The Tsitsa Approach to Sustainable Land Management & Rehabilitation

TSITSA PROJECT

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DISCLAIMER

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The contents of this report do not necessarily reflect the view and policies of the DFFE, Chief Directorate: NRM, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

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Acronyms

CC	Climate change
CLD	Causal loop diagram
CoP	Community of Practice
CMF	Catchment management forum
DHSWS	Department of Human Settlements, Water and Sanitation (previously DWS)
IAP	Invasive Alien Plant species
KM	Knowledge Management
NRF	National Research Foundation (of South Africa)
PMERL	Participatory Monitoring Evaluation Reflection and Learning
RESILIM-O	Resilience in the Limpopo-Olifants [USAID-funded programme]
RIS	Research Investment Strategy (version 1 and version 2)
SAM	Strategic Adaptive Management
SLM	Sustainable land management
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Intro to ecosystem services and the Tsitsa Project

Rural communities are heavily reliant on ecosystem services, especially those who are impoverished. Such people are often not formally educated and are isolated from formal markets, making them highly vulnerable to shocks and stresses, especially with the looming threats of climatic changes and associated natural disaster risk, such as higher temperatures and more variable rainfall.

The quality of the ecosystem services that are provided by any given landscape is directly related to the quality or condition of that landscape. This document describes the novel approach adopted by the partners in the Tsitsa Project towards sustainable land management and rehabilitation that aims to maintain ecosystem services delivery and avoid degradation, in support of rural, land-based livelihoods in the Tsitsa River catchment. The document captures the highlights of an integrated approach to long-term sustainable land management **with and for** local land users, key insights from the engagement and development process and recommendations to readers such as: government at various levels, NPO and NGO's; private enterprise; and national and international funders.

Document structure

This document describes, in Section 1, some of the Tsitsa Project background, its objectives, and operational principles that enable integrated work towards its aim. Section 2 focusses on its development since 2014, key partners and key conceptual, theoretical, and implementation frameworks and the ways in which we develop the various focus areas to realise the project aim. Section 3 provides a systemic view of drivers, pressures, stressors and condition of the SES and leverage points where effective longer term changes can be made. The way in which the project actually did 'enhanced integrated rehabilitation' is presented in Section 4. Section 5 presents key project insights and supporting evidence around enhanced integrated rehabilitation, whereas Section 6 provides various recommendations under three main pathways and enablers that will support enhanced integrated rehabilitation.

Enhanced Integrated Rehabilitation

The Tsitsa Project promotes the development of capability for a wide range of local stakeholders and residents to be able to meaningfully participate in planning and decision-making processes pertaining to land use, rehabilitation and livelihood activities in the Tsitsa River catchment. Critical capabilities have been identified as stepping stones or pathways for the achievement and sustainability of catchment management/land use initiatives and practices, including adaptation to climate risks and vulnerabilities. We term this approach "Enhanced integrated rehabilitation". Enhanced integrated rehabilitation (EIR) is about integrating rehabilitation and livelihoods for sustainable land management and climate change adaptation using an approach based on participatory principles. It is about being able to be flexible in terms of activities, timelines and targets; it is about Government funders, implementers, researchers and importantly, catchment residents, working together to achieve an agreed outcome; and it is about commitment by all to long-term investment.

Developing and supporting enhanced rehabilitation

The Tsitsa Project approach consists of five core components that are integrated in order to support sustainable land management, namely: avoided degradation, sustainable land management and rehabilitation; strengthening participatory governance including integrated village-level planning; green economy, rural livelihoods and climate change innovations; local monitoring, evaluation, learning and

adapting; capacity and capability development. These activities strive to develop stakeholder capacity so governance is more participatory and local land users are involved in decision making, monitoring, learning and changed behaviour in favour of the sustainability of the social ecological system. The methods used in these components are summarised in the document with reference to further supporting material that was developed by the project.

Insights

The Communities of Practice (CoP) within the Tsitsa Project played a key role in project development and the insights from their work were captured as they could apply to new and existing projects in similar settings. Each of the insights are substantiated by an example from the local landscape. These insights were presented according to each CoP, but the insights relate to project governance, processes around capacity development, capability development, integrating green livelihoods with SLM, participatory governance, monitoring, reflection and learning and integrated planning around sustainable land management.

Recommendations under pathways and enablers

Based on the insights we have developed a list of recommendations for readers and these were grouped under pathways and enabling factors. We proposed three pathways, which can guide people working on landscape rehabilitation towards sustainable land management, but we also identify some important *enablers/enabling factors* which, from our experience, enable smoother movement along the pathways, and have also made it easier for us to develop and move along these pathways. These are often behind-the-scenes activities or explicit culture shifts that are needed or likely to emerge to support the work suggested in the pathways. Below we outline the three pathways and the three enabling factors:

Pathway 1: The 'research praxis pathway': Enable engaged research-praxis collaborative partnerships;

Pathway 2: Supporting green livelihoods and catalysing green innovations pathway: Catalyse green innovation for sustainable development and the realisation of residents' aspirations;

Pathway 3: Build capacity to enable local agency and capabilities;

Enabler 1: Working progressively towards an enabling institutional and operational context;

Enabler 2: An adaptive, reflexive, learning orientation to (a) stakeholder engagement; (b) rehabilitation planning and management; and (c) monitoring and evaluation;

Enabler 3: A working culture of respect, humility, openness and inclusivity.

1. INTRODUCTION

Rural communities are heavily reliant on natural resources, especially those who are impoverished. Such people are often not formally educated and are isolated from formal markets, making them highly vulnerable to shocks and stresses, especially with the looming threats of climatic changes and associated natural disaster risk, such as higher temperatures and more variable rainfall.

Benefits derived from the landscape are termed ecosystem services. The quality of the ecosystem services that are provided by any given landscape is directly related to the quality or condition of that landscape. These services are classified into four categories: *provisioning services* (e.g. biomass), *regulating services* (e.g. water purification), *cultural services* (e.g. religious activities) and *supporting services* (e.g. soil formation). Maintaining ecosystem services delivery is crucial for the longer-term sustainability of the social-ecological system.

In support of maintaining ecological infrastructure and developing and supporting enhanced integrated rehabilitation work (see box below) the **Tsitsa Project vision** is to "*Support sustainable livelihoods for local people through integrated landscape management that strives for resilient social-ecological systems and which fosters equity in access to ecosystem services*".

Enhanced integrated rehabilitation (EIR) is about integrating rehabilitation and livelihoods for sustainable land management and climate change adaptation using an approach based on participatory principles. It is about being able to be flexible in terms of activities, timelines and targets; it is about Government funders, implementers, researchers and, crucially, catchment resident working together to achieve an agreed outcome; and it is about commitment by all to long-term investment.

The guiding **principles of the Tsitsa Project** can be summarised as:

1. Understand the Tsitsa River catchment as on-going inter-dependent interactions between humans and the environment.
2. Be open to different forms of knowledge and bring these together to build a shared understanding.
3. Work together, take a questioning approach and be willing to adapt in response to change.
4. Learn and build skills together to respond to the unknown future.
5. Manage and make decisions in a way that involves all levels and centres of governance.
6. Involve all relevant stakeholders so that costs and benefits are shared fairly.
7. Use and value scientific knowledge appropriately.

The **objectives of the Tsitsa Project** are to:

1. Act according to the Tsitsa Project principles
2. Avoid and counteract the degradation of natural resources
3. Diversify and support local livelihoods
4. Strengthen governance at all levels (*see text box below defining* **government** *in relation to* **governance**)
5. Enable participation and action of the wider community
6. Support adaptive decisions through observations.

Distinguishing between 'government' and 'governance'

Government is the formal system of administration, rules, structures and organisations

Governance is the political and institutional relationships including those of power and knowledge

The Tsitsa Project promotes the development of capability for a wide range of local stakeholders and residents to be able to meaningfully participate in planning and decision-making processes pertaining to land use, rehabilitation and livelihood activities in the Tsitsa Catchment. Critical capabilities have been identified as stepping stones or pathways for the achievement and sustainability of catchment management/land use initiatives and practices, including adaptation to climate risks and vulnerabilities.

Capability development and capacity building processes focus on enhancing stakeholders' knowledge and skills in order to achieve a goal while allowing for those whose development is at stake to express their views and aspirations. The **design** of enhanced rehabilitation activities and the **choice** of investments should ideally be made with project implementers, managers and partners working with local residents. A capability development approach promotes equity and empowerment with the objective of balancing the improvement of the catchment's natural resources, on the one hand, with the advancement of the people dependent on the ecosystems and the services they provide, on the other. The Tsitsa Approach envisions that capability development will be achieved through implementing the five interrelated components of the approach, namely:

1. Avoided degradation, sustainable land management and rehabilitation
2. Strengthening participatory governance and integrated village-level planning
3. Green economy, rural livelihoods and climate change innovations
4. Local monitoring, evaluation, learning and adapting
5. Capacity and capability development (see Table 4).

The Tsitsa Approach is described across six sections of this document, following the structure outlined in **Figure 1**.

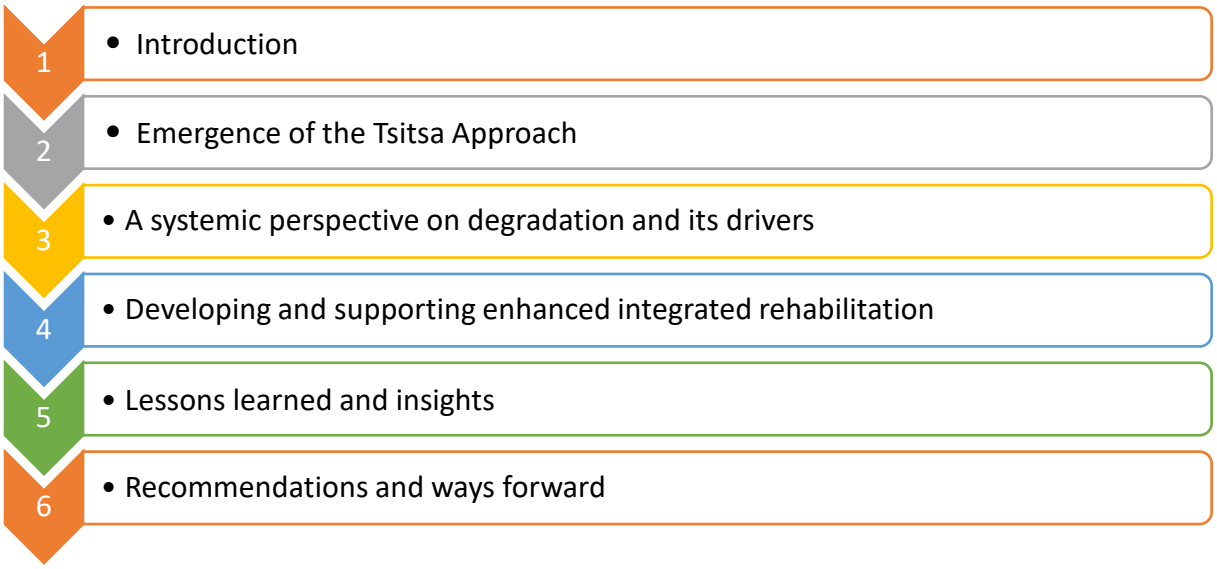


Figure 1: Document structure.

2. THE EMERGENCE OF THE TSITSA APPROACH

The Tsitsa Approach was developed out of applied research in the Tsitsa River Catchment in the Eastern Cape of South Africa. The development of the Tstisa Approach is best understood as a culmination of inputs from a diverse stakeholder group and a real threat of a water resource development project that may have been short lived. The various inputs, events, factors, theories, partners and organisations are summarised in Figure 2 then expanded upon in the next sub-sections, as follows:

- **Section 2.1** introduces the Tsitsa River Catchment and its stakeholders with a brief contextual profile;
- **Section 2.2** outlines the enabling funding and support from the Department of Environment, Forestry and Fisheries (DEFF) and other key partners;
- **Section 2.3** provides a brief history of the Tsitsa Project, locating the development of the Tsitsa Approach within this history, with reference to a timeline of important events and occurrences and a diagram illustrating the project's structure.
- **Section 2.4** summarises the foundational and constituent research that underpinned and informed the Tsitsa Project more generally, and the Tsitsa Approach more specifically;
- **Section 2.5** briefly introduces the contributing projects and organisations and the contributing ideas, theories and frameworks;
- **Section 2.6** gives an overview of the theoretical/conceptual frameworks including the project's theory of change, implementation framework, and framework for governance capability development.

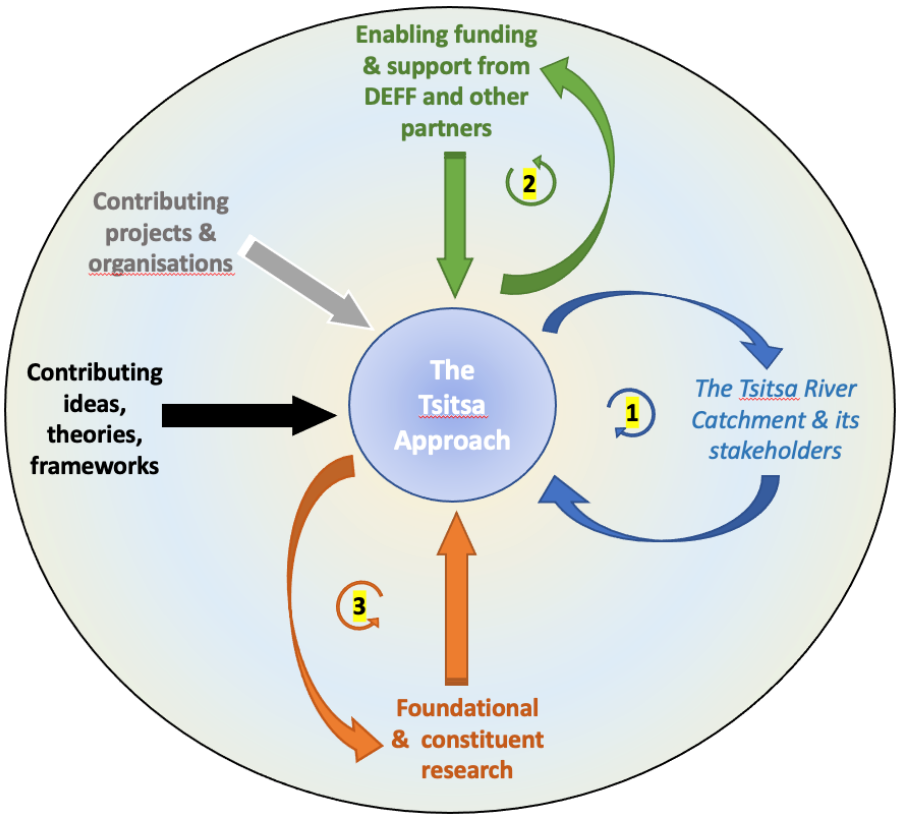


Figure 2: What's behind the Tsitsa Approach? (a) The Department of Environment, Forestry and Fisheries (DEFF) as the key enabler; (b) foundational and constituent research in the Tsitsa River catchment; (c) a range of contributing projects and organisations; and (d) a host of contributing ideas, theories and frameworks. The four components contributed to the development of the Tsitsa Approach, which was piloted in the Tsitsa River Catchment in participation with a range of catchment residents and stakeholders. Feedback 1 captures that the piloting was done in iterations underpinned by reflexive learning-by-doing and co-learning. Feedback 2 captures the central rationale behind DEFF's funding of, and participation in, the Tsitsa Project, namely that the Tsitsa Approach was envisioned to provide policy impact within DEFF. Feedback 3 captures the way that the approach was informed both by foundational research (undertaken prior to the project starting) and the ongoing research of the project itself, and that the ongoing research was informed by the Tsitsa Approach as it has developed.

2.1 The Tsitsa River Catchment and its stakeholders

The Tsitsa River forms part of the upper reaches of the Mzimvubu River (see Figure 3), the only major river in South Africa that is both unregulated and unimpounded. The Mzimvubu Water Project (MWP) was proposed by the then Department of Water and Sanitation (DWS), (now Department of Human Settlements, Water and Sanitation [DHSWS]) to alleviate poverty in the area through job creation, water supply and hydroelectric power (DWS, 2014). The Tsitsa Project was initiated in response to concerns about the feasibility of the MWP relating to erosion, land degradation (Le Roux et al, 2015) (Powell et al., 2018) and financial feasibility (DWS, 2014).

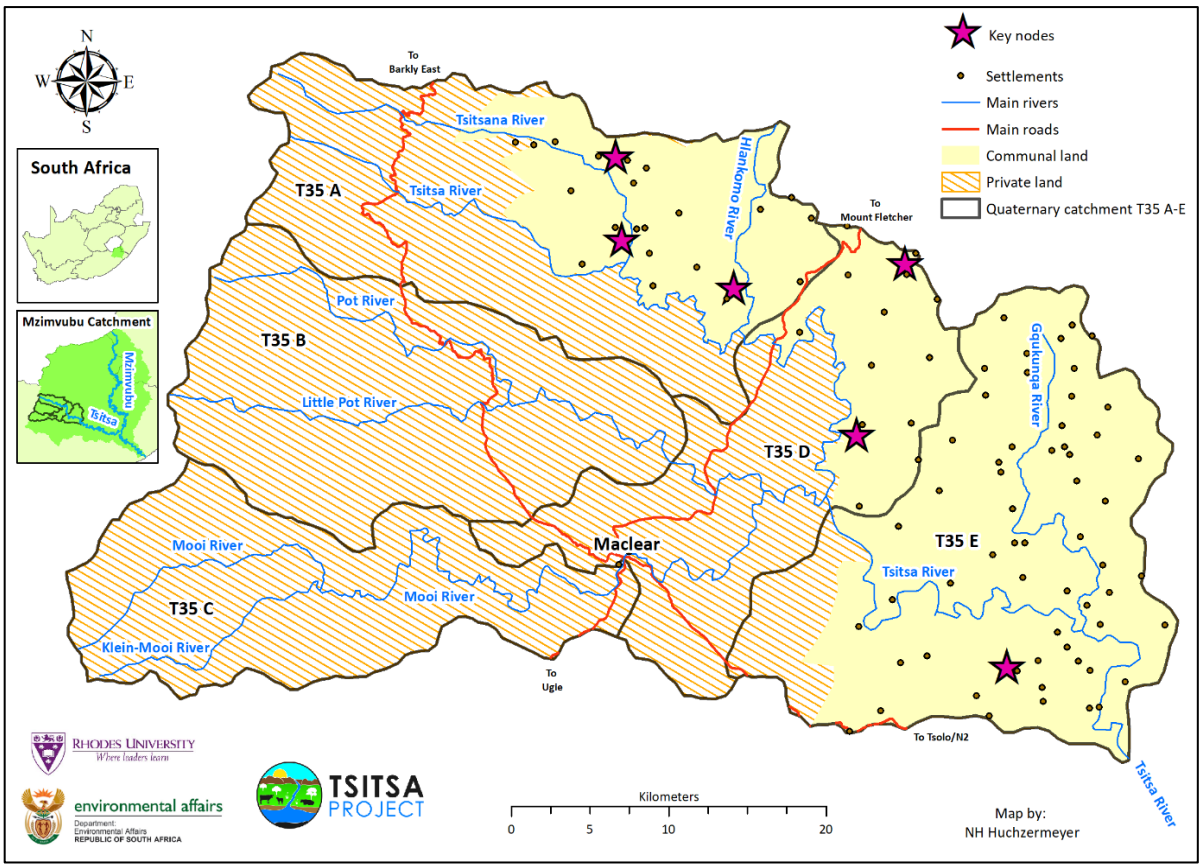


Figure 3: Map of the Tsitsa Project area in relation to the Umzimvubu River catchment. Quaternary catchments are hydrological delineations of sub-catchments; and key nodes refer to focal areas for the Tsitsa Project's engaged research and rehabilitation work. Note that 'communal land' refers to areas that are under customary law (i.e. are managed by traditional authorities. Map by N.H. Huchzermeyer.

The land degradation in the catchment is attributed to the presence of highly erodible mudstones, high rainfall variability, increased hillslope-river channel connectivity and poor landscape management, resulting in sheet and gully erosion (Le Roux et al, 2015) (Huchzermeyer, et al., 2019). The highly variable rainfall pattern and erosivity (i.e. climate) drives the highly variable and flashy hydrology which in turn drives the highly variable soil erosion/sediment transport/deposition which occurs in the catchment. Increased connectivity in the form of cattle tracks and dirt roads is also a driver of degradation. Large parts of the catchment fall in the grassland biome. Soils are variable but in many places fine grained and with a highly erodible duplex structure. The topography in the upper parts of the catchment is steep, and whilst prolonged droughts are common, summer rainfall can be very intense and therefore highly erosive. Large portions of flatter ground in the catchment have been ploughed in the past but are now unused. Springs and wetlands are important for winter grazing and stock watering and are still present despite the widespread degradation of the soils and natural vegetation. Invasive vegetation – at times in dense, extensive stands – can be found along drainage lines. The majority of Tsitsa Project's work has been focused on communal land in the Tsitsa River catchment, where low levels of formal education, high unemployment and low household incomes result in dependency on government grants and remittances. A large proportion of the employed/employable population lives outside of the Tsitsa River catchment in larger urban centres, leaving youth and pensioners to remain in the landscape (Hodgson, 2017). Crime and abuse of (people, women, children, alcohol, other substances) are common. Section 3 provides a systemic perspective on the drivers of degradation in a way that shows the connections between the factors introduced in this section.

2.2 Key development partners

The key partners in the development of the Tsitsa Approach were:

Local land custodians:

- Community members allowed research to take place in their landscape, collaborated with researchers and implementers in the implementation of rehabilitation activities, monitoring and were active in capacity development programmes.
- Traditional leadership that allows and supports the rehabilitation work and associated activities.

Department of Environment, Forestry and Fisheries – Natural Resource Management (NRM) division. DEFF was (and is) a key partner in this learning approach and not just the funder; working with the project and as a part of the project in the piloting (as per Figure 2).

Rhodes University has driven the Tsitsa Project with partner institutions and places a strong focus on applied research to improve holistic natural resource management. Activities in the catchment include: coordinating activities between various actors; running community training workshops on topics such as governance, climate change, livelihoods, monitoring, rehabilitation; running planning workshops in villages; monitoring catchment level processes; doing research.

LIMA Rural Development Foundation is a non-governmental and non-profit organisation that has partnered with Rhodes University and the Tsitsa team to facilitate effective stakeholder engagement and participation with catchment residents. LIMA's objective is to enhance stakeholder capacity to improve sustainable rehabilitation and management in the Tsitsa catchment. LIMA's activities in the catchment include:

- facilitating local level stakeholder engagement and integrated planning;
- supporting local livelihoods by promoting local income generating initiatives and sustainable SMME development;
- enhancing rehabilitation activities through related livelihood activities; and
- supporting local institutions.

2.3 A brief history of the development of the Tsitsa Project

At the start of the Tsitsa Project there was a strong focus on stopping sediment from reaching a proposed downstream dam. At this stage the focus was on using grey infrastructure to reduce the sediment yield in the catchment. A tension soon developed between project members that had a more holistic view of landscape management and those with an engineering view who advocated for constructing systems to trap sediment and reinstate certain baselevels among wetlands. This tension was only resolved years later with the help of a Comparative Risk Assessment[1]. An overall outcome was the recognition that a mixture of interventions were needed to shift to a longer term solution involving local land users, local governance, alternative livelihood development, capacity development and monitoring, and learning and adaptation for local conditions. Green

[1] Comparative Risk Assessment is a technique used by risk assessors to compare very disparate scenarios in order to prioritising objectives in a nuanced way that effectively supports decision-making. This process is applied towards the end of the adaptive planning process (see Kingsford and Biggs 2012).

solutions and 'prevention is better than cure' also became widely accepted amongst the Tsitsa Project group. This aligned well with international strategies such as the Land Degradation Neutrality (LDN) 'avoid, reduce and reverse' hierarchy, which promotes avoiding degradation over costly rehabilitation work. Various land mapping, soil modelling and community natural resource mapping, alongside socio-economic and governance-focused applied research, allowed for more integrated land management work to take place (see Table 1 for a summary of this research).

The timeline in Figure 4 shows the sequence of events and occurrences that led to the development of the Tsitsa Approach as part of the broader work of the Tsitsa Project. The organisational structure of the Tsitsa Project is then described (Figure 5).

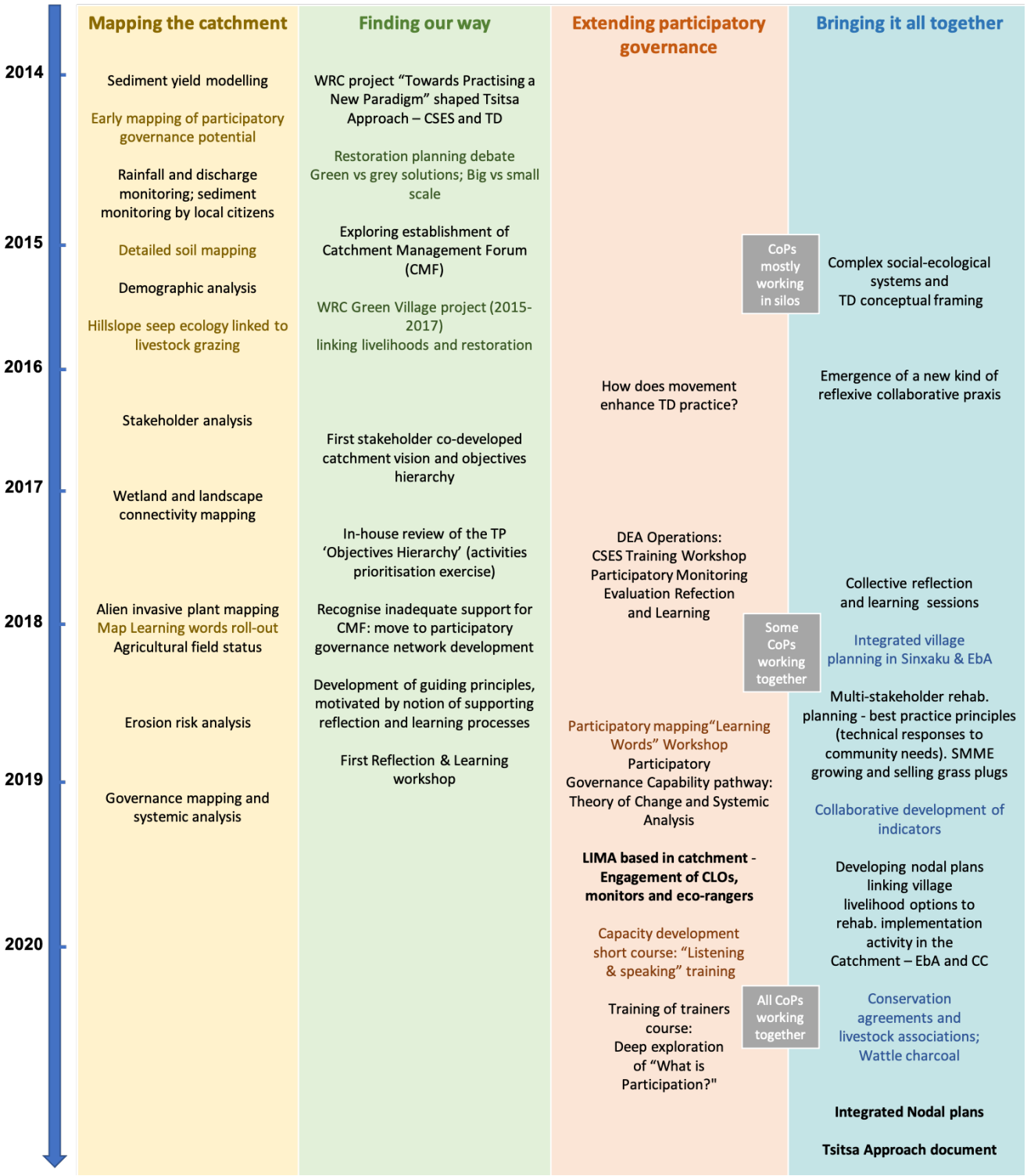


Figure 4: A timeline showing the start date and sequence of various work packages and projects that enabled the Tsitsa Project approach.

To achieve the objectives of the Tsitsa Project a comprehensive governance structure was put in place to ensure cooperation and input across a wide range of stakeholders. Figure 5 indicates the various management teams and communities of practise (CoP).

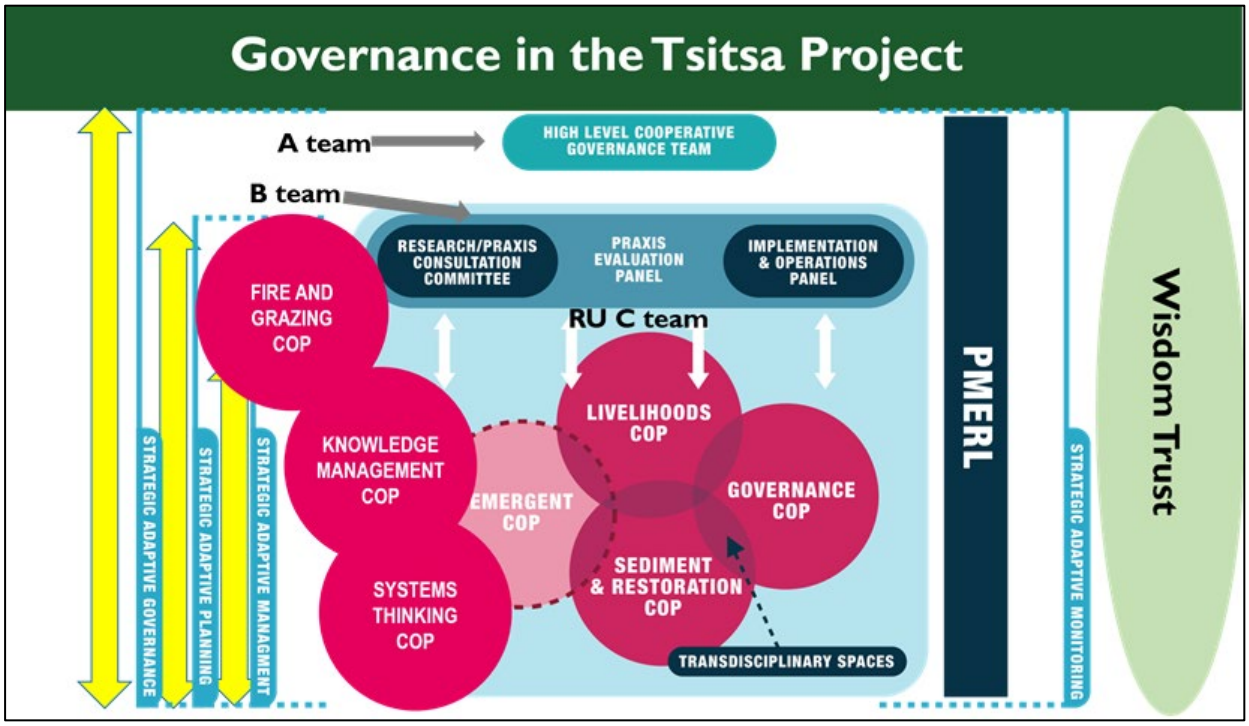


Figure 5: The governance structure of the Tsitsa Project (Botha, et al. 2017).

2.4 Foundational and constituent research

As noted earlier, the Tsitsa Project was informed both by foundational research in the Tsitsa River Catchment and by applied and action research undertaken as part of the project itself (referred to here as 'constituent research'). Table 1 summarises this research, with a particular focus on research that contributed to the Tsitsa Approach.

Table 1: Summary of foundational and constituent research that supported the development of the Tsitsa Approach.

Component	Type of research	Description
Foundational and constituent research *(see Table 1 in Appendix 1 for breakdown of this research)*	Biophysical mapping, modelling and monitoring	Soil loss and sediment modelling Alien plant listing and mapping; Wetland mapping and classification; Mapping agricultural fields; Understanding landscape connectivity; Sediment monitoring; Soil mapping; Mapping of key vegetation resources
	Social / demographic / stakeholder-related	Demographic analysis; Situation Analysis / stakeholder analysis; Participatory mapping, life histories, livelihood trajectories

Component	Type of research	Description
	Participatory Governance development	Still to be completed, but includes Research on Catchment Management Forum establishment Epistemic justice Leverage points for increasing participatory natural resource management
	Green Village Project	Foundational research re. community participation, and integrated planning (led by RU Geography Dept, funded through the WRC)
	Other	Systems modelling of Ntabelanga dam

2.5 Contributing projects and ideas

The Tsitsa Project did not develop in a vacuum. It was the product of a multitude of individuals and ideas. Table 2 summarises the main contributing projects, organisations, ideas, theories and frameworks.

Table 2: Summary of the contributing projects, organisations, ideas, theories and frameworks that informed the Tsitsa Approach.

Component	Organisation, project, or theory/framework	Description
Contributing projects and organisations	Thicket project	Led by the Rhodes Restoration Research Group (RRRG), funded primarily by DEFF
	Towards Practicing a New Paradigm (TPNP)	Led by the Institute for Water Research (IWR) at Rhodes, funded primarily by the Water Research Commission (WRC)
	RESILIM-O	Led by Association for Water and Rural Development (AWARD) and partners, funded by United States Agency for International Development (USAID)
	LIMA Rural Development Foundation	Formal institution responsible for catchment based praxis activities
	Umzimvubu Catchment Partnership Project	Piloting SLM ideas in a similar catchment context
Contributing ideas, theories, and frameworks	Social-Ecological Systems (SES)	(Audouin, et al. 2013, Folke, et al. 2016)
	Systemic praxis	Including systems thinking, systems modelling, and systems analysis (Forrester 1994, Arnold and Wade 2015, Ray and E 2020)
	Strategic Adaptive Management (SAM)	(Ison 2016, Kingsford and Biggs 2012, Roux and Foxcroft 2011)
	Integrated Water Resource Management (IWRM)	(Palmer, et al. 2018, Van Koppen and Schreiner, 2014)
	Transdisciplinarity	(Lang, et al. 2012, Wolff, et al. 2019)
	Capabilities approach to development	(Bockstael and Berkes 2017, Nussbaum 2003, Sen 2002)

2.6 Theoretical/conceptual frameworks underpinning the Tsitsa Approach

Important frameworks are summarised in this section as follows:

- Figure 6 (theory of change),
- Figure 7 (implementation framework), and
- Figure 8 (the governance capability pathway).

Theory of Change

During the first three years of the Tsitsa Project a story of what may be wrong in the Tsitsa River catchment and what could be done about these aspects emerged. A Theory of Change, developed in 2017 (Figure 6), shows the present negative outcome of land governance, some of the barriers to change, possible change domains and associated interventions and the resultant positive SES outcomes. This theory of change was used an initial starting point for the Tsitsa Project and continues to evolve as deeper reflection and understanding of changes taking place within the Tsitsa River catchment emerge.

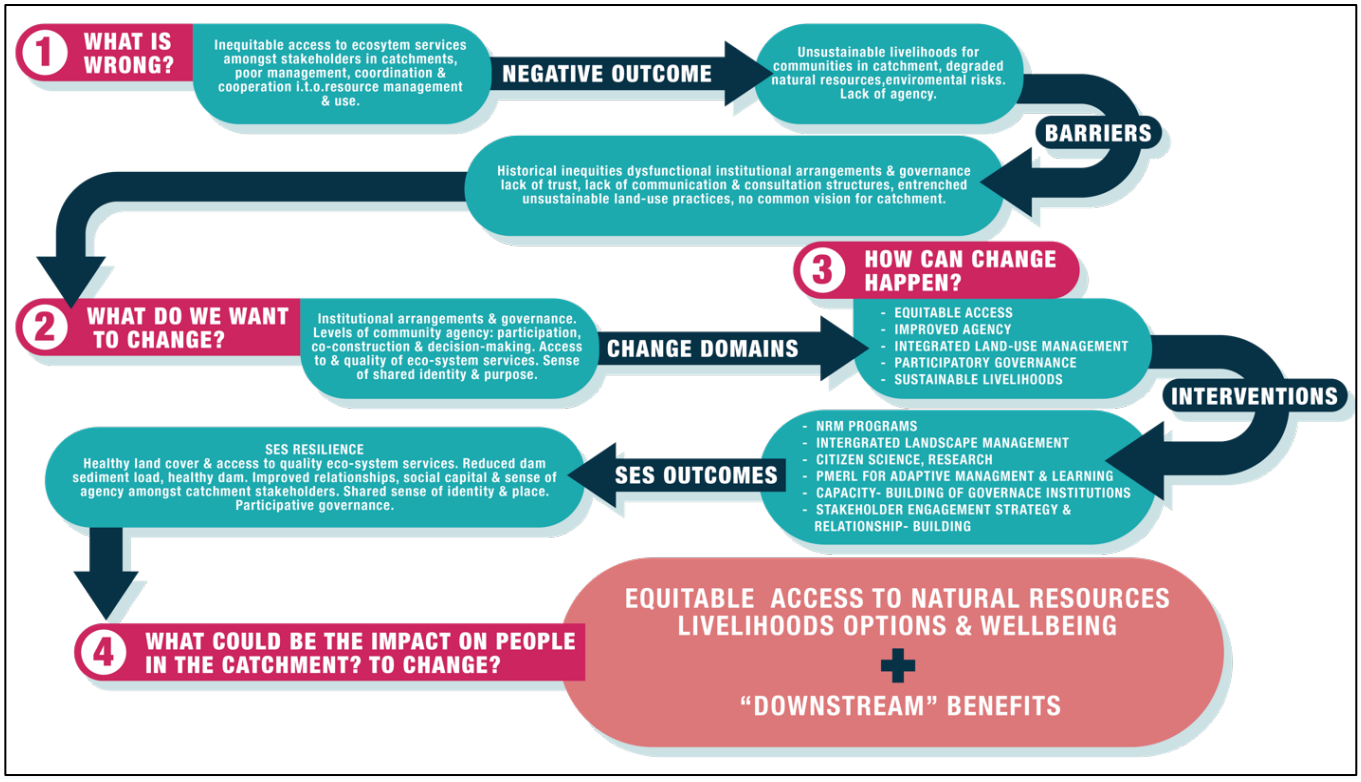


Figure 6: Tsitsa Project Theory of Change (Botha, et al. 2017).

Implementation framework

The pathway or pathways of achieving the endpoint of the theory of change was strongly influenced by a SES view and adaptive management. In these, the land users are central and should be part of the entire process to ensure that the sustainable land management has a long-term view with real ongoing benefits to land users. The implementation framework is presented in Figure 7 which shows the development from short-term, reactive land management through learning and adaptation to longer-term proactive land management.

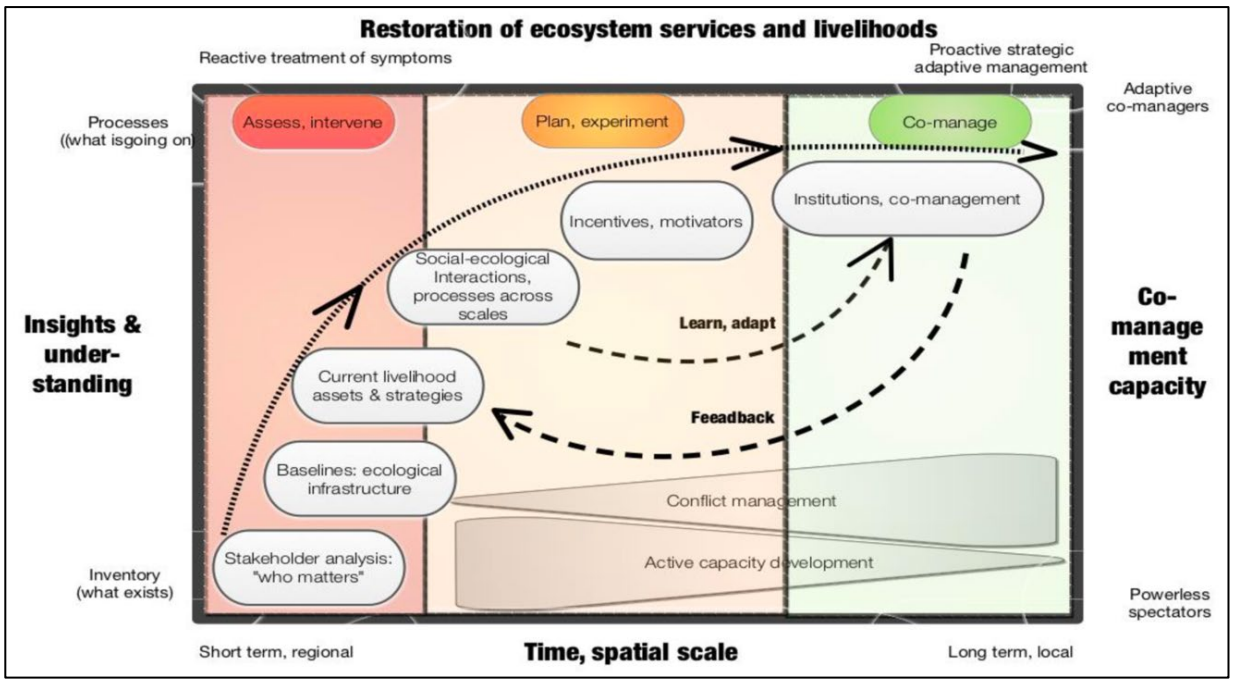


Figure 7: Implementation framework for the Tstisa Project (*note the omission of governance capabilities development;* Fabricius et al. (2016) based on Cowling, et al. (2008)).

Capability pathway

As introduced in Section 1, the Tsitsa Project promotes the development of capability for a wide range of local stakeholders and residents to be able to meaningfully participate in planning and decision-making processes pertaining to land use, rehabilitation and livelihood activities in the Tsitsa Catchment. Critical capabilities have been identified as stepping stones or pathways for the achievement and sustainability of catchment management/land use initiatives and practices, including adaptation to climate risks and vulnerabilities. The five stages of the **Capability Pathway** (Figure 8) are:

- *Co-Knowing*: common understanding of key terminology and concepts related to the process.
- *Co-Listening and co-speaking:* establish speaking and listening relationships.
- *Co-Planning:* meaningfully participate in planning processes.
- *Co-Influencing and co-deciding*: influencing decision-making through active participation, building co-ownership of initiatives and co-development of stakeholders' agency, thus promoting equity and social justice in governance processes.
- *Co-acting and co-adapting:* all of the above leads to the manifestation of capability achievement in changes to landscape management, sustainable livelihoods and local peoples' contributions to decision-making as one engages in the Capability Pathway stages of (co)acting and (co)adapting.

In Figure 8, the capability pathway is shown as the five stages, where each stage is ongoing over time (rather than ending) and where each stage results in increasing governance capability. The stages are also shown to

feed back into one another, with co-listening and co-speaking feeding back into co-knowing, and co-planning feeding back into co-listening and co-speaking, and so on [2].

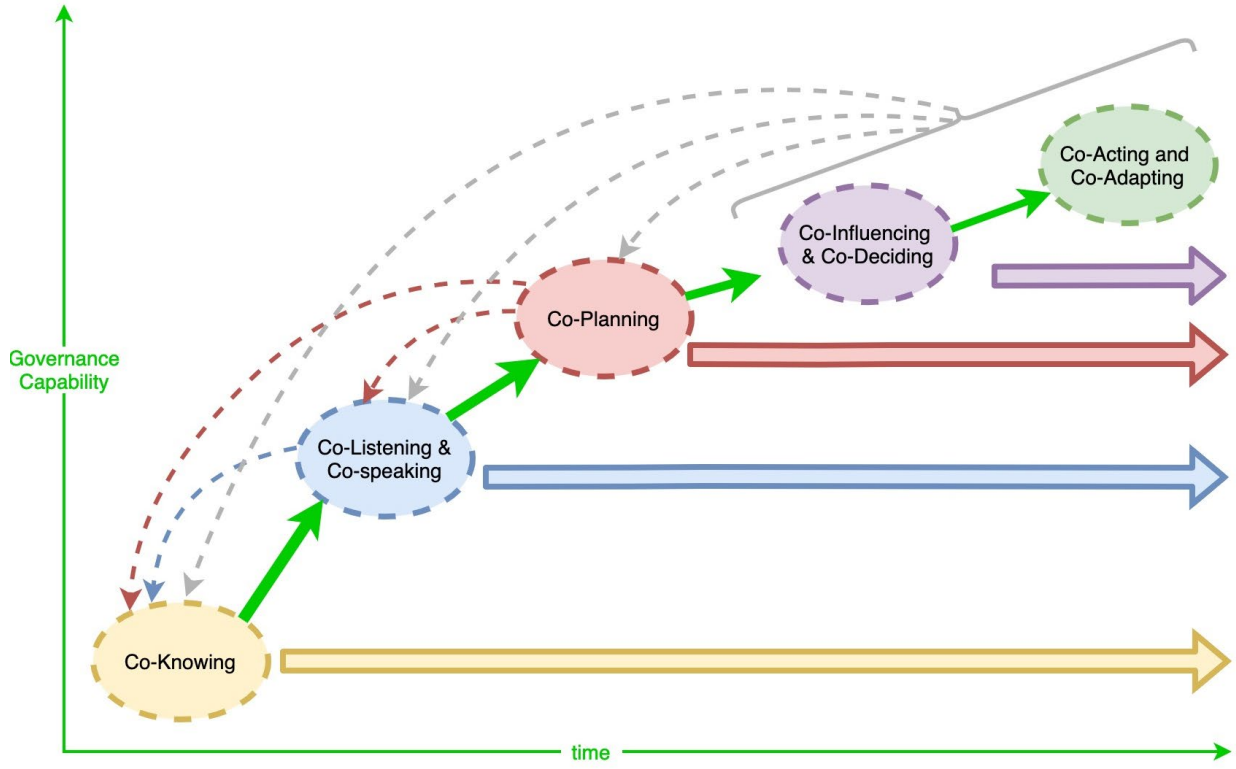


Figure 8: The governance capability pathway.

[2] Paper shortly due to be submitted to the journal *Sustainability Science* by Palmer et al. on a systemic perspective on developing the capability pathway.

3. A SYSTEMIC PERSPECTIVE ON THE FACTORS AFFECTING DEGRADATION AND APPROPRIATE RESPONSES

This section summarises the factors affecting degradation in the Tsitsa River Catchment and the responses conceptualised, initiated and proposed by the Tsitsa Project.

Please note that this section contains material reproduced from the following paper:

Itzkin, A., Scholes, M., Clifford-Holmes, J.K., Rowntree, K., van der Waal, B., & Coetzer, K. A social-ecological systems understanding of drivers of degradation in the Tsitsa River Catchment to inform sustainable land management. *Sustainability*, *13*, 516. https://doi.org/10.3390/su13020516.

3.1 Drivers, Pressures and Stressors causing Land Degradation in the Tsitsa River Catchment

The Tsitsa Project's position on degradation was informed by its systemic framing (as introduced in the earlier two sections). One of the conceptual frameworks used to conceptualise the drivers of land degradation is the 'Drivers, Pressures, Stressors, Conditions and Response' framework. This framework includes four different types of responses, namely **reduction**, **remediation**, **restoration**, and **recovery** (hence the framework acronym, $DPSCR_4$). In order to describe the Tsitsa Approach to land degradation in the Tstisa River Catchment, this section provides a systemic perspective on degradation using the $DPSCR_4$ framework. A summary of the main variables is provided in Table 3.

Table 3: Drivers Pressures Stressors Condition and Responses ($DPSCR_4$) for the Tsitsa River Catchment. Source: reproduced from Itzkin et al. (2021).

Drivers (Fundamental Forces, Natural and Anthropogenic)	**Pressures (Human activities and natural processes that cause stressors)**	**Stressors (Natural and anthropogenic)**	**Condition (Assessed using indicators, related goals)**	**Responses (Societal and ecological: reduction, remediation, restoration and recovery)**
Natural: Physical aspects: Soil type Topography Climate	Unstable governance Disuse of fields (land use changes)	Woody vegetation (largely invasive species)	Goal: Reduce land degradation	Reduction: Environmental Education (Learning words and Tsitsa Project workshops) Market Access initiatives

Drivers (Fundamental Forces, Natural and Anthropogenic)	**Pressures (Human activities and natural processes that cause stressors)**	**Stressors (Natural and anthropogenic)**	**Condition (Assessed using indicators, related goals)**	**Responses (Societal and ecological: reduction, remediation, restoration and recovery)**
Demographic, Social and Economic: Past and present (colonial, apartheid and post-apartheid) policies Poverty and disempowerment Traditional values re. livestock Climate change	Livestock numbers Free or over grazing Out-migration	Low ground cover Soil erosion Gully formation Grassland condition	Improve Sustainable livelihoods Poverty alleviation	Land-use management (rangeland associations) Policies and Regulations Restoration: Remove invasive species Rehabilitation of eroded land Recovery: Rest landscape to enable ecological recovery All R_4s: LDN integrated land use planning

The $DRSCR_4$ from Table 3 are arranged into two systems diagrams. Figure 9 illustrates how the drivers, pressures and stressors are interrelated, and would not have the same outcomes if they were not. Figure 10 highlights the entry points and systemic pathways through which potential responses, encapsulated in the Tsitsa Approach, are hypothesised to impact the system. The variables are categorised in the diagrams below, as noted in the key at the bottom of the figures, as follows:

- the ***light red*** boxes show fundamental drivers of degradation (which could be natural or anthropogenic);
- the ***orange*** ovals show pressures (which are defined here as human activities and processes that cause stressors);
- the *grey* parallelograms show stressors (which could be natural or anthropogenic);
- the ***blue*** rectangles show the condition (in this case the resulting condition of interest is land degradation); and lastly,
- the ***green*** arrows show interventions (which do not fall into the other variable categories).

Figure 9 maps the relationships between some of the key variables driving land degradation in the Tsitsa River catchment, showing why coordinated, integrated and cross-sectoral interventions are required to reduce degradation and improve sustainable livelihoods in the area.

In the lower right side of the diagram is the (undesirable) condition of interest*, land degradation*, which is exacerbated by soil erosion, gully formation and invasive species (the **green '+'** signs on the arrows show relations where a change in the cause creates a change in the effect in the **same direction** – for e.g., the *more* climate change, the *more* soil erosion and gully formation, causing *more* land degradation; the **red '–'** signs on the arrows show inverse relations, where a change in the cause creates a change in the effect in the **opposite direction** – for e.g., as drought *increases*, ground cover *decreases*).

If we shift our focus to the fundamental drivers of degradation in the diagram, we see that *past and present policies* (such as apartheid policies which forced large numbers of indigenous people on to the Transkei, and restricted their access to education) fuelled a reinforcing cycle of *poverty and disempowerment* of the population in the communal lands which made the prospect of *out-migration* appealing. Post-1994 policies (such as freedom of movement) enabled widespread *out-migration* as people moved out of the catchment in search of opportunities.

Out-migration contributes to the *disuse of cultivated fields.* The *physical characteristics* (such as soil type and topography), *climate processes* and existing *land degradation* of the catchment necessitate *farming inputs* for *viability of agriculture;* but *poverty and disempowerment* precludes farmers from acquiring these inputs. These barriers to viable agriculture further drive the *disuse of cultivation fields*. With increasing *disuse of fields,* the number of *invasive species* growing on fields increases, contributing to *land degradation,* which reduces the *viability of agriculture* thus leading to further *disuse of fields* in a reinforcing cycle. *Climate change* increases atmospheric *carbon levels* which increases *invasive plant* growth. *Climate change also* increases the likelihood of both *heavy rainfall (*which directly increases *soil erosion and gully formation that t*he *physical characteristics* predispose the landscape to*)* and *drought (*which decreases *ground cover,* in turn increasing *soil erosion and gully formation)* to cause further *land degradation.*

Past and present policies (driven by broader national issues and the breakdown of local governance systems) have resulted in *unstable governance*. *Poverty and disempowerment* have a negative effect on *participation in NR governance,* reinforcing the *unstable governance,* which enables *uncontrolled and over grazing. Uncontrolled and over grazing* reduces *ground cover*, increasing *soil erosion and gully formation* driving *land degradation. Land degradation* reduces the *livestock carrying capacity* of the area, resulting in increased *livestock deaths* which decreases *stocking numbers, thus* allowing the landscape to recover and reducing *land degradation.*

Increasing *disuse of fields* together with *unstable natural resource management (NRM) governance,* leads to *grazing on abandoned fields,* which is part of a wider issue of *uncontrolled and over grazing,* also driven by *traditional values* that emphasise the desirability of high *livestock numbers.*

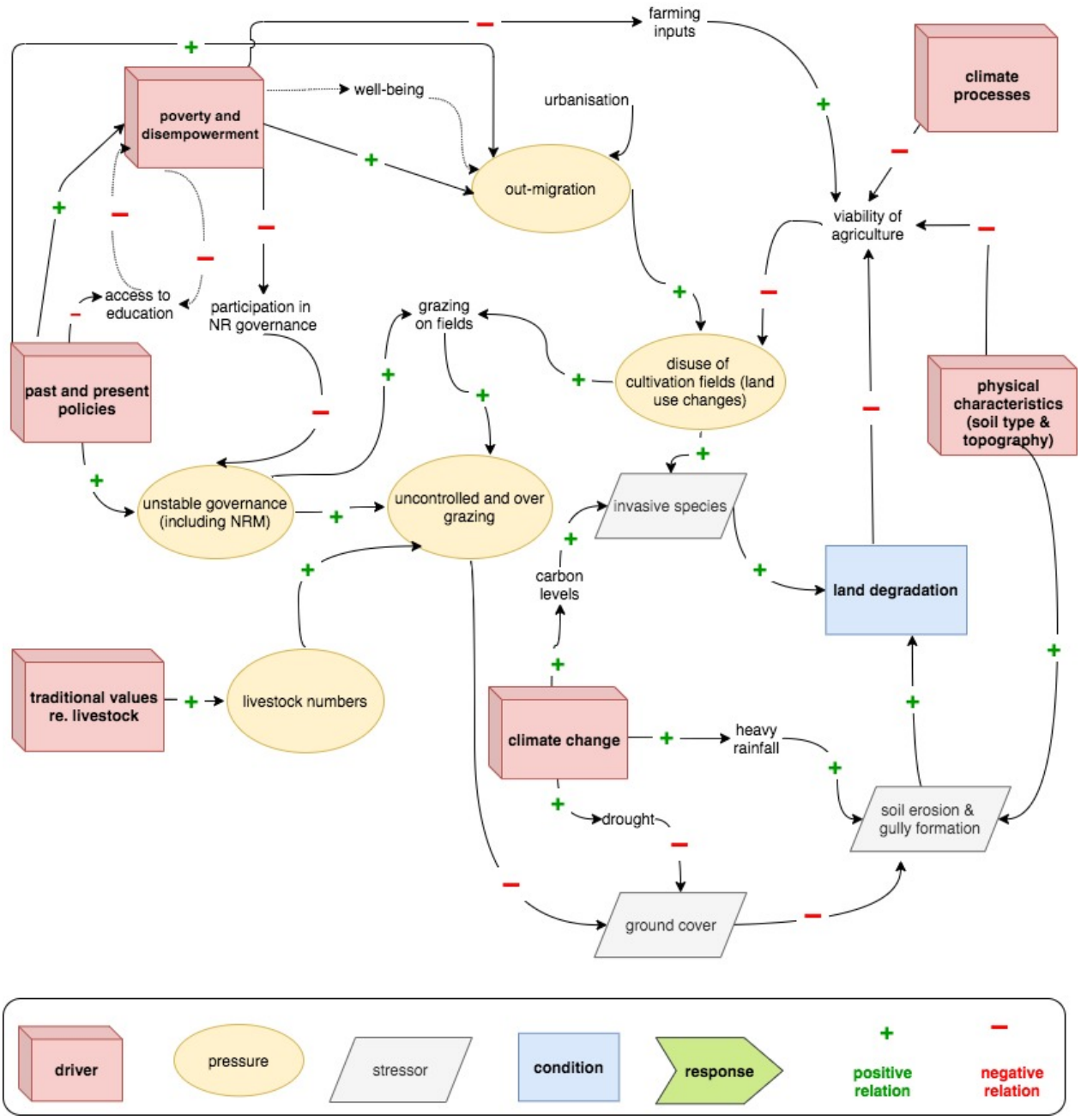


Figure 9: Drivers, Pressures and Stressors that cause land degradation in the Tsitsa River Catchment. Source: reproduced from Itzkin et al., (2021, 15).

3.2 The Tsitsa Project Response to Land Degradation

One of the ways that the Tsitsa Project is different from other state-funded rehabilitation projects that typically focus on technical solutions to degradation, such as physical erosion control structures, is its explicit transdisciplinary SES approach (see **Section 2).** This includes ensuring that community perspectives and knowledge are integrated within the project, which is considered key to its long-term sustainability. Livestock numbers are culturally important to the community with less focus on their productivity which drives range degradation and low cash income (van der Waal et al. 2018). Participants at a 2015 workshop in the Sinxaku villages in the catchment did not believe livestock to be a cause of erosion (Rowntree et al. 2018), though perceptions may have since changed. Despite livestock and grazing controls being a sensitive issue, the

community responded positively to the idea of a ranger system that allows a rotational rest period of rangelands, similar to the one that existed in the past (Rowntree et al. 2018). Such a ranger system would work with an agreed set of rules, developed by the community with the help of researchers, to monitor and limit activities that start or increase erosion (Rowntree et al. 2018).

The Tsitsa Project supports DEFF's interventions through:

- advice on where different measures should be applied (based on biophysical monitoring data and participatory community mapping);
- identifying areas at risk to erosion but not yet degraded; growing vetiver in household gardens for use in the rehabilitation (thus creating income for households);
- supporting livestock associations, giving advice on livestock management and facilitating links to marketing opportunities;
- biophysical and social monitoring;
- building capacity of community members to participate in these activities and to become involved in NRM governance;
- building internal and external networks; and
- bringing these together in an integrated plan applied at the village or village group level (Biggs et al. 2019).

These activities are already happening. The systems diagram (Figure 10 below) positions the Tsitsa Project's responses within their systemic context to demonstrate how they are linked. It shows the pathways (drivers, pressures and stressors) through which the responses are hypothesized to affect the system. The analysis provides a basis for integrated planning. Deeper individual analysis of each potential response can identify alternate potential pathways and impacts, but part of intervening in complex systems is accepting that responses may have unforeseen or unintended consequences. The dynamic approach of the Tsitsa Project has enabled the implementation of *responses* to target various *drivers* and *pressures* placed on the landscape as follows (displayed graphically in Figure 10):

- *Environmental education*, envisioned to improve the capabilities of communities to participate in natural resource governance.
- *Market access initiatives* such as 'Meat Naturally' incentivize livestock owners to maintain livestock quality (as opposed to focussing mainly on quantity) by providing an avenue to sell healthy livestock at a good price, which would decrease active *livestock numbers*. This would be an indirect way of managing land use to improve the viability of livestock as a sustainable livelihood and could lower *poverty and disempowerment.*
- *Policies and regulations* should be explicitly designed to reverse the negative impacts of *past and present policies* on the social-ecological condition of the area.
- *Land use management* such as *rangeland associations* would decrease *uncontrolled and over grazing*
- The *removal of alien invasive species* directly decreases the number of *invasive species* on the landscape.
- Efforts to *rest the landscape* would allow necessary plant growth to increase *ground cover*
- *LDN integrated land use planning* has the potential to avoid, reduce and reverse land degradation, via multiple pathways.
- DEFF has also invested considerably in direct rehabilitation using *erosion control structures* to reduce *soil erosion and gully formation.*

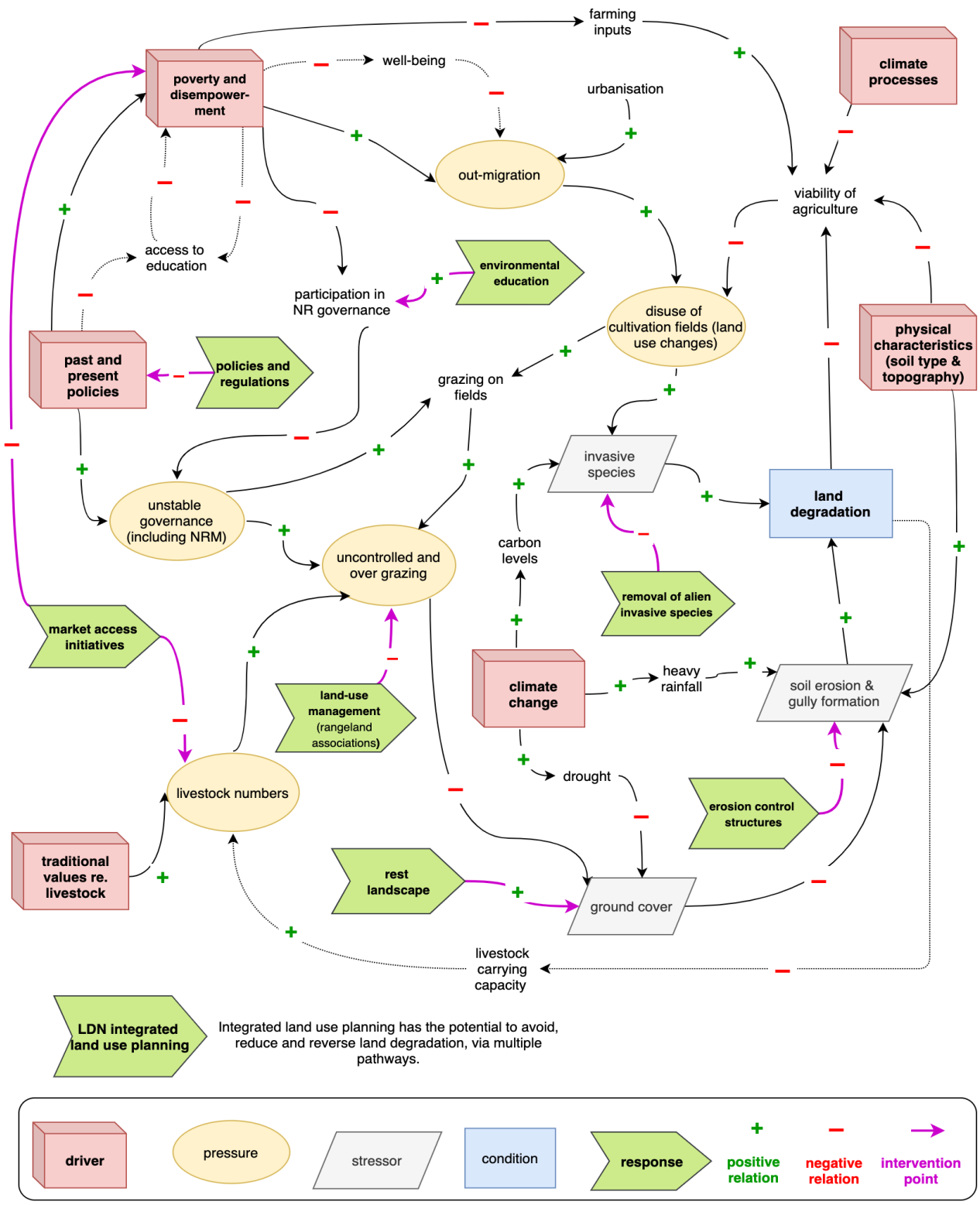


Figure 10: Drivers of degradation and potential responses being considered by the Tsitsa Project to reduce degradation and improve sustainable livelihoods in the Tsista River Catchment. Source: reproduced from Itzkin et al. (2021, 16).

4. DEVELOPING AND SUPPORTING ENHANCED INTEGRATED REHABILITATION

The Tsitsa Project has developed its approach to enhanced rehabilitation and SLM over six years with a range of different components that were integrated over the last two years (see the timeline in Figure 4). Enhanced rehabilitation and SLM is about…

- **integrating rehabilitation and livelihoods** for SLM and climate change adaptation using an approach based on participatory principles (see Section 1 and 2);
- **being flexible** in terms of activities, timelines and targets;
- government funders, implementers, researchers and catchment residents **working together** to achieve an agreed outcome; and
- **commitment by all** to long-term investment.

The main components of the approach are summarised in Table 4 with associated rationales addressing the purpose ('why?'), the focus of each component (the 'what?') and an overview of the component's approach (the 'how?'). Each of the components listed in Table 4 are expanded in the following sub-sections.

Table 4: Components of the Tsitsa Approach for Enhanced Integrated Catchment Rehabilitation

Component	Why?	What?	How?
Avoided degradation, sustainable land management and rehabilitation (Section 4.1)	Some of the land whilst not degraded is at risk, but can remain productive or improve if managed sustainably. Sustainable land management is an important component of climate change adaptation and provides limited mitigation through rebuilding soil carbon stocks.	All land users, especially livestock owners, give input to important and sensitive natural resource areas, followed by agreements to sustainable use that includes resting and ways to rehabilitate the degraded portions. The implementer helps with the rehabilitation once the land management improves. Monitoring, maintenance, learning and adaptation is an essential part of success.	By identifying areas sensitive to degradation, working together to improve vegetation cover and soil health, resting portions of the grazing land on a rotational basis and rehabilitating land that is degrading.
Strengthening participatory governance including integrated village-level planning (Section 4.2)	Local communities know their land best and make decisions on a day to day basis. By including them in planning and decision making promotes equity and access to resources. They are also the people who are directly impacted by the rehabilitation activities so they need to (a) benefit directly in a way that is relevant to them and (b) understand why rehabilitation is important.	Develop capability to engage with governance; map with local land users; agree on use and management.	Workshops on natural resource management involving all actors, capability training, mapping, community meetings.
Green economy, rural livelihoods and climate change innovations	Livelihood options (e.g. livestock production) are limited in the Tsitsa catchment. Sustainable land management and rehabilitation support current livelihood strategies	Local residents or 'green preneurs' have multipurpose gardens, growing vegetables and grass plugs. These plugs	Buy grass plugs for vegetation hedges from the local SMME.

(Section 4.3)	and provide new opportunities that can provide some income and food even during climatically difficult times.	are sold to the implementer through the SMME. Support grazing management to ensure MeatNaturally approval and access to market. Livelihoods interventions are informed by CC adaptation approaches.	Support conservation grazing agreement development and integrate with rehabilitation and ecoranger activity. CC adaptation are integrated into livelihoods strategies.
Local monitoring, evaluation, learning and adapting (Section 4.4)	Collecting baseline data and monitoring interventions provides valuable data to support learning, both during the contract period and in the longer term. This monitoring needs to connect with the broader catchment-wide monitoring system so as to build evidence for the cumulative impact of interventions over time. Embedding reflection as a practice within implementing agencies is important as a foundation for learning and adaptive management.	Collaborate with Tsitsa Project on how to monitor the impact of interventions. Help Tsitsa Project community-based monitors to locate and access intervention sites for monitoring. Add a basic reflection element to implementer reporting, and share reports with Tsitsa Project.	Meetings and ad-hoc interactions with Tsitsa Project monitoring and evaluation team. Small modifications to existing reporting templates (e.g. guiding questions to support reflective report-writing); reflection guidelines.
Capacity and capability development (Section 4.5)	It promotes equity and empowerment to participate in planning and management.	Key processes for shifting towards participatory governance to reach the objectives of more equitable access to, and use of, ecosystem services and the long-term sustainability of rehabilitation practices.	Attending training courses, supporting livelihoods development, involvement in participatory monitoring, be involved in biophysical rehabilitation and practising climate change monitoring and adaptation.
Internal governance of the Tsitsa Project (Section 4.6)	Effective governance is a crucial component of sustainable land management efforts. Bureaucracy and isolated work processes can lead to low levels of trust, cooperation and constructive team efforts and does not support cooperative governance.	The Tsitsa Project developed an elaborate internal governance structure to create an enabling environment at various levels of governance. The “internal” governance interfaces and helps promote wider “external” governance.	Improved governance requires good communication and management at all levels. The Tsitsa Project introduced various governance teams (A-team at national government level; B- team at provincial level dealing with praxis issues and a c-team for internal operational governance) and A strategic advisory structure (the so-called “Wisdom Trust”)

4.1 Avoided degradation, sustainable land management and rehabilitation

Researchers, community members and leaders, government officials, and implementing agents work together as the Tsitsa Project to plan, implement and monitor sustainable land management and avoided degradation interventions by learning and sharing knowledge towards:

- Identifying and prioritising key ecological infrastructure and services in need of protection and rehabilitation
- Understanding landscape processes, uses and vulnerabilities in the Tsitsa River catchment
- Developing long-term community-based sustainable land management plans for improved livelihoods and climate change resilience

Shifting towards an enhanced integrated rehabilitation approach highlighted the need for changes in DEFF administrative and project management systems for tendering, bidding, planning, and progress control in order to support implementers to work closely and effectively to meet both community *and* DEFF sustainable landscape management priorities.

The Sediment and Rehabilitation (SedRest) Community of Practice (CoP) works closely with all CoPs, but particularly relies on the work of the Governance and Livelihoods CoPs for facilitated local knowledge input and capacity development, on the Grass and Fire CoP for long-term, sustainable land use and grazing planning, and on DEFF for best practice guidance within their scope of work. The SedRest CoP is supported by LIMA in terms of the financial administration of the citizen technician-based suspended sediment monitoring network.

SedRest CoP's Tsitsa-learned approach to enhanced rehabilitation is illustrated by the insights below, which emerged from a combination of community mapping workshops, scientific research, and land management practitioner input from 2015 onwards. A multi-stakeholder workshop held in June 2019 synthesised these efforts and ideas into a landscape rehabilitation planning framework based on community need and sustainable land management best practice. Rehabilitation intervention sites were prioritised, best practices were identified, and monitoring programmes were integrated with communal land-management plans as the foundation for sustainable land use that avoids further degradation and increases the resilience of land-based livelihoods.

Sustainable Land Management and Rehabilitation activities

As part of the landscape rehabilitation framework, rehabilitation intervention sites were identified, prioritised and best rehabilitation activities decided on to integrate with the land use and landscape.

Accepted integrated activities included:

- rotational resting of pastures where rehabilitation work is taking place;
- reslope steep eroding gully sides and reseed;
- slow and spread overland flow through vegetation hedges, silt fences and wood fibre rolls;
- reseed bare soils (break capped soils, reseed and protect with wood fibre blankets);
- kill invasive alien trees standing through bark stripping.
- Biocontrol release in remote landscapes

4.2 Strengthening participatory governance at multiple levels

The Tsitsa Project sought to strengthen participatory governance in the Tsitsa River Catchment at multiple levels and via multiple pathways. The Tsitsa Approach to participatory governance development is described here in two parts: a higher-level introduction to building governance capability and an operational-level introduction to doing participatory and integrated village-level planning.

High-level introduction to building governance capability

The foundational vision of the Governance CoP (GovCoP) was based on the realisation that even a relatively long research-based development intervention, like the Tsitsa Project, ends. At that point, if the project process has not developed and created functional relationships, understandings and practices that enable local people to engage with formal and traditional government, institutions, and governance process, in order to represent their interests, then the outcomes of rehabilitation and livelihood development are likely to falter and fail. The GovCoP set out to build the relationships, understandings and practices necessary for participatory governance.

After an initial conceptualisation of participatory governance development through the Department of Human Settlement, Water and Sanitation (DHSWS)'s Catchment Management Forum (CMF) structure, the focus shifted towards the development of a participatory governance network. Community Liaison Officers became the key actor-interface between catchment residents and formal and traditional governance structures.

The capabilities of people living and working in the catchment is a primary variable influencing the long-term success of such a governance network. The GovCoP envisioned a participatory governance development 'Capability Pathway' (Figure 8) and worked collaboratively to develop participatory governance capabilities.

> **Note:** There is a systemic barrier to the emergence of participatory governance in South Africa. While there are institutional arrangements for participatory governance, for example Catchment Management Forums, they are non-statutory. As such they are not funded by government and participation is voluntary. However, in practical terms most participants have an income and their presence is supported by an institution – even if it is an NGO. Local residents without formal employment, participate with no compensation and often without their direct costs being covered. In the Tsitsa Project direct costs were covered and we clarified the advantage of attendance was not monetary, but rather was in the form of gaining knowledge, which could be strategic. The pitfalls of paid participation are obvious, but the notion of equitable local participation needs careful re-consideration.

Operational-level introduction to doing participatory and integrated village-level planning

Local communities know their land best and make decisions on a day-to-day basis. Working in a participatory manner in planning and decision-making promotes equity and access to resources. This can be done through

a) developing capability for local communities to better engage with natural resource governance;
b) undertaking participatory mapping and co-learning with local land users; and
c) collaboratively agreeing on resource use and management.

Supporting activities include:

- workshops on natural resource management involving all stakeholders;
- capacity development (including training and short courses);
- natural resource mapping; and
- community meetings.

The village-level participatory planning workshops are geared towards the development of core capabilities for decision making, governance and integrated land use management and practices. These local village-level consultations and participatory processes enable catchment residents and stakeholders to identify opportunities and develop specific NRM and livelihoods related interventions and plans (e.g. develop livestock management plans and beef markets, plug-preneur micro-enterprises, etc.). A participatory planning process typically follows a sequence of activities as:

i. introduction to the Tsitsa Project and co-knowledge;
ii. mapping of natural resources and key problem areas;
iii. prioritisation, development and validation of solutions and innovations (including livelihood strategies and interventions for climate change resilience and adaptation);
iv. drafting action plans; and
v. establishment of village-level committee/champions and innovation hub or forum.

This process is followed by the implementation of the interventions emanating from the local engagements and multi-stakeholder partnerships fostered. At the core of the planning phase lies the opportunity to support and expand local capability towards participatory governance and equity in decision-making as described in the capability development pathway (Figure 8). The planning process also includes an assessment of the resource status, the stakeholders and their challenges and should result in prioritised strategies for improved and sustainable livelihoods and NRM. This level of intervention allows for high influence on land use practices as well as optimisation of multi-stakeholder engagement and reach to local communities. The village-level plans also feed into the on-going development and adaptation of the nodal plan interactions. These planning processes should overlap, inform and be informed by other catchment planning processes.

4.3 Capacity Development

The Tsitsa Project has adopted a learning-centred approach as an overarching principle guiding engagement (Biggs, et al. 2019). Learning and agency development is similarly a key driver of the Tsitsa Project Theory of Change (Botha, et al. 2017). Understanding how learning can be enabled and supported is an important component of the Tsitsa Project approach to enhanced rehabilitation. In the Tsitsa Project, capacity development facilitators sought to equip capacity development (CapDev from hereon) beneficiaries to empower them to be able to sustain their learning beyond the Tsitsa Project learning interventions and beyond the lifespan of the Tsitsa Project itself. Beneficiary empowerment is an important outcome of CapDev processes. Empowering stakeholders to take learning into their own hands and act in their own interests is critical to enabling integrated, sustainable landscape management and livelihood generation.

Adopting a learning-centred approach to rehabilitation interventions, one opens a window of opportunity rehabilitation implementers to design learning processes that not only develop the skills capability and

knowledge of beneficiaries, but optimise agency and stewardship development, their understanding of the environment, and how rehabilitation research fits into the broader natural resource management context.

At its simplest form capacity development is the building of skills and knowledge of a person. The Tsitsa Project views the existing capacity of individuals and their historical and cultural context as the foundation from which to develop capacity.

For the Tsitsa Project, CapDev:

- Involves enabling people to act in their own interests,
- Is a shared process, co-developed and applicable to all actors engaging in the Tsitsa Project – the Tsitsa Project learns as much about how to operate as scientists in the Tsitsa Project context and how to work with each other and across disciplines,
- Should help beneficiaries achieve what is important to them and not us as researchers telling them what is important,
- Should also, to a certain extent, help beneficiaries achieve the objectives of the Tsitsa Project, e.g. help capacitate monitors and the Tsitsa Project to achieve their work objectives, and
- Includes a continuum of different forms of learning from knowledge acquisition to open ended learning processes.

CapDev activities can take the form of structured training through accredited and non-accredited training courses, workshops and seminars and symposia to un-structured training such as mentorship, learning exchanges, field trips and demonstration sites. CapDev can also occur naturally outside of formal processes as people learn from one another through participation in a shared practice (Lave and Wenger 1991). Lastly, the focus of capacity development initiatives or processes could be internally (on the implementation team) or externally focussed (on the beneficiaries or stakeholders of a rehabilitation process e.g. catchment residents).

Two case study examples of how the principles were applied are given below:

Monitor Capacity Development Course:

Purpose: To support Monitor capacity development for the Tsitsa Project. As part of a project that embraces participatory governance, this short course was designed to validate the indigenous knowledge of people in their own contexts. It supported the development of community-based researchers who can share knowledge that is culturally and contextually rooted. As part of supporting a reflexive and applied knowledge creation, the course employed a reflexive 'work together' / 'work away' structure which allowed participants to apply what they have learnt in between course sessions. The course was delivered over three Modules between November 2019 and September 2020.

Facilitating Social Learning and Stakeholder Engagement in Natural Resource Management Contexts (Training of Trainers): Introductory Course:

Purpose: To inform and strengthen the practice of current and future community and adult educators, trainers and facilitators in NRM contexts with introductory level theory and expanded facilitation, teaching, engagement and basic intervention design methodologies. The course was delivered online, over four Modules between October 2020 and April 2021.

4.4 Green economy, rural livelihoods and climate change innovations

Livelihood options are limited in the Tsitsa catchment area. Sustainable land management and rehabilitation avail new opportunities that can provide some income and food security, especially in the light of climate change stresses. These opportunities that were developed in the Tsitsa Project include:

a. local residents (or 'green preneurs') having multipurpose gardens to grow vegetables and grass plugs, with the grass plugs being sold to the implementer for vegetation hedges that prevent soil erosion;
b. grazing management linked to grazing agreements that integrate grassland rehabilitation and ecoranger activities means that livestock production related livelihoods are also improved; this can facilitate effective access to appropriate livestock markets such as offered by the MeatNaturally programme and
c. production and sales of charcoal from Alien Invasive Plants.

These activities, together with landscape scale rehabilitation interventions, support Ecosystem-based Adaptation as a sustainable response to manage the risks arising from climate change (see Figure 11).

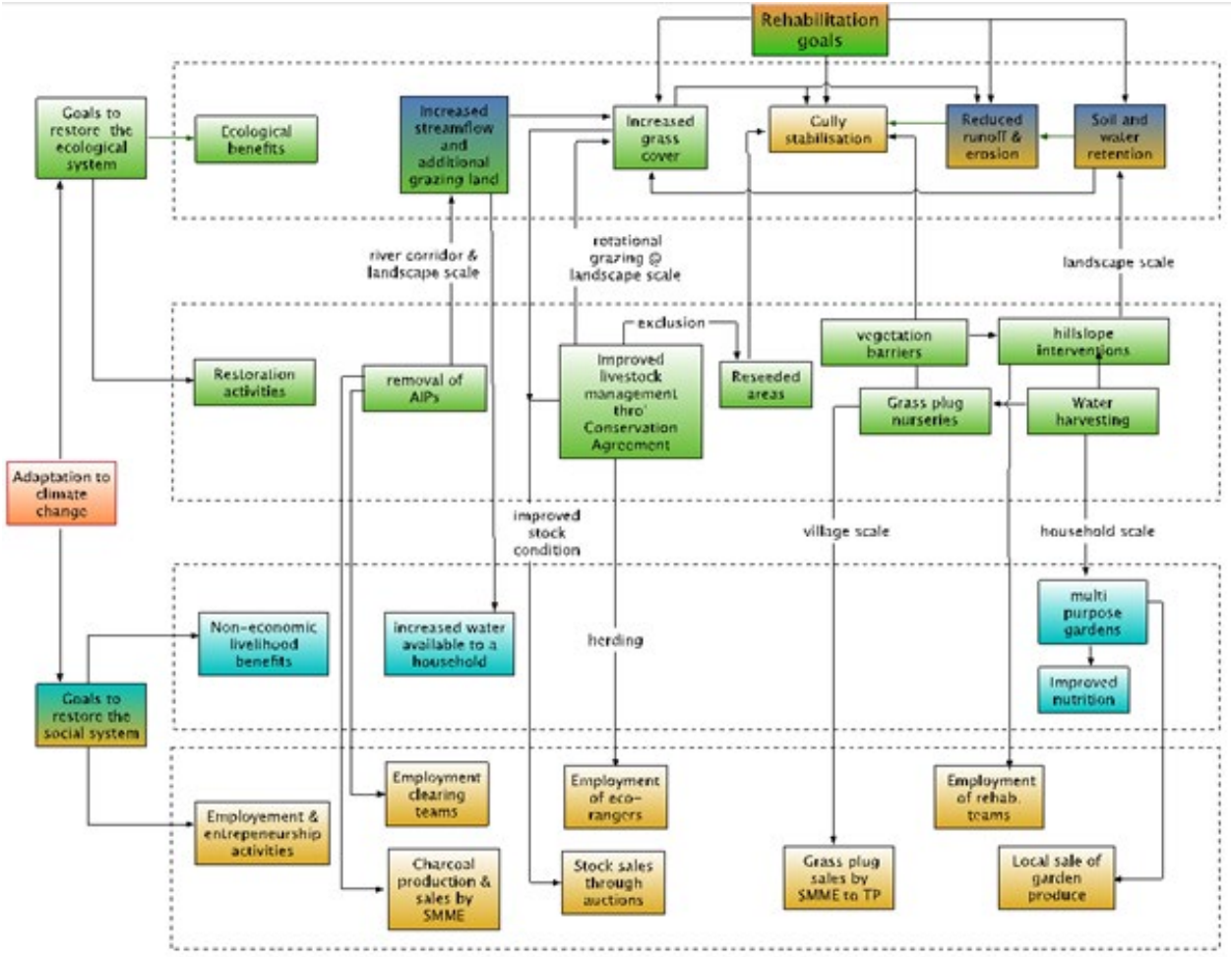


Figure 11: Integrated solutions to the rehabilitation of socio-ecological systems (Rowntree, et al. 2018)

4.5 Monitoring, reflection and learning

The importance of Participatory Monitoring, Evaluation, Reflection and Learning (PMERL) as an important enabler of Strategic Adaptive Management (SAM) in complex social-ecological systems has been discussed above. However, realising the ideals of this approach and putting it into practice has raised some challenges and the Tsitsa Project team has learnt important lessons about both the specific role or purpose which PMERL plays in the project, and what is needed to implement it effectively in practice.

4.6 Internal governance of the Tsitsa Project

The project has a strong internal governance structure. The "internal" governance interfaces and helps promote wider "external" governance. This overall governance provides the ongoing interest, capabilities and capacity to deal effectively with sustainable land management, rehabilitation and improvement of livelihoods. Without this governance, the landscape efforts will falter, be misguided, or not be sustainable. The boundary between "internal" and "external" is necessarily fuzzy, and its definition should be a convenience rather than a concern.

The components of the internal governance are depicted in Figure 5, and were deemed to be: core staff (program manager, administrative assistant, part-time advisor, and catchment co-ordinator); a sub system linked to universities to deal with associated postgraduate students, postdoctoral fellows, and visiting scientists (one of the tasks of the "C-team" below); a set of so-called "Communities of Practice" (CoPs) for project theme areas (Figure 5), which integrated their activities continuously through a CoP co-ordination structure, and, at a principle level, through the "C-team"; a mid-level bureaucratic and agency/implementer structure (the so-called "B-team") to allow scientists and practitioners to meet and discuss praxis issues on a regular and, when necessary, ad hoc urgent basis, – this soon spawned working subcommittees e.g. for planning issues; a policy level strategic oversight structure (the so-called "A-team") of high-level officials of relevant departments and agencies, meeting annually; and a strategic advisory structure (the so-called "Wisdom Trust"), also meeting annually, of senior academics and development experts, also reaching out to Traditional Councils. Often understated but key to the overall governance is a healthy relationship between the project team, stakeholders, and funders. Readers looking for more detail about any of these structures can consult Figure 5.

5. LESSONS LEARNED AND INSIGHTS FROM THE TSITSA PROJECT

The Communities of Practice (CoP) within the Tsitsa Project played a key role in project development and the insights from their work were captured as they could apply to new and existing projects in similar settings. Each of the insights are substantiated with an example from the local landscape (i.e. the Tsitsa River Catchment). These insights are presented here according to each CoP, but the insights relate to internal project governance, processes around capacity development, capability development, integrating green livelihoods with SLM, participatory governance, monitoring, reflection and learning and integrated planning around sustainable land management.

Table 5: Section summary, showing the relationship between the particular project theme or community of practice (CoP) to the numbered insights.

Section	Theme / CoP	Insights
5.1	Internal governance CoP key insights	1.1 – 1.5
5.2	Experiences and key insights of the Sediment and Restoration Community of Practice	2.1 – 2.5
5.3	Strengthening participatory governance	3.1 – 3.6
5.4	Strengthening local participatory governance and integrated village-level planning, action and adaptation	4.1 – 4.5
5.5	Green economy, rural livelihoods and climate change adaptation	5.1 – 5.5
5.6	Lessons learned and insights from doing monitoring, evaluation, reflection and learning	6.1 – 6.5
5.7	Capacity development insights	7.1 – 7.5

5.1. Internal governance CoP key insights

Internal governance within the Tsitsa Project and associated Government Departments and organisations that deal with SLM was a fundamental component that enabled much of the Tsitsa Project. Key insights from the internal governance are presented in the table below.

Insight	Insight background
Insight 1.1. Diverse configurations A diverse but appropriate configuration of internal governance structures and processes is essential to effectively handle any project conceived as dealing with a social-ecological system	From our own principle of polycentric governance; taking various lessons from other large regional projects (such as the Kruger National Parks Rivers Research Programme, USAID's RESILIM-O, etc); and above all from our own learnings and experience as we went along and saw what was necessary next. Over time we developed a sense of the usefulness for us compared to the cost in effort, but always tried to also look in totality, as these structures should not exist in isolation. Sensible links between them are essential, and some cross-membership is always helpful, and explicit champion "connectors" (see Section 2.3) equally so.
Insight 1.2. Partnership mindset with funders A partnership mindset between funders and the Project is advantageous in terms of motivation, navigating direction in the complex SES, and adaptive management for learning	Experience in previous projects in which several participants and advisors had been involved, suggested this. Working effectively in SES's is daunting, and any developmental work carried out requires mutual empathy as to the SES context. The Tsitsa Project was fortunate in that the Project was explicitly encouraged by DEFF under such anticipation, and appropriate space given in it to experiment and suggest. At the same time it is accepted that funders have control functions, making this a tight path to walk. Without the mindset of partnership, it is unlikely the Tsitsa Project would have become viable.
Insight 1.3 Safe productive work spaces Establishing enthusiasm at various levels in appropriate invigorating structures with sufficient credible commonality of interest, can allow more rapid and committed (and more effectively integrated cross-departmental) action in the home departments or agencies, than if conventional hierarchical structures followed.	Though by no means an either/or option, if a project has convening ability for such meetings outside of formal vertical bureaucratic control up and down each department, the contacts established in this slightly alternative format can represent a "safer and easier operating space" for cross-departmental and cross-disciplinary endeavours so often required in social-ecological systems work. Participants and advisors previously experienced this occasionally elsewhere, and when implementing it in the Tsitsa Project, our own experience with particularly "B" and "A" teams, was that these materially assisted bringing in other ideas and smoothing the way for co-operative planning and action.
Insight 1.4. Panel of experts A thoughtfully-constructed and run panel of "experts" can provide a strategic advantage and additional credibility.	Here again a Project's convening ability is important, and there needs to be something exciting and worthwhile to attract the "experts". The "experts" must draw energy and value from the interactions, which should include field visits to sample actual conditions in the SES. The Tsitsa Project's "Wisdom Trust" is run like a think tank, and although members are not expected to reach even sufficient consensus (though they quite often do) and only make recommendations, these are taken seriously. They are given adequate feedback on what we conclude and do, and they have commented favourably on the Project's continuity over time. In our reflections, they are deemed very influential. Many are also good ambassadors for the Tsitsa Project.

Insight	Insight background
Insight 1.5. Handling fast expansion and project sprawl In the potentially wide and relatively fast expansion required to achieve the functional interconnections needed to achieve any complex SES project goals, there needs to be a sense (thoughtfully changing over time) of a Project's bounding and identity, as well as that expected of other agencies around us, to avoid becoming hopelessly swamped – but yet sufficiently diverse and well enough linked. These boundaries need to be continuously negotiated.	Most previous experiences brought into the Tsitsa Project's planning emphasised the importance of visioning, objectives and core values, all features of Strategic Adaptive Management (see Section 2.5). But essential and helpful as these are, the objectives are necessarily so diverse and the interconnections to exploit or build sufficiently numerous, that after a few years the prospects of dilution of effort across too many themes and fronts starts feeling more and more real, and can sap energy. At this time the Tsitsa Project came up with a co-built schematic which helped define the growth trajectory, as well as what needed to be achieved by others around us, if the Project were to become even viably regional. This diagram (Appendix 2) continues to assist thinking around our identity and the limits around it and helps do the same for the constellation of partners. Another helpful bounding or focussing tool we used on several occasions was that of Comparative Risk Assessment which helps prioritisation of initiatives or mixes (see Section 2.3)

5.2. Experiences and key insights of the Sediment and Restoration Community of Practice

The Sediment and Restoration CoP focussed on understanding landscape processes, how erosion can be reduced, what interventions are suitable for the local landscape and what monitoring can be done to track changes to ecosystem services. Their main insights relating to the Tsitsa Project approach are presented below. Other insights on rehabilitation best practise for the local context were captured in CoP reports.

Insight	Insight background
Insight 2.1. Identifying and prioritising key ecological infrastructure and services is the basis for successful community involvement with subsequent rehabilitation and monitoring	Community natural resource mapping, sharing the observed landscape history and identifying currently valued EGSs was essential to understanding some of the key community/landscape interactions. The Green Village project played a significant role in pioneering this process. Researchers compiled an inventory of mapped physical aspects (soil types, areas susceptible to gully formation, wetlands, disused agricultural lands (likely to be used when conditions and resources align), invasive alien species, grassland condition, sediment yield, etc.) formed a valuable physical database to plan from.
Insight 2.2. Understanding landscape processes, uses and vulnerabilities is foundational to sustainable landscape management.	Information from research about landscape processes, such as subsurface soil erosion, supported the understanding of where interventions are more likely to succeed. The subsoils are highly erodible, so without dense vegetation cover soil erosion is likely. The SedRest CoP helped to organise the SAAG conference and field trip in the Tsitsa River catchment. Insights from this event were instrumental in developing our knowledge on processes, vulnerabilities and solutions.
Insight 2.3. Developing long-term community-based sustainable land management plans requires input from all stakeholders and continuing feedback, maintenance, and adaptation.	Monitoring, learning based on local experience, and maintenance of interventions are all critical to the ongoing success of rehabilitation efforts. Community development and a shift of land ownership linked to business opportunities support sustainable land management. Grazing and fire management is the main aspect in the communal land that can allow the vegetation cover to improve.
Insight 2.4. Enhanced rehabilitation administrative systems are required (requires enhanced management and administrative systems)	Implementers already undertake community engagement regarding specific areas for clearing within demarcated work blocks, but current government administrative systems present obstacles to implementers adopting new rehabilitation practices and ongoing maintenance work. Revised administrative procedures are needed for identifying work areas, issuing tenders and adjudicating bids, as well as for operating, safety, and quality control norms and standards.
Insight 2.5. The anthropogenic drivers of degradation need to be addressed for avoided degradation, sustainable land management and rehabilitation to be feasible.	Overgrazing, trampling and flow pathways that concentrate storm flows accelerate soil erosion. The pressure on sensitive land units remains high as is seen where interventions are negated by trampling, grazing on newly germinated grass plantings and stormwater cuts through resloped gully walls. The areas sensitive to degradation thus need rest periods and a reduction in land use pressure and disturbance.

5.3. Strengthening participatory governance

Strengthening participatory governance to enable inputs from all levels of stakeholders is a large focus area of the Tsitsa Project. The key insights relating to the process of strengthening participatory governance is presented below.

Insight	Insight background
Insight 3.1. Using the Capability Pathway helps to guide the emergence of participatory governance	The Participatory Governance Capability Pathway is the integrated outcome of five years of engagement with all the actors involved in the Tsitsa Project. It emerged out of many different ideas and initiatives, and is the distillation of processes that enable the emergence of participatory governance.
Insight 3.2. Participatory governance starts with the project team.	Being inclusive and respecting all forms of knowledge is the foundation of building participatory governance. This starts with the research team. Therefore all meetings and activities, from organising workshops to writing papers and reports, are planned and implemented collectively, consultatively and co-operatively. Individuals take responsibility for particular roles, and are supported by the team. This way of working builds trust and respect. Differences in understanding inevitably arise, among team members, and between the team and participants. The need to manage differences constructively highlights the importance of trust and cooperation. Example: 1) Organising collaborative activities with other project groups (e.g. other CoPs) is challenging, involving more, and divergent, perspectives and priorities. The careful navigation required, emerges from strong internal trust. 2) We recognised that team members who could work effectively across different groups were crucially important.
Insight 3.3. Expect interruptions and unexpected ideas, don't panic, and adapt! (This insight connects to the Palmer et al. (2015) Transdisciplinary practice principles. They are worth taking a look at.)	Much of the work is workshop-based. Interruption, disruption, and the emergence of new circumstances in planning and implementing activities is a constant experience, often exacerbated by the rural context. Two related skills are: adapting in the moment, and keeping an open mind to transformational realisations, which could enable a more fundamental shift. Examples: 1) Catchment Management Forums (CMFs) are an existing participatory governance institution, regionally and nationally networked, and supported by DHSWS. The establishment of a Tsitsa CMF seemed a logical starting point. The early workshops with that purpose initiated essential relationship-building and a co-produced catchment vision. However, it was vital to respond to the reality that there was insufficient political will for constructive DEFF-DHSWS collaboration, and that developing a flexible participatory governance network would be more effective. 2) Vigorous interactive debate about the partnership with LIMA, and the possibilities offered by the appointment of CLOs, together with inter-CoP discussions about a systemic view of participatory governance catalysed the emergence of the Capabilities Pathway - which became the fundamental guide to participatory governance development.

Insight	Insight background
Insight 3.4. It is important to work across all levels of governance.	We learned to recognise, and flexibly categorise, a complex governance landscape, including: formal governance via national provincial and local government – with differing sector mandates at different levels; Traditional governance associated with traditional leaders; and local catchment residents, the commercial sector, civil society and NGOS as potential actors who could engage in participatory land and water governance. The historical context of the apartheid government homelands is a strong influence and there is tension between formal and traditional governance. Transformation of governance systems requires a nuanced grasp, and sensitive actions of the governance landscape. Examples: 1) During engagements about the CMF establishment, traditional leaders responded positively to recognition and inclusion and expressed concern about exclusion from other Tsitsa Project activities. 2) Local governance actors generally experience a lack of support and buy-in in the hierarchical functioning of governance . Engaging with, and connecting different governance institutions legitimises local institutions while creating a diverse governance network. 3) We identified a critical gap between intention and delivery of the EPWP that left workers vulnerable. We recognised national level governance is clumsy and slow to respond. This remains a tension.
Insight 3.5. Open, respectful and diverse engagement encourages participation	Enabling honest and meaningful participation is difficult and requires a respectful appreciation of the different abilities and interests which different people bring into an engagement. Language matters! Use the language of the majority of participants as the primary language in engagement. Examples: 1) The shift from English workshops being translated into isiXhosa to isiXhosa run workshops dramatically changed the dynamics of the interaction. Participant involvement became more creative and confident. 2) The 'Learning Words' workshops began to investigate the local understanding of land and water, while building local understandings of the Tsitsa Project and natural resource management in general. 3) Using diverse methods in workshops and capacity development have enabled different skills to emerge, and different individuals to participate where they are able and feel comfortable. Some examples include: careful facilitation (for example random inclusion of participants regardless of hierarchy), arts-based methods, experiential methods, buzz groups, theatre, network mapping, landscape modelling using props, presentations, ice breakers.
Insight 3.6. Include time for informal communication – being present, and listening	It is worth making time and space for informal connectivity. For example: i) through the roadshow, in which listening and spending time with residents was prioritised, we were able to encourage a two-way communication channel of ideas and desires; and ii) social events, particularly overnight stays, created informal communication and relationship-building time.

5.4. Strengthening local participatory governance and integrated village-level planning, action and adaptation

The Tsitsa Project focussed on capacitating local land users that engage with the landscape on a daily basis so they can be part of local governance, village level planning and being part of the solution to SLM. Insights from the process is presented below.

Insight	Insight background
Insight 4.1: **The role and significance of multi-stakeholder and multi-level partnerships in local participatory engagements for collective action and agency** to enact transformation and change in land use practices and management. The process promotes the emergence of 'hybrid' knowledge and governance configurations at the village-nodal scale.	Hybrid knowledge refers to the bringing together of different forms of knowledge (traditional, contextual, scientific, tacit) and co-creation of new 'hybrid' knowledge that fits and is useful for the context. Hybrid governance formation is similar but encompasses the grouping of different forms of governance actors engaging together with a common purpose.
Insight 4.2: Actively surfacing and understanding the historicity of local land use practices and related 'problem issues' (contradictions and dissonances) as fertile ground to expand, shift and reimagine more sustainable and effective land use practices.	Social and transformative learning methodologies employed in local-level planning and co-learning interventions (e.g. Qulungashe village-level planning workshops) were initiated by the careful socio-cultural and historical analysis of problem areas, concerns and constrains found in relation to the expansion of NRM and sustainable livelihoods. These served as starting points for discussion, deliberations and the nurturing of collective agency to address these problems and the modelling of feasible responses or actions.
Insight 4.3: **Village-level engagements open up opportunities for social learning processes that enable capability expansion** towards integrated land management, governance and ultimately sustained practices.	Carefully designed local-level participatory interventions have created opportunities for collective multivoiced and multilevel engagements that enabled the co-production of locally relevant designed innovations and solutions; the strengthening of institutional capability to take these forward; and their ongoing adaptation to the contextual demands, changes and vulnerabilities.
Insight 4.4: Local participatory processes, in the form of integrated planning, are 'spaces' for the **nurturing transformative agency and change with the use of mediating or facilitation tools** that trigger participants' willingness to collaborate in shifting the status quo and pursuing their agreed goals or aspirations.	Conceptual and material tools have been brought into the facilitation of village-level planning and decision-making engagements geared towards the development of local level land use and management plans. Participatory planning activities coupled with, for instance, Google Earth mapping opened up opportunities for catchment residents and stakeholders to co-develop and co-design relevant and doable plans, establish governance structures, and ultimately actioning some of the proposed priorities.
Insight 4.5: Local level participatory planning interventions are most effective when coupled with capacity building opportunities for the enhancement of participants' core knowledge and skills required to expand their capabilities for decision-making, governance and action (capability development pathway).	The need for enhanced and deepened participants' understanding and reflexivity in sustainable land use practices called for the integration of formal and informal capacity development processes into local level engagements. In this way participants felt better prepared and informed to meaningfully engage in participatory planning and governance opportunities afforded in their local landscape or catchment area.

5.5. Green economy, rural livelihoods and climate change adaptation

The Tsitsa Project explored ways in which to grow and secure rural livelihoods, involve local people in the green economy and prepare for the anticipated climatic changes. Below are the key insights on these topics.

Insight	Insight background
Insight 5.1: **Integrating livelihood strategies with rehabilitation interventions brings benefits** to both and is essential for successful rehabilitation outcomes and long term sustainability. Implementers must work with local residents and align their activities with their aspirations.	As an example, during the village-level integrated planning process in the Qulungashe village in Lower Sinxaku, the local residents made the link between the rehabilitation interventions and benefits in term of improving the local spring flow, income generation opportunities derived from selling vetiver grass to the implementers as well as employment opportunities. The implementers planned their activities to support these benefits.
Insight 5.2: **Land use management and practices are most likely sustained by catchment residents who have developed a common understanding of the Tsitsa Project objectives and vision for their catchment and actively engaged in decision-making** processes to guide rehabilitation interventions and livelihood opportunities. These processes and successes, however, are often filled with tensions and power dynamics among different catchment stakeholders and as such, it is crucial to mediate these interactions and conflicts objectively and fairly.	One of the first activities with Sinxaku residents in 2015 was to take a transect walk through the local area coupled with an activity to develop a time line of historical events causing landscape degradation. This enabled joint learning by the facilitators and residents. Potential opportunities arising from the rehabilitation project were introduced. Community Participatory approaches (e.g. mapping of village boundaries and grazing areas with headman). The road show provided an opportunity for the village residents to map areas where they would like to see some rehabilitation work, e.g. reducing the expansion of the gullies and spring protection, and showed enthusiasm to form a livestock association and grazing and sign conservation agreements. Ownership of processes in the catchment/village occurred through: communities developing their own livestock association and constitution, setting up their own rules and joining fees; selection of the committee members; identification of areas in their rangelands, where seasonal resting should take place; establishing fire belts with the help of ecorangers. The process was supported by participatory and learning "interventions" over a significant period of time. The successful achievements of one or two residents can give rise to resentment from others who may act in a manner that has negative consequences e.g. goats were let into a garden where vetiver was being grown.
Insight 5.3: Various forms of capacity development inputs into **developing and expanding catchment residents' core knowledge, skills and capability are critical to the expansion of livelihoods aspirations, the improvement and uptake of a wider spectrum of livelihoods options and responding to future climate change risks through climate change livelihood adaptation**. Learning opportunities range from workshops, practical demonstrations, learning exchange and field visits, attendance at conferences and events, and co-learning interactions among	In March 2017 three livestock owners from Upper Sinxaku attended a meeting organised by the UCP in Matatiele; this was followed by a field auction organised by MeatNaturally. Being included in a scientific meeting, also attended by people from other southern Africa countries, built their self-esteem. They came home enthused about the income earning opportunities offered by the auction and were keen to find a way to develop this system in Sinxaku. A learning exchange with the Macubeni GEF project allowed participants to learn new rehabilitation skills and share knowledge about growing vetiver. During a workshop participants recognised that many of the village-level rehabilitation and livelihood activities already adopted were also climate change adaptation responses.

Insight	Insight background
residents and stakeholders. The Tsitsa Project project staff, including the CLOs, citizen monitors and ecorangers, play a crucial part in the learning processes as they provide ongoing support and constant presence in the catchment.	
Insight 5.4: The prototyping of the various green-preneur initiatives enable residents, practitioners and researchers to jointly interrogate and explore the feasibility of such livelihoods alternatives in the catchment. "Start-up" inputs, "incentives" packages and optimal and sustained funding flow amplify successful outputs. The uptake or consolidation of these 'pilot' initiatives requires a substantial level of time to undergo the various reconceptualisation and development stages required.	The prototyping of the grazing agreements and conservation agreements at Upper Sinxaku will allow proper rangeland management practices and fire management in the area, while complying with the conservation agreements will yield incentives benefits such livestock auctions, wool markets, livestock husbandry related training and improving household income.
Insight 5.5: Securing access to market value chains reinforces the green-preneurs motivation to engage in new ventures as a way to increase their income generating opportunities and contribute to their overall Tsitsa catchment vision.	The establishment of a plug-preneur network with the focus on vetiver grass was catalysed as a result of the local NRM implementer committing to purchase produce for the rehabilitation interventions. Individual growers now worked together to form an SMME that was a necessary prerequisite in order to sell to the implementer.

5.6. Lessons learned and insights from doing monitoring, evaluation, reflection and learning

Doing monitoring, evaluation, refection and learning with local residents were important components of the Tsitsa Project. Key insights are presented below.

Insight	Insight background
Insight 6.1. Recognise synthesis and knowledge integration as a key purpose of PMERL: PMERL plays a key role in synthesising findings across disciplines and interest groups - to help develop a 'bigger picture' understanding of knowledge about the system. This cross-cutting role needs to be allocated to someone/some organisation – it will not happen on its own; needs allocation of resources, requires specific skills, and it depends on effective knowledge management and mediation. e.g. synthesis reports need to be 'mediated' - can't just assume people will read them (e.g. through reflection events of various kinds which help people to engage with and reflect on the findings).	The evolution of PMERL's reflection reports over the last few years has shown the need for ever-more cross-cutting synthesis and sense-making. Readers of reflection reports and participants at PMERL-hosted events noted how these reports and/or events were often the only time they got to learn about what others in the project are doing. An expansion of the PMERL and KMM team has been necessary to do the time-consuming synthesis work effectively. Reflection events were set up to 'mediate' reports as they were not being read much.
Insight 6.2. Actively build a culture of reflection, learning and care: A culture of reflection, learning and care is an important enabler of PMERL. It is an ongoing task, and requires time, willingness and resources. PMERL can play an important role in supporting people's wellbeing and ability to navigate the "messiness" of transdisciplinary and inter-organisational work. It also helps to build relationships across the project team and can enable the development of a more caring work environment.	Early PMERL reflection events revealed the need for someone to pay attention to the well-being of team members, and to be a listening ear. PMERL seemed well-placed to do so as a cross-cutting function. Participants commented that they enjoyed getting together with other team members during reflection events, not only to share knowledge and experiences, but to get to know each other and look out for each other
Insight 6.3. Ensure that PMERL is tightly linked into SAM: PMERL needs to be well linked with planning and management to enable strategic adaptive management (SAM), i.e. the feedback loops need to be short and they need to 'close'. This means that information generated by PMERL needs to directly influence project management and decision-making over regular time intervals (i.e. not just at the end of the year).	The PMERL team found that recommendations were coming out of reflection reports, but were not being actioned, i.e. the feedback loops were not being closed. In response, recommendations now include a 'who' and 'by when' note. The reflection processes are now also being done over shorter time intervals: quarterly, rather than annually.

Insight	Insight background
Insight 6.4. Plan and capacitate for participation, collaboration and inclusivity. Enabling inclusive and genuine participation (the 'P' of PMERL) is not easy. It requires careful planning, preparation and paying attention to practical aspects of facilitating meetings and events (e.g. translation, power dynamics, providing transport and technology support, being physically present, etc). Specific capacities and skills are needed for the social process work which enables the creation of an inclusive space for reflection and learning across the diverse project team.	A key feedback item from early reflection events was that PMERL needed to include a wider range of project partners (esp. the more catchment-based partners) and to be more inclusive. Another key item raised was the need to interweave the Tsitsa Project PMERL system with the DEFF monitoring and reporting system. Acting on this feedback has had important implications for how we engage the diversity of partners in the PMERL work. The PMERL team hosted an online reflection event during the COVID-19 lockdown which required significant preparation with catchment partners to ensure they were technologically- ready to participate. It also required translation of the whole event (isiXhosa-English) which took a lot of time and key skills.
Insight 6.5 A monitoring system that capacitates and employs local residents as monitors and interfaces with other monitoring systems brings multiple benefits.	The early set-up of the sediment monitoring system, and related research (e.g. 3x Masters these) revealed important insights about how best to involve local people in monitoring, it also confirmed that this is cost-effective and has multiple benefits. Through employing, working with and capacitating local people as monitors (e.g. CTs, CLOs, CMs, etc) we have learned that this not only helps with collecting and generating data, but it also creates employment opportunities. helps to build a network of SLM-capacitated people locally, helps with knowledge exchange, and increases the reach of the project and its potential impact.

5.7. Capacity development insights

Capacity development is a crucial component of the Tsitsa Project that enables local land users to engage in governance, monitoring, learning and diversifying livelihoods. The key insights are presented below.

Insight	Insight background
Insight 7.1: **Partnering with an actor and/or organisation in the area in which CapDev is taking place is a significant CapDev enabler**.	In the Tsitsa Project, LIMA, an NGO and primary catchment-based implementing agent of the Tsitsa Project (https://lima.org.za/), and the Tsitsa Project Catchment Coordinator are critical catchment based implementing and coordination agents of the Tsitsa Project processes in the catchment and play a central role in CapDev processes. It is important that LIMA and the Tsitsa Project Catchment Coordinator be included in, to a feasible degree, the design and implementation of CapDev processes.
Insight 7.2: **A transdisciplinary team is required to design, implement and coordinate structured CapDev courses**.	Designing, coordinating, administrating and facilitating a training course successfully requires diverse skill sets, extensive human resource hours and sufficient budget. In addition, moving a course online requires more than double the effort than running a similar process face-to-face.
Insight 7.3: **Pay attention to process design and practicalities** to enable meaningful, equitable and beneficial CapDev.	Careful attention should be made to prepare, design and facilitate CapDev processes so as to enable diverse, meaningful and equitable participation and learning. Design and process should: take account of language (translation), the physical set-up of the room, anticipate and mitigate power dynamics, enable epistemic justice and directly benefit participants.
Insight 7.4: In a CapDev process **everyone is a learner and a teacher**	CapDev is not always externally focussed (e.g. on rehabilitation beneficiaries) but is equally important for the implementation/facilitation team. In this sense, everyone is a learner and a teacher. Both the implementation team (facilitators, managers, researchers and students) and external CapDev stakeholders (rehabilitation beneficiaries) should also be beneficiaries of CapDev processes. Everyone involved in a CapDev process brings their own knowledge and experiences that add to the richness of a learning environment. The CapDev implementers have an equal opportunity to learn from the contextual and local knowledge of the external participants as the participants have to learn scientific knowledge and experiences of the implementers.
Insight 7.5: It is important to **consider the opportunities and constraints to moving face-to-face learning to online learning**	Adapting CapDev to remote learning provides the opportunity to reach a wider range and number of stakeholders. However, designing and facilitating impactful and accessible online CapDev (e.g. a formal certificate course) requires a high investment in human resources and time. Important considerations include preparing and delivering content and mediating learning in a way that is accessible, relevant and engaging for an often diverse audience (diversity in educational levels, technological access, language and competing time commitments).

6. RECOMMENDATIONS AND WAYS FORWARDS

6.1. Recommended pathways towards capability expansion and participatory governance for sustainable land management

If you have had the opportunity to spend time in rural South African rangelands you will probably recognise this image: a series of pathways, trodden by livestock and people, which weave across the landscape, taking those walking them from one point to another, through twists and turns, and coming together, then moving apart, at various intersections. While these pathways are sometimes clearly defined, sometimes less so, and go in different directions, they are purposeful, and they help the walkers to find a way forward more easily, than if there were no pathway.

In that vein, we have drawn together the insights and lessons learnt from our own journey through the work of the Tsitsa Project to propose three ***pathways*** that we believe together could lead to capability expansion and participatory governance to realise sustainable land management. These three pathways frame the recommendations that we share with others, which are based on our experiences and the evidence we have gathered. They are of course not the only pathways, and not all are necessary all the time in all places: others may find different pathways more relevant for their context, or only choose to wander along some of those we propose here. Nonetheless, we feel that embarking on a journey towards sustainable land management along all three the pathways we propose here might well lead to favourable outcomes.

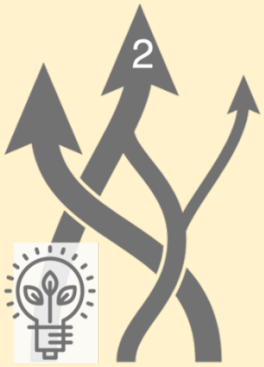
Pathway 1 - The 'research praxis pathway':

Enable engaged research-praxis collaborative partnerships

Supporting enhanced rehabilitation planning and implementation through praxis requires the development of collaborative partnership with (local/nearby) researchers - this should become a standard way of setting up rehabilitation implementation.

Researchers can and should play a key role in supporting rehabilitation planning towards sustainable land management (SLM), but this requires an engaged, transdisciplinary, praxis-orientation to research that adopts an explicit social-ecological systems framing in its work.

Making this work requires the creation of safe and equitable work spaces in which power dynamics are acknowledged, and inclusive and diverse research and engagement methodologies are prioritised.

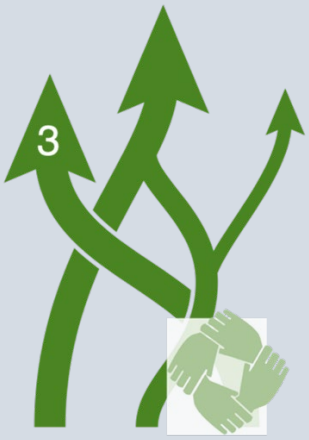


Pathway 2 – Supporting green livelihoods and catalysing green innovations pathway:

Catalyse green innovation for sustainable development and the realisation of residents' aspirations

Transforming the socio-economic context of rural landscapes requires the development of incubators for prototyping and experimenting with innovative green jobs and green livelihoods activities (e.g. plug-preneurs, Meat Naturally, etc).

These require local innovation hubs, operating as multi-stakeholder platforms, enable collaborative development of new markets and ways of driving the rural economy that contribute to sustainable land management and climate change adaptation.



Pathway 3: build capacity to enable local agency and capabilities

Involve, empower and, where appropriate, employ local people as central players in making a better future for their landscape to enable sustainable land management and climate change adaptation

(relational, trans-formational, reflexive capabilities)

To support enhanced rehabilitation planning and implementation towards resilient ecosystems and livelihoods, local communities need to be employed and empowered to contribute beyond the current focus on technical and 'manual labour' skills, i.e. as monitors, co-researchers, co-innovators and entrepreneurs (livelihoods and institutional entrepreneurs), and community engagement and capacity development and coordination (governance) officers involved in decision-making. Only if they are centrally involved in SLM processes across the board will enhanced rehabilitation and long-term SLM be possible.

Capacity and agency-building initiatives for all kinds of stakeholders (local residents, implementers, managers, researchers, policy-makers, etc.) need to go beyond the current focus on technical skills and competencies to build relational, transformational and reflexive competencies. The importance of relationship and trust-building (relational competencies), and agency-building, future, and change-oriented activities (transformative competencies), and reflexive orientations (reflexive competencies) for enhanced rehabilitation, sustainable land management and climate change adaptation is becoming increasingly important (Cockburn, Palmer, et al. 2018, Cockburn, Rosenberg, et al. 2020, Rosenberg and Kotschy 2020). To enable this requires drawing on mediating or facilitation tools in local participatory processes such as integrated planning, to catalyse participants' agency to collaborate in shifting the status quo and pursuing their agreed goals or aspirations.

Not only do we propose a set of pathways, which can guide people working on landscape rehabilitation towards SLM, but we also identify some important ***enabling factors*** which, from our experience, enable smoother movement along the pathways, and have also made it easier for us to develop these pathways. These are often behind-the-scenes activities or explicit culture shifts which are needed or likely to emerge to support the work suggested in the pathways: Below we outline the pathways and then introduce the enabling factor.

Enabler 1:

Working progressively towards an enabling institutional and operational context

Working towards secure, long-term funding that is administered with empathy and flexibility;

Striving for good working relationships and partnerships among key leaders of the initiative;

Aiming to inform the development and testing of supportive policy frameworks.

Enabler 2:

An adaptive, reflexive, learning orientation to (a) stakeholder engagement; (b) rehabilitation planning and management; and (c) monitoring and evaluation

This orientation needs to influence the work at multiple levels and is embodied, for example, in PMERL and SAM approaches, which have been key framings of the Tsitsa Project.

Enabler 3:

A working culture of respect, humility, openness and inclusivity

This way of working also pays attention to the internal dynamics or governance of project teams, i.e. not only trying to 'change the world out there' but also internally. The diversity of stakeholders is a central consideration, and attention is paid to issues of power dynamics, language, and different forms of knowledge.

6.2. Nesting the recommendations inside of the pathways and sets of enabling factors

Pathway 1: The 'research praxis pathway': Enable engaged research-praxis collaborative partnerships

- Work towards enhancing the convening ability of your initiative, such that a diverse panel of willing experts can be attracted into an advisory think tank where they too learn and benefit. In the spirit of opening options, they need not always reach consensus, the Project taking final decisions about the use of their suggestions (see insight 1.4).
- Work with local land users to understand what is important to them and what ecological infrastructure they would like to improve for ecosystem benefits (see insight 2.1).
- Invest in understanding biophysical and social processes and their interactions while planning and ideally before implementing (see insight 2.2).
- Target the land use and land cover planning and management issues that drive degradation before starting rehabilitation work (see insight 2.5).
- Develop and maintain monitoring systems that produce evidence to guide adaptive management. Update the existing best practice guidelines for rehabilitation based on local reflection and learning outcomes.
- Respond to new threats at an early stage while the extent of the problem is relatively small (e.g. new invasive species that is still localised).
- The Project must itself, in its particular context, decide which of these recommendations are generic (and even perhaps too broad to operationalise easily, and hence work at that), which are already well-known truisms yet useful to remember and embed, and which recommendations are indeed novel and/or textured enough to come close to their own context. For obvious reasons, the latter group may be the most useful value add in their case, and should be the ones to highlight alongside the more usual or known ones.

Pathway 2: Supporting green livelihoods and catalysing green innovations pathway: Catalyse green innovation for sustainable development and the realisation of residents' aspirations

- Combine capacity building opportunities with local level participatory planning interventions in order to enhance participants' core knowledge and skills required to expand their capabilities for decision-making, governance and action (capability development pathway) (see insight 4.5).
- Integrate livelihoods strategies with rehabilitation intervention in order to bring about benefits to both as is essential for successful rehabilitation outcomes and long term sustainability (see insight 5.1).
- Implementers must work with local residents and align their activities with local residents' aspirations (see insight 5.1).
- Facilitate the expansion of catchment residents' core knowledge, skills and capability, drawing on various forms of capacity development inputs to build on their livelihood aspirations and the improvement and uptake of a wider spectrum of livelihoods options. These should incorporate climate change adaptation principles, where appropriate. The capacity development and learning opportunities may range from training workshops, practical demonstrations, learning exchange and field visits, attendance at conferences and events, and co-learning interactions among residents and stakeholders. (see insights 5.3).

- Prototype green-preneur initiatives to enable residents, practitioners and researchers to jointly interrogate and explore the feasibility of such livelihood alternatives in the catchment. The uptake or consolidation of these 'pilot' initiatives requires a substantial level of time to undergo the various reconceptualisation and development stages required (see insight 5.4).
- Secure "Start-up" inputs, "incentives" packages and optimal and sustained funding flow to amplify successful outputs (see insight 5.4).
- Secure access to market value chains to reinforce the green-preneurs motivation to engage in new ventures as a way to increase their income generating opportunities and contribute to their overall Tsitsa catchment vision (see insight 5.5).

Pathway 3: Build capacity to enable local agency and capabilities

- Actively involve all stakeholders, especially the local land users, when developing long term sustainable land management plans as they will be driven at a local level that requires maintenance and adaptation (see insight 2.3).
- Use the Tsitsa Project Participatory Governance Capability Pathway within existing activities to build governance capabilities (see text box below and insight 3.1).

> **Co-knowing**: Check for a common understanding and ability to use vocabulary, technical terms and concepts;
>
> **Co-listening and co-speaking:** Develop habits of respect: attentive listening and clear speaking;
>
> **Co-Planning:** Check the people being planned for are part of the planning;
>
> **Co-influencing and Co-deciding:** Check the people affected have a chance to influence and participate in decision-making;
>
> **Co-acting and co-adapting:** As planning is implemented, work with participant to adapt as context then changes.
>
> Note you will need and get to practice each of the capabilities repeatedly in different stages of managing resources. The pathway is not linear.

- Practice being truthful and transparent. Be attentive to language: use the language of most people present and translate from there. Be aware that people learn in different ways and account for this by using a variety of facilitation tools. Be culturally and contextually sensitive (For example: dress codes, opening/closing with prayer, who opens/closes) (see insight 3.5).
- Forge multi-stakeholders partnerships into local-level participatory engagement for collective action and agency to enact transformation and change in land use practices and management (see insight 4.1).
- Facilitate social learning processes and engagements at village-level aimed at enabling capability expansion towards integrated land management, governance and ultimately sustained practices (see insight 4.3).
- Draw on mediating or facilitation tools in local participatory processes such as integrated planning, to catalyse and trigger participants' willingness to collaborate in shifting the status quo and pursuing their agreed goals or aspirations (see insight 4.4).

- Integrate an awareness of climate change risks and climate change adaptation approaches as a fundamental livelihood principle (see insight 5.3).
- The Tsitsa Project project staff, including the CLOs, citizen monitors and ecorangers, play a crucial part in the learning processes as they provide ongoing support and constant presence in the catchment (see insight 5.3).
- Plan and capacitate for participation, collaboration and inclusivity (see insight 6.4).
- Develop a monitoring system that capacitates and employs local residents as monitors, and interfaces with other monitoring systems (see insight 6.4).
- Ecosystem based adaptation and green solutions need ongoing maintenance and resources.

Enabler 1: Working progressively towards an enabling institutional and operational context

- Strive to secure and maintain a healthy partnership attitude between your initiative and its funders, an attitude that allows two-way motivation, joint navigation as both parties learn and adapt in the complex SES (see insight 1.2).
- Ensure that there are sufficient invigorating structures and "safe" spaces to support particular commonalities of interest, ones that allow open thinking and discourse and at times provide a pathway to more committed and rapid action in tandem with more formal 'slower' structures (see insight 1.2).
- Once a complex SES project starts (necessarily) showing a "mushrooming" of sub-initiatives, develop a method of constraining energy-draining 'marginal' activities or those that can be satisfactorily shared largely with effective partners. Continuously define the project's evolving identity, and its core values and principles using various appropriate techniques (see insight 1.3).
- Develop management and administrative systems that can adapt to the novel ways of land management and rehabilitation (see insight 2.4).
- Take time to find out what governance structures (institutions) actually exist, and how they function. Work from "what is there". Think about all of the possibly relevant institutions and what they might have to add. Be sure to consider informal formal institutions. It is useful to undertake 'governance mapping' (see insight 3.4).
- Identify and partner with competent actor(s) and/or organisation(s) based in the area in which CapDev processes are to take place (see insight 7.1).
- Having a catchment coordinator was a big step for us in improving communication.

Enabler 2: An adaptive, reflexive, learning orientation to (a) stakeholder engagement; (b) rehabilitation planning and management; and (c) monitoring and evaluation

- Practice being tolerant. Be tolerant of interruptions and plans that don't work out, of people who don't immediately understand you, people who think differently from you. Always give yourself extra time. Negotiate conflict carefully. Plan well, carefully and in detail and be prepared to respond to on the ground needs and adapt easily (see insight 3.3).
- Plan and budget for informal interaction time. Advocate retaining this budget item! (see insight 3.6).
- Actively surface and understand the historicity of local land use practices and related problem issues (contradictions and dissonances) as fertile ground to expand, shift and reimagine more sustainable and effective land use practices (see insight 4.2).
- Recognise synthesis and knowledge integration as a key purpose of PMERL (see insight 6.1).
- Ensure that PMERL is tightly linked into SAM (see insight 6.3).

- When considering on-line learning, beware of underestimating the time and human resources required to design, coordinate and implement a successful online learning process (e.g. a certificate course) (see insight 7.5).
- The Project must consider rates and types of change taking place. It is almost impossible to accurately predict, or replicate elsewhere exactly, the speed and depth at which changes that are required (are) to be made in a particular context. For instance, it is usual that existing structures (e.g. University Departments) and their mindsets impose constraints as they start working in a trans-disciplinary way, or become culturally accustomed to listening seriously to and hence meaningfully including other forms of knowledge. Erring on the side of keeping the pressure up towards the needed change is advised, but there are times to back off slightly, at the same time keeping it clear that the trajectory change rate needs to be strong enough to maintain impetus or there may be stasis or reversal.
- The Project must understand that universal recipes cannot be slavishly followed with any likely sustainable success, and show the initiative in assembling their own set of sequencing and balancing of these recommendations, and others they add, into a sustainable learning process with enough motivated participation to chart a desirable and flexible enough trajectory an a context likely to itself be changing.
- Target areas with a high likelihood of success first before more problematic areas are attempted. This will allow learning and method adaptation to take place before larger challenges are attempted.

Enabler 3: A working culture of respect, humility, openness and inclusivity

- Practice trust-building participation within your team. Be inclusive, especially across hierarchies. Pay attention to inclusive language and cultural sensitivities. Practice within group reflection so as to adapt and learn together (see insight 3.2).
- Develop a common understanding with residents of the Tsitsa Project objectives, catchment vision and land use management decisions for the catchment to guide rehabilitation interventions and expand livelihoods opportunities. This understanding must be placed in the context of future climate change and associated risks (see insight 5.3).
- Objectively and fairly mediate tensions and relational dynamics among different catchment stakeholders for livelihoods strategies and associated processes to have a better chance of success (see insight 5.3).
- Actively build a culture of reflection, learning and care (see insight 6.2).
- Form a transdisciplinary team in order to design, implement and coordinate an effective and impactful structured CapDev process (e.g. certificate courses) (see insight 7.2).
- Pay careful attention to process design and practicalities to enable meaningful, equitable and beneficial CapDev (see insight 7.3).
- Design and implement CapDev processes with the view that everyone involved (implementers and participants) is a CapDev beneficiary (see insight 7.4).

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APPENDIX 1: DETAIL OF FOUNDATIONAL RESEARCH (EXPANDING ON TABLE 1).

Research type	Description	Associated researcher(s)
Biophysical mapping, modelling and monitoring	Soil loss and sediment modelling	Jay le Roux early work and researchers from the University of the Free State, Bennie van der Waal
	Soil mapping	Johan van Tol, George van Zijl
	Alien plant listing and mapping	Ralph Clark and Nick Huchzermeyer
	Wetland mapping and classification	Pippa Schlegel and Nick Huchzermeyer
	Agricultural fields	Silindile Sibiya and Nick Huchzermeyer
	Fire dynamics	Gareth Snyman
	Understanding landscape connectivity	Bennie van der Waal, Nick Huchzermeyer, Pippa Schlegel, Laura Bannatyne
	Sediment monitoring (including citizen technician monitoring network)	Laura Bannatyne
	Key vegetation resources	Theses (Notiswa Libala, Qawe Mkabile, William Liversage Quinlan, Sean Heard-Hoare)
Environmental Education	Nosi Mtati masters and her early work setting up monitoring and traditional council networks	Nosiseko Mtati
Social / demographic / stakeholder-related	Demographic analysis (including disaggregating census data and integrating with land cover data (Masters))	Danuta Hodgson
	Situation Analysis / Stakeholder analysis	Led by Lawrence Sisitka
	Participatory mapping, life histories, livelihood trajectories PhD)	Dylan Weyers
Participatory Governance development	Hearing silent voices: A learning-centred approach to sustainable land rehabilitatin and natural resource management (Masters)	Margaret Wolff
	Exploring hillslope seep wetland importance inrelation to livestock grazing using a social-	Notiswa Libala

	ecological systems approach in the Upper Tsitsa River catchment (PhD)	
	Investigating epistemic justice in an adaptive planning process: towards developing a local catchment management strategy (Masters)	Mateboho Ralekhetla
	Leverage point for enabling participatory land and water governance in a rural catchment (Masters upgraded to PhD)	Anthony Fry
	An exploration of ways in which Dance Movement Therapy (DMT) can be used within a transdisciplinary water management research context (PhD)	Athina Copteros
Green Village Project	Laid the foundation for community participation and integrated planning in the Elangeni node (funded through the WRC)	Led by Kate Rowntree and the RU Geography Dept
Other	Systems modelling of Ntabelanga dam (Masters)	Rozanne Bester