their activities. The framework's ability to identify the different types of values accrued from social learning also possesses the ability to inform learning practitioners about the social learning activities which learners deem valuable in assisting them to establish new practices, which will transform their activities to a point that their competence or abilities add value to their personal and professional capacities. In addition, the framework also assists practitioners to track and monitor which learnings provide the capacity for the participants to be transformed or reframe what they thought was normal, and how it aids in participants' understanding and grasping of their agency. The framework assists in organising concerted efforts towards new learning spaces, because of tracking and recording of previous learnings. Transformative value is highly valuable for projects in NRM contexts because most learning is geared towards learning together on how to better manage our natural resources collaboratively, and how to ensure that communities in NRM contexts understand their agency, so that all NRM efforts are sustainable and projects such as the LCP remain, even after the project timeline.

10.3 Contribution 3 – Provision of Tools and Learning Theories for the Catchment Participants

Another contribution I made towards the LCP is that I was able to democratise theories and tools which previously were inaccessible to most people, especially those in the catchment context, and I held a generative space where people could come together to advance their collective actions for management of water resources (see section 9.2). Establishing a learning community which is strong “sets the ambience for life-giving and uplifting experiences necessary to advance an individual and a whole society” (Lenning & Ebbers, 1999, p. 7); thus,

the learning community has been called “a key feature of 21st century schools” (Watkins, 2005, p. 8) and a “powerful educational practice” (Zhao & Kuh, 2004). Transformative learning is at the heart of the LCP and transforming activities relating to the individual and the collective play a crucial role in fulfilling the objectives of the endeavour. However, before transformation can be a reality, certain conditions have to be met which relate to the actual environment of the learning space. In their review and research of learning communities, West and Williams (2018) found the following aspects to be common relational characteristics of learning communities: (1) sense of belonging, (2) interdependence or reliance among the members, (3) trust among members, and (4) faith or trust in the shared purpose of the community (Figure 10.4). The above-mentioned characteristics were essential elements in my study and ensured that the research could advance in a peaceful, successful and progressive manner. These characteristics of strong learning communities need to be absorbed by the LCP, as I have done, so that these learnings can be scaled up and lessons reproduced. West and Williams (2018) state that because of the extensive learning advantages that research has found for strong learning communities, teachers, administrators, researchers and instructional designers need to comprehend how to form learning communities that provide these benefits.

In terms of the access element in the learning community, this was expressed as mediated support according to the activity system analysis. There was ready access between the participants and me, as the researcher. The Change Labs provided a space to meet where learning could occur, and knowledge could be exchanged. With regard to the relationship element, this was expressed in the willingness to resolve the contradictions together. This was also expressed as the formation of the two distinct groups. The groups formed in order to work on the contradictions together, and these partnerships were built on trust, interdependency and a belief that the learning community had come together to solve an important issue. For the vision element, it was expressed as the shared object of activity, which was the willingness to work together to co-manage water resources in order to be a water secure catchment. The participants shared this common vision and aim, even though they were part of different activity systems. With regard to the function element, this was expressed by the multi-voiced activity systems boundary crossing and coming together to work towards the partially shared object. This involved the use of double-stimulation tools to work on the surfaced contradictions. The use of the activity system analysis as a second stimulus was important as a way to navigate the learning and model the solutions.

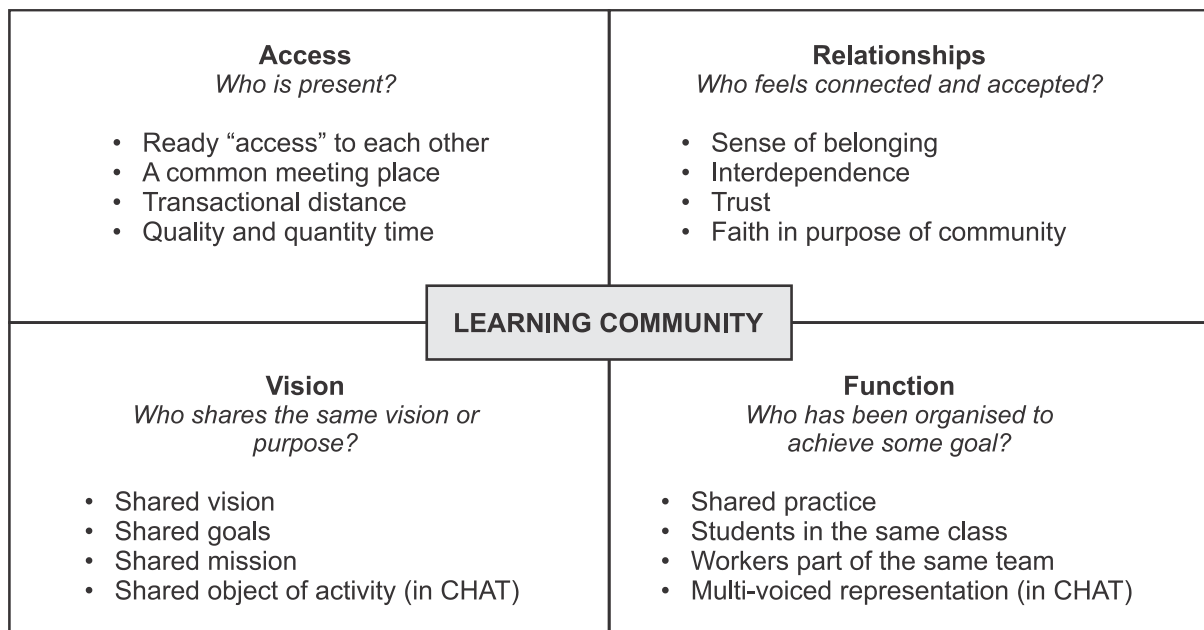


Figure 10.4: The defining characteristics of learning communities, representing different ways of defining the boundaries of a community (West and Williams, 2018), adapted to LCP context

In essence, I made learning tools (in my case CHAT and VCF) available and brought them closer to communities so that they could use these theories in their own contexts collectively, to solve the NRM issues and other social contradictions. As seen from the previous chapters and from the data that was provided, people had already started using CHAT in their own communities for contradictions present in their unique contexts. The contradictions which the participants faced were the first stimulus, and the activity system analysis was the second stimulus to resolve the contradictions. The introduction of *isiphithiphithi* as a manifestation of certain contradictions in the study assisted in deepening the analysis, which helped in the provision of more robust data. This new term was particularly useful because it paints a picture of the complexities of poor governance which plague numerous communities in Africa, and potentially, other developing countries located in other continents. The participants in the learning groups had begun modelling the solutions to their chosen contradictions using the activity system analysis, and over time the modelling became sophisticated. This was even manifested through the participants presenting their solutions to other stakeholders in and outside the catchment. This means that people used the knowledge from the Change Labs to engage with the contradictions they encountered and to transform their activities. However, what transpired during my research was not an anomaly, as other research on the indigenisation of scientific knowledge has found the same. Daka and Tamira (2019) state that the indigenisation of research itself is a scientific approach which deals with cultural facts whose

tools of investigation contribute to the production of knowledge directly usable for the targeted social group. Western and scientific knowledge need not be separated or used in silos, there is space for the amalgamation of diverse knowledge types for the production of innovative solutions –and this research contributed towards that end. The problems which are encountered in catchment communities tend to be complex and “wicked”, and need a transdisciplinary approach, instead of unilateral tactics which characterised previous catchment interventions and development agendas. One of the key reasons for a lack of uptake of interventions from communities is that development policies have always had a particular tendency of keeping African rural communities in low esteem. As a result of their prejudiced position as developers, they express the notion of rural societies as illogical, homogeneous and cold (Daka & Tamira, 2019).

My research has played a role in bridging the gap between the diverse stakeholders involved in water management in the catchment. One of the ways was adopting a formative interventionist research positionality instead of the common external interventionist approach (which assumes to bring knowledge to people, instead of co-learning and embarking on co-engaged research with participants). The other way was to be intentional in convening a space which allowed participants to perceive themselves as agents of change and knowledge co-producers, thereby advancing cognitive and social justice at niche level in Just Transitions. An important lesson to consider for the LCP and all similar future interventions going forward is summarised by the following sentiment:

All science is culturalist and African cultures are just as much as the so-called Western ones carrying scientific rationality. That is said, the alternative to this problem lies in the citizenship of scientific research in sub-Saharan Africa. African researchers must join the African man [and woman] in his creations to produce Indigenous scientific knowledge capable of inducing societal transformations. (Daka & Tamira, 2019, p. 9)

From the VCF data, one can see how expansive learning, co-engaged research, modelled solutions and transformative agency added value to the catchment participants because it assisted in terms of their individual and professional development. Therefore, that is an important contribution towards the LCP objectives because it expresses that although people may not be formally educated, that does not mean they are illiterate, especially with regard to resource management issues. Theories and concepts can be potentially digested and used by people if they are correctly understood by the formative interventionist and if the correct/right language has been used. This contribution is very important because it has shown that people

have been dealing with issues relating to water security in their catchment before “formal” interventions from external stakeholders. People have been grappling with natural resource issues relating to water governance and have held an understanding of the dynamics of the uMzimvubu catchment, and consequently set up their own unique systems to manage these water resource contradictions which might be different from the Western systems. The research has shown that it is feasible for catchment communities to augment their IKS with other knowledge types emanating from academic disciplines to better manage their water resources. According to Grey (2014), indigenous knowledge (IK) comprises the expressions, practices, beliefs, understandings, insights and experiences of Indigenous groups, produced over centuries of deep and reflective interactions with a particular territory. Community interventions which acknowledge IK have a higher probability of success, because such IK has been tested over time, is widely accepted and has been generated through profound interaction. Therefore, the reason to produce solutions to the issues of water in the catchment, was so that participants could see the value in augmenting their IKS (relating to water management) with the theories and tools I introduced; this was mostly through using the CHAT framework and embarking on the expansive learning cycle. What was evident through this research was that communities could use the theories and the tools they had acquired from the interventions to engage with their contradictions and transform their activities related to water resources and other natural resources, and then relate this to knowledge and experience of the NGOs and state actors who were supporting the shared object.

10.4 Conclusion

In this chapter, I sought to highlight and bring out the contributions emerging from this study. Although the contributions emerging from this study may be at the niche level innovation in the TIPC and Just Transitions frameworks discussed in Chapter 2, they have a potential to influence other catchments and other policies. This chapter also highlighted the importance of adopting the formative interventionist research approach. I provided reasons why this approach was important and how it assisted me in my endeavour to contribute towards the LCP, and towards that greater formative interventionist research space. The LCP contains certain objectives and targets it has to meet. The contributions I made to the project have ramifications for all the clusters, especially Cluster 1 and Cluster 2. As the project comes to an end in November 2023, it would be beneficial to analyse the contributions I made and find ways to amalgamate them into the greater LCP report. The LCP is a project situated in a unique space which contains different stakeholders, policies, agendas, legislations, institutions, etc. which

all relate to water management in the country. Water management is not an easy task, and this research has sought to express the difficulties and nuances related to the above-mentioned.

The first contribution which was highlighted in the study was the provision of a robust social learning methodological approach. As mentioned in chapters 1 and 3, social learning in NRM is important, and this approach has been used as an alternative to other technocentric or extractive ways of managing the environment. The methodological approach has the potential to be added to the already existing repository of citizen science tools in the LCP because this tool has the ability, if properly translated, to facilitate and capture the social learning journeys in other catchments. Along with the phases approach (namely Phase 1 to Phase 4), this chapter also highlighted how exactly the methodological approach can be represented in a diagram. This also forms part of the social learning contribution developed from the study.

The second contribution was the provision of a tool to evaluate social learning and assess the ZPD using the VCF tool. This was important to evaluate if any learning occurred concerning co-management of water resources. The issue of the ZPD being assessed was important for learning and fulfilling the learning objectives related to the LCP for monitoring and reporting purposes. Therefore, this tool which I provided offered a practical way to demonstrate how much learning has occurred in the project, meaning that it is potentially able to assist the LCP in its reporting needs to the TIPC and other funding bodies. Associated with assessing the ZPD was understanding the value indicators which were present at the A-view of the study and the new value indicators which were present in the B-view of the study. This was also highlighted in the different diagrams provided in this chapter. The development of new indicators highlighted a shift, both in the expansion of the learning and the transformative agency, which occurred as the participants worked through the surfaced contradictions.

The third contribution was the provision of tools and learning theories for the catchment participants. This is related to the fact that tools which were previously inaccessible to most of the people who were in the study were democratised and freely provided. This is important because the Change Labs held a generative space where people could come together to collectively advance the object of co-management of water resources. The expansive learning actions which occurred in the study were also in line with the defining characteristics of learning communities, as described by West and Williams (2018) in Figure 10.4. It was important that these theories and tools, namely CHAT and VCF, be brought closer to the communities so that they could be used by the participants in their own contexts. What started

to occur was that the participants began using the activity system analysis to resolve the contradictions as individuals and in groups. During the different Change Labs, it was also noted that as the participants used the activity system analysis, they became more sophisticated over time, up to a point where they could even do a PowerPoint presentation in front of various stakeholders who came from inside and outside the catchment.

The LCP is a project situated in a unique space which has ramifications for research and academic output; therefore, any outputs relating to knowledge products would add to the LCP's holistic aims. Learning is not an easy task, and this research sought to express the difficulties and nuances related to this concept. The next chapter details the recommendations from the study and the conclusion. This study also had certain limitations, and these are highlighted in the next chapter. This next chapter summarises and concludes all the work that was done in this study.

CHAPTER 11: CONCLUSION AND RECOMMENDATIONS FROM THE STUDY

11.1 Introduction

There were new insights gained into expansive learning and co-management of water resources in the uMzimvubu catchment. These insights are based on the findings which emerged from the study, and they are an answer to the research questions and respond to some of the key areas that were highlighted and deliberated on by stakeholders during the expansive learning process. Chapter 6 provided a background of the activity systems which were present in the study, along with their unique background contexts and relationships to the shared object of water co-management. Chapter 7 surfaced the contradictions which influenced the shared object within and between activity systems and Chapter 8 expressed how the expansive learning process influenced the modelling of solutions by the two groups which were formed during the Change Labs. Throughout Chapter 8, the issue of transformative agency was explored, and insights were given on the surfaced transformative agency emanating from the study. Alongside transformative agency, a key theme which was important in this study was the issue of collaboration and co-management across activity systems to include traditionally marginalised voices.

As stated in Chapter 1, the study sought to explore expansive learning and co-management via the uMzimvubu catchment case study, which is one of the SWSAs in South Africa and forms part of the LCP, and the TIPC pilot. The empirical case study approach was then able to assist in providing insights into learning and the evaluation thereof, and lessons learnt, in order to produce recommendations for other catchments in and beyond the LCP, including future studies relating to collaboration among stakeholders positioned in diverse activity systems and their co-learning journey towards working on a chosen object. Upon review of the literature relating to the management of water resources in South Africa and the potential gap which co-management can assist in filling, there is a need for this contribution, as argued in chapters 1, 2 and 3. This chapter provides a synthesis of what has been learnt from the uMzimvubu catchment empirical case study and makes recommendations on how this approach to expansive learning may potentially inform co-management of water resources. This chapter also highlights the contributions emerging from the study, as expressed in Chapter 10. Lastly,

it concludes with the insights and new knowledge this study contributed and makes some suggestions regarding the way forward.

11.2 Overview of the Study

Chapter 1 of this study indicated that this research aimed to explore expansive learning and co-management in the uMzimvubu catchment. This study was positioned within the Environmental Education field, focusing specifically on collaboration, co-learning and transformative agency in co-management of water resources, and the evaluation thereof. The study aimed at understanding how the expansive learning process could potentially assist in surfacing transformative agency among the learning participants in the various activity systems, and how that can then help in promoting collaborative efforts in securing water resources in the catchment, through also understanding the value created for participants, and how this can inform indicators for evaluating such learning in future. The changes which have occurred in the water resource management policies and laws have meant various implications for the management of water resources in the country. As highlighted in section 1.2 of the study, South Africa has adopted an IWRM approach, and this has implications for communities on the ground in catchments and other sectors of society. The study's literature review in Chapter 2 highlighted the role of the LCP as a TIPC policy experiment in South Africa, and how it forms part of a larger policy roadmap towards water provision for South Africa. The study also expressed the foundational tenets of the TIPC and how it came about. The study has expressed precisely how it can feed into various streams of knowledge bodies, policies, goals and targets, and how it has potentially affected the work of the LCP as a live experiment initiated by the TIPC.

While there is work regarding integrated water resource management and co-management in various fields and disciplines (as indicated in Chapter 1), there is a gap in understanding the exact role and place of community stakeholders in the water sector, and how they are learning co-management, and how such learning can be evaluated. The South African water laws and policies do acknowledge the importance of including communities in water management, however, the approach and methodology to include the people on the ground is not well established. There is an emerging body of work in various fields which deal with stakeholder analysis and mapping, collaboration and engaging communities in issues of water, but there are some gaps in establishing the process of inclusion and surfacing the transformative agency within and between activity systems. As in the case of the uMzimvubu catchment, the

community stakeholders were already aware of water challenges in the area (see section 6.4), however, there was no established process to facilitate the learning regarding those challenges and means to include the community voices to work towards resolving those challenges.

In order to address the gaps in knowledge, this study explored the use of the expansive learning processes, with the associated practices and procedures, including the use of the VCF tool, as both a double-stimulation tool and a tool to evaluate or assess any social learning. Expansive learning was beneficial to this study because this process enabled collaboration and boundary crossing across activity systems; this being an important tenet in the desire to attain co-management of water resources in the uMzimvubu catchment. This process occurred through critically analysing and exploring emerging issues relating to water co-management which could potentially contribute to the education system, the school curriculum, and national and international policies potentially influencing water issues in South Africa. This study sought to show that it is both imperative and beneficial to all parties concerned to have learning platforms convened to facilitate expanded learning on water resources security and management. These co-learning platforms are able to provide the applicable and appropriate educational tools for the learning participants to address contradictions, engage in modelling contextual solutions, surface the emerging and demonstrated agency, and reflect on the value accrued during the expansive learning cycle. These above-mentioned outcomes of the expansive learning process are needed to support the stated intentions and objectives of the policies related to water governance in the country in order to ensure their realisation. The realisation and practical implementation of the IWRM approach has the potential to aid in the securing of the water resources in the country and moreover, aid in the development and establishment of transformative agency for traditionally marginalised voices.

As stated in Chapter 1, this research was conducted to achieve these six main objectives:

- Review the impetus for co-learning and management in South Africa's Living Catchments (Phase 1) (Chapters 1, 2 and 3).
- Use an activity system analysis framed by 3rd generation CHAT to understand the activity systems and their cultural historicity and to surface contradictions within and between activity systems, as this relates to the object of co-management of water for increased water security (Phase 2) (Chapters 4 and 5).
- Review and evaluate existing learning in the different activity systems found in the LCP in the uMzimvubu catchment using the VCF to establish what value has been created

(or not) for activity systems through any learning and co-management in the catchment to date, and consider how this may inform the contradictions analysis (Phase 2) (Chapters 6 and 7)

- Engage in expansive learning to resolve some of the contradictions and absences in the learning with interacting activity systems (Phase 3) (Chapter 8).
- Through Change Labs and my role as a formative interventionist researcher in the expansive learning process support the expansion of the object of water management towards more collaborative approaches (i.e. shared co-management) and help to create a new norm involving shared responsibility for co-management for water security (Phase 3) (Chapters 8 and 9).
- Provide recommendations to assist in water security at a national level in South Africa by evaluating the expansive learning for co-management strategies that emerge from the process in the uMzimvubu catchment and potential policy application thereof (Phase 4) (Chapters 10 and 11).

As expressed in Chapter 4, CHAT after Vygotsky, Leont'ev and the more contemporary work by Engeström provided the theoretical framework that assisted in the methodology and analysis when undertaking this research. As further explained in chapters 4, 6 and 9, the CHAT framework was supported by the VCF tool to assist in evaluating and assessing social learning, and to be used as a double-stimulation tool to assist in the expansive learning process during the Change Labs. The CHAT framework was important for providing the tools to analyse the activity systems involved in the shared object, and how and to what extent they interacted. The CHAT framework was also important for provision of analytical tools to explicate expansive learning emerging from the study and to assist in surfacing the agency demonstrated in the study. There were inherent tools within the framework to assist in explicating the contradictions and to analyse the contradictions, which enabled further learning and potential modelling of solutions to which this study added *isiphithiphithi* as another manifestation of contradictions. In light of transparency and honest reflection, the VCF tool assisted in analysing the different types of values emerging from the study. Also, the tool played a role in facilitating reflection among the participants to track and monitor the expansive learning process we were engaged in during those six months. This approach, as depicted in Figure 10.1, was relevant in achieving the aim of the study and fulfilling the objectives. The methodological approach was key in providing the insights required to assist in fulfilling the objectives of the LCP and to assist in the already occurring partnerships and learning endeavours in the uMzimvubu catchment. The approach helped consider the historical context of the contradictions in the catchment and the

culture upholding the values, norms and traditions of the communities in the catchment, including the culture affecting learning and participation. In addition to the objectives of the study, the study was also focused on responding to the five main research questions, with the assistance of the contextual and vital literature review, aided by the CHAT theoretical framework and supported by the VCF tool:

- Why is the LCP work important in South Africa; what is the value-add of the LCP in terms of advancing catchment co-management, and how can this value be enhanced via expansive learning for co-management?
- What are the current experiences of, and opportunities for co-engaged expansive learning and co-management which exist in the LCP? What value has already been created in this area, if at all?
- What are the different catchment management activity systems present in the uMzimvubu catchment respectively? And what contradictions emerge within or between the catchment management activity systems that have potential to shape expansive learning and co-management?
- How can an expansive learning process potentially contribute to value creation, collaboration, co-learning and co-creation of knowledge in and across catchment management activity systems among the interacting activity systems?
- What insights from this study can contribute to the evaluation of expansive learning in co-management in the LCP? And what is the significance of this for the LCP as a policy innovation case study conceptualised as Just Transitioning in the water sector?

11.3 Methodology and Design of the Study

Chapter 5 of the study detailed the methodology and design of this study, and these were founded on the approaches and principles of the formative interventionist research through Change Labs and using the uMzimvubu catchment as a case study. Chapter 4 of the study provided the background and context of the CHAT theoretical framework along with the VCF tool and the reason for its inclusion in this study. This methodological approach influenced the aim, objectives, research questions and the contextual underpinnings of the study (see chapters 1, 2 and 3). The CHAT provided the tools to surface the expansive learning which had occurred and was occurring, the possibilities of expanding the learning and the modelling of solutions. The VCF tool assisted CHAT in providing the baseline data at the A-view of the study, and the tools to track and monitor how much learning occurred during the expansive learning cycle. It also assisted the study with the tools for reflection, and surfaced data from the expansive

learning process at the B-view of the study. This method assisted with the provision of sociocultural and traditional-Indigenous lenses as part of the expansive learning process geared towards the water resource management inquiry. The contradictions identified in the uMzimvubu catchment provided a platform to bring the interacting activity systems together, to boundary-cross, collaborate and model solutions based on the agency possessed by the learning participants (see chapters 7 and 8).

As elaborated on in chapters 1 and 5, the study was divided into four phases. Phase 1 involved reviewing and investigating the impetus for co-learning and management in South Africa's Living Catchments. Phase 2 involved analysing the potentially interacting activity systems in the shared object of water management and understanding their cultural and historical context. This phase also involved establishing what value had been created (or not) for activity systems through any learning and co-management in the uMzimvubu catchment to date. Phase 3 included engaging in the expansive learning process through the Change Lab platforms, and resolving some of the contradictions and absences in the learning with interacting activity systems, helping to create a new norm involving shared responsibility for co-management for water security. Phase 4 involved the evaluation and reflection of the expansive learning process embarked on, so as to provide recommendations to assist in water security at a national level in South Africa.

The research I embarked on provided some insights into learning processes, however, it also sought to convene a learning space for all the stakeholders in various activity systems involved in the co-management of water resources in the uMzimvubu catchment. Furthermore, this study expressed that formative interventionist researchers have a potentially valuable role to play in facilitating and enabling collaboration, co-learning and boundary crossing, which can directly contribute to change and transformative learning on the ground. The methodological approach developed in this study showed that a conglomeration of diverse knowledge types and practices from stakeholders involved in the object of co-management of water resources contains potential value that could add to the LCP's aim and objectives, and inform practices on the ground. This approach was also based on respect, transparency and reflexivity, because these values are important in convening safe spaces for learning, potentially free of bias, bigotry and prejudice. The learning participants in the Change Labs came from different backgrounds, contexts and areas of training, hence it was important to uphold these values during the expansive learning process, so as to include historically marginalised voices. Lastly, this

research occurred during the Covid-19 period and therefore it was important that we adhered to the nationally proclaimed regulations. The methodological approach I followed was also influenced by this factor, but was not necessarily hindered by it, as the learning participants were also well versed with issues of social distancing, sanitising and wearing of protective masks.

11.4 Main Findings Emerging From the Study

As elaborated in Chapter 1, the uMzimvubu case study was identified because it was part of the catchments involved in the LCP and had various stakeholder relations which had already been established. The study site was chosen in a bid to understand how expansive learning could potentially influence co-management of water resources. The study was developed to inform the LCP objectives, in a bid to influence its practices and principles. An in-depth inquiry on the relations within activity systems and between activity systems, as they interacted with the shared object, began to provide some insights on why expansive learning could potentially benefit the aim of co-managing water resources in the catchment. The insights from the lessons learnt from this study could potentially be replicated in other catchments within the LCPs scope and even beyond to other catchments.

11.4.1 Value created before the expansive learning process

The first finding of the study related to the question of what value had been created in this area and why the LCP work is important in South Africa. This was in response to the first two research questions posed in section 1.4.2 of the study. From the study, it was evident that there was some value already created in the catchment and that there was some awareness concerning water issues and the potential measures that could be set in place in the district. The work of the UCP was a key factor in the catchment, as this platform was important in bringing different stakeholders together, and to a certain extent in convening learning and awareness spaces. The work of the NGOs in the catchment was also important in the creation of value for the stakeholders in the catchment, as it brought about awareness, employment, training and learning. The LCP work had demonstrated that it was adding value in terms of advancing catchment co-management practices to some extent, because the resources and funds from the programme did not establish any new work in the catchment, however, these mechanisms sought to support the existing work in the area and to provide the necessary funds required to convene learning spaces in the catchment. As stated by a LCP activity system subject:

LCPAS-II: The beauty about the LCP is that it allows for freedom of operation. People work in silos and rarely network with each other. The LCP creates an enabling environment for catchment engagement, for knowledge exchanging and for learning from each other, and with each other. It is then that we can co-create solutions and come up with plausible interventions, which are from the catchment and that we can learn from as the South African National Biodiversity Institute.

Section 6.2 showed why the uMzimvubu catchment was chosen as part of the LCP's sites and its importance as a strategic water source area in the country. This section also highlighted some of the water issues which had begun to plague the catchment and the need for intervention in the area. As stated in the preceding chapters, the UCP played a pivotal role in understanding the catchment context and stakeholders, and for the provision of in-depth knowledge about the natural, social, political and economic landscape of the uMzimvubu catchment. An analysis of the activity systems and their interactions with each other on the potentially shared object enabled me to gauge what value had been created so far. The VCF tool assisted in the analysis of the types of value created at that time. It was evident from the study that there had been some changes over time which had occurred in the different activity systems, and this potentially influenced the process of value accretion for the different stakeholders. Employing the VCF as a social learning evaluative tool helped me to understand the diverse ways of learning relating to water security and management, which the participants found valuable in their own context.

From analysing the answers provided in the VCF forms filled in by the various stakeholders, I identified indicators from the data which informed my perspective of the value already created before the expansive learning process. From the VCF, it was shown that the training on rainwater harvesting and water preservation, the water working session to supply communities with water, the ecological infrastructure workshops and the UCPP quarterly meetings were sources of immediate value. These activities were initiated mostly by the NGO, the LCP and local government activity systems. Other indicators of value already attained by the participants included awareness of purification chemicals that one can buy to purify rainwater harvested, being taught that recycling water is important and that one can re-purpose used water and receiving information to be able to establish a water project steering committee to guide water-related projects (see Figure 10.2). These indicators of value were expressions of how learning about water issues was present in the catchment and that stakeholders in the catchment were willing to learn more, as expressed by their voluntary signing up to join my Change Labs. The VCF tool played a crucial role in establishing a baseline view on existing strategic learning

before we embarked on the expansive learning process, and it also served as a double-stimulation tool to spur further learning and provide mirror data.

11.4.2 Evidence of expansive learning within and between the catchment management activity systems

The second finding was related to the third and fourth research questions. Section 6.3 showed the various activity systems which were present in the uMzimvubu catchment. Section 7 dealt with the activity system and contradiction analysis in the uMzimvubu catchment. From the research, it was evident that the contradiction analysis assisted with the enabling of culturally and historically grounded expansive learning. This process also assisted in the inclusion of historically marginalised voices, who were also affected by water insecurity, but were not included in the activity geared towards the object of water co-management. The contextual profiling trip, interviews, field excursions and desktop analysis assisted me in producing mirror data. This mirror data was then utilised to spur on expansive learning. In the process of analysing the contradictions, the expansive learning process became evident, as the participants in the various activity systems began engaging in the contradictions. From the contradiction analysis process, four levels of contradictions were evident, ranging from within and between the activity systems. Section 7.2 reveals the different types of contradictions which were surfaced from the study. The contradictions occurred within activity systems and between activity systems. The contradictions were related to a) springs, b) wattle invasion, c) raw sewerage and pollution, d) water access and e) grazing of livestock. It was important to try and surface the real issues plaguing the catchment on the ground and engaging in research which could potentially result in changes that could affect the process of modelling of solutions at the local catchment level. The quote below shows why it is important in embarking on researching rooted in context and why working in the uMzimvubu catchment was important:

Eastern Cape Department of Forestry, Fisheries and the Environment individual interview: Our department is currently embarking on a research, and as I am looking at the current trajectory of our work, I do not think that we are focusing on the right issues. I am not sure if our interventions are targeting the right issues and if they are prioritising the right water source areas. I say this because the Eastern Cape is having water problems currently, and my question is ‘are our interventions targeting the right catchments and are they addressing the risks which are associated with the current water crisis that we are facing?’ I do not see our department being proactive towards the emerging water issues, and I do not see any research being geared towards them.

As described in Chapter 7, there were contradictions which emerged in the rules of springs management within the community activity system, and between the community activity

system and the NGO activity system, reflected in the undesirable state of springs in some villages in the catchment. In the community activity system there were primary contradictions relating to the subjects, as surfaced from the research interactions. The study also showed that there were quaternary contradictions between the community activity system and the NGO activity system. Engaging in these contradictions expressed the importance of the springs not just for water security in the catchment, but for spiritual and cultural purposes. The expansive learning process provided a platform for the community activity system and the NGO activity system to discuss about rules and regulations of springs, and to understand the cultural-historical context of springs.

The second contradiction which emerged was related to wattle management within the subjects of the community activity system, between the community activity system and the traditional leadership activity system, and between the community activity system and NGO activity system reflected in the degree of wattle infestation and extensive presence in the catchment. There were primary contradictions surfaced within the subjects of the community activity system. There were also tertiary contradictions in the rules of wattle management between the traditional leadership activity system and the community activity system. The study expressed that the conflicts and tensions which arise because of black wattle are rooted in history, culture and rules regarding black wattle. The expansive learning process revealed how the different subjects within the community activity system viewed black wattle; the perspective was not uniform. This contradiction analysis surfaced the importance of rules for black wattle management. Furthermore, through the expansive learning process, it was evident that the traditional leadership had initiated some rules concerning black wattle, and this work was also supported by the NGO activity system.

The third contradiction to emerge was in the rules governing service provision in the local government activity system, and in the rules regarding littering and nappy disposal in the community activity system. Secondary contradictions in the local government and community activity systems were surfaced during the analysis. The expansive learning process unearthed the tensions and conflicts which had emerged with regard to this contradiction. An interesting factor to have been surfaced in this process was the awareness and new knowledge which the community activity system participants received as they interacted with the local government activity system. The issue of nappies was also raised by the community activity system as a major contributor to water source pollution and littering in the catchment. Through the various

interviews and field trips, it was evident that nappies require a new type of waste handling, as the village dwellers do not have the resources to dispose of these nappies.

The fourth contradiction to emerge was between the rules governing water access and service in the community activity system, and the rules governing water supply by the community members in the local government activity system, affecting the shared object of co-management between the two activity systems. The contradiction analysis surfaced that there were rules governing water access in the community activity system. The process revealed that there were quaternary contradictions in the rules governing water service providers, who are within the community element of the local government activity system. Section 7.3.4 revealed the background to this contradiction and the newspaper extract from 2020, which showed the detrimental effects of the inability to access clean and safe drinking water for the community. The expansive learning process revealed the conflicts and tensions related to illegal water connections and criminal activities leading to inability of municipality to serve the communities. The process also revealed how external factors such as political feuds and corruption within the local government activity system jeopardised the ability of the communities in the catchment to access safe drinking water. There were also discussions on how these issues could be resolved, such as using windmills instead of fuel powered boreholes.

The last contradiction to emerge was in the mediating artefacts and subjects within local government activity system, and between the shared object between the local government activity system and the community activity system. Section 7.3.5 showed how important wetlands are for the country and the government's stance on protecting wetlands, as part of the country's water resources. The contradiction analysis revealed that there were mainly tertiary contradictions in the traditional leadership and community activity systems. The expansive learning process revealed that the lack of awareness and trainings given on wetlands appears to affect the ability of the local chiefs to fulfil their work of governance and fulfilment of the object of water co-management. From the study it was evident that this tension reflected the lack of awareness of the roles of wetlands and has resulted in the chiefs issuing out land in areas which are wetlands. The expansive learning process allowed the different activity systems to discuss the role of wetlands, advise each other and raise awareness about the importance of wetlands in the catchment.

11.4.3 Emerging transformative agency as demonstrated in the expansive learning process and modelling of solutions

Chapter 7 and Chapter 8 showed that in the course of the expansive learning process, the learning participants self-organised and formed two groups, based on the agency they felt they possessed. The two groups were mixed and consisted of different stakeholders involved the activity systems. The groups emerged and formed because of the contradiction analysis journey we had embarked on. This group formation process was an expression of practical collaboration amongst the stakeholders and crossing of boundaries in a bid to solve water-related issues. This was a response to the fifth research question. As stated before in this study, the notion of agency was important in the study. The VCF tool was used because of this reason. The VCF tool was imperative for evaluation and monitoring expansive learning process, as it assisted with mining and surfacing the different types of values accrued by the learning participants. In addition to being a monitoring and evaluation tool, the VCF tool played a role as a second stimulus tool in the expansive learning process to support the subjects in the different activity systems to be better aware and exercise their agency for co-management of water resources. From the data extracted in the study, it became evident that there was transformation in the values of certain participants involved in the study. Transformative value was not present in the first VCF. Also, there was more realised value reflected on in the second VCF (compared to the first VCF). These factors reveal that the expansive learning process was potentially able to assist the learning participants to realise their agency in securing of water resources and their values regarding water co-management were possibly transformed as they embarked in the expansive learning journey. The Change Labs and the expansive learning cycle supported the ambitions of the LCP by convening learning spaces which could result in transformation on the ground, as indicated below:

LCPAS-II: I can say that the kind of work we want to do, is to inspire freedom. The past way of learning did not really inspire agency. If we want to grow people's capacity, we need to open spaces where they can learn with an agency of their own. That is the fundamental transformation. If we come and approach things with this perspective, to inspire them to be free and ask questions, we create answers to our questions with the engagement with the people, because our learning is directed by our questions and lines of engagement.

The expansive learning process also assisted in the provision and democratisation of educational tools to assist the learning participants in the different activity systems to model solutions to issues facing their own unique issues. The study in chapters 7, 8 and 9 contains quotes which reveal how the learning participants began appropriating what they learnt in the

Change Labs and used in their own contexts, including work and professional contexts. Section 8.2.1 demonstrated how expansive learning in the activity systems, was reflected by modelling of solutions by various individuals. The section showed how the expansive learning process had assisted the participants in being aware and demonstrating their agency, through solving issues in their context. The expansive learning process also assisted in modelling solutions and co-creating new knowledge, as demonstrated by the participants in section 8.2.2 and 8.3. The participants did not just only demonstrate agency by presenting their modelled solutions, they also decided to have a presentation day to show their work and discuss their solutions with other members of the community in the uMzimvubu catchment.

11.5 Recommendations From the Study

Below is a list of recommendations which emerged from this study. Some of the recommendations are insights which emanated during the overall research process. Other recommendations were expressed by the learning participants during the expansive learning process. There were seven recommendations emerging from the study. These recommendations are a response to the final research question and the final objective of the study, as discussed in section 1.4.2 and 1.4.3, respectively. Providing recommendations is an important part of the study and also for the greater LCP. Below is an extract from the LCP director, with regards to recommendations from the study:

LCPAS-II: Again, these entities (Department of Science, Water Research Commission and Department of Water and Sanitation) are waiting for recommendations from our students from the Living Catchments Project, because what we are learning has to feed into the DSI, because this agency is promoting innovation. The DSI sees the Living Catchment Project as another intervention option that's promoting innovation. As the LCP, we are promoting what they call social innovation. The DSI does not only work with artificial intelligence related innovation, but other forms of innovation, hence they are promoting our social innovation work.

11.5.1 Recommendation 1: Using a contextually adaptable framework, to support a culturally historically grounded expansive learning process in conducting research

As explained in section 10.1.1, one of the outputs or contributions this study brought forth, was the development of a robust social learning methodological approach. This approach has been elaborated and discussed in more depth in the section 10.1.1, and Figure 10-1 is a model of the methodological approach I developed. However, it is my recommendation that before using this methodological approach I developed, or any other in fact, it is important to embark on a thorough and robust contextual profiling trip. The contextual profiling trip does not only assist

in the provision of mirror data for the expansive learning process, but it also introduces the researcher to the landscape, surfaces local nuances and helps in building trust. The desktop analysis and literature review alone are not sufficient, because the researcher will only be then looking at stagnant and non-responsive data. However, if the formative interventionist researcher undertakes a desktop analysis and literature, then followed by contextual profiling trip, this enriches the research experience and potentially adds to more robust, specific and contextualised mirror data to be used in the Change Labs.

As stated in section 10.1.1, the LCP approaches its end in November 2023, and this tool can be added to the project outputs related to Cluster 1 and Cluster 2; because this methodological approach has contributed towards collaboration, co-engaged solutions formulation and transformative learning. Another supporting tenet, vital to this methodological approach, is trying to ensure that the potential participants are not in any way coerced or pressured in joining the planned intervention. Allowing the potential participants to exercise agency from the beginning stages, in deciding or not deciding to join the expansive learning process, is important in establishing an ethical and just foundation for the learning which will potentially occur. Making the expansive learning process participants aware of their agency has been an important theme in this study. This methodological approach is beneficial in this regard. The quote below expresses a view from one of the learning participants:

COMAS-CLD: Working on Mzukisi Kuse's PhD was refining particularly for speed and results. The formative interventionist research approach could be very useful for government developmental dialogues and workshops which typically are time sensitive and require effective feedback communication for mediating the role and work done by government in or for communities. Those are my loose but refined reflections.

11.5.2 Recommendation 2: Enhancing and strengthening the existent collaboration between the community activity system, the NGO activity system and local government activity system

Chapters 6, 7 and 8 discussed in various degrees, the interactions between the community activity system, the NGO activity system and local government activity system. Some of these interactions were characterised by tensions and conflicts, as expressed more in Chapter 7. However, this was not the case for all the interactions, there were some positive interactions yielding to some beneficitation for the parties involved. From Chapter 6, it was evident that NGOs had taken strides in order to reach communities and to assist them. The various quotes emanating from the contradiction analysis in Chapter 7, was evidence that the NGO activity

system played an important role in skills development, awareness raising, training and employment. From the data in Chapter 6 and 7, it became clear that the local government activity system and the community activity system still had some tensions to resolve. The Change Labs were a good starting platform for continuing discussions between the stakeholders in these two activity systems.

From the expansive learning process, it was demonstrated that there was some work already existing and implemented by the NGOs in the uMzimvubu catchment. It is my recommendation that this type of work should continue, as it has yielded some benefits for the people in the villages. Future projects, similar to the LCP, should seek to consult and collaborate with the NGOs already implementing projects at the ground level, as there has been trust and links formed amongst these stakeholders. The UCP meetings assisted me in getting participants for my study, because that platform was established by the NGOs in the catchment to bring together all the stakeholders involved in natural resources management. However, the strengthening of collaborations between communities and the NGOs will not only benefit the community, the NGOs can also potentially benefit. The community stakeholders possess traditional ecological knowledge (TEK) and are custodians of IKS in the catchment. Through mediated processes, and learning facilitation, interventions can be geared towards expanding socio-culturally and environmental knowledge in and amongst stakeholders from community and NGO activity systems. The communities do possess agency as demonstrated in the study, and it is important that they are consulted regarding anything which involves the catchment or work intended to be done in their jurisdiction, as indicated in the quotes below:

LCPAS-II: Whenever you are doing things for the people, you need to do it with the people. I have learnt that you cannot do anything for the people without involving them. When you do things with the people, they will tell you what is important for them and what is not important; this helps with prioritising resources, hence I always need to listen.

NGOAS-II: In uMzimvubu, things are different. The communities want their springs protected. However, the twist here is that we had to understand and learn about the issues related to springs; cultural and spiritual nuances imbued with managing springs. When we consulted the communities, one of the spiritual leaders stated that we should not close the eye of the spring with cement when we protect it, because that is where the life of the spring is. So, we have learnt to couple local ecological knowledge, Indigenous Knowledge Systems and Western knowledge in the LCP, when we do catchment work.

11.5.3 Recommendation 3: Increased investment in terms of empowering and raising awareness for local traditional leadership

Section 7.3.2.2 discussed some contradictions between the traditional activity system and the community activity system, with regards to black wattle management. The research has showed that there are differing views concerning this alien species. In section 7.3.2 the background and statistics of wattle invasion in the country, along with the consequences of the invasion are showed. It was evident from the data that the local traditional leadership had implemented systems in place to try and manage the issue of the black wattle. However, it was surfaced from the expansive learning process that not all the chiefs in the catchment are aware or working towards the management of black wattle. I recommend more investment in raising awareness about black wattle management. As expressed also in section 7.3.2, there is a contradiction in the rule element of the community activity system and the traditional leadership activity system, reflected in the presence of contemporary black wattle management rules, against the backdrop of traditional catchment norms and customs. Local leadership is important in the life of the catchment, if external bodies want to make changes at the ground level, it is of utmost importance to consult the local leadership, as they are the catchment custodians. Furthermore, this process may assist in closing the gap between ‘formal’ government and traditional leadership, in order to better serve communities and to streamline decision-making processes. Departments should start learning to work with communities on the ground and partner up in a strategic manner, if they are to effectively deal with issues of alien plants affecting water security. Drafting of policies should include community partners, who have a better grasp on the reality on the ground. There is a desire for collaboration (as indicated in the quote below), however, that collaboration needs to cross departmental boundaries, and also include community members. The quote below indicates one of the surfaced contradictions which could be potentially resolved if the Eastern Cape Department of Forestry, Fisheries and the Environment could collaborate with community and traditional activity systems:

Eastern Cape Department of Forestry, Fisheries and the Environment individual interview: We as the DFFE are mandated to clear invasive plants in strategic water source areas and in catchments. The Department of Water Affairs should liaise with our department and form a strategic partnership in a bid to deal with that emerging water issue, because they are the leading body when it comes to water issues in the country. For me that is the only way we can make a proper impact. This issue of just drafting policies and plans, has its place, but if they do not inform progress, in terms of implementation or have an impact, it seems as if they are just theoretical exercises and not doing anything worthwhile.

As mentioned in section 11.5.2 above, the work of the NGOs in the uMzimvubu catchment should be supported, as the data from the study shows that NGOs have shown to be effective vehicles of change on the ground. The traditional leadership can find value in strengthening their ties with the NGO, if they desire to better manage their areas of jurisdiction. The NGO activity system can only do some work to a certain extent in the catchment communities, because the communities possess their own agency and rules to self-govern. Section 7.3.2 revealed how there was a contradiction in the subjects of the community activity system and the object of the NGO activity system, reflected by the resistance and acceptance of wattle clearing/management by NGOs and partner organisations. At the heart of this tension and conflict, it is the traditional leadership activity system which can assist in negotiation of black wattle management between the NGO activity system and the community activity system's subjects. If sufficient awareness is raised to support the work of traditional leaders, they can occupy a strategic role in mediating and facilitation of natural and sociocultural tensions in the uMzimvubu catchment. This need is indicated in the quote below:

NGOAS-II: There are several stakeholders who work in this catchment. So, collaboration and intentional working together is important, so that we maximise the resources that we have, rather than coming in and working in silos. If we could learn to cooperate and maximise the resources, instead of just working and ticking the box of our particular mandate, as the different stakeholders. Alien invasion is severe in this catchment, and no one organisation can lead to eradication by itself. An agency like Working for Water alone will not win the battle, other stakeholders need to join hands and work together. Alien invasive plants are a major problem in the catchment, because they impact the water scarcity in this catchment.

11.5.4 Recommendation 4: Supporting and investing in the modelled solutions presented by the two groups from the expansive learning process

Chapter 8 of the study discussed and elaborated on the emergent and demonstrated agency which emanated from the expansive learning process. The two groups which formed chose to embark on solving an issue which they felt they had agency over. These groups managed to come up with two distinct solutions, following the contradiction analysis in the expansive learning journey. I recommend that there should be a degree of investment in funding or supporting these two modelled solutions. These solutions emerged from a local context and can be adapted to other catchments. These solutions should also be recognised by the LCP as an expression of social innovation. Social innovation is an important tenet underpinning the work of the LCP and the DSI. These modelled solutions could even be explored and experimented, in a bid to try and manage the national water resources. There is a gap for

potential impact for the social innovation and modelled solutions by the two groups from the study, as indicated below:

LCPAS-II: And we are hoping through the Water Research Commission, because they are an entity of the Department of Water and Sanitation, we can take these recommendations, develop them and feed them into the Department of Water and Sanitation. So that's how we will then be able to influence that roadmap for the policy work of the department through our friends at the Water Research Commission. The WRC has a vested interest in the students' work, because they are funding the students and that is why we are confident that the research will not go to waste but it will feed into that roadmap.

As stated in section 8.3, two groups formed and there was boundary crossing and collaboration to solve the chosen issues. These two issues were chosen by the participants because they both are endeavouring to solve the water insecurity issue in the uMzimvubu catchment. The first issue dealt with black wattle management, and titled their modelled solution as ***“Turning issues into assets: Using commercial strategies to clear alien invasive plants in the uMzimvubu catchment.”*** This issue of wattle was deliberated on in the contradictions, and it was both a point of discussion and a learning stimulus tool. The second group dealt with the issue of dealing and solving broken water infrastructure, in a bid to alleviate any further despoliation of community water resources. The second group project was titled as ***“Enhancing water security collaborations between communities and municipalities.”*** Using their expertise and the agency they possessed in the group, they developed a water reporting tool, unique to their context, which could be used by the inhabitants of the uMzimvubu catchment. These first modelled solution could be highlighted and presented as one of the black wattle management approaches in uMzimvubu catchment. It could potentially be further refined in order to be even adopted by the local government activity system. The second modelled solution, as expressed in section 8.3.2 could be potentially digitised and transformed into a Water App (application). If it could be made an App, it would not only just assist with the issue of water insecurity, it would even yield some benefits to the community who engineered the reporting tool. The learning participants who engaged in this expansive learning process were aware of their agency and they even accrued transformative value from the process, leading them to create a novel solution, with new knowledge and potentially adaptable to other catchment contexts and districts. These novel solutions emerging from the study could potentially influence government ambitions, at various levels, as indicated below:

LCPAS-II: If we had an extension to the Living Catchments Project, we would also want to link the work we are doing to the district development model. Government is continuously promoting

the district development model and this model is really about governance, collaboration and coordination. This is similar to the work of the Living Catchments Project, because our work is centred around collaboration, and our coordination is about creating spaces where we play and learn together. So, if we had the time continue, we were going to advise the district development model for the upcoming years to uptake recommendations and the lessons we have learnt. These would be learnings for the districts in terms of how they collaborate and work together with communities with the research as best as they can.

11.5.5 Recommendation 5: Using the contributions to inform further research to feed into the Living Catchments Project and the greater Transformative Innovation Policy Consortium

Chapter 10 of this study lists all of the potential contributions I made. These potential contributions were geared towards the LCP, national and international policies. During the course of this study, I had to be constantly aware of the various roles which I held. I was a formative interventionist researcher during the expansive learning process. I am a PhD student in the field of Environmental Education. I am enrolled at a higher learning institution (Rhodes University). I am a citizen of the RSA, and that makes me a custodian of various rights and responsibilities. I am one of the few students working under the umbrella of the LCP. The quote below resonates with me, because of my positionality and the responsibility I hold in society because of what I have been privileged enough to be exposed to:

TLAS-II: People should learn that life is a holistic system: and that the environment informs the way you live. Most people in South Africa are not even aware of global climate and environmental issues, their values need to be changed from a young age, so that we can inform change. This is why I say that awareness is so important, people need to learn and be made aware of environmental matters. We need to instil values in our people which can change their minds, because I feel this is the only way to change things. We need to educate people and make them learn and be aware of water resources.

In my quest to surface my contributions, I had to be aware of my positionality and how it overlaps across several sectors. I therefore did not meaninglessly embark on a PhD study, but it was influenced and affected by my positioning. From this study, I list the following recommendations:

- I. I recommend that more studies should explore the usage of expansive learning, as I did, as this can enable collaboration, boundary crossing and co-learning. The use of expansive learning enabled me to bring together diverse stakeholders who had a vested interest in ensuring that co-management of water resources in the catchment. As stated in section 11.5.1, this process should be underpinned by a robust methodological framework, to aid in the collection of data, facilitation of learning and contradiction analysis, in order to produce contextually applicable solutions. Researchers should not

shy away from the process of exposing the education or technical frameworks to learning participants. Democratisation of educational tools became an important part of my research, as I did not just use the tools to extract data, but in a way “I gave them away.” Chapter 8 provides the evidences of how the learning participants then used these tools to inform their modelling of solutions.

- II. Based on my second contribution, in section 10.1.2, I recommend the usage of monitoring and evaluation tools that are suited to the evaluation of social learning processes. The VCF tool was able to assist me in evaluating the social learning which occurred during the expansive learning process. Additionally, I found that evaluation and monitoring tools employed in expansive learning endeavours as double-stimulation tools, and tools for reflection have the potential to make the learning participants aware of their agency and to reflect on the knowledge concerning their object of activity. From this research, it was evident that the learning participants already a certain degree of knowledge concerning the shared object. This allowed me to understand the point at which my learning participants were at, and present to me the baseline data. It should also be noted that the VCF tool is an important double-stimulation tool to provide mirror data for the expansive learning process. This process is crucial in ensuring contradiction analysis and modelling of solutions later on in the process.
- III. As stated in section 1.1 of the study, educating communities about the importance of conserving natural resources has always been important to me. The field of Environmental Education assisted me in providing both educational and environmental tools and theories in trying to help communities learn about water security. I do recommend that this field should be looked at as a viable means to educate communities about natural resources, because it has a plethora educational tools to assist in attaining to this means, amongst them the CHAT process framework. I also managed to contribute to the field, because my research provided an interesting perspective for Environmental Education research, because I have had to contextualise and adapt the frameworks I used, in order for my work to fit into a unique South African catchment context.
- IV. Lastly, as a student who is part of the Living Catchment Project, led and coordinated by the South African Biodiversity institute, it was important that my research contain inferences towards policies as indicated in Chapter 1. The South African Biodiversity Institute has a mandate of informing and advising on policy. In the early stages of our research as the LCP we were told that we have to be cognizant of this fact and take it into consideration as we embark on our research. I recommend that in the future, any research undertakings by students positioned in a project such as the LCP, should also be aware of how their research could potentially influence policy. As stated in section 10.4, the disparity between policy and action on the ground is not unique to South Africa. Policy is important in influencing the processes on the ground. In section 7.3.3 of this study, it was evident that certain communities cannot be necessarily assisted in certain matters because of regulations governing municipal spending. During the

contradiction analysis, it was shown that the MFMA is a critical component governing municipal spending and thereby vicariously influencing the provision of services on the ground. Overall, the study's methodology also contributes to policy, especially helping to resolve the problem of policy implementation in the water sector as outlined in Chapter 1.

11.6 Concluding Reflections and Directions for Further Research

11.6.1 Concluding reflections and directions for further research

The research which I embarked on and its potential value for water co-management and NRM have been highlighted throughout the study. Also, my research added to the greater concept of collective learning versus the notion of “extractive” research and intruder syndrome, which does not give communities a chance to work out their issues by using their unique TEK and IKS, which also have cultural-historical mediated tools. This is critical because another aspect of the TIPC work and the LCP work involves citizen science and using tools to understand and capture environmental issues in communities. This study endeavoured to democratise educational research tools and brought them to the learning participants, so they can use them in their communities to help them manage their ecological issues. This was important in aiding the LCP in achieving some of its aims, as indicated in the quote below:

LCPAS-II: The outcomes of this project are important and it goes back to what I said about closing this feedback loop, whereby we also want researchers to work very closely with implementers, so that policy practitioners use information based on the ground realities to feed into the relevant policies. So, this is why the work that the students are doing becomes very important, because one of our objectives is to strengthen governance in all of these catchments. Alongside governance, we also want to strengthen collaborations; we want to understand what are the enablers of governance and will enable us to have strong a solid catchment governance. Our students have interacted directly with the catchment stakeholders and other related role players, and they have initiated their research focusing on catchment governance, water governance and water security, so they will be able to formulate informed recommendations for us as the LCP.

An outcome of this was that the research participants developed two outputs; a tool to monitor water issues in their communities and a management approach/strategy to assist in wattle management, which is a dire environmental challenge in SWSAs. It is recommended that the LCP should uptake these tools, develop them further and assist in funding them because they can be contextualised. Both solutions which emanated from the communities are important for the LCP endeavours and also for the greater TIPC work because it shows that the live experiment, in this case at the niche level, is yielding benefits for this international project. The methodological approach and tools emerging from the study are rooted in empathy and

listening. These are two foundational concepts to be grasped if one is to embark on transformative work in local contexts. These are not “soft skills” but highly sophisticated skills, as they allow individuals or communities involved in interventions to voice their needs or desires. This is demonstrated in the quote below:

LCPAS-II: The Living Catchments Project has also allowed us as SANBI to learn from the people directly, and to hear what their needs are, even as we are trying to work towards water security. We once had passed on a questionnaire to the catchment, around the needs of the community and enhancements of their livelihoods. The interesting thing which came up from that study was that the people did not want those things we thought they wanted or anything related with water. Instead they required assistance with waste management, disposal of nappies and provision of sanitary pads (because most girls cannot go to school during their menstrual cycle). This is the importance of listening and learning.

Also, this work which I did expressed explicitly that citizen science is important; it can be a reality when people are supported and successful and when expansive learning is embarked on by formative interventionist researchers. The work I did can be potentially taken up and upscaled into the other catchments in the LCP because these four catchments were chosen because of their similarities. To note, this will not be a copy-and-paste endeavour but will be an informed adaptation. Also, concerning evaluating if my case study can achieve positive change if ever it is taken up or scaled up to the other catchments, it would be important to evaluate its efficacy; in Chapter 2, I provided an evaluation scheme which was highlighted by the TIPC which has certain guiding principles for evaluation of interventions. This research could potentially aid the government in dealing with their NRM issues in the country and how they can learn new ways of dealing with environmental challenges, through seeing the value of expansive learning. The expansive learning process followed in this study could possibly assist the Eastern Cape Department of Forestry, Fisheries and the Environment in achieving its aims with regard to the uMzimvubu catchment, as there appears to be such a need as indicated by the quote below:

Eastern Cape Department of Forestry, Fisheries and the Environment individual interview: From our perspective as DFFE, uMzimvubu is one of our priorities, because it is a strategic water source area. It has its own challenges, which range from alien invasive plants, which are quite vast in the area, wetland degradation, increasing dongas and the area is fire prone. Along with these challenges, we find issues of people who do not have water access and rely on springs, and this is further compounded by poverty, especially in the rural areas. Our work needs to be informed by the research which gets done, so that we respond to water issues, by implementing solutions which are robust and linked with research.

This research has expressed that expansive learning is important in establishing co-management practices. In a bid to co-learn and collaborate, expansive learning enables stakeholders to learn what is not there yet. In relation to this, another important aspect is that my research was able to trace, through evaluation, how the participants' ZPD shifted; it shifted as they learnt new skills and used new tools, and this bridged the gap progressively.

It was important for me to undergo this research as it also led to my personal development – through this research, I perceived how I transformed from having a scientific background by training, to assuming the role of a formative interventionist researcher. I can see how I had to learn and unlearn, challenge what constituted knowledge, and approach research as a process of working WITH people instead of working FOR people. I also have been changed from merely writing and researching about issues concerning NRM matters in the community context to actually getting into the people's contexts, repositioning myself as a “knowledge-giver” according to traditional science, to becoming an engaged formative interventionist researcher. From my practical experience on the ground, I could see that there was potential in working with the communities in their local catchment contexts. It is my advice that potential funders and project conveners should receive some form of orientation about the realities on the ground (with regard to the intervention location). Decision makers and funders do require contextual profiling trips to sensitise and make them aware of nuances at the catchment level if they are truly invested in seeing transformation and changes at the ground level. Reflexivity and awareness of one's positionality can enable trust building and enhance collaboration with the intended stakeholders. Reflexivity may assist the LCP students to potentially advise the SANBI and possibly inform the work they do on the ground, as indicated below:

LCPAS-II: The advice and recommendations from our students will not just be based on theory and they will assist us as SANBI in approaching the work we do with our partners on the ground, and then it will feed into our own strategies. That is how plan to uptake the work from the students, by receiving recommendations and receiving learning based on ground realities. These outputs will also be fed to our partners so that they can strengthen their collaboration on the ground, based on actual data from reliable ground research.

Embarking on this research assisted me by revealing through interaction and experience and not just document analysis for research work, that people do not come as empty vessels which just sponge information – they have their own knowledge which may be different to the type of knowledge of the interventionist, nonetheless, still important and valuable knowledge. Lastly, just because people do not have formal education training according to Western notions of learning and pedagogy, it does not mean that they are illiterate and uninformed about natural

resource issues and other societal issues plaguing their catchments or communities. Fortunately, the LCP was founded on principles of the enablement of collaboration, cooperation and co-learning among diverse stakeholders. This study has revealed that working towards water security is not an easy feat as there are numerous variables involved. Also, any intervention at the catchment level needs to consider the nature and type of stakeholders in the activity systems who share the object, including the cultural and historical nuances embedded in those activity systems, as shown in the quote below:

LCPAS-II: When we established the Living Catchments Project, our idea was that what we wanted to know who were the active role players in all the catchments, so that we focus on addressing water security challenges. The Living Catchment Project's aim is to get all these people together to create a platform for them to come together and start interacting with one another. So those who are implementing on the ground, either being NGOs or municipality of the province, we say come here is a platform for you. Traditional Leaders and communities, here is a platform for you. Researchers who may be doing research in those areas, here is a platform for you.

11.6.2 Limitations of the study

As elaborated on above, the study has contributed insights into learning processes relevant to the co-management of water in the LCP in South Africa as well as insights into how such learning can be evaluated. It has also led to practical benefits and outcomes for the communities and stakeholders concerned. However, there were some limitations associated with the study, which I mention below:

- *Scope of the study:* One limitation of the study is that I was only able to work in one catchment for a limited period. There is, therefore, much potential to carry this work forward in other catchments and for a longer period in the uMzimvubu catchment in future processes that I hope to contribute to.
- *Time constraints affecting the study:* A PhD study is limited to a set number of years, which is usually three, and can have some extensions, depending on the institution to which the researcher is affiliated. These factors put a time perimeter on the formative intervention and limit the scope of interaction. Change Labs are dynamic in nature and require flexibility in terms of time, to reflect on the potential learning which occurred and open a space for further progress relating to the learning. In the expansive learning cycle followed in the Change Labs, reflecting on the process and consolidating the new practice, steps 6 and 7, respectively, are iterative and follow a back-and-forth process, which can take some time. For my study, I had limited time to allow these particular two steps to follow the intended process. In addition, the LCP, which I am part of, also had a limited period and this added to the timeframe possible for this study (the LCP ended in 2023).
- *Use of tools in the Change Labs:* As indicated in the study descriptions, the use of the activity system model was particularly productive in the Change Labs that I was

facilitating. I also used the VCF questionnaire as a tool in the study. It was useful especially in the early phase of the study to understand existing learning and to generate reflections on further learning in and between activity systems (i.e. as a double-stimulation tool). It also allowed me to develop indicators of learning based on earlier learning before the formative intervention. I used the same tool at the end of the study after the expansive learning process and developed further insights into new indicators of learning. I could, however, have complemented the use of this tool with other evaluation methods and tools (e.g. evaluation focus groups), but at this point, the study scope was already extensive. As mentioned in the study, the tools within CHAT also offer useful evaluative insights such as insight into transformative agency and expansion of the object. I could, in the final analysis, have done a more extensive analysis of all these perspectives, but again, as the study scope was already vast, I reasoned that this could be done in post-doctoral work going forward. The reporting in the thesis has captured these other forms of value (e.g. transformative agency and expansion of the object) but this was not synthesised in relation to the outcomes of the VCF analysis in its second iteration, although some of the new indicators point to these outcomes using the VCF categories of description.

- *Depth and breadth:* The nature of this PhD was interdisciplinary, in that it involved various concepts, theories and viewpoints from various disciplines. While this allowed me to position the study in ways that are relevant to the Environmental Education field in which I was studying, and the water sector where the study was based, it also presented challenges as different disciplines use different discourses. For example, the NRM sector uses the concept of social learning, while community-based education in Environmental Education uses the concept and process of expansive learning. In this study, I had to reconcile these two fields so that the study could ‘make sense’ to both research communities. In addition, the study had a practical interest to contribute to the learning of communities in catchments of the LCP, and the evaluation tools interest of the LCP programme itself, and this required me to work with plain language as far as possible to facilitate accessibility, which may have traded off some aspects of in-depth theoretical deliberation and discussion. Again, I tried to balance these demands within the scope of this PhD as far as was possible. For example one area that could benefit from further theoretical depth is the relationship between the VCF framework of Wenger-Trayner et al. (2020), especially in its most recent iterations, and the processes of CHAT, especially third and fourth generation CHAT. In this study I did point to some of these relational points but I concede that this could involve much more in-depth deliberation. This could also be the subject of a post-doctoral research paper, especially following the way that the VCF was used in this study both as a double stimulation tool and as a reflective evaluative tool to capture value created from the expansive learning process itself.

11.7 Conclusion

In this study I was able to develop a culturally and historically grounded expansive learning process which strengthened collaboration and transformative agency in co-management among and across activity systems, especially regarding the inclusion of marginalised voices. This gives meaning to realising the policy intentions and the LCP aspirations to contribute to transformation innovation policy via the TIPC. The VCF tool assisted me in monitoring the

learning during the expansive learning process, and it was used as a second stimulus in the expansive learning process to spur further learning. Both the activity system analysis, and the VCF tool assisted in supporting the subjects in the diverse activity systems to be better aware of and exercise their agency for co-management of water resources in Just Transitions. Thus, the study has addressed the gap identified in Chapter 1, which was identified as a need to provide more understanding of the learning processes associated with co-management and also to evaluate these. The study was grounded in a policy need for such work and contributes to the transformative innovation policy for Just Transitions in South Africa, if at the niche level.

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Appendices

Appendix A: Consent Form for Research



INFORMED CONSENT FORM

TITLE OF STUDY

Exploring expansive learning and co-management in the Tugela and uMzimvubu catchments

PRINCIPAL INVESTIGATOR

Mzukisi Kuse

Environmental Learning Research Centre
PO Box 94
Makhanda (Grahamstown) 6140
Eastern Cape, South Africa

0814972430

mzukuse@gmail.com

PURPOSE OF STUDY

You are being asked to take part in a research study. Before you decide to participate in this study, it is important that you understand why the research is being done and what it will involve. Please read the following information carefully. Please ask the researcher if there is anything that is not clear or if you need more information.

The purpose of this study is to explore how collaboration between all relevant stakeholders involved in the Living Catchments Project, particularly in the Tugela and uMzimvubu catchments, can affect water security and spur further expansive learning in the areas.

STUDY PROCEDURES

The research will employ the use of audio and video recording, this is to ensure that all the information is stored correctly and can be used for later analysis.

Change Labs will be part of the research, which includes audio and video recording.

Focus groups will be used as part of the study.

Written interviews will also feature in the study.

Rhodes University, Research Office, Ethics
Ethics Coordinator: ethics-committee@ru.ac.za
t: +27 (0) 46 603 7727 f: +27 (0) 86 616 7707
Room 220, Main Admin Building, Drostdy Road, Grahamstown, 6139

Participant's Initials: _____



BENEFITS

The participant(s) will benefit from the study through knowledge sharing and dissemination.

The participant(s) will benefit from the study through activities which will have the possibility to impact and change their attitudes, values and actions towards the management of water resources.

CONFIDENTIALITY

For the purposes of this research study, your comments will not be anonymous. Every effort will be made by the researcher to preserve your confidentiality including the following:

- Assigning code names/numbers for participants that will be used on all research notes and documents
- Keeping notes, interview transcriptions, and any other identifying participant information in a locked file cabinet in the personal possession of the researcher.

Participant data will be kept confidential except in cases where the researcher is legally obligated to report specific incidents.

CONTACT INFORMATION

If you have questions at any time about this study, or you experience adverse effects as the result of participating in this study, you may contact the researcher whose contact information is provided on the first page. If you have questions regarding your rights as a research participant, or if problems arise which you do not feel you can discuss with the Primary Investigator, please contact the Supervisor on the following contact number: 0466038111.

VOLUNTARY PARTICIPATION

Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship

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Participant's Initials: _____



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you have, if any, with the researcher. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

CONSENT

I have read and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

Participant's signature _____ Date _____

Researcher/Investigator's signature _____ Date _____

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Ethics Coordinator: ethics-committee@ru.ac.za
t: +27 (0) 46 603 7727 f: +27 (0) 86 616 7707
Room 220, Main Admin Building, Drostdy Road, Grahamstown, 6139

Participant's Initials: _____

Appendix B: Invitation to Participate in Research



INVITATION TO PARTICIPATE IN RESEARCH

Participant's Name

Rhodes University

Grahamstown.

6139

Dear (participant's name)

Re: Invitation to participate in a research study

You are invited to participate in a research study entitled ***Exploring expansive learning and co-management in the Tugela and uMzimvubu catchments***. The aim of this research is to evaluate how expansive learning by the different stakeholders involved in the Living Catchments project can contribute to effective co-management of the Tugela and uMzimvubu catchments.

Your participation is important to explore how collaboration between all relevant stakeholders involved in the Living Catchments Project, particularly in the Tugela and uMzimvubu catchments, can affect water security and spur further expansive learning in the areas. The research will be undertaken through Change Labs, Focus Groups and interviews. Your participation in the research is anonymous and your identity will not be revealed. The collection of this data will require between six to eight months.

If you agree to participate, we will explain in more detail what would be expected of you, and provide you with the information you need to understand the research, at the meeting which will be set by the Living Catchments Project and local authorities committee. These guidelines

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t: +27 (0) 46 603 7727 f: +27 (0) 86 616 7707
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would include potential risks, benefits, and your rights as a participant. Once this study has been approved by the Ethics Committee of the Faculty of Education you will be sent the letter of ethical approval.

Participation in this research is voluntary and a positive response to this letter of invitation does not oblige you to take part in this research. To participate, you will be asked to sign a consent form to confirm that you understand and agree to the conditions, prior to the commencement of the Change Labs, Focus Group sessions and interviews. Please note that you have the right to withdraw at any given time during the study.

Thank you for your time and I hope that you will respond favourably to our request.

Yours sincerely,

Student's name: Mzukisi Kuse

Supervisor name: Professor Heila Lotz-Sisitka

Rhodes University, Research Office, Ethics
Ethics Coordinator: ethics-committee@ru.ac.za
t: +27 (0) 46 603 7727 f: +27 (0) 86 616 7707
Room 220, Main Admin Building, Drostyd Road, Grahamstown, 6139

Appendix C: VCF Template

Name	
Date	
Organization	
Typical cycles:	Your story:
1. Activity: Describe a meaningful activity you participated in and your experience of it (e.g., a conversation, a working session, a project, etc.)	
2. Output: Describe a specific resource this activity produced for you (e.g., an idea or a document) and why you thought it might be useful.	
3. Application: Tell how you used this resource in your practice and what it enabled that would not have happened otherwise.	
4. Outcome: a. Personal: Explain how it affected your success (e.g., being a better professional, job satisfaction.) b. Organizational: Has your participation contributed to the success of your organization (e.g., metrics they use)	
5. New definition of success: Sometimes, such a story changes your understanding of what success is. If it happened this time, then include this here.	

[Open Rubric](#)

Appendix D: Water Security and Expansive Learning Workshop Certificate



Certificate of Recognition

This is to certify that

NAME
SURNAME

Institution line 1
Institution line 2

has gained this certificate in
recognition of partnership
for the

**Catchment-based Indaba
on Ecological Infrastructure**
of the South African National Biodiversity Institute

November 2021

Ms Deshni Pillay
Chief Director, Biodiversity Information
and Policy Advice, SANBI

Mahlodi Tau
Living Catchments Project Lead



Open Rubric

Appendix E: Group 1 Change Lab Presentation



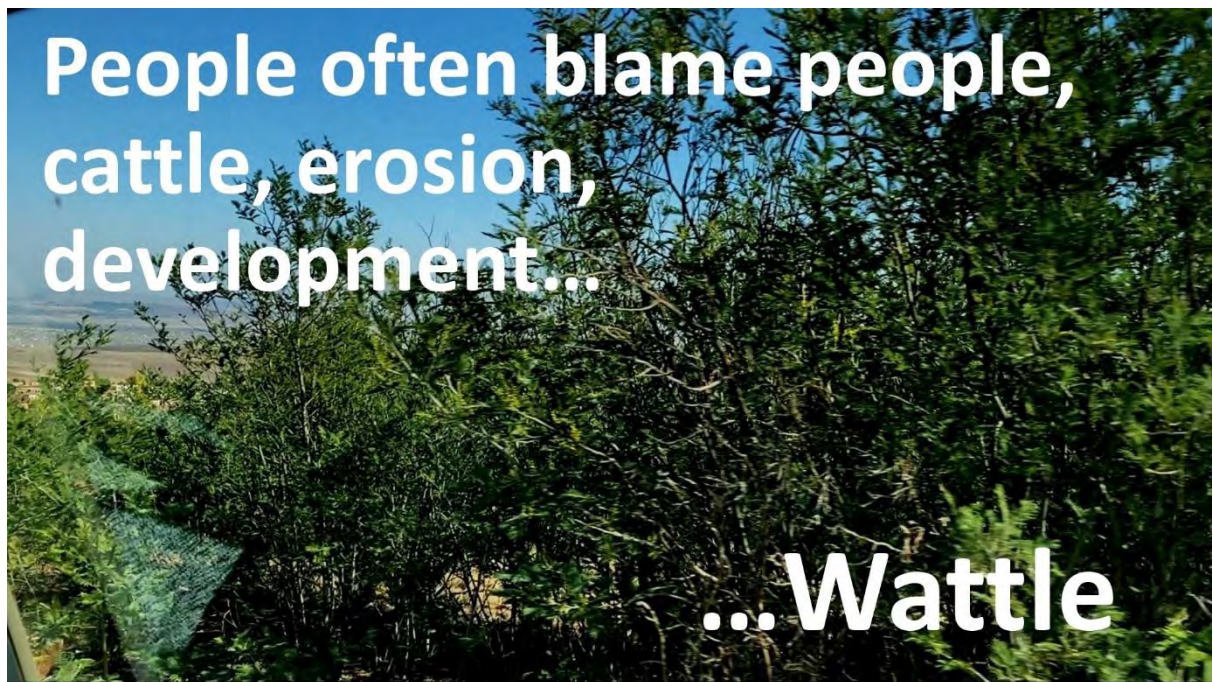
WORK APPROACH

1. The challenge at hand
2. Understanding the situation, (Use of the Chat triangle)
3. The tool developed
4. Tool Uptake and response monitoring





**These areas
are under threat from
many drivers of degradation**



**People often blame people,
cattle, erosion,
development...**

...Wattle



How are we tackling this issue?

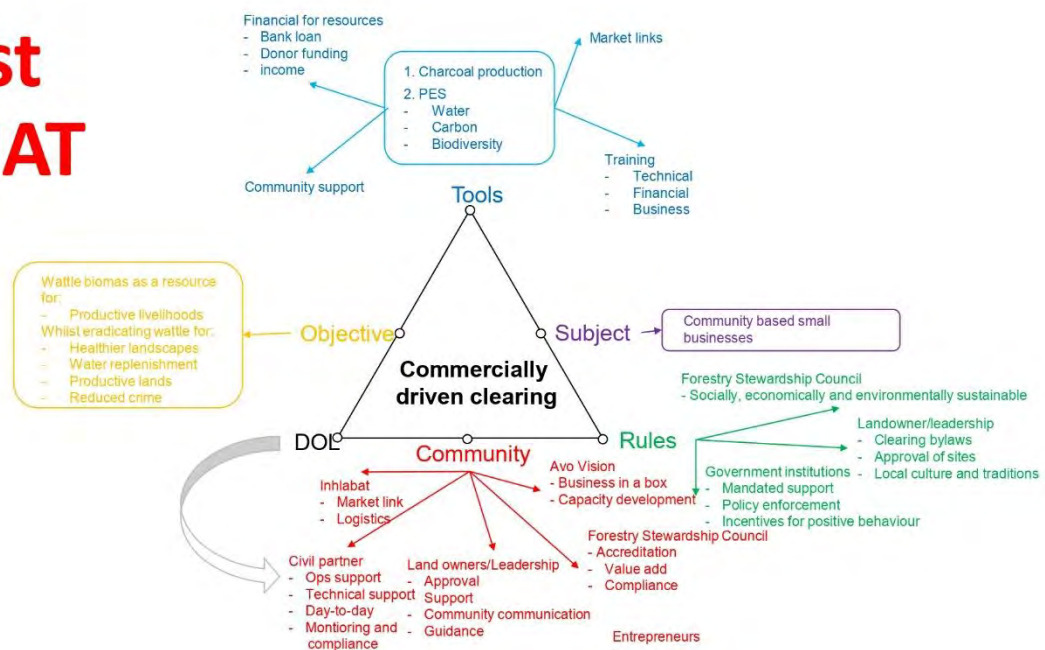
- Government funded clean

- Government funded clearing
- Corporate funding
- Commercially driven clearing



All approaches have their pros and cons – a blended approach is best

Lest CHAT



Where do we intervene?

- Integrate clearing into local management plans
- Stimulate local green economies

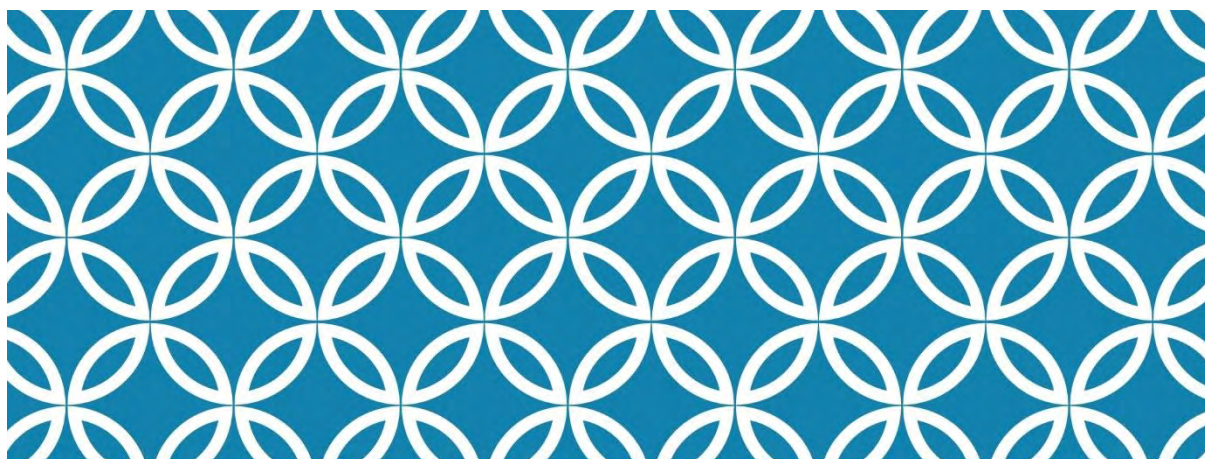
The diagram overlaid on the right side of the image is titled 'Lest CHAT' in red. It features a central triangle with vertices labeled 'Incentives', 'Subject', and 'DOE'. The triangle is labeled 'Commercially driven clearing' and 'Community'. Below the triangle, there are several boxes and lists of text, including 'Rules', 'Community', 'Incentives', 'DOE', and 'Rules'. The diagram is complex and appears to be a conceptual model for land clearing management.

- # Where do we intervene?
- Integrate clearing into local management plans
 - Stimulate local green economies
-
- The diagram overlaid on the right side of the image is titled 'Lest CHAT' in red. It features a central triangle with vertices labeled 'Incentives', 'Subject', and 'DOE'. The triangle is labeled 'Commercially driven clearing' and 'Community'. Below the triangle, there are several boxes and lists of text, including 'Incentives', 'Subject', 'Rules', 'DOE', and 'Community'. The diagram is complex and appears to be a conceptual model for land clearing management.



Thank you

Appendix F: Group 2 Change Lab Presentation



GROUP 2 TOOL: ENHANCING WATER SECURITY COLLABORATIONS BETWEEN COMMUNITIES AND MUNICIPALITIES

Group 2

WORK APPROACH

1. The challenge at hand
2. Understanding the situation, (Use of the Chat triangle)
3. The tool developed
4. Tool Uptake and response monitoring



1. THE CHALLENGE AT HAND

Water security is a serious concern for a growing number of communities within our area.

Often times the task of ensuring that communities have a safe and adequate supply of water is left to our municipalities alone.

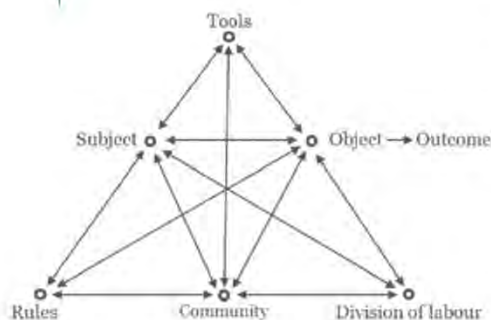
This is not entirely sustainable given our ever growing communities and ever more diverse water supply opportunities and needs.

The bottom line:

Communities need to play a larger supporting role in ensuring the water security needs are addressed.



2. UNDERSTANDING THE SITUATION (CHAT TRIANGLE)



The Group used the CHAT triangle as introduced to us to help understand the parameters within which we would have to operate.

Tools – Range of methods available for addressing a need. (doing the work). UCP platforms, Water security PSC meetings, Survey Data, Video and photograph data, Water PSC MOU

Subject – Who we are trying to affect. Water manager area office, the expectation is that the water area managers office will recognise and offer greater support to local projects.

Object – Intended outcome, Greater uptake, endorsement and support of local projects recognised as significant

Rules – What we have to abide by. Guided, simple and should not significantly increase the workload of affected parties. Rules of engagement with how and when we operate among ourselves.

Community, Division of labour - Members of the general public, youth groups, village, elders, NGOs, Community forums, municipal workers, water technicians,

3. THE TOOL

Traditional Authority				
Date Submitted				
Village and ward Number,				
Infrastructure Type	Municipal	Communal (Community Owned)	Private	Not Sure
Infrastructure Significance; i.e. How does the community rely on this particular infrastructure?				
Observation Made				
Observer details				
Photographs captured? Attached?				
Reported to Municipal Technician?	Yes	No		
Technician name and contact details?				
Report Outcome;				
Was the issue addressed? Yes?				
Proposed intervention, if not addressed				
Proposed persons or group to assist Name, contact details, credentials....				
Support needed?				
Resolution				

4. TOOL IMPLEMENTATION RESPONSE AND MONITORING

Continue refining the tool and so that it better speaks to the challenges on hand.

Introduction of the tool at the Water Security PSC meeting

Implementation and review

Further refinement and implementation

Thank you

