



## RESILIM-OLIFANTS

Resilience in the Limpopo Basin Program



## Final Report



October 2020







# Project Details

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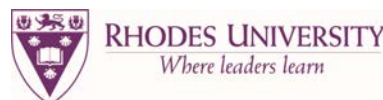
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# Project partners

AWARD worked with a variety of partners in the implementation of the RESILIM O. We recognize and acknowledge the valuable contribution they made to the program. A full list of partners is beyond the scope of this report - the logos of the major partners are included here.









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## Acronyms & Abbreviations

Agri-SI	Agricultural Support Initiative
AWARD	Association for Water and Rural Development
CBA	Critical Biodiversity Areas
CMA	Catchment Management Agency
CMF	Catchment Management Forum
CPA	Communal Property Association
CSO	Civil Society Organization
CSO-SI	Civil Society Organization - Support Initiative
DEFF	Department of Environment, Forestry and Fisheries
DICLAD	Dialogues for Climate Change Literacy and Adaptation
DWS	Department of Water and Sanitation
GIS	Geographical Information Systems
GLTFCA	Greater Limpopo Transfrontier Conservation Area
IDP	Integrated Development Plan
INWARDS	Integrated Water Resources Decision Support
IWRM	Integrated Water Resources Management
KNP	Kruger National Park
LEDET	Local Economic Development, Environment and Tourism (Limpopo Province)
LMC	Legalameetse Management Committee
MERL	Monitoring, Evaluation, Reporting and Learning
MSI	Municipal Support Initiative
MTPA	Mpumalanga Tourism and Parks Authority
NGO	Non Governmental Organization
NRM	Natural Resources Management
ORC	Olifants River Catchment
OLCMA	Olifants-Letaba Catchment Management Agency
RESILIM-O	Resiliency of the Limpopo River Basin
RQO	Resource Quality Objectives
SANParks	South African National Parks
SWSA	Strategic Water Source Area
USG	United States Government





# 1 Executive Summary

The RESILIM-Olifants programme was implemented by co-operative agreement to AWARD between 2013 and 2020 with the goal of *reducing vulnerability to climate change through building improved transboundary water and biodiversity governance and management of the Olifants Basin, through the adoption of science-based strategies that enhance the resilience of its people and ecosystems through systemic and social learning approaches*. It focused on the transboundary Olifants Basin shared between Mozambique and South Africa. The work arose in response to the rapid and continued degradation of water and natural resources of the Olifants Basin due to multiple drivers of change including climate change with profound implications for water security, natural resource sustainability and livelihoods of the region, particularly for the most vulnerable. The Olifants River Catchment is of international importance in maintaining flows of the lower Limpopo River, but is also one of the most degraded in South Africa.

Conceptually, AWARD adopted an innovative systemic, social learning approach for the RESILIM-O program. Methodologically this supported the use of processes and tools such as systems thinking, socio-ecological systems and resilience thinking, group model building, Strategic Adaptive Management, Collaborative Resilience Assessment, participatory action research, Activity Network Theory, expansive learning and a complexity-sensitive M&E system known as MERL. We focused strongly on governance systems and practices, also a program innovation. The program entailed two phases with Phase I dedicated to building collaborative understanding and stakeholding and the identification of needs and priorities for Phase II ‘projects’. Phase II comprised over 26 projects which responded to needs identified in the first phase and that addressed core areas of climate, water and land ‘systems’ (see diagram below). Twelve of these projects were implemented by partners through 22 sub-grants. Each thematic area was guided by an objective as follows:

## Water

To support catchment-based water resources governance through systemic, collaborative and adaptive approaches that focus on the development and uptake of tenable institutional arrangements, strategies, practices and tools, for water resources protection and climate change adaptation.

## Land and Biodiversity Management

To conserve biodiversity and sustainably manage high-priority ecosystems by supporting collective action, informed adaptation strategies and practices and tenable institutional arrangements.

## Climate Change

To reduce vulnerability to climate change and other factors by supporting collective action, informed adaptation strategies and practices and tenable institutional arrangements.

## Institutional Capacity

To institutionalise systemic, collaborative planning and action for resilience of ecosystems and associated livelihoods through enhancing the capacity of stakeholders to sustainably manage natural resources of the Olifants River Basin under different scenarios.



## Results and Outcomes

Results and outcomes for the above are summarized below.

### Water Resources Protection and Water Security

Significant advances were made in supporting overdue decentralized governance arrangements through support to the Olifants-Letaba CMA (OLCMA) for building a systemic understanding and practices and strategic intent through the Catchment Management Strategy supported by systemic tools and stakeholder capacity and participation. We also worked to support greater co-operation between South Africa and Mozambique. However, uncertainty caused by major institutional changes in 2017 which effectively put the CMA process on hold, meant a review of strategic action and greater support to non-state actors such as SANParks and Water User Associations. RESILIM-O developed systemic tools such as FlowTracker aimed at ensuring real-time monitoring of flows and compliance with gazetted standards. This app is freely available and used by stakeholders to monitor flow compliance and dam levels. It represents a first for the country and region. An integrated decision support system known as INWARDS was also designed to respond to the needs of DWS officials tasked with compliance monitoring and enforcement and the authorization of water use. Training in the use of INWARDS was undertaken but had to be put on hold after 2017. The value of INWARDS is shown in its role for maintaining flow when it was used by AWARD, SANParks and DWS to mitigate the five-year drought, the worst on record, through the de Hoop release model. Parallel monitoring gauges were established to provide backup to the DWS system facing challenges. Multiple networks for collective action were also supported, some of which were initiated by RESILIM-O including the River Health Monitoring Network of private protected areas, and the middle and lower Olifants operations networks.

Challenges that have emerged include weakening governance systems although the OLCMA appears to be back on track, failing maintenance of monitoring systems, the lack of adequate and updated planning and water resource availability assessments and outdated data on water use and the need to plan for climate change. Major concerns have been raised regarding water quality, unlawful use and the need to regulate the plans to move water out of the Olifants to Polokwane for mining, and the lack of systemic governance.

### Land and Biodiversity Management

To address the recent inclusion of biodiversity into spatial land planning by local government, AWARD provided tools and support to develop and sustain these roles in a way that promotes integration by embedding biodiversity into spatial planning in the region. Biodiversity and climate change adaptation were successfully integrated into spatial planning in the lower Olifants region through promoting understanding and application of the Critical Biodiversity Area (CBA) maps and land-use guidelines among spatial planners and other stakeholders involved in spatial planning and biodiversity-based activities, together with the development of resources and tools. The CBA Resource Pack for municipal spatial planners was a breakthrough in support for the officials and consultants tasked with integrating biodiversity data into spatial planning. Furthermore, the project made considerable impact on the provincial inclusion of biodiversity in Spatial Development Frameworks by providing a new conceptual framing of land-use planning in which biodiversity features strongly. The project also worked with estate agents and new landowners under the land restitution program to understand the full value of including biodiversity in land evaluations and plans.

As part of the collaboration between AWARD and the Spatial Planning and Economic Development (SPED) directorate of Maruleng, the MSI team initiated the development of a proof of concept for an electronic version (mobile phone App) of the Critical Biodiversity Areas (CBA) map. If the concept is taken to scale it will be a 'game-changer' for how biodiversity is integrated into municipal land-use planning. The App will also be useful for prospective landowners, conservation planners, estate agents and many others. We are



currently exploring funding mechanisms for the full development of the mobile phone app that will be downloadable from various software platforms.

For praxis a number of initiatives were undertaken. Our work on invasive alien plant control and restoration of the biodiverse, strategic water source area of the Blyde Catchment highlights the institutionalization of short- and medium-term collaborative planning amongst the partners engaged in restoration in the area and the emergence of an integrated landscape approach to restoration over the five-year period. It achieved new areas of collaboration, partnerships and institutional arrangements. The program also helped to build custodianship amongst the new landowners and provided important lessons for praxis and policy on the co-management of high priority, protected areas in South Africa through experiences at Legalameetse Nature Reserve. Restoration of the Limpopo estuary mangroves through community-based management is progressively increasing the extent of these important systems.

A major challenge involves the perceived notion that biodiversity is only the responsibility of (underfunded) conservation entities; mainstreaming biodiversity and associated ecosystem services practice was the point of departure for the activities under this part of the program.

### Climate Change Adaptation

RESILIM-O significantly increased the understanding of the basin-scale impacts of climate change at the regional, national and international context of climate change policy and adaptation for the catchment. This indicated an expected increase in temperatures and changes in rainfall patterns leading to increased risk of flood and drought. Climate change narratives for specified climate regions in the Olifants River Catchment were developed and technical briefs were also prepared for selected local municipalities. More specifically the impacts on water resources indicated a significant reduction in stream flow (increasing in an easterly direction) and a reduction in water storage capacity.

From this, we were able to develop a dialogical approach to learning about climate change and to plan adaptation strategies. Climate change was embedded into all projects in Phase II including through Disaster Risk Reduction of local government, agro-ecological practices for small-scale farming, water availability assessments and planning, WCDM, civil society actions, and capacity development with teachers in the Limpopo estuary and across tertiary institutions in the catchment. The program worked to integrate climate change into local government's Integrated Development Plans (IDPs) and into the IDP situational analysis in two municipalities. Although attempts were made to integrate climate change into the planning processes of water resources, this area remains a challenge. The Agri-SI (Agricultural Support Initiative) strengthens resilience and adaptation of small-scale farmers to climate change through a number of collaboratively designed options centred on improved soil and water conservation techniques and by means of a collaborative network for practice and improved marketing. Co-management of protected areas between the state and land claimants is also an important adaptation strategy as is the removal of invasive alien plants in Strategic Water Source Areas and the restoration of mangroves in the Limpopo estuary which offer important buffers against salt-water intrusion and dampen the effects of floods.

A number of challenges were identified including the capacity of local governments to take on the mandate for climate change planning and adaptation and the need to incorporate climate change projections into water resources planning and assessments.

### Institutional Capacity for Resilience

In order to give meaning to our systemic, social learning approaches within capacity development, AWARD designed a number of Resilience Support Initiatives for municipalities, small-scale agriculture and civil society. These required multi-disciplinary approaches and teams. Additionally, support was given for improved governance and institutional arrangements for Integrated Water Resources Management, co-management of protected areas and mangroves and for restoration and the control of invasive alien plants.





Institutions of Higher Learning were supported with curriculum revitalization whilst the capacity of young professionals was also addressed through our internship/ mentorship project.

- The **Municipal Support Initiative (MSI)** focused on improving preparedness and responsiveness of one district, Mopani, and two local municipalities, Maruleng and Ba-Phalaborwa, to deal with natural resource degradation and climate change vulnerability. A **water conservation and water demand management business plan was developed for Ba-Phalaborwa and Maruleng municipalities. Turnaround plans were developed for three municipal wastewater treatment plants, which all scored under 25% in Green Drop compliance.**
- The Civil Society Organizations-SI (CSO SI) engaged a broad spectrum of stakeholders from across the catchment including NGOs, community-based organizations, church and religious groups and citizen organizations. Capacity development enhanced **preparedness and responsiveness to climate change and environmental vulnerability**, through helping 45 CSOs to remain relevant within their contexts, engage in collective action, think and work systemically, and develop action competence, commitment and motivation.
- Agriculture SI, see above, supported over 380 farmers and about 3000 associated families. There is now a vibrant network of farmers in the lower Olifants and Sekhukhune district.

Support was given for improved governance and IWRM through planned institutionalization in the new Olifants-Letaba CMA and other organizations playing important roles in monitoring and protection of water resources. Unfortunately, major challenges were introduced when the CMA process was put on hold in 2017 in South Africa. Nonetheless, governance was strengthened through support to parastatals and non-state actors and the integration of actors from Mozambique.

Institutional arrangements were supported and strengthened in areas of co-management in Strategic Water Source Area and protected area management. This involved the state and new landowners who had successfully won claims to their land. Challenges remain in terms of land rights and transformation processes. Community based management institutions have been established in Mozambique for the protection of estuarine mangroves.

Through our **interns and mentors project**, AWARD provided workplace-based learning space to build the capacity of 21 young professionals through providing experience in resilience and systems thinking, multidisciplinary approaches, and “learning by doing” in the areas of water, biodiversity and NRM, climate change, institutional strengthening and stakeholder engagement.

## Findings for Resilience Building

This report provides a set of key findings with respect to resilience-building that emerged from the RESILIM-O program which are summarized below. Readers are referred to the full report for details.

1. Viewing the Olifants Basin as a socio-ecological system (SES)
2. Resilience and water security
3. Resilience and biodiversity
4. Resilience and governance
5. Resilience and the co-management of high priority protected areas
6. Resilience and local government
7. Resilience, livelihoods and food security
8. Learning and resilience



## Recommendations

The report provides a set of key recommendations for future work, both within the basin and beyond, which are summarized in Table A below. Readers are referred to the full report for details.

**Table A: A summary of challenges and recommendations that have emerged from the RESILIM-O program**

THEMATIC AREAS	
1. RESILIENCE AS THE RATIONALE FOR LONG TERM MANAGEMENT OF BASINS	The process of resilience-building offers an important link between degradation and sustainability but the concept remains to be mainstreamed
2. CHALLENGES TO WATER SECURITY AND SUSTAINABILITY	<ul style="list-style-type: none"> <li>- Urgent need to revitalize the OLCMA and secure adequate capacity and resources to manage effectively and systemically. Development of a Catchment Management strategy and uptake and use of INWARDS for management are key</li> <li>- Continued water quality degradation and the effects on biotic and human health cause for concern</li> <li>- The ORC in South Africa is effectively closed (water use exceeds water availability)</li> <li>- Class I catchments and SWSA need to be afforded proper governance efforts</li> <li>- Plans to move water out through and inter-basin transfer to Polokwane and mining will likely place the middle and lower reaches at great risk in an already over-utilized catchment</li> <li>- Unregulated increased abstraction and unlawful use pose similar risks - regulation is a priority</li> <li>- Climate change projections likely to decrease water availability, stream flow and storage capacity. Increased risks of flood and droughts likely WCWDM urgently needed</li> <li>- Regular non-compliance with EWRs and other standards needs to be addressed</li> <li>- Bilateral flow agreements between South Africa and Mozambique are needed</li> </ul>
3. GIVING BIODIVERSITY HIGHER PRIORITY	<ul style="list-style-type: none"> <li>- The effectiveness of tools developed by RESILIM-O is undermined without the formal adoption by municipal councils.</li> <li>- Biodiversity compatible outcomes need also to be 'institutionalized' in municipal by-laws</li> <li>- Support for new practices and new priorities that recognize biodiversity at the municipal level are needed.</li> <li>- Continued support for co-management and restoration initiatives developed under RESILIM-O are needed<sup>1</sup>.</li> </ul>
4. CLIMATE CHANGE IN CONTEXT	<ul style="list-style-type: none"> <li>- Few institutions that are planning for climate change in practical terms</li> <li>- Impacts on water security, biodiversity and food security are of particular concern and need to be integrated</li> </ul>

1. DEA is addressing this through additional support in the Blyde Catchment but support to LEDET for co-management is urgently needed.



## CONTENT AND PROCESS

<p><b>5. CO-MANAGEMENT OF HIGH-PRIORITY, PROTECTED AREAS</b></p>	<ul style="list-style-type: none"> <li>- Issues related to land rights are still unresolved and hence creating confusion and tension</li> <li>- Co-management is a new practice unknown to both parties, and so co-learning is key</li> <li>- Co-management involves shifting power dynamics and cannot therefore be a rapid process</li> <li>- This is a transformative process for all parties involved and must be designed as a facilitated learning process with adequate support</li> <li>- The praxis of co-management needs an integrated systemic, social learning approaches</li> <li>- Beneficiation lies at the heart of many areas of conflict. This together with development plans must be strategically planned for and negotiated with landowners</li> </ul>
<p><b>6. GOVERNANCE AND POLICY</b></p>	
<p><b>6.1. THE NEED FOR STRONG, TENABLE AND ROBUST GOVERNANCE ARRANGEMENTS</b></p>	<ul style="list-style-type: none"> <li>- Unexpected institutional flux and dynamics were widely evident in many areas of support leading to uncertainty, distrust and conflict. Should be a priority consideration in any new initiative in the ORC</li> <li>- Changes in water governance have been highlighted in terms of their impacts, as is the case in co-management and municipal functions related to biodiversity, water supply and WWTW (see individual projects)</li> </ul>
<p><b>6.2. GIVING EFFECT TO POLICY INTENTIONS</b></p>	<ul style="list-style-type: none"> <li>- One does not implement policies (such as the Reserve) but rather it is a bundle of strategies and practices that give effect to a policy intention. This must be systemically planned for</li> </ul>
<p><b>6.3. THE IMPORTANCE OF LEADERSHIP AND GOVERNANCE FOR TRANSFORMATION</b></p>	<ul style="list-style-type: none"> <li>- Leadership of a <u>particular kind</u> is key for transformation to drive transformation with a particular vision</li> <li>- In general, this was weak although pockets of transformative leadership were identified and supported</li> </ul>
<p><b>6.4. THE IMPORTANCE OF A LAWFUL AND REGULATED SYSTEM</b></p>	<ul style="list-style-type: none"> <li>- All of the Olifants catchment is bedevilled by non-compliance creating a situation of vulnerability</li> <li>- Requires investment in and maintenance of monitoring systems, competent staff who have powers to follow due procedure and seek legal remedy and incentives to comply</li> </ul>
<p><b>6.5. LACK OF CONTINUITY IN ELECTED GOVERNANCE</b></p>	<ul style="list-style-type: none"> <li>- A lack of continuity in local government councils holding authority for technical decisions still remains a problem</li> </ul>
<p><b>7. INTEGRATED, SYSTEMIC APPROACHES</b></p>	
<p><b>7.1. SYSTEMS APPROACHES</b></p>	<ul style="list-style-type: none"> <li>- The continued lack of integrated approaches at the basin scale, despite significant gains, still persists in some quarters e.g. the lack of integration between protection of water resources and the lack of catchment-wide competencies for IWRM</li> </ul>
<p><b>7.2. ENSURING REQUISITE SIMPLICITY</b></p>	<ul style="list-style-type: none"> <li>- RESILIM-O offers many examples of where complicated ideas and procedures have been reframed in simpler terms e.g. biodiversity integration into land-use guidelines, river flow monitoring, water resources and climate change, working with municipalities around natural resources management and principles for agroecology</li> </ul>
<p><b>7.3. SUPPORT FOR SELF-ORGANIZATION AND FEEDBACK</b></p>	<ul style="list-style-type: none"> <li>- Functional, responsive <u>multi-scale feedbacks</u> are essential for management of complex systems as they provide the basis for learning</li> <li>- Support for leadership and the ability to self-organize are key</li> </ul>

8. A FOCUS ON PRACTICES

<p>8.1. PEOPLE, TOOLS AND PRACTICES ARE PARTS OF ACTIVITY SYSTEMS</p>	<p>- Viewing practices (e.g. co-management, biodiversity planning) as parts of an activity system that collectively supports an intended outcome, helps to develop a realistic understanding of what is needed to ‘implement’ a policy</p>
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9. LEARNING SYSTEMS FOR RESILIENCE AND SUSTAINABILITY

<p>9.1. MEANINGFUL LEARNING, NETWORKS FOR COLLECTIVE ACTION AND ENGAGEMENT</p>	<p>- Rather than using a “transfer-of-knowledge model”, networks that are supported over time through a social learning approach to develop a collective understanding are most likely to reduce resource related conflicts and vulnerabilities</p>
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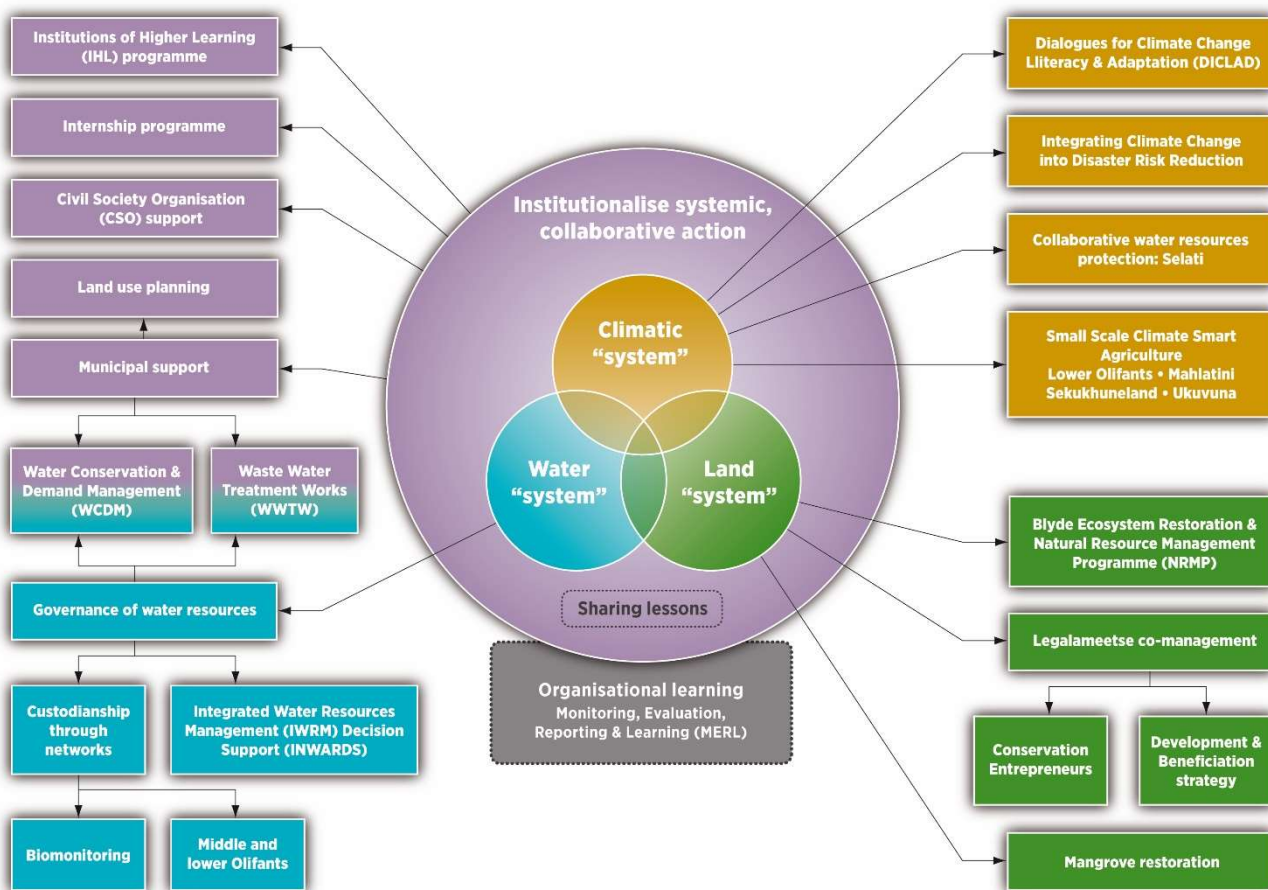


Figure A: Schematic of key programmatic areas with associated projects for RESILIM O Phase 2





## PART 1

## 2 Background

The Building Resilience in the Limpopo Basin Program, known as RESILIM, was commissioned by USAID in 2012. The intention of the program was to focus on policy, capacity-building, technical assistance and promotion of learning at the regional transboundary level. The overall goal of RESILIM was to improve transboundary management of the Limpopo River Basin, resulting in enhanced resiliency of people and ecosystems. RESILIM was set up to support equitable access to water that balances urban and rural needs with ecosystem requirements under changing climate scenarios. The project team was expected to work with national governments, LIMCOM, and other regional organizations including the Greater Limpopo Transfrontier Conservation Area (GLTFCA), to improve governance of natural resources and build capacity to integrate sound natural resource management practices and adaptation strategies into policy and planning.

The RESILIM program mechanism was based on two distinct approaches, one for the Limpopo Basin (RESILIM B) and for the Olifants Basin (RESILIM-O) based on a contract and a co-operative agreement respectively. While the overarching goal and objectives were the same for both, USAID anticipated specific activities, approaches and impacts to be different and complementary. The work reported here was conducted under the co-operative agreement that was given to AWARD (Association for Water & Rural Development).

The program was funded with resources earmarked by the U.S. Congress for Biodiversity Conservation and Climate Change Adaptation (approximately 50:50 ratio). As such, the program and all activities were designed to meet the necessary Biodiversity and Climate Change earmark requirements as defined by the Agency's "Biodiversity Code" and the Definition for USAID Global Climate Change Adaptation Programs.

### USAID Biodiversity code

Within the Biodiversity code are four key criteria, all of which must be met to be considered a biodiversity program:

1. The program must have an explicit biodiversity objective: it is not sufficient to have biodiversity conservation result as a positive externality from another program;
2. Activities must be identified based on an analysis of threats to biodiversity;
3. The program must monitor associated indicators for biodiversity conservation; and,
4. Site-based programs must have the intent to positively impact biodiversity in biologically significant areas.

Under the Foreign Assistance Framework, biodiversity is recognized as a "key issue" reflecting, "activities having biodiversity conservation as an explicit objective in natural and managed terrestrial and aquatic ecosystems. Activities are identified through an analysis of the threats to biodiversity and have associated indicators for biodiversity conservation".



### The definition for USAID Global Climate Change Adaptation Programs

Adaptation refers to efforts to deal with the impacts of current climate variability and future climate change. USAID’s adaptation programs seek to build resilience to climate change in the most vulnerable countries. Adaptation investments must have the explicit objective of assisting developing countries to reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks.

An adaptation program or activity funded with US GCC earmarked funds must have an explicit, primary, goal to achieve climate change adaptation-related outcomes. Programs or activities should consider policy priority activities, including:

1. Science and analysis to inform decision making in topics sensitive to climate, including context-specific vulnerability assessments;
2. Improved governance to address climate-related risks; and,
3. Piloting, evaluating, and implementing effective adaptation methods and systems to address climate-related risks.

Finally, the program or activity must monitor its impact on addressing climate change using one or more GCC indicators, at least one of which must be a standard USAID GCC Adaptation Indicator.

## 2.1 The RESILIM-O Program

The RESILIM-Olifants or RESILIM-O program was the title of the co-operative agreement with the Association for Water and Rural Development (AWARD), funded through USAID. RESILIM-O focuses on the Transfrontier Olifants Catchment shared between South Africa and Mozambique (Figure 1) which is part of the Limpopo Basin.<sup>2</sup>

The overarching goal of RESILIM-O was “To reduce vulnerability to climate change through building improved transboundary water and biodiversity governance and management of the Olifants Basin, through the adoption of science-based strategies that enhance the resilience of its people and ecosystems through systemic and social learning approaches”.

The RESILIM-O program comprised over 26 projects in total which addressed core areas of climate, water and land “systems”. Twelve of these projects were implemented by partners through 22 sub-grants (see Appendix 10.1).

## 2.2 About AWARD

The Association for Water and Rural Development (AWARD) is a non-profit organization specializing in multi-disciplinary, participatory, research-based project implementation aimed at addressing issues of sustainability, inequity and poverty. The organization has been in existence for over 20 years. Informing their work are the values of trust, dignity for all, justice, fairness, non-discrimination, unity and learning through practice. The organizational approach involves thinking across disciplines, boundaries and systems.

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<sup>2</sup> RESILIM B worked at the scale of the four SADC member states that share the Limpopo Basin (South Africa, Botswana, Zimbabwe and Mozambique).



While working collaboratively with other organizations and developing strong and rich professional networks, AWARD strives to build natural resource management competence in civil society, government agencies and private enterprise. The organization commits to providing a foundation for robust and sustainable development policy and practice in southern Africa that can stand up to an increasingly complex world.

For further information, see [www.award.org.za](http://www.award.org.za)

## 2.3 The Olifants Catchment: An Overview

As mentioned, the Olifants River Catchment falls within the Limpopo River Basin, which is part of an international drainage basin that stretches across South Africa, Mozambique, Zimbabwe and Botswana. The Olifants River contributes nearly 40% of the water that flows in the Limpopo River making it an important catchment in the system as a whole and one that maintains flows in the lower Limpopo during the dry season.



Figure 1: Map showing the Limpopo Basin with the Olifants catchment in the north eastern region of southern Africa





Figure 2: Although the Olifants River is one of the most degraded in South Africa in terms of water quality, tributaries such as the Blyde are some of the most pristine



Figure 3: The Olifants Catchment is located in the southern part of the Limpopo Basin and falls and falls in South Africa and Mozambique





The Olifants River is a vital artery that flows for 560 km through South Africa and into Mozambique, where it is known as the Rio dos Elefantes. This mighty river originates in South Africa's Highveld, traversing three provinces (Gauteng, Mpumalanga and Limpopo) before flowing through the iconic Kruger National Park and into Mozambique where it reaches the Indian Ocean near Xai Xai, just north of Maputo. The main tributaries are the Wilge, Elands, Ga-Selati, Klein Olifants, Steelpoort, Blyde, Klaserie and Timbavati Rivers. The Olifants Catchment comprises 55 000 km<sup>2</sup> and is home to about 3.5 million people in South Africa and 0.7 million people in Mozambique.

From both an aquatic and terrestrial perspective, the Olifants Catchment is a rich and diverse landscape. It is home to areas of endemism and high biodiversity, particularly along the Drakensberg Escarpment which includes the Blyde and Legalameetse Nature Reserves and some tributaries of the Olifants. The Drakensberg Escarpment is one of South Africa's Strategic Water Source Areas (SWSA). The Olifants River flows into the Limpopo River and the Maputoland-Tongoland Ecoregion, an area of rich biodiversity and endemism which includes the Limpopo River estuary. Currently, the Olifants River is the only tributary that sustains flows of the Limpopo River in the dry season.

Large areas of the catchment have been substantially modified and the upper catchment is almost totally transformed through agriculture and mining with the latter increasing significantly in the last decade even across former agricultural areas. A number of ecosystems are considered either critically endangered or endangered and many more are vulnerable. Declining water quality and decreased flows threaten aquatic systems along the entire Olifants River within South Africa and to the Xai Xai estuary in Mozambique.

In Mozambique, the estuarine area is classified as a *National Maritime Ecosystem Priority* area. Equally, the mainstem of the Olifants River is regarded as critically endangered from its source to the protected areas in the Lowveld. Likewise, almost all westerly-flowing rivers in the high and middle-veld are critically endangered. Intact river systems are limited to the Blyde (although under threat from mining), some tributaries of the Steelpoort and the upper Selati (Legalameetse Nature Reserve) of the lower Olifants.

Unchecked pollution, inappropriate land and resource use, poor enforcement of regulations and poor protection of habitats and biodiversity impact on the livelihoods of all the catchment's residents. With over 600 former or existing mines<sup>3</sup> (coal and platinum in particular), impacts are felt in both the terrestrial and aquatic systems and on human livelihoods. The discharge effluent from many of the 100plus waste-water treatment works (public and private), many of which are struggling to meet national standards,<sup>4</sup> impacts on the aquatic systems downstream and again on peoples' livelihoods. Indeed, AWARD's work suggests that the most vulnerable livelihoods in terms of the direct dependencies on ecosystem services are in the former "homelands" which cover about half of the catchment. Between 6,000 and 10,000 small-scale farmers as well as the mangrove ecosystem at Xai Xai are dependent on flows into Mozambique. These connections highlight the importance of the systemic approach adopted by AWARD.

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<sup>3</sup> RESILIM-O database

<sup>4</sup> RESILIM-O database and analysis





*Figure 4: The Olifants River flows over a gauging weir giving an indication of the heavy sediments loads that it carries to the sea during the rainy season*



## 2.4 Overview of the Resilience Building Activity

The Olifants River ceased flowing for a number of days as far back as in 2005, prompting widespread concern and calls for an integrated focus on all of the easterly-flowing rivers of the Lowveld of South Africa. Clearly the resilience of this system was being drawn into question. Despite the enabling legislative framework for water reform in South Africa since 1998, the integrity of most rivers in this catchment continued to degrade both in terms of quality and quantity. Given that all these rivers form part of international systems, the implications are of wider significance than for South Africa alone. As now shown by our work, this ongoing degradation is caused by a complex interaction of factors that vary across the catchment and along the length of the river. Key drivers include rapid growth in mining, irrigated agriculture and various industries, coupled with weak governance, regulation and enforcement. When combined with the threats of climate change, rural poverty and food insecurity, these factors threaten to cause widespread livelihood vulnerability, environmental degradation and intensifying conflict over resources.

Due to the complexity of issues at the scale of the catchment, a specific and unique approach was adopted in the RESILIM-O program for assessing these drivers, which is outlined later in this report. Three characteristics broadly describe a system's resilience:<sup>5</sup>

- the amount of change the system can undergo and still remain in the same configuration (retain the same controls on structure and function);
- the degree to which the system and its institutions are capable of self-organization (feedbacks); and
- the degree to which the system can build the capacity to learn and adapt.

The resilience assessments then provided the basis for the collaborative formulation of resilience-building activities in the catchment. Further details are covered in this report but essentially, as Walker et al. (2004) argued,<sup>6</sup> it is crucial to specify which system state is being considered (*resilience of what*) as well as which disturbances are of interest (*resilience to what*).

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<sup>5</sup> Carpenter et al. 2001; Walker et al. 2002

<sup>6</sup> Walker B, Holling CS, S.R.Carpenter and Kinzig A (2004) Resilience, adaptability and transformality in social ecological systems. *Ecology and Society* 99 (2) 5



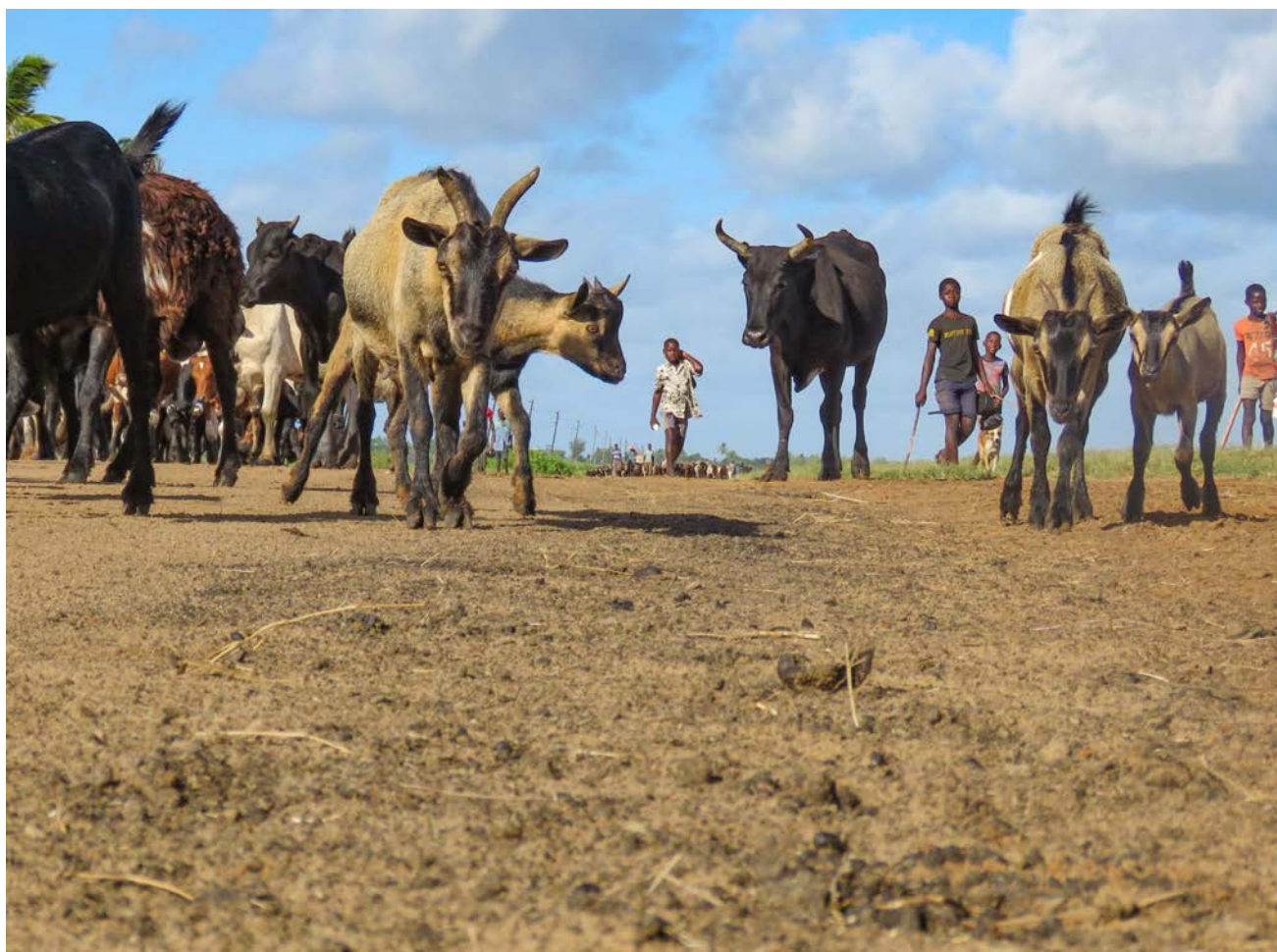


Figure 5: Resilience building is about adapting to change, for example, should a system degrade, so the people of the Olifants Catchment will need to adapt their agriculture practices to cope

## 2.5 Key Design Features

We maintain that historical bias toward ecological and economic research in understanding resilience has led to inadequate framing of practical resilience-building action. At the start of the program there was emerging consensus that environmental problems are basically also social and behavioural problems (Pollard & du Toit 2011)<sup>7</sup> and are complex and non-linear. It is clear that there is movement away from conceptualizations of ‘ecological systems’ and ‘social systems (including governance)’ as dualisms towards a more integrated view of socio-ecological systems SES (Holling 2001)<sup>8</sup>.

Alternative methodologies are required to address this re-conceptualization of ‘environmental problems’. Based on previous extensive experience (Pollard and du Toit 2011<sup>9</sup>; Pollard et al 2014<sup>10</sup>), the RESILIM-O

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7 Pollard S. and Du Toit. 2011. *Towards Adaptive Integrated Water Resources Management in Southern Africa: The Role of Self-organisation and Multi-scale Feedbacks for Learning and Responsiveness in the Letaba and Crocodile Catchments. Special Edition Water Resources Management*

8 Holling, C. S. 2001. *Understanding the complexity of economic, ecological and social systems. Ecosystems* 4:390-405

9 Pollard S and du Toit D. 2010. *Towards the sustainability of freshwater systems in South Africa: An exploration of factors that enable or constrain meeting the Ecological Reserve within the context of Integrated Water Resources Management in catchments of the lowveld. WRC Report No. TT/477/10, Water Research Commission, Gezina*

10 Pollard, S., H. Biggs & D. R. Du Toit. 2014. *A systemic framework for context-based decision making in natural resource management: reflections on an integrative assessment of water and livelihood security outcomes following policy reform in South Africa. Ecology and Society* 19 (2): 63. [online] URL: <http://www.ecologyandsociety.org/vol19/iss2/art63/>





program provided an opportunity to shift methodology from the dominant technicist<sup>11</sup> approaches in natural resource policy and management and to include elements where practitioners engage with development and use in a reflexive manner.

The first important feature of RESILIM-O is that the program was designed with a systems orientation in mind which recognizes inter-connectedness between ‘sub-systems’ whether socio-economic, environmental or political, that is by viewing the ‘system’ as an SES. Relationships between these are dynamic, changing in space and time, thereby introducing the concept of complexity, emergence and uncertainty. This orientation assumes that addressing environmental and developmental challenges such as building social and ecological resilience in the face of climate change, is a systemic endeavour where research and implementation – ‘intervening’ in real-world, complex ‘systems’ – requires different approaches.

Importantly for monitoring and evaluation, this requires what USAID (Patsalides & Britt 2014<sup>12</sup>) calls a complexity-aware programmatic approach. Interventions and evaluation approaches that work in simple systems (which have regular, predictable outcomes) do not work in complex systems (that are dynamic and largely open-ended, with complex feedback loops and emergent properties). Kurz & Snowden (2003<sup>13</sup>) usefully distinguished between simple, complicated and complex systems. The RESILIM-O monitoring and evaluation system was therefore specifically designed for building evidence with complexity in mind (see MERL section).

Additionally, RESILIM-O’s multiple, related and system-wide actions to build resilience have at their centre the notion of ‘systemic social learning’ and ‘learning together what is not yet known’;<sup>14</sup> this influences the particular approach to capacity development and communications interventions. These were interactive, participatory and open-ended, of a longer-term nature, and centred around changing practices, including institutions and governance, rather than simply raising awareness and passing on technical skills. The latter can however be part of a range of broader *systemic social learning* processes that include deeper, reflexive learning.

Lastly, the progress towards the outcome of the program occurred in two phases. Phase 1 was foundational in understanding the Olifants as a system – its key components, institutions, relationships, management and the drivers behind the system *status quo* – arriving at a value judgement as to the state of resilience or vulnerability of the system. Phase 2 was dedicated to testing and institutionalization of resilience-building actions. The outcomes and objectives (see Figure 6) of the program remained the same throughout both phases. Detail on the two phases is provided later.

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11 A view dominated by empirical science

12 <https://usaidlearninglab.org/events/complexity-aware-monitoring>

13 Kurz, CF and Snowden, DJ. 2003. *The new dynamics of strategy: Sense-making in a complex and complicated world.* IBM Systems Journal, 42(3), 462-483.

14 As articulated by Ison, Wals, Engeström and others

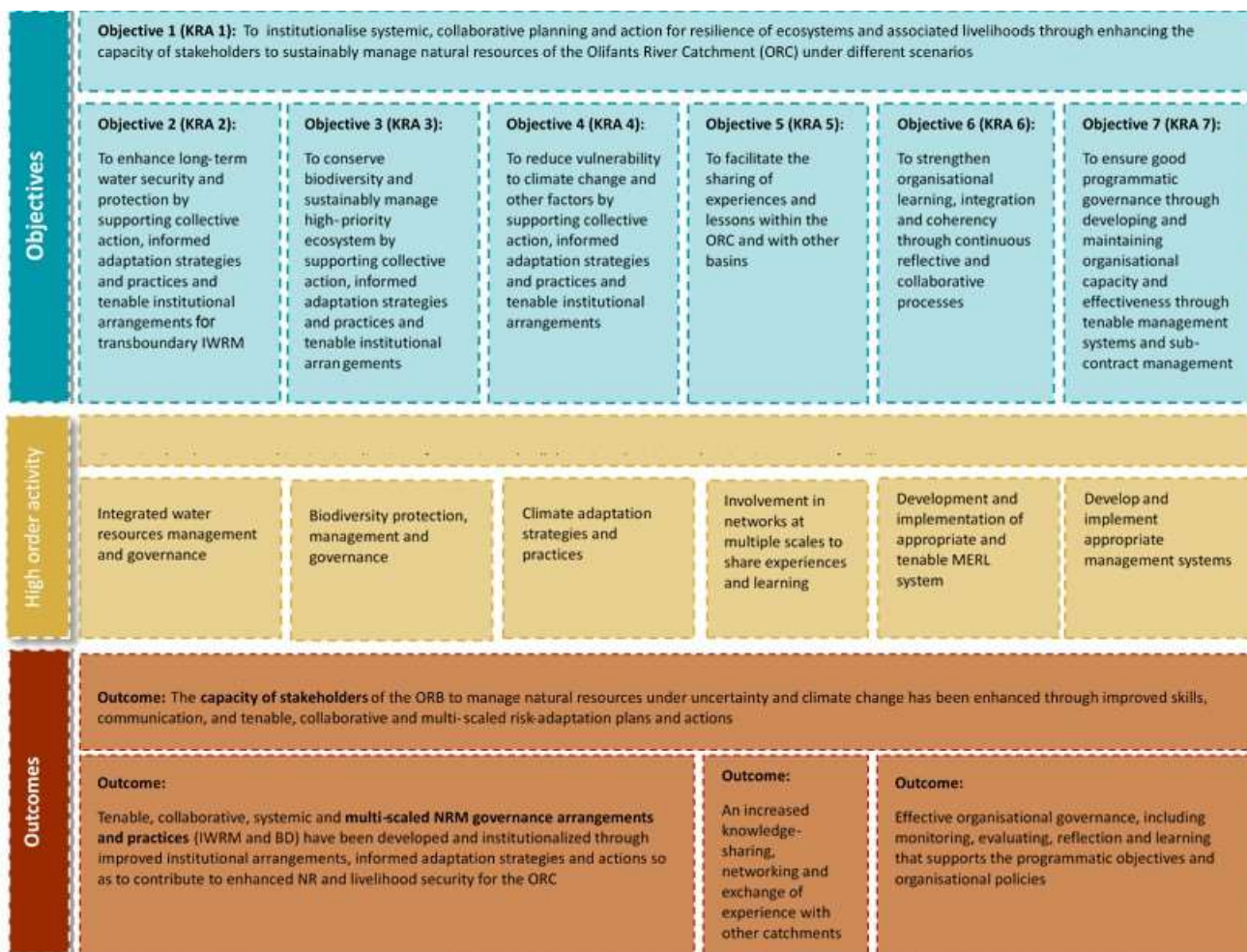
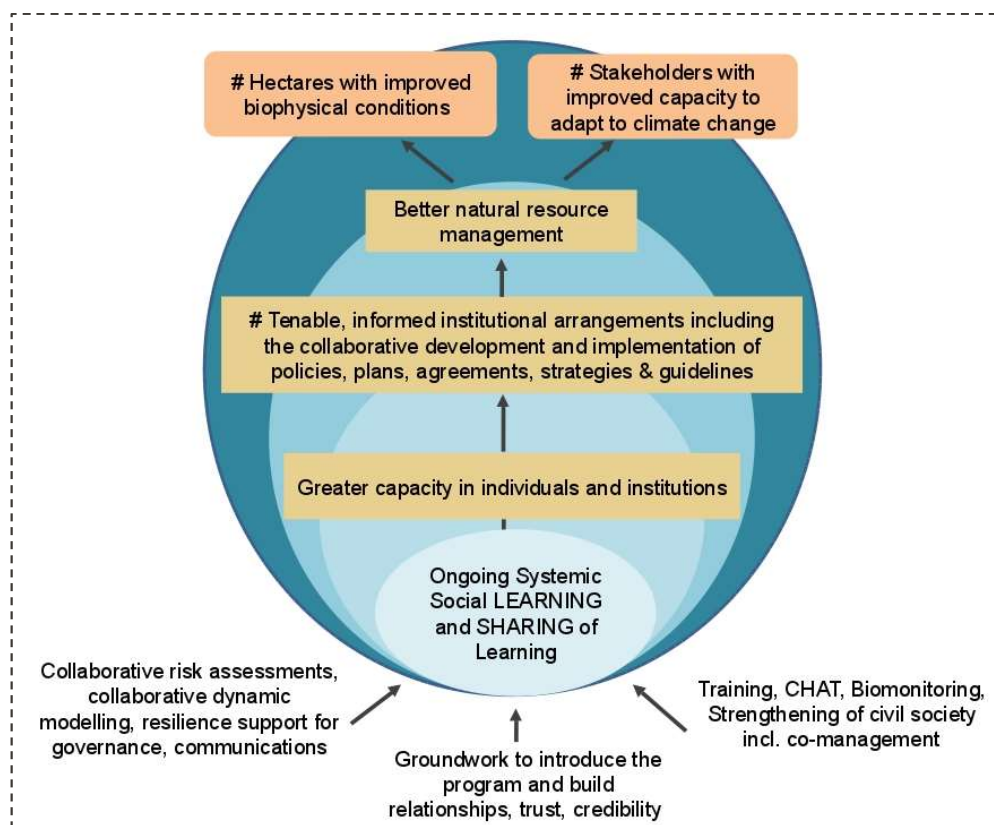


Figure 6: Schematic of RESILIM-O programmatic objectives, higher order activities and related outcomes. ORB - Olifants River Basin; NRM – Natural resources management refers to water and biodiversity management

## 2.6 Theory of Change

The program theory of change emphasizes systemic, social learning as foundational to the program, both as a mechanism and an outcome. In Figure 7 the concentric, shaded circles depict the non-linear way in which system-wide social learning is expected to spiral out from and inform all program activities. Desired outcomes (e.g. collaborative development and implementation of policies and plans) are a result of social learning but also contribute to further social learning. Additional documentation can be found at [www.award.org.za](http://www.award.org.za)



*Figure 7: RESILIM-O theory of change showing the relationships between the high-level USAID indicators (coloured boxes) against which the program is reported*

Essentially success at the program level was measured by whether project activities contributed to reducing vulnerability to climate change and improving transboundary water and biodiversity governance and management in the Olifants River Catchment. These programmatic outcomes are intended to enhance the resilience of people and ecosystems in the longer term (the program impact). Improved water and biodiversity governance and management was expected to take place through institutionalization of collaboratively developed policies, practices tools and guidelines, and through building the capacity of individuals and organizations in the catchment. Capacity development was understood as any activity or process that enhances one or more of the following five aspects:

1. Individual capacity and competence (staff skills, behaviours, attitudes, application of tools and technologies, decision-making ability, management skills, systems thinking, etc)
2. Organizational capacity (organizational systems, information management systems, processes for management, financial systems, procurement, accountability, transparency in decision making, etc.)
3. Presence of “enablers” (e.g. policies, technology, tools, maps, infrastructure, capital equipment, etc)
4. Capacity for collective action (ability to work together, ability to build consensus, within and outside the organization, effectiveness of relationship management)
5. Capacity for appropriate communication and feedback (early warning systems, feedback loops, engaging stakeholders and providing opportunities for participation)





*Figure 8: Women are frequently at the interface of resource use and resource management. Here women prepare to plant young mangroves in the Limpopo estuary in Mozambique.*





## 3 Report Overview

This report is the final report on the USAID: RESILIM-Olifants program implemented by the Association for Water and Rural Development (AWARD) and partners. It comes at the end of seven years of project activities (spanning the period 1 December 2012 to 30 June 2020<sup>15</sup>). Although it is taken to signify the end of the program as defined by the co-operative agreement, it is also hopefully a formative document for charting a way forward for the Olifants Catchment, and other catchments interested in building resilience into catchment planning. To this end, the report intends to provide a descriptive overview of the project, its key design features, its activities and the key outcomes. It provides a summary of key recommendations and challenges as experienced and documented over the life of program.

The report is structured to make sense of an expansive scope of activities conducted over seven years of the program. Details of specific projects and processes are to be found in specific project documentation and technical reports that are referenced and listed in the appendices.

### This report covers the following:

#### PART 1: Program Design

- a] Design aspects and methodology;
- b] Key systems tools developed, tested and/or applied in the resilience building processes;
- c] Summaries of the key activities with reference to where further documentation can be found;
- d] Main communications methods and designs with instructions for those interested in locating detailed documentation and reading;
- e] Program structure;
- f] Summary of process and procedures followed over time;
- g] Partnership approach;
- h] Program management approach.

#### PART 2: Results

- a] Phase 1: Contextual assessments with implications for resilience building in Phase 2;
- b] Phase 2: Overview and summaries of program actions for catchment resilience building;
- c] Programmatic results, outcomes and impact through the unique monitoring and evaluation approach: Summaries of qualitative and quantitative data for the program;
- d] Resilience building processes;
- e] Financial summary.

#### PART 3: Challenges and Recommendations

- a] Challenges and recommendations and for resilience building
- b] Conclusion

#### PART 4: Appendices

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<sup>15</sup> Extended due to Covid 19 related impacts



## 4 Methodology

The RESILIM-O program design draws on a broad spectrum of theoretical frameworks for resilience building. The most important are outlined briefly here with details provided in technical reports, guidelines and program documentation [see [www.award.org.za](http://www.award.org.za)].

### 4.1 Systems Thinking: Understanding Complex Systems

Together with social learning, the most important framework underpinning the RESILIM O program is systems<sup>16</sup> and complexity theory<sup>17</sup>. As noted, systems approaches recognize the inter-connectedness between socio-economic, environmental or political ‘sub-systems, Relationships between these ‘sub-systems’ are dynamic, changing in space and time, thereby introducing the concept of complexity, emergence and uncertainty. Systems thinking recognizes that many environmental and social problems are interconnected across different areas of interest (food, water, land, livelihoods, climate) and across space and time. We recognize that so-called ‘social’ and ‘ecological’ systems are more usefully seen as interacting, co-evolving and complex socio-ecological systems (or SES). While referencing real features of the world, a system is essentially a socially constructed entity with particular boundary choices which suit the particular purpose. Systems thinking requires a shift from a reductionist view to a complexity frame of reference which recognizes variability, uncertainty and interactions between components.

AWARD has a strong history of systems thinking in praxis (Pollard & du Toit 2011<sup>18</sup>; Pollard et al. 2014<sup>19</sup>) and adopted a systemic basin-wide approach to natural resources governance and used this thinking in the development of the RESILIM-O methodology. It is this commitment that underpinned the transboundary approach, across administrative, political, social or economic ‘boundaries’. The contextual framing is dealt with in PART 2.

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<sup>16</sup> Berkes, F., and C. Folke, editors. 1998. *Linking social and ecological systems: management practices and social mechanism for building resilience*. Cambridge University Press, Cambridge.

<sup>17</sup> Holling, C. S. 2001. *Understanding the complexity of economic, ecological and social systems*. *Ecosystems* 4(3): 90-405.

Holling, C. S., L. H. Gunderson, and D. Ludwig. 2002. *In quest of a theory of adaptive change*. Pages 3-22 in L. H. Gunderson and C. S. Holling, editors. *Panarchy: Understanding transformations in human and natural systems*. Island Press, Washington DC.

<sup>18</sup> Pollard, S., Toit, D., & Biggs, H. (2011). *A guide to complexity theory and systems thinking for integrated water resources research and management*. Water Research Commission Report. 1431201626.1-68.

<sup>19</sup> Pollard, S., H. Biggs & D. R. Du Toit. 2014. *A systemic framework for context-based decision making in natural resource management: reflections on an integrative assessment of water and livelihood security outcomes following policy reform in South Africa* *Ecology and Society* 19 (2): 63. [online] URL: <http://www.ecologyandsociety.org/vol19/iss2/art63/>



## 4.2 Resilience<sup>20</sup>

Resilience is an ability to recover from or adjust easily to misfortune or change. The Resilience Alliance<sup>21</sup> ([www.resalliance.org](http://www.resalliance.org)) adopts a definition of resilience as the capacity of a social-ecological system to absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and functions. It describes the degree to which the system is capable of self-organization, learning and adaptation.

Table 1: Principles for resilience building in socio-ecological systems

### Principles for building resilience in social-ecological systems (SES)

The first seven of these have been developed by the Resilience Alliance<sup>22</sup>. Equity was added under RESILIM-O.

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**1. Diversity & Redundancy (nature & amount).** Diversity is a source of future options and determines a system's ability to adapt to change. Diversity describes the entities or parts that make up an SES (e.g. species, organizations, people or landscape patches). Three interrelated but distinct aspects must be considered together to fully capture the property of diversity, namely *variety* (how many different parts are present), *balance* (how many representatives of each part) and *disparity* (how different the parts are from one another). Redundancy describes the replication of parts or pathways in a system, and is a measure of the number of ways a particular function can be performed.

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**2. Connectivity (nature & amount).** Connectivity refers to the way in which parts of an SES interact with each other (transfer or exchange information, energy or material). It can be described in terms of how the interactions or transfers take place (*structure*) and also the *strength* of the interactions.

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**3. Feedbacks (nature & amount) and slow variables (including social recognition of these).** Feedbacks occur when a change in a particular variable, process or signal leads to changes in the system that eventually loop back to affect the original variable, process or signal through reinforcing or balancing effects. Slow variables typically determine the underlying structure or configuration of an SES, while the dynamics of the system arise from interactions and feedbacks between "faster" variables<sup>23</sup>. Importantly, slow variables can lead to large and rapid changes in system structure once key thresholds are crossed (regime shifts). Identifying and monitoring slow variables is therefore important for resilience.

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**4. Complex adaptive systems thinking (nature & amount).** Complex adaptive systems thinking is a mental model for interpreting the world that recognises characteristics of complex systems, such as high levels of interconnectedness, potential for non-linear change, and inherent uncertainty and surprise. Mental models affect how people think about and make sense of SES dynamics.

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**5. Learning (nature & amount).** Learning is a multifaceted phenomenon which includes acquiring information and increasing knowledge, memorising, acquiring facts, skills and methods, making sense of or abstracting meaning, and reinterpreting knowledge. Recognition of complexity in SESs suggests that knowledge will always be partial, and that knowledge requires continual renewal otherwise it will become obsolete as the system it represents changes. Social learning refers to learning that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between people (see Pollard et al 2014)

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**6. Participation (nature & amount).** Participation refers to the active engagement of relevant stakeholders in SES management and governance processes. A prescriptive definition of participation is avoided in the resilience literature because who participates, and why they contribute, is context specific and should be revised over time.

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**7. Polycentricity (extent & nature).** Polycentricity is a governance system in which there are multiple interacting governing bodies with autonomy to make and enforce rules within a specific place and policy arena. Having multiple governance units creates a mechanism for enabling other resilience-enhancing factors such as diversity, redundancy, connectivity, participation and learning.

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**8. Equity (nature & amount).** Equity is an ethical principle of social justice that comes from the idea of moral equality, that people should be treated as equals. It represents a belief that people have basic needs that should be fulfilled, that burdens and rewards should not be spread too divergently across the community, and that policy should be directed with impartiality, fairness and justice towards these ends.

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<sup>20</sup> Gunderson, L. H., and C. S. Holling, editors. 2001. *Panarchy: Understanding transformations in human and natural systems*. Island Press, Washington DC.

<sup>21</sup> Resilience Alliance. 2007a. *Assessing and managing resilience in social-ecological systems: A practitioners workbook. Volume 1, version 1.0*. Available online [<http://www.resalliance.org/3871.php>].

<sup>22</sup> Most recently described in Biggs et al., 2015

<sup>23</sup> Pollard, S., & du Toit, D. (2011). *Towards Adaptive Integrated Water Resources Management in Southern Africa: The Role of Self-organisation and Multi-scale Feedbacks for Learning and Responsiveness in the Letaba and Crocodile Catchments*. *Water Resources Management*, 25: 4019-4035. doi:10.1007/s11269-011-9904-0.



Figure 9: The RESILIM O program adopted methods that were participatory by nature and that could be foundational to social learning processes

## 4.3 Social Learning

Building resilience entails the process of adaptation and change as the context shifts or provides new challenges. This requires a particular kind of learning that to a large extent is about ‘learning about what is not yet there’.<sup>24</sup> To this end the RESILIM-O program applied the ideas of social learning. Social learning is not just learning in a social context, but aims to transform and change ways of responding in the world. Social learning is defined as a change in understanding that goes beyond the individual and spreads throughout communities or groups through social interactions between people.<sup>25</sup> Wals (2007<sup>26</sup>) suggests important ‘stages’ in the process of social learning where one critically analyses one’s own beliefs, norms and values (deconstruction), confronts those of others, and makes new meanings (reconstruction). Ison et al. (2004) describe social learning as a process of socially constructing an issue with actors through which their understanding and practices change, leading to transformation of the situation through collective and concerted action. In Figure 10, S2 refers to the situation, S3 to its modified solution, and Sn to the result of further iterations of modifying the situation (Ison et al. 2004<sup>27</sup>).

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<sup>24</sup> Du Toit, D. R., Biggs, H., & Pollard, S. (2011). *The Potential Role of Mental Model Methodologies in Multistakeholder Negotiations: Integrated Water Resources Management in South Africa*, *Ecology and Society* 16(3):21.

<sup>25</sup> Reed, et al 2010

<sup>26</sup> Wals, A. E. J. 2007. *Social learning towards a sustainable world*. Wageningen Academic Publishers. Netherlands.

<sup>27</sup> Ison R, Steyaert P, Roggero PP, B. Hubert B and Jiggins J (2004) *Social Learning for the Integrated Management and Sustainable Use of Water at Catchment Scale. Final Report, SLIM August 2004* (accessed at <http://slim.open.ac.uk>).





These perspectives have significantly influenced AWARD's way of working so that we are attentive to processes that foster a 'safe' learning space where people participate with each other to create new ideas or meanings. Most complex problem-solving around natural resources management requires action beyond the individual, making collective 'meaning-making' and collective action of central importance.

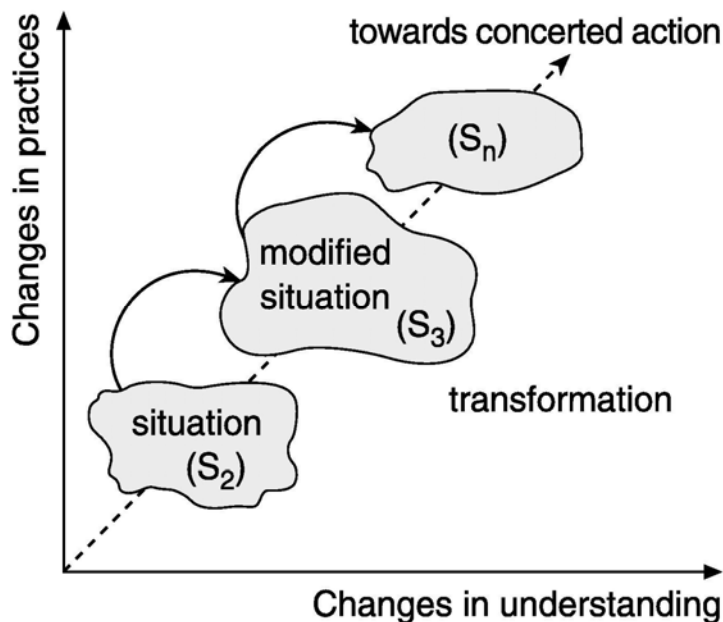


Figure 10: Social learning is a transformative process through learning to respond and adapt (Ison, 2004)

## 4.4 Collective Action

Collective action is defined as “the collective process of involving diverse stakeholders for resolving conflicts and advancing shared visions” (Gray, 1985<sup>28</sup>) such as for natural resource management challenges. Invariably, diversity in terms of institutions, agents, identity, interests and values are brought to bear on the management process and this requires facilitation to direct management processes towards sustainability instead of resource degradation and collapse.

Engagements for collective action are characterized by face-to-face dialogue, mutual learning, and voluntary participation in working towards shared goals employing a framework so that it is not a random or disorganized process of engagement. There is no single formulaic application of collective action as each context is different. However, the basic constituents and procedure should apply in all cases. It is important to consider the contexts under which collective action may or may not be appropriate. For example, integral to collective action is the assumption that diverse stakeholders perceive the **same** management problem, which may not always be the case. Under such a condition it might be important to employ a social learning process in order to move forward to a situation where the collective can function rather than remain in a state of conflict or tension.

<sup>28</sup> Gray, B. (1985) *Conditions Facilitating Interorganizational Collaboration*, *Human Relations*, 38: 911-936.



Figure 11: Participants in the CSO SI discuss and plan for the implementation of their Changing Practice projects in the Olifants Catchment, part a broader social learning process for catchment change

## 4.5 Strategic Adaptive Management

The project was strongly grounded in an approach known as Strategic Adaptive Management (SAM) which is built on the assumption that natural systems are complex and knowledge is imperfect but that we can learn from purposeful, documented objectives and actions. Essentially, it is a framework for management based on learning-by-doing.

AWARD has a long history of adopting and adapting SAM in natural resources management.<sup>29</sup> The application of SAM in the environmental management field moves management away from reactive management to consensus driven, learning-orientated management for clearly articulated ecosystem outcomes which are constantly **reflected on and modified** with learning (Figure 12). In many senses this represents a fundamental shift from management styles which view nature as stable and predictable and which attempted to reduce variability. SAM involves stakeholders in the research and management processes to help them cope with the unpredictability of change and to adapt resource management practices iteratively. Stakeholders and researchers need to interact with each other in a process of discovery and learning about how each other's behaviours affect an ecosystem and the natural resources in which they have a shared interest.

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<sup>29</sup> Pollard, S., Du Toit, D., & Biggs, H. (2011). River management under transformation: The emergence of strategic adaptive management of river systems in the Kruger National Park. *Koedoe*, 53(2), 1-14. And Kingsford, R. T., Biggs, H. C., & Pollard, S. R. (2011). Strategic Adaptive Management in freshwater protected areas and their rivers. *Biological Conservation*, 144(4): 1194-1203. doi:10.1016/j.biocon.2010.09.022

Several key features of this trial-and-error approach to adapting and learning involve:

- Management actions that support experimentation,
- The integration of local and formal scientific knowledge
- A capacity to self-organize and reorganize to support changing needs,
- Broad-based stakeholder involvement in assessments for monitoring and the evaluation of the state of resources.

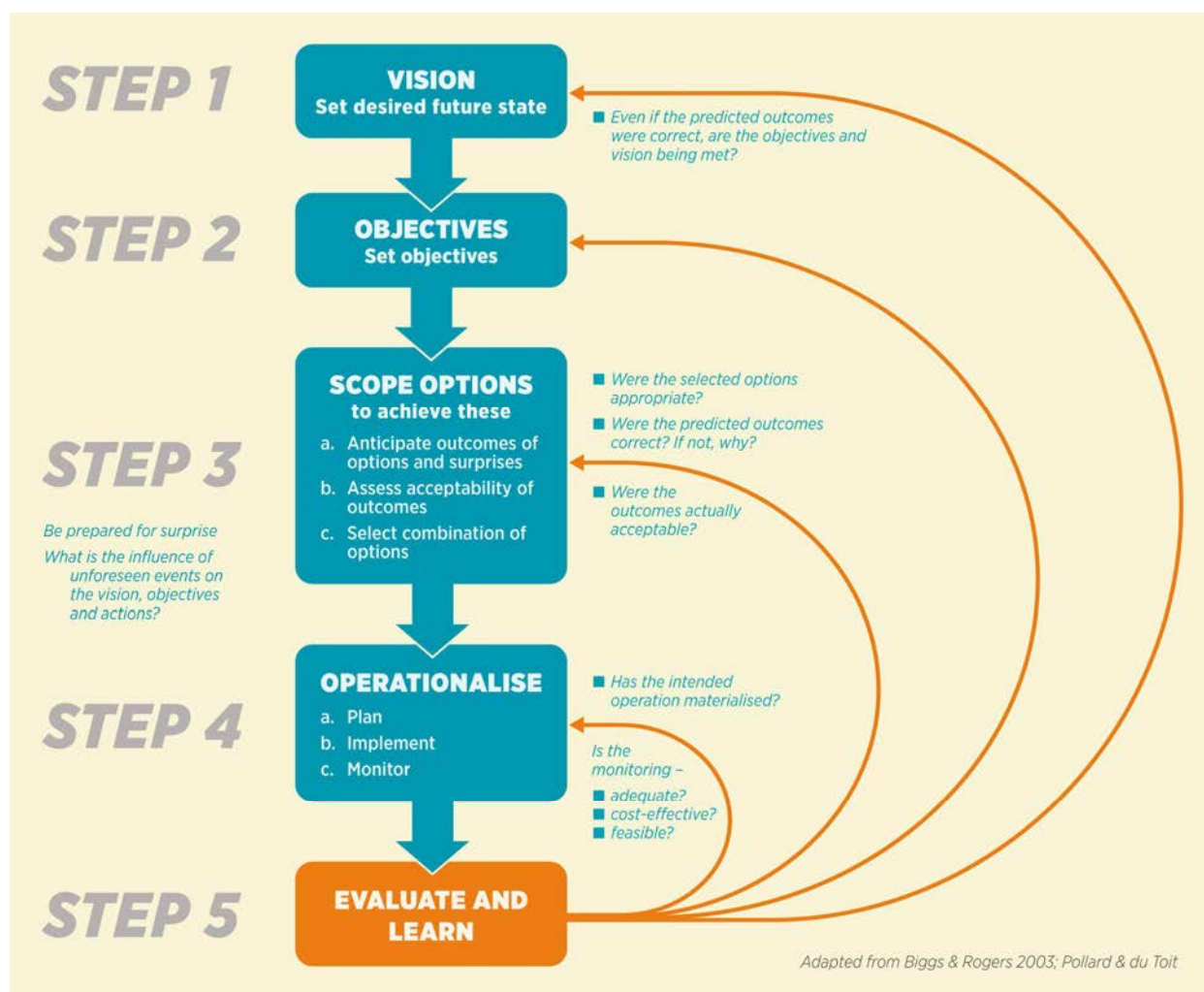


Figure 12: Flow diagram indicating the process and procedure for strategic adaptive management that can be applied to most management contexts<sup>30</sup>

<sup>30</sup> Pollard, S. & du Toit, D.R. 2006. Adaptive Management and the Rivers Research Programme of the Kruger National Park, South Africa. Ecosystems, Protected Areas, and People Project. IUCN World Commission on Protected Areas, Bangkok, Thailand





Table 1: Systems approaches developed, applied, tested and/or implemented under RESILIM O

APPROACH	PURPOSE	APPLICATION
<b>Collaborative Resilience Assessment Process (COLRAP)</b> with values, social, technical, ecological, economic and political (VSTEPP) approach	A participatory and collaborative contextual profile developed WITH stakeholders in order to conduct a collective resilience assessment of context so as to support a social learning process towards designing collective action	Conducted at 13 sites in the Olifants catchment including the estuary in Mozambique
<b>Cultural Historic Activity Theory (CHAT)</b> including expansive learning (Engestrom, 1999) <sup>31</sup>	A socio-constructivist view of learning as a collective process focusing on shared activity systems	Applied in order to identify and understand practices and resilience building processes. Expansive learning was applied to identify priority focus areas such as co-management of nature reserves, water quality management and land use planning for biodiversity integration
<b>WatRES</b> (Water-related ecosystem services)	A participatory method for specifically assessing the role of water in a particular socio-ecological system with a strong focus on ecosystem and livelihood security	Middle and lower Olifants catchments
<b>Causal loop diagrams (CLDs)</b>	A systems methodology for understanding the relationships between components of a socio-ecological system with the purpose of seeking leverage points for engagement and social learning	Broad application in the RESILIM-O program including water resources management training, climate change dialogues with civil society, small scale agriculture, water resources management and youth training
<b>Collaborative Dynamic Modelling</b>	A participatory method for developing systems understanding through collaboratively developing and engaging with system models together with stakeholders	Middle and lower Olifants catchment forums, piloted in the Selati sub-catchment <sup>32</sup>
<b>Actor Network Theory (ANT)</b> (Law, 1992) <sup>33</sup>	A social theory that seeks to integrate practice, practitioners and technologies into an evolving network	ANT was foundational for understanding stakeholders, practices and networks and used to formulate an approach to network building in the RESILIM-O program
<b>Critical realism and laminated reality</b> (Bhaskar, R., & Danermark, B. (2006) <sup>34</sup>	A means for understanding stakeholders and their responses to context at different levels of reality	A mechanism used to build stakeholder profiles in Phase 1 of the program to gain an understanding of the scope of stakeholder conceptual understanding and responses to the Olifants catchment
<b>IAP2 Spectrum for public participation</b> ( <a href="http://www.IAP2.org">www.IAP2.org</a> )	A tool for understanding the nature and level of public participation in various polices, and public decision-making processes related to natural resources management especially EIAs and licencing processes	A foundational framework used to understand the level of public participation required in the management of the Olifants catchment
<b>Comparative risk assessment (CRA)</b>	Comparative risk assessment supports stakeholders to identify key risks and prioritize actions for attention. The CRA customizes a process used by mainstream risk assessment practitioners in a way that makes it directly useable for participants in Strategic Adaptive Management to collaboratively assess different identified risks and therefore prioritize action	The strength of CRA is its ease of use and its ability to bring people from very different fields together to express their particular priority concerns, and discuss them mutually using risk as currency. The method was used for selecting projects in the lower Olifants.

<sup>31</sup> Engeström, Y. (1999). *Activity theory and individual and social transformation*. IN: Engeström, Y, R. Miettinen & R. Punamaki (eds) (1999). *Perspectives on activity theory*: Cambridge University Press

<sup>32</sup> Carnohan, S.A., Clifford-Holmes, J.K., McKnight, U. and Pollard, S.R. In press. *Climate Change Adaptation in Rural South Africa: Using Stakeholder Narratives to Build System Dynamics Models in Data-scarce Environments*. *Journal of Simulation*. Accepted June 2020.

<sup>33</sup> Law, J. (1992). *Notes on the theory of the actor network: Ordering, strategy and heterogeneity*: Lancaster, Centre for science studies, Lancaster University

<sup>34</sup> Bhaskar, R., & Danermark, B. (2006). *Metatheory, Interdisciplinarity and Disability Research: A Critical Realist Perspective*. *Scandinavian Journal of Disability Research*, 8(4): 278. <http://doi.org/10.1080/15017410600914329>



*Figure 13: Residents of the Limpopo estuary in Mozambique participate in the development of a collaborative contextual profile*



## 5 Summary of Activities under RESILIM-O

Table 3: A summary of RESILIM-O responses to the three key areas set out by USAID as the basis for resilience building in the Limpopo Basin

### 1. Reduce climate vulnerability by promoting the adoption of science-based adaptation strategies in priority sub-catchment(s)

- Participatory resource assessments conducted, including assessment of ecological flow requirements, inventory of water use patterns, and analysis of community and ecosystem vulnerabilities under different climate change scenarios.
- Collaborative research, monitoring and analysis by civil society, communities, government, and/or academic institutions conducted at various sites in the catchment.
- Active stakeholder participation in natural resource management and policy dialogues supported, including local communities, traditional leaders, civil society representatives, businesses, and private sector
- Active engagement of public and private sector in improved management of water resources to ensure long-term sustainability supported in Upper, Middle and Lower Olifants catchment.
- Active involvement through coordination with Provincial and District Disaster Management Centres for sharing climate data to other sub-catchments in the Limpopo River Basin (and surrounding basins),
- Climate dialogues approach to help stakeholders to design and implement tenable climate change adaptations relevant to their context
- Restoration of ecosystems (e.g. mangroves) which provide a buffer against the effects of climate change.

### 2. Conserved and sustainably managed biodiversity in high-priority ecosystems.

- Assessments and prioritization of critical biodiversity areas identified and plans for improved protection put in place for priority areas
- Water monitoring (quality and quantity) in critical habitats and high biodiversity areas
- Developed baseline of indicator aquatic species in sub-catchment and implemented ecological monitoring.
- Government departments, communities, and other stakeholders supported to integrate biodiversity conservation and climate change adaptation efforts.
- Developed and implemented priority biodiversity conservation strategies through spatial planning and land use guidelines.
- Improved coordination and innovation in removal of alien invasive vegetation in priority areas.
- Built capacity for sustainable forestry practices.
- Enhanced biodiversity conservation in protected areas, nature reserves and/or private lands in partnership with government and communities in order to encourage livelihoods diversification

### 3. Capacity of stakeholders developed to sustainably manage water resources and biodiversity in priority sub-catchments.

- Professional support and training to improve climate resilience, reduce water demand, reduce water quality degradation and encourage cooperative governance of resources.
- Involvement of local CSOs and communities in management of sub-catchments supported
- Provided training in integrated water resource management for sub-catchment water management authorities and stakeholders.
- Build capacity within governments, communities, and other stakeholders to mitigate climate threats water demand management, strategic water source area maintenance and restoration, community-based forest management and livelihood diversification.





*Figure 14: Capacity development includes the application of improved systems and infrastructure that can enable the system to function more efficiently. The image shows the water quality and quantity tracking system installed by RESILIM O along the lower Olifants River.*

## 5.1 Communications Materials, Publications and Resources

Central to building a resilient catchment is the need to be inclusive and to engage individuals and institutions in a new vision for the catchment. Whilst it is impossible to build capacity for managing the catchment through training and professional support of all institutions, it is possible to shift the common discourse through strategic and well-planned communications. AWARD deployed a broad spectrum of communications instruments in engaging a variety of stakeholders and institutions in the resilience building endeavour. These are summarized in Table 4. Further details are available from [www.award.org.za](http://www.award.org.za) and a full list of publications is available in Appendix 10.2



Table 4: Communications materials, purpose and application in the RESILIM O Program

PRODUCT	PURPOSE	APPLICATION
Technical reports	Scientific evidence building process to understanding specific aspects of the system using data collection, analysis and synthesis to arrive at a proposal for action	Technical reports were developed in both Phases 1 & 2 and used as a basis for sharing scientific and technical studies, evidence building and ultimately strategic planning. They comprise quantitative and qualitative reports and summaries of techniques, studies and explorations of context, practice, conceptual frameworks and examples of resilience building under the RESILIM-O program.
Guidelines	Guidelines were central to supporting the development and transformation of key practices in the catchment. They were a means to propose appropriate and relevant action based on key principles for resilience building	These were developed for projects that worked with practitioners in the social learning and capacity development processes (spatial planners, CSOs, land reform partners, water managers, climate change practitioners). They were also shared with practitioners, media and academic institutions (for six tertiary institutions) as these focus on skills development and practices for natural resources management and climate change.
Training manuals	Training manuals were the basis for training programs that followed a fixed curriculum of learning and that resulted in certification	These were designed for supporting the use of tools, such as FlowTracker and INWARDS, for developing water conservation and water demand management strategies in local municipalities and for the Moletete Youth Program
Media releases, social media, video footage and monthly NewsFlashes	For bringing specific issues to the attention of the public and broad stakeholder groups	These included TV news programs (Carte Blanche & People’s Weather), radio, Reuters News Agency, local print media, Facebook and Twitter. A number of short videos were also created about various aspects of the program.
AWARD Website	For communicating to a wide interested audience	AWARD used its website to communicate the RESILIM-O program and its progress to a wide audience and as a repository of resources and visual materials
WhatsApp groups	For supporting collective action, group communication and Communities of Practice	One of the main methods for supporting group communication among CSO members, small-scale farmers, stakeholders engaged in river monitoring, and the Moletete Youth program
Academic papers	To communicate scientific findings, present new methodologies and to present project outcomes in peer reviewed journals	14 papers were published in peer reviewed journals
Games and modelling	These provide a “safe” learning environment for running simulations and for testing new ideas and approaches	Mainly used for exploring decision making processes under the Legalameetse Nature Reserve project and in modelling water management decisions in the lower Selati under climate change <sup>35</sup> (water allocation and water management)
Presentations and training materials	For supporting learning in workshops, forums, and conferences	A vast collection of presentations was developed under the RESILIM- O program and are available on request
Images and visual material	To provide visual evidence for monitoring purposes, examples of techniques, as a basis for initiating dialogue and for inclusion in reports and communications materials	An image bank of the Olifants was established under each of the thematic areas. A collection of artistic materials depicting different management challenges was used in the social learning processes especially where literacy levels were low.
GIS spatial data and maps	For reflecting complex data sets in a visual format	Used in a variety of ways to display data at a catchment scale. Foundational for the development of the Critical Biodiversity Areas maps and sector plans as well as for the Blyde catchment rehabilitation
Flyers, Brochures and practice briefs	Used to communicate key ideas in an efficient and compact format for policy makers and partners not interested in lengthy detailed descriptions	Used extensively for communicating key RESILIM-O ideas and activities

<sup>35</sup> Carnohan, S.A., Clifford-Holmes, J.K., McKnight, U. and Pollard, S.R. In press. Climate Change Adaptation in Rural South Africa: Using Stakeholder Narratives to Build System Dynamics Models in Data-scarce Environments. *Journal of Simulation*. Accepted June 2020

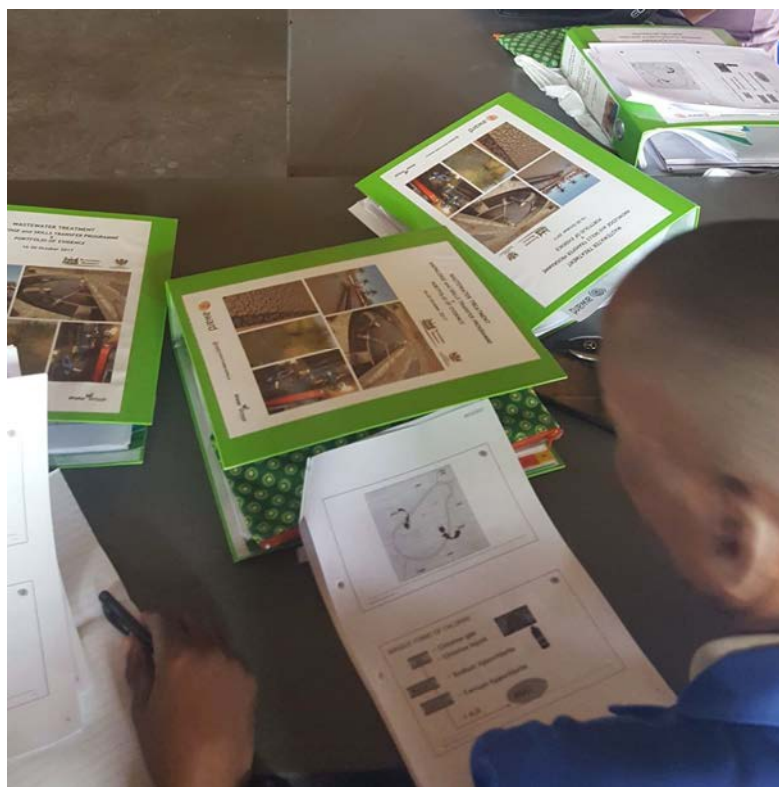


Figure 15: Training manuals created to support workplace training of municipal process controllers

### 5.1.1 The RESILIM O Resources Library

The RESILIM O program developed an extensive resources library comprising a wide variety of guidelines, technical reports, training manuals, booklets, brochure, technical and practice briefs with a broad audience in mind. The library is colour coded to match with the programmatic areas: land, water, climate change and institutional support. All these materials are available for download from [www.award.org.za](http://www.award.org.za).

### Final project reports



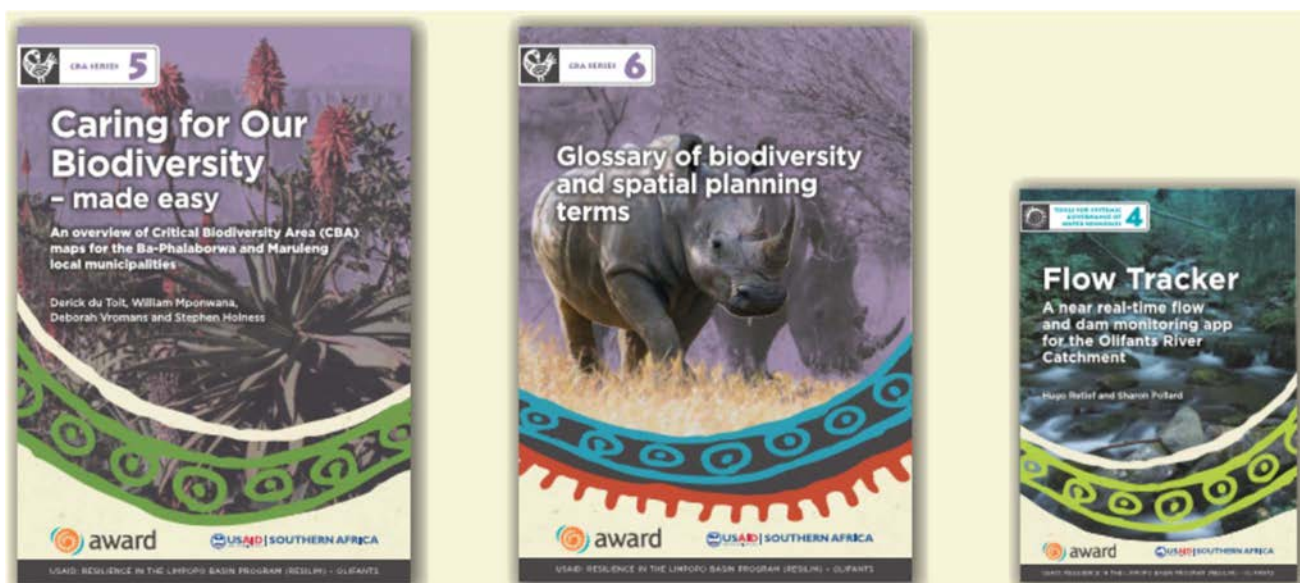




## Technical reports



## Booklets and brochures





## Guidelines, handbooks and manuals



## Policy and practice briefs and flyers



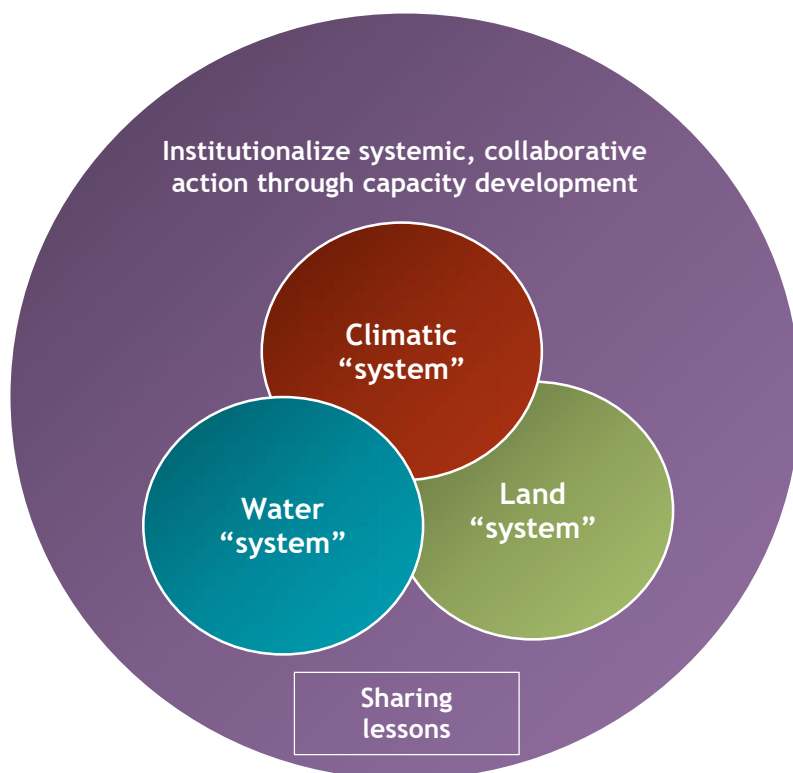
## 5.2 Context: Areas of Application

The RESILIM-O project was designed as a context specific suite of responses to the Olifants catchment and its challenges. Although designed on the back of contextual assessments for the Olifants catchment we maintain that it is possible to apply the methods and approaches to other basin systems. In this section we outline the different aspects of context considered in designing the resilience building processes.



## 5.2.1 Conceptual bounding

Resilience building needs to be bounded. As noted previously this is a process of strategically responding to a particular contextual issue or set of issues, by a particular individual, group or institution. The RESILIM-O program bounded its actions within the framework of four key “systems” namely, land, water, climate and institutions for natural resources governance.



*Figure 16: Schematic showing how the three programmatic systems are embedded in governance and institutionalization processes*

Various assessments pertaining to these four systems were conducted during the first phase of the program. During the second phase of the project, specific practices and projects for resilience building were designed in a participatory manner to best respond to the challenges arising out of each system. The details of the systems assessments and resilience actions are outlined in more detail in the sections focusing on Phases 1 and 2 later in this report.

## 5.2.2 Geographic areas

The program made various decisions related to geographical areas selected for project specific activities (reported under the section on Phase 2) but the overarching context remained the transboundary catchment. This is fundamentally important in a systems approach that recognizes that all parts of a system are connected and that systemic transformation cannot be anticipated if interventions are designed in isolation of the system.

The system therefore needs to be bounded and described so that stakeholders are clear as to the subject of management. This presented the project with a number of challenges (discussed later) in that many institutions (with the exception of water and forest management institutions) do not recognize the catchment as their fundamental unit of management.





### 5.2.3 Priority areas

The catchment area is vast (approx. 55 000 km<sup>2</sup>) meaning that resources and effort had to be deployed judiciously and strategically. The Phase 1 assessments guided the selection process of arriving at key priority areas for intervention. These priority areas are depicted in Figure 17.

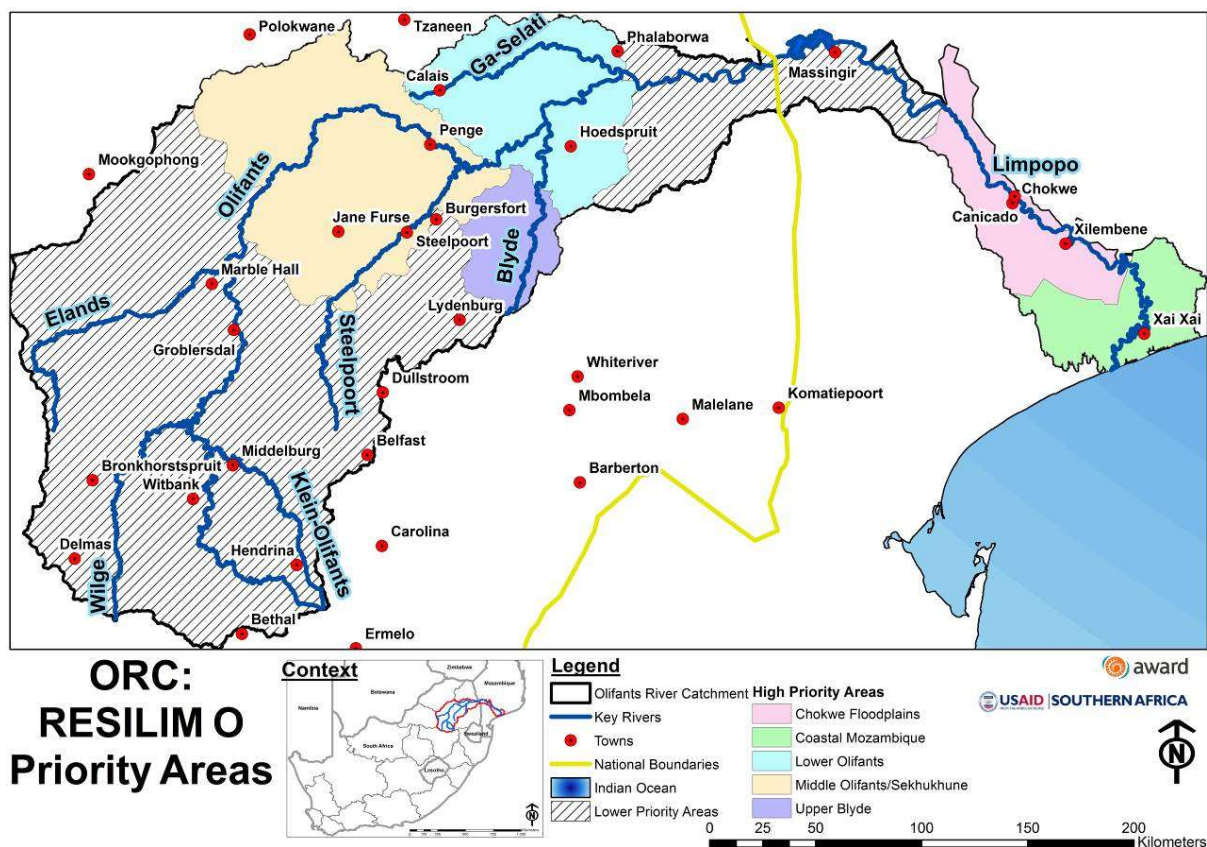


Figure 17: Map indicating the key areas of activity under Phase 2 of the RESILIM-O program

### 5.2.4 Hydrological zones and mean annual runoff

The management of water resources is best conducted on the basis of hydrological zones. The water management activities of RESILIM-O adopted the hydrological boundaries for conducting resilience building.

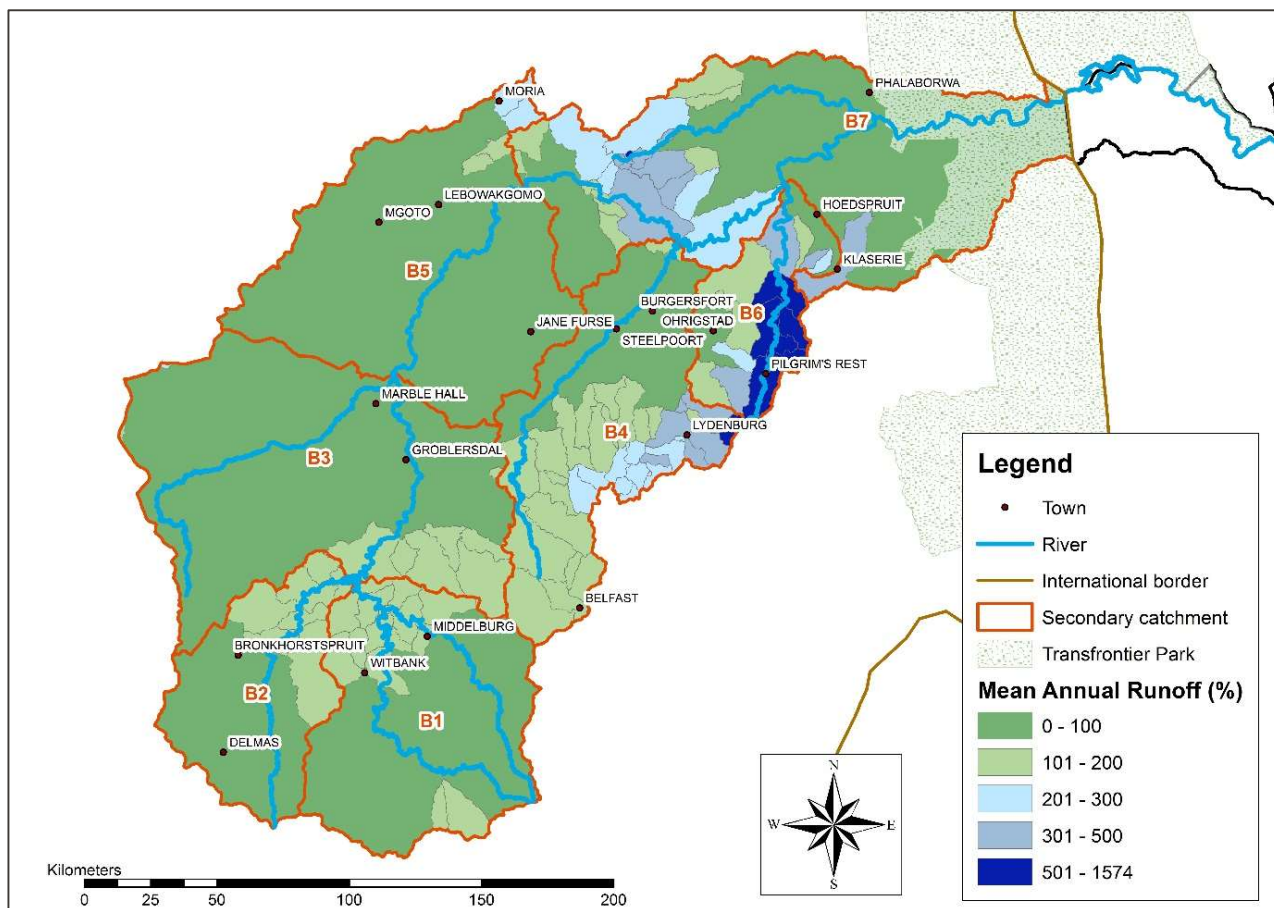


Figure 18: Olifants Catchment: Mean Annual Runoff per sub-quaternary catchment expressed as a percentage of the average of the primary catchment. Sub-quaternary catchment areas with a mean annual runoff about 300% are considered high water yield areas

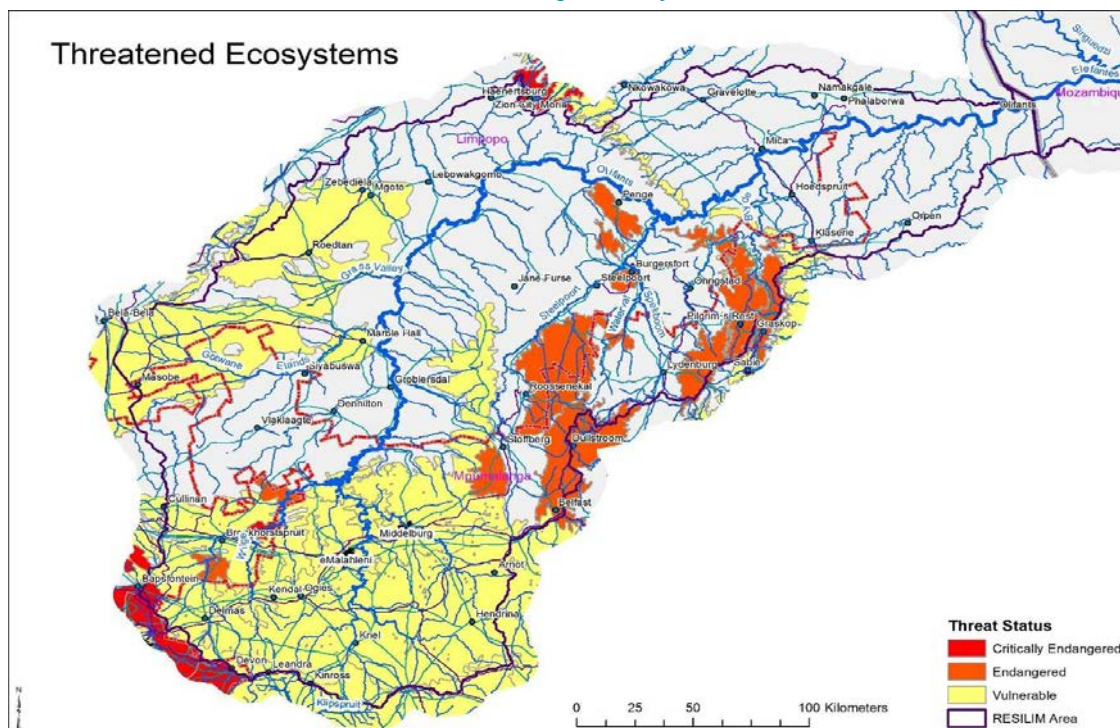
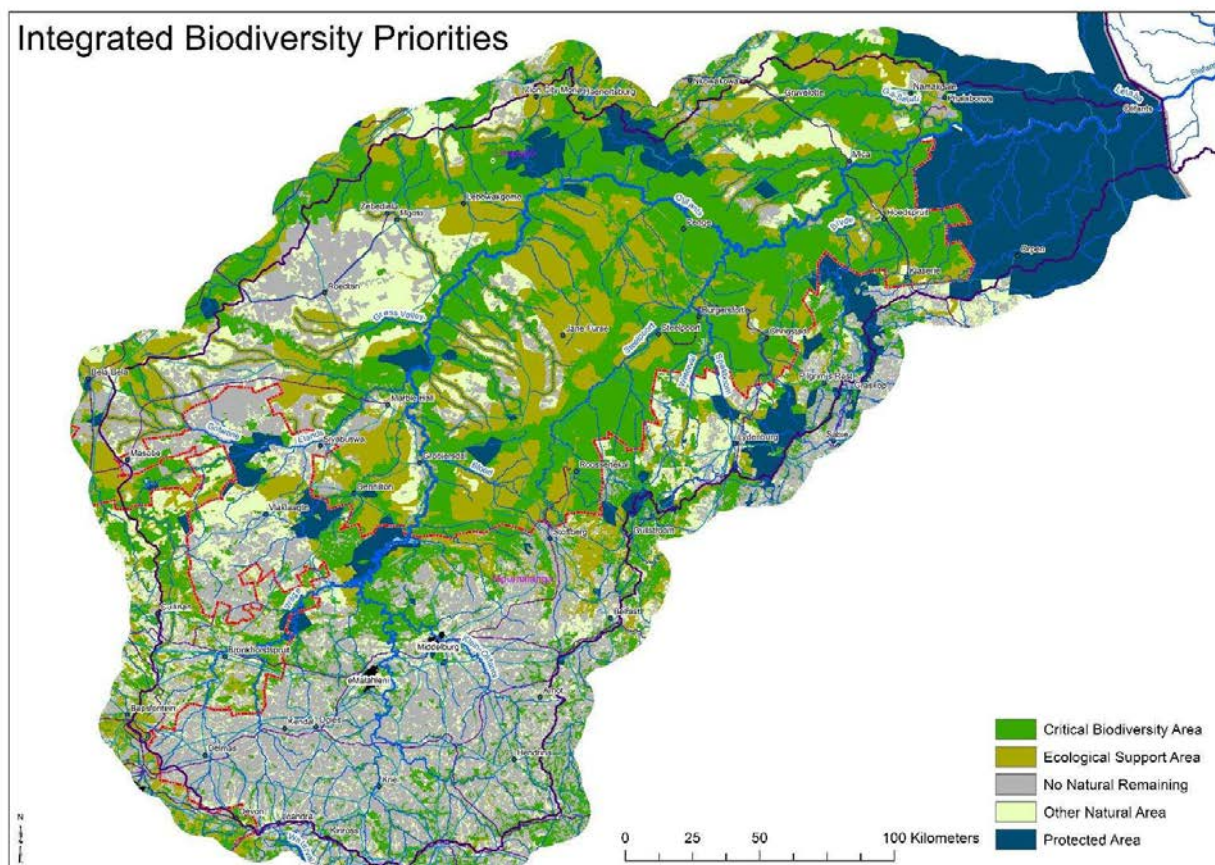


Figure 19: Map of the threatened ecosystems within the Olifants catchment (including Shingwedzi and Letaba catchments) in South Africa (source: EMF, 2009)



## 5.2.5 Areas of significant biodiversity

The RESILIM-O program’s challenge during Phase 1 was to identify key biodiversity ‘hotspots’ as well as areas vulnerable to biodiversity loss. This information was to be the basis of designing a variety of projects aimed at securing the biodiversity through a range of mechanisms, tools and institutionalization processes - explained under the Results section.



*Figure 20: Integrated Biodiversity Priorities for the Olifants catchment are the basis for the development of the CBA map and landuse guidelines (see later)*



## 5.2.6 Climate context

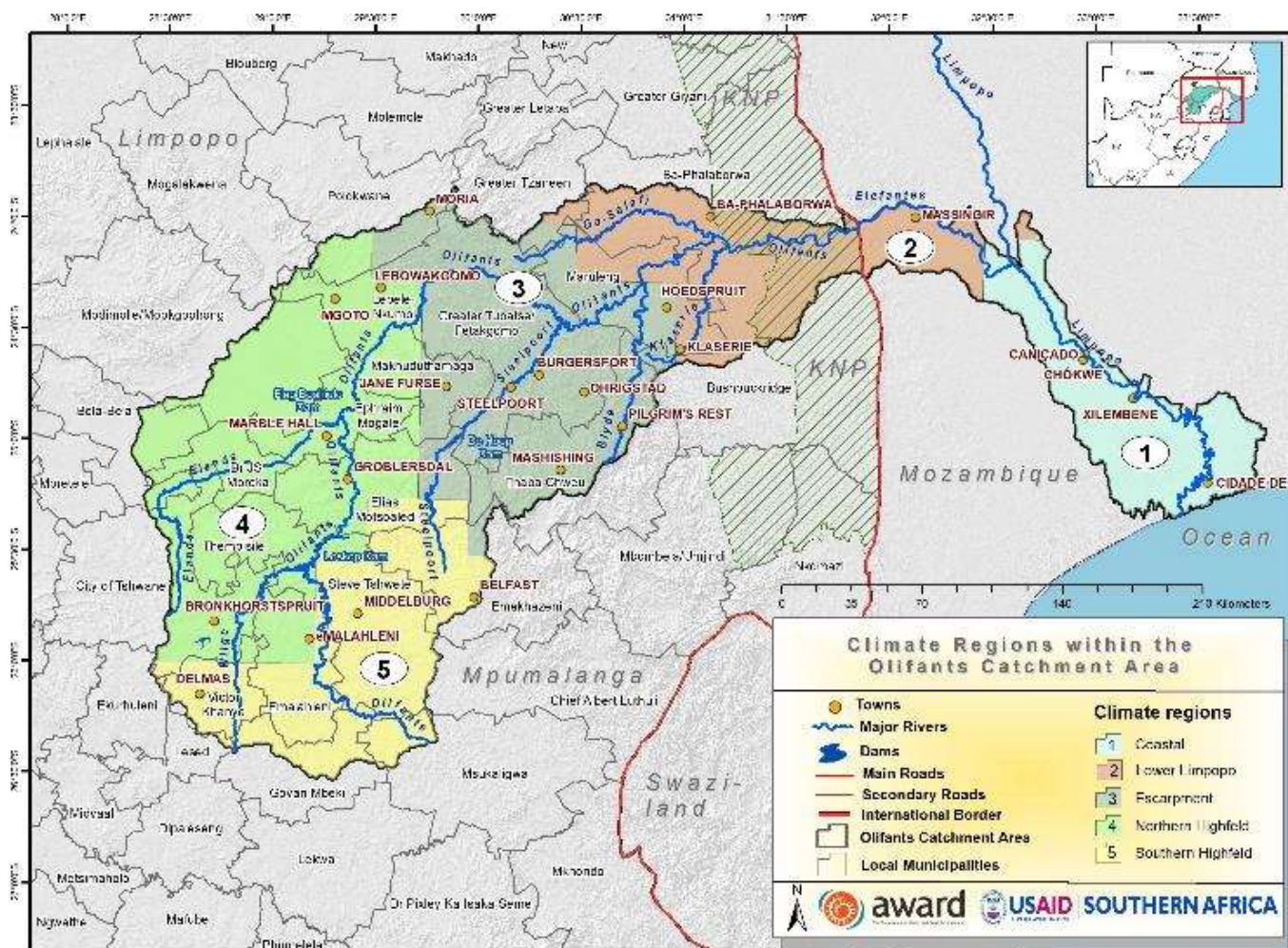


Figure 21: Five climate regions delineated by CSAG: (1) Northern Highveld; (2) Southern Highveld; (3) Escarpment; (4) Lower Limpopo; and (5) Coastal (Source: CSAG 2018)

Based on our work, The Olifants River Basin was delineated into five climate regions: (a) Northern Highveld; (b) Southern Highveld; (c) Escarpment; (d) Lower Limpopo; and (e) Coastal. Each climate region represents an area with similar seasonality, inter-annual variability and combination of both that is distinct from another

## 5.2.7 Administrative context

The program functioned within the following administrative context:

- 1) Two countries (transboundary)

The program was tasked to build resilience in the Olifants section of the catchment which meant that the program operated in two countries, namely South Africa and Mozambique.



2) Municipalities/provinces. The catchment incorporates a number of administrative entities. However, these boundaries are not contiguous with the catchment, presenting a number of serious challenges for catchment-based programs such as RESILIM. The program included the following administrative entities:

- a. Provinces: 4 (South Africa – 3, Mozambique – 1)
- b. Districts: 21 (South Africa - 10, Mozambique - 11)
- c. Local municipalities: 27

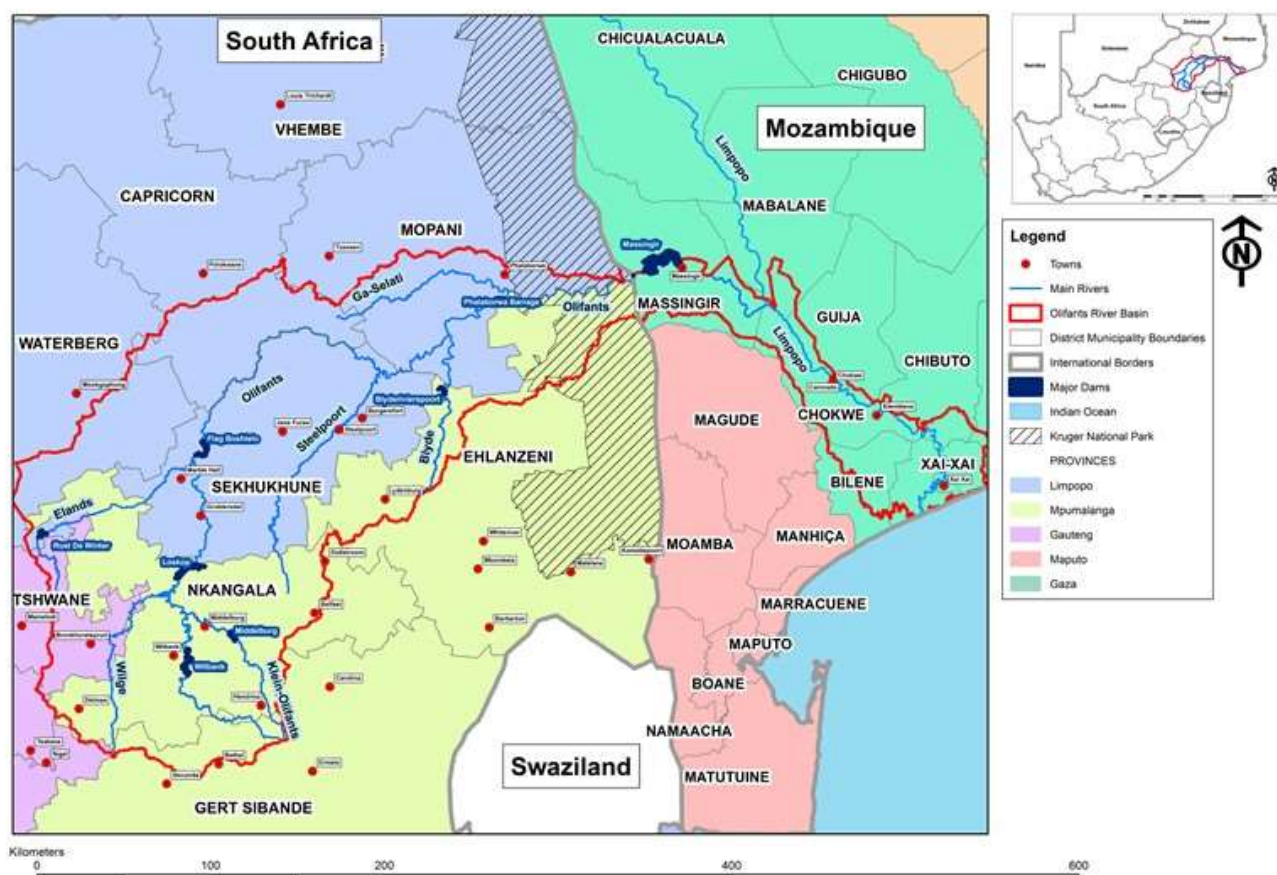


Figure 22: Map showing provinces included in the Olifants Catchment



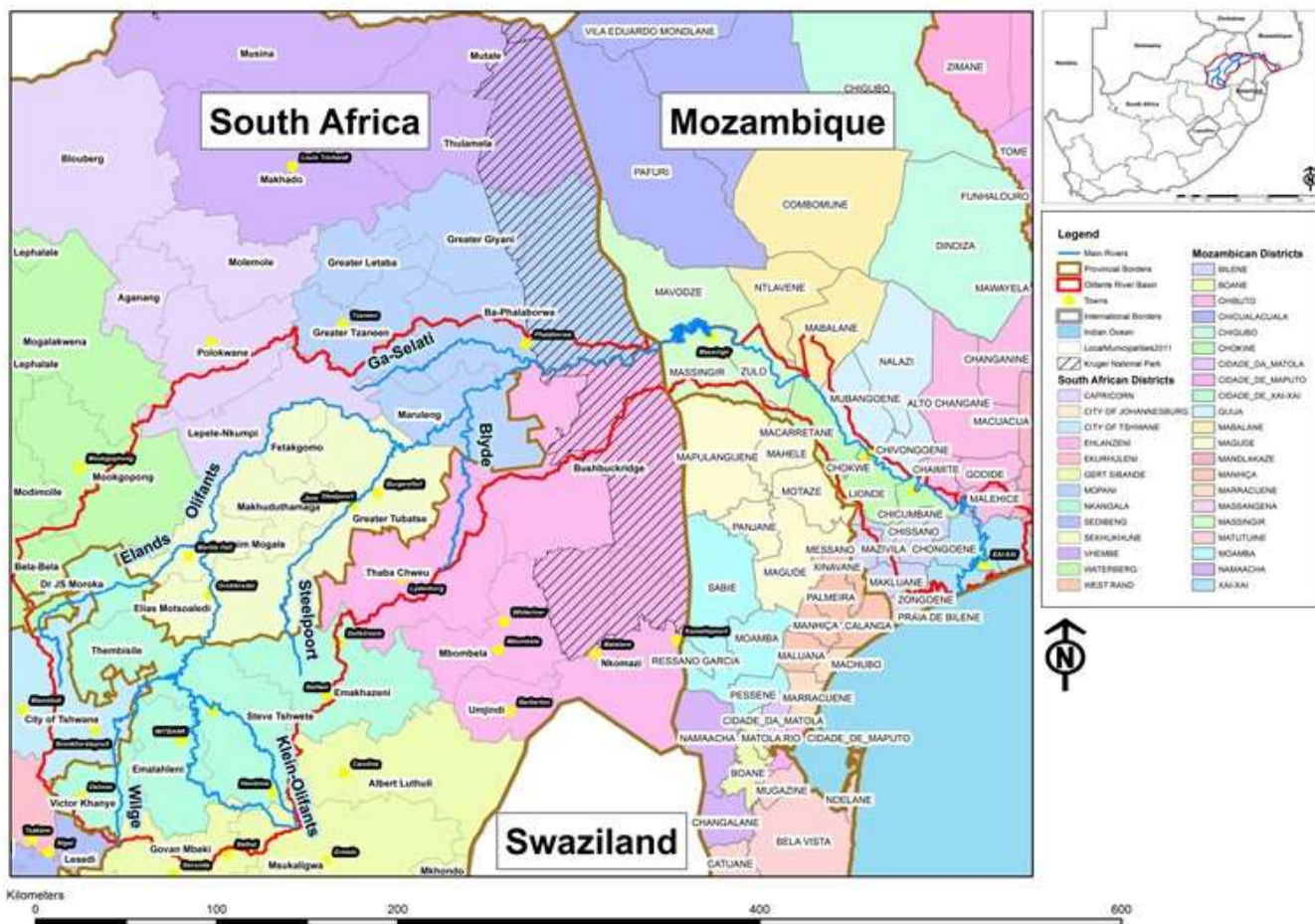


Figure 23: Map showing districts included in the Olifants Catchment in South Africa

## 5.2.8 Institutional context

A vast spectrum of institutions was engaged based on political and legal mandates. However, priority was given to those institutions with the ability, capacity and legal mandate to influence practices that build resilience for the three systems: water, land and climate. The details of the institutions involved are given in the results section, suffice to say the categories included regulators, spatial planners, custodians, enforcement authorities, consultants, landowners/managers, academic institutions and the media.



*Figure 24: AWARD staff member, William Mponwana, engages with spatial planners from the Maruleng municipality in order to determine the nature of support relevant for the inclusion of biodiversity data into land use planning*

## 5.2.9 Practice context

A particular focus of RESILIM-O was the support for practices and practitioners who could influence resilience building. These and their relationship to other ‘supporting’ practices will be discussed later; suffice to say that resilience building is as much about supporting individual practices as it is about supporting the links between various practices (see Figure 25) below. Examples of such practices are:

- a. Regulation
- b. Resources allocation
- c. Delegation
- d. Authorization
- e. Compliance monitoring
- f. Informing, reporting and accounting
- g. Contracting
- h. Collaborating



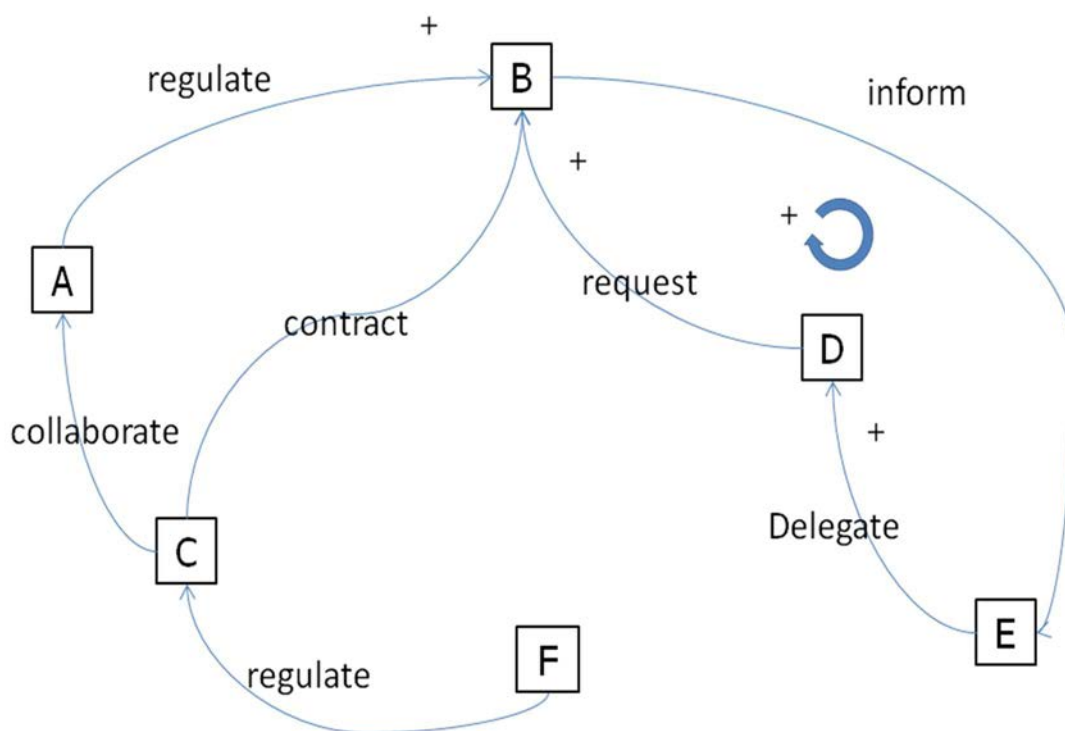


Figure 25: A generic example of a systems diagram showing various aspects that constitute the system as well as the nature of the relationship between these components. For example: A = Local Government, B = Mining, C = Investors, D = Catchment Authority, E = Department of Water and Sanitation. Detailed explanations of systems approaches can be found in the RESILIM O technical reports.

### 5.3 Considerations for Size, Scope, Extent of Activities and Application

As noted earlier, the size of the catchment and the scope of institutions meant that some important decisions needed to be taken regarding scale and focus. The following approach was adopted for ensuring reasonable traction and application of efforts:

- a. Piloting of new ideas and innovations at specific sites (e.g. specific municipalities) in order to assess the value of such interventions
- b. Study sites where partners (e.g. small-scale farmers) conducted their own experiments and studies in order to improve practices
- c. Generic tools with specific intentions to expand application so that the innovations could be tested in a variety of locations under a variety of conditions (e.g. FlowTracker, Landuse guidelines)
- d. Guidelines and principles were used so as not to limit the applicability of the work to too specific a context

The advantage of these strategies was that there was adequate opportunity to develop and test new innovations and negotiate new practices with stakeholders. There was also opportunity for sharing data, new techniques and for deliberation on effectiveness in specific contexts. The reflexive approach also allowed time to build arguments and evidence for particular strategies and practices which is not possible where generic awareness raising approaches are adopted. That said, such intensive approaches can present challenges where there are language and cultural differences (e.g. Mozambique, Sekhukhune, etc.).



## 5.4 A Partnership Approach

There is a wide variety of private, public and non-governmental organizations active in the Olifants catchment. Diverse partnerships were deemed critical to the achievement of RESILIM objectives and a consortium approach was fundamental to the RESILIM-O design. The program set out to partner with local, regional and international organizations active in priority sub-catchment(s). Strategic partners, critical for the achievement of the program outcomes, included:

1. River Basin Authorities:
  - a) Ara Sul (Mozambique): The river basin authority responsible for the part of the Olifants catchment that falls in Mozambique. The program required endorsement to work in Mozambique and to access information and engage with practitioners and stakeholders.
  - b) Olifants Letaba Catchment Management Authority (OLCMA): This was never established during the time of RESILIM-O program, resulting in loss of opportunities to institutionalize practices.
  - c) Inkomati Usutu CMA: The sister organization to OLCMA provided an opportunity for shared learning. This partner was also part of the training and skills program.
2. Department of Environment, Forestry and Fisheries (DEFF) (national) (RSA): Planning instruments such as the Spatial Development Frameworks (SDFs), Natural Resource Management Programmes (WfW etc.), and Environmental Protection and Infrastructure Programmes (EPIP) were important points of contact for resilience building. This partner was also part of the training and skills programme.
3. Department of Water and Sanitation (DWS<sup>36</sup>) (national)(RSA): RESILIM-O needed endorsement to work collaboratively towards institutionalizing practices. Planning instruments such as the Catchment Management Strategies (CMS), were important points of contact for resilience building. This partner was also part of the training and skills programme.
4. OLLI (Olifants Levuvhu, Letaba, Inkomati) Technical operations committee: A multisectoral river operations committee that provided an opportunity to influence practice, monitoring and reporting.
5. South African National Biodiversity Institute (SANBI) (RSA): Mainstreaming of biodiversity is one of SANBI's core mandates, through strategic and technical components of the National Environmental Management Act (NEMA), and land use planning.
6. Sectors: (mining, agriculture and as specified) (Moz and RSA): Provided an opportunity to collaboratively explore responsiveness, innovation, co-operation, integration and catchment-based outcomes, resilient practices, and mechanisms - essential to project outcomes.
7. Mpumalanga Tourism and Parks Authority (MTPA): Protected areas management and stewardship practices to secure Strategic Water Source Areas in Mpumalanga
8. Limpopo Department of Economic Development Environment & Tourism (LEDET): Protected areas management and stewardship practices for the Legalameetse Nature Reserve and management of the Policy and Planning directorate for the integration of biodiversity into land use planning through the CBA maps and landuse guidelines
9. SANParks: Protected areas management and stewardship practices developed collaboratively with a special focus on resilience building for protected area management and monitoring. Collaborative development of an integrated river management approach.

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<sup>36</sup> Formerly Department of Water Affairs and Forestry (DWAF)



*Figure 26: Partnerships for learning and transformation. Capacity develop is not only about training; it is about doing things smarter and faster. From a systems point of view this might require training but it can also include far more effective systems, improved tools and better communication. Leadership needs to commit to change and support transformation processes. Here process controllers at Ba-Phalaborwa wastewater treatment works participate in skills development training under the RESILIM O program*

Making sure that the partnership approach was honoured meant making staff available for setting up platforms for social learning and collective action. This was much more than once-off engagements and/or workshops (frequently associated with awareness-raising). These teams needed to establish some formal relationship and recognition within the various institutional settings if adequate institutionalization of resilience practices was to be achieved. One of the key instruments for setting up relationships for institutionalization was by means of Memoranda of Understanding (MoUs). This provided the project staff with the credibility and endorsement to be able to work with practitioners and officials within the various institutional settings.

## 5.5 Governance and Institutionalization

While tools and products can be very useful, they can only be as effective as the governance and management systems in which they are embedded. In other words, a tool for monitoring biodiversity or river flow for example, is of little value unless it is part of a wider, responsive governance system that can act to address and improve the situation. Importantly, this governance system should include not only government but also civil society and sectoral participation.





Part of our philosophy was that if one designs back from practice in a way that responds to users' needs and context, then institutionalization is almost a given as part of the process. Put another way, social learning is a cornerstone for institutionalization and the uptake of new systemic practices and tools since one involves practitioners right from the start in a process of co-enquiry, co-learning and co-development where "ownership" is key. The institutionalization processes were augmented by securing commitment from various institutions by means of Memoranda of Understanding (MoUs).

Table 5: Areas of Institutionalization under RESILIM O

#	AREAS	Local government	National government	Provincial government	Natural Resource Management	CMFs and WUAs	Land owners	Civil society organizations	Conservation agencies	Educational institutions	Farmers	Forestry companies	Mining companies
1	Climate preparedness	x	x	x			x	x		x	x		
2	Improved management of water resources	x		x			x	x	x		x	x	x
3	Improved management of priority biodiversity areas	x		x	x		x		x			x	
4	Strategic planning	x	x	x	x		x		x	x		x	
5	Policy		x	x			x		x	x	x	x	
6	Governance and institutional arrangements	x		x	x	x	x			x		x	
7	Human resources development and training	x		x	x	x	x	x	x	x	x	x	
8	Development of systems and tools	x	x	x	x	x	x		x	x		x	x
9	Livelihood diversification						x				x		
10	Collaborative research, monitoring and analysis		x	x	x		x	x	x	x			

Fundamental to building resilience is the development of capacity within the region and its institutions to carry the process of adaptive management and social learning forward. Phase 2 therefore focused on capacity development, innovation, testing, embedding and institutionalizing resilience-based practices in various institutions. Although the project could not hope to reverse all the processes that have been in place for a number of decades, it aimed to make a considerable contribution by providing new ways of addressing management challenges, new strategic direction for responding to climate change, and by supporting development options that are built on sustainable resource management.



Figure 27: Local municipalities are institutions that hold the mandate for a number of services delivery programs

## 5.6 Capacity Development Processes

Capacity development is a meaningless concept unless it is associated with a particular purpose or function. In the context of systems approaches, it needs to be defined in relation to a particular system and its management rather than in terms of “improved performance”. There are particular challenges in this regard in that most institutions support skills development of staff without consideration for systems thinking or transformation. These challenges are discussed in the final section of this report. However, the major challenge with the concept of capacity development is that it is conflated with “training”. We viewed capacity development from a systemic perspective where the capacity of the “SYSTEM” (or sub-systems) - and practices within the system – to respond needs to be improved rather than only the portfolios of individuals through “training”. In the table below, we summarize the rationale for RESILIM-O capacity development. Details can be found in the various reports available on the AWARD website ([www.award.org.za](http://www.award.org.za)).



Figure 28: Capacity is not only about training – it is also about being prepared and being able to respond effectively



Table 6: Three areas of capacity development as framed by the RESILIM O program

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## 1. ORGANIZATIONAL CAPACITY AND SYSTEMS

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### Why?

- Organizations have the ability/obligation to integrate policies/laws
- Institutions often hold mandates
- They are institutional ‘home’ to protocols, activity systems, practices
- They have the power to ‘institutionalize resilience practices’
- They can act as facilitators for social learning
- They can mobilize and commit resources to actions
- Can be held accountable
- Operate widely
- Can delegate authority
- Opportunity for institutional memory and long term action in a system
- Can act over a long period

### How?

- Development of policies, guidelines, protocols, memos, that have institutional APPLICATION
- Influence over direction of strategic plans: strategic and integrated planning, DRR, IDP, LUP, climate change adaptation)
- Influence over managerial practices (NRM, financial management, SAM)
- Infrastructure development, operation and maintenance
- Conflict resolution and mediation
- Application of tools and technologies
- Determination of governance issues: decision making, sanctions, social processes
- Endorsement of orientating and sensitizing concepts: resilience-building, sustainability etc.

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## 2. SKILLS, COMPETENCE BUILDING & TRAINING (INDIVIDUAL/PROFESSIONAL/ WORKPLACE LEARNING)

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### Why?

- Individual skills are a critical link to institutional capacity
- Sources of commitment and innovation through critical thinking and social learning
- Can facilitate change
- Carriers of agency and ability to influence actions
- Can be managed within institutional setting
- Can be accredited and tracked
- Provide feedback and learning
- Can be engaged in dialogue
- Respond to learning processes

### How?

- The South African Qualifications Framework (SAQA) for lifelong learning was used as a guide to what skills and competences should be included in skills development programs
- The SAQA framework recognizes that learning occurs throughout life and that programs need to be aligned with these stages from school through to workplace skills development

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## 3. CREATING AN ENABLING ENVIRONMENT

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### Why?

- Items, tools, guides, and anything that might in any way support, facilitate or enhance actions and practices
- Items, tools, guides and anything that will enhance effectiveness
- Items, tools, guides and anything that will enhance efficiency

### How?

- Through the development of the following:
  - Tools
  - Guidelines
  - Apps and software
  - Frameworks
  - Policies
  - Agreements
  - Vision and position statements defining commitment
-



## Networks for Resilience

Developing new practices is not always about building new institutions. Systems approaches include consideration of relationships between different entities and the negotiation of new and more appropriate relationships. The theoretical framing known as Actor Network Theory (ANT) developed by two French scholars, Michel Callon and Bruno Latour (Latour 1987), and British sociologist John Law (1992) is useful in this regard as it explains a position where the components of a system are held together by interactions and relationships, forming systems or networks that are capable of transforming and responding to contextual changes. Actor network theory is a particularly powerful tool for environmental questions. Its strengths lie in the refusal to accept traditional dualisms - nature and society, local and global, expert and lay knowledge. Rather, it begins with the proposition that relationships between entities are fundamental to understanding action and responsiveness.

In the diagram below we see that single point entities are less important in systems formulations than is the integration of entities and their relationships to form a network (either formalised or otherwise). Understanding resilience-building action requires the simultaneous understanding of entities, technology, policy, relations, identity, hierarchy and power - the network.

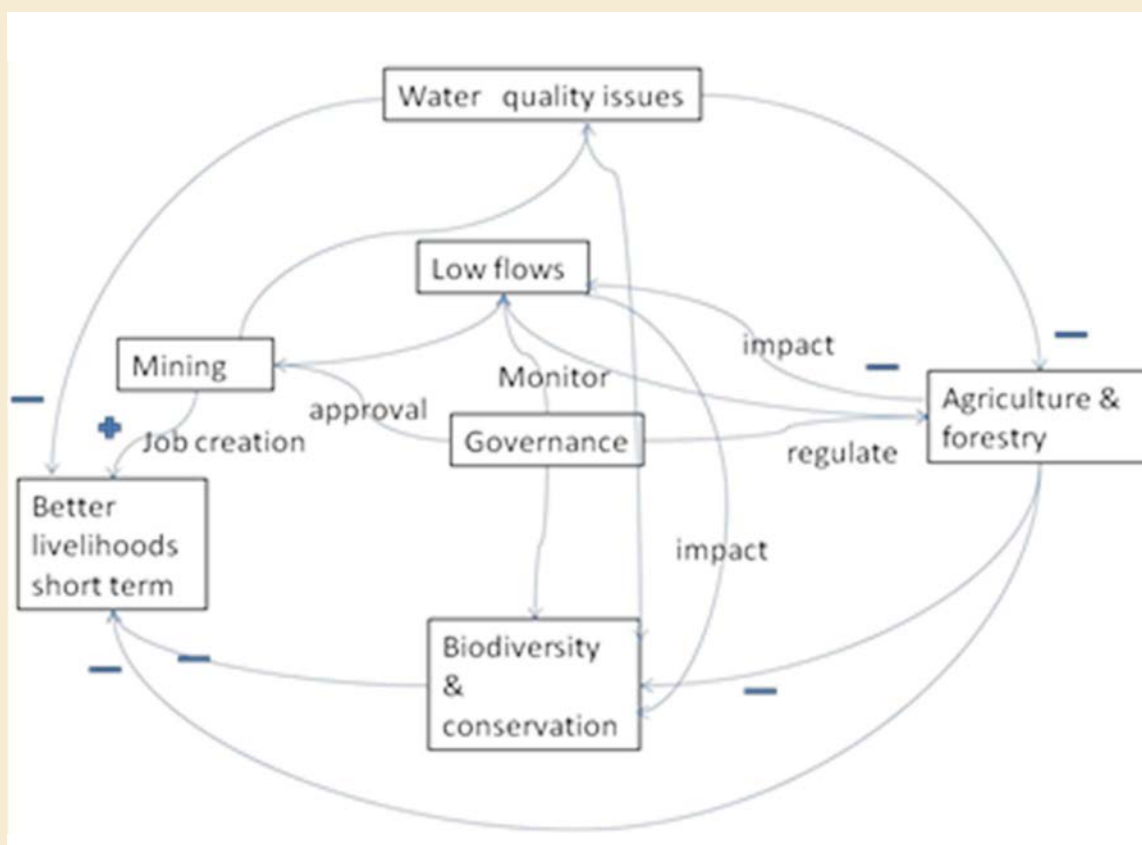




Figure 29: A civil society member explores the systemic nature of climate change

## 5.7 Management Approach

The following management approach was adopted in the achievement of the programmatic objectives and to ensure the sustainability and impact of RESILIM-O.

- **The utilization of local resources** in order to build local institutional capacity, not only as a project output but also as an integral part of program implementation. We utilized local people in key personnel positions as a means of ensuring strong linkages with local realities and to build management capabilities in Southern Africa. This included purchasing products and services locally and regionally when appropriate.
- **Consideration for gender, culture, and equity.** Gender and cultural elements were factored into assessments of program plans and impacts as a management tool for achieving and reporting on results and to better and more explicitly address development challenges. All work considered rights and needs of local people, especially the historically marginalized sectors of society (indigenous populations, internally displaced persons, women and girls and the landless poor).
- **Strategic adaptive management** was a fundamental management principle in order to be flexible and adaptive. The program needed to be agile in the face of dynamic political and economic changes in the region. Strategic adaptive management and its application is explained in the sections below.
- **Principles for regional adoption.** Important too was the focus on a strong core of principles that allowed for future geographic and programmatic flexibility and application at catchment and basin scales.
- **A narrative approach through a robust communications and outreach strategy** was adopted. This was augmented by an innovative monitoring and evaluation approach that produced case studies and reports based on both quantitative and qualitative indicators and data. Shared learning events were arranged to share program outcomes.



- The objective of the communications strategy was to a) to increase understanding of the program and its processes amongst USG and other stakeholders; b) communicate issues of importance in a timely manner for improved awareness and participation of civil society; and c) to promote informed planning and decision making affecting the region's natural resources.
- **Promotion of learning.** A major focus of the RESILIM-O program was to adopt an approach that promoted learning and exchange with relevant institutions and stakeholders to build a resilient foundation for change and sound resource management. The key mechanism holding the learning was the concept of networks to support dissemination of lessons learned and best practices.
- **Ensure environmental management and compliance.** The program ensured that it met the highest standards in relation to environmental requirements articulated in the Environmental Monitoring and Mitigation Plan (EMMP) that was audited annually.
- **Memoranda of Understanding (MoUs).** In partnership with regional, national, and local institutions, the program formalized partnerships that improved project sustainability and impact.
- **Facilitation of participatory processes.** The program worked in close collaboration and coordination with stakeholders and facilitated their meaningful engagement and participation using the International Association for Public Participation ([www.IAP2.org](http://www.IAP2.org)) standard.
- **Rigorous monitoring of projects.** A robust MERL framework was put in place and adhered to by both project staff and sub-grantees (see Results section).

## 5.8 Project Design: Team Composition, Grants and Contracts

The program used a combination of the following mechanisms to implement its activities:

1. **AWARD 'in-house' staff expertise:** A team of specialists and support staff was used to effectively carry out the resilience activities.
2. **Consultancies:** A number of consultants were contracted to augment work conducted by the AWARD team.
3. **Sub-grants:** As part of honouring an obligation to develop capacity in the region, a number of sub-grants were awarded to local organizations (mostly NPCs). This also provided a mechanism by which to spread AWARD's overall approach of systemic, social learning for resilience building. See Appendix 10.1 for list of grants.

The implementing of the AWARD approach was not without challenges. The complexities of the resilience-building endeavour warranted a specific focus on the composition and nature of the teams tasked with implementation. The delicate balance between technical, social and developmental elements meant that teams needed a broad scope of experienced and specialist individuals.

One of the most challenging aspects was sourcing staff with experience of systems approaches. Since there are few basin-scale programs with this approach, there are few such individuals with these skills circulating in the job market. This meant that the RESILIM-O team had to be built out of individuals with specialist knowledge, and then the program needed to provide a platform through which systems approaches, integrated planning, transformative social research and action research could be learnt, facilitated and coordinated. Staff needed support in areas, methodologies and techniques with which they were unfamiliar.

Scarcity of skilled personnel in the climate change, water and biodiversity sectors gave rise to the Internship Program that aimed at providing an educationally sound professional development program and workplace-based learning space for new entrants, unemployed or underemployed graduates in NRM related positions.





## 5.9 The MERL Approach: Innovation of Monitoring and Evaluation for Complex Systems

The program employed a hybrid approach to monitoring and evaluation which explicitly foregrounded the importance of learning. The Monitoring, Evaluation, Reporting and Learning (MERL) system combined the value of monitoring against indicators with reflective process monitoring and open-ended processes for obtaining explanatory data and evaluative insights, including case studies. Indicators and logical frameworks were used within the overarching complexity-aware framing which guided how they were used and interpreted (see AWARD 2017 MERL Framework for further details). The MERL system was developed using the very processes it sought to encourage in the program: experimentation, reflection, social learning and iterative design.

Key design features of the MERL system (Figure 30) included:

- A **collaborative approach** to MERL where staff and MERL team members interacted regularly around monitoring, evaluation, reflection and planning.
- **Innovations in reporting** to increase its value for reflection and learning.
- Regular meetings and shared learning events with a **dedicated reflection component**.
- Collaborative, evaluative **case studies for formative evaluation** (rather than leaving evaluation solely to external experts at project end).
- Working with standard M&E elements such as indicators, targets and logic models in non-standard ways - in particular, **creating space for ongoing learning and refinement** of these tools.
- Combining breadth of data coverage (monthly quantitative and qualitative monitoring) with depth (evaluation case studies, synthesis and writing projects).
- The Reference Group served the purpose of providing strategic guidance to the program, playing the role of a “critical friend” and connection to the outside world.

## The Roles of MERL in RESILIM-O

### Accountability

Some monitoring and reporting are designed only to meet the needs of the funder. These needs are important, but programs are also accountable to their own managers, staff, partners and intended beneficiaries. Accountability is about counting \$ spent and # of people engaged; *but also* about making sure that the numbers of people reached have indeed benefitted – that capacity and resilience is indeed being built. In complex systems this is difficult to achieve and ascertain and so we also need to *learn*.



### Learning & Sharing

So, learning is part of being accountable to ourselves, our funders and other stakeholders. Implementers need learning for adaptive management: what works or not, what to change, drop or expand, how best to build capacity and resilience. Such learning must be shared with the donor partner and with other development practitioners beyond the catchment, to advance broader knowledge & practice. *MERL must support learning.*

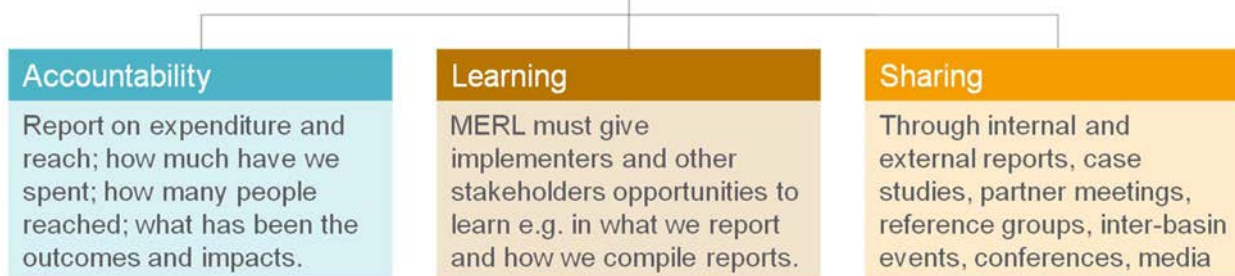


Figure 30: MERL played multiple, mutually supportive roles in RESILIM-O

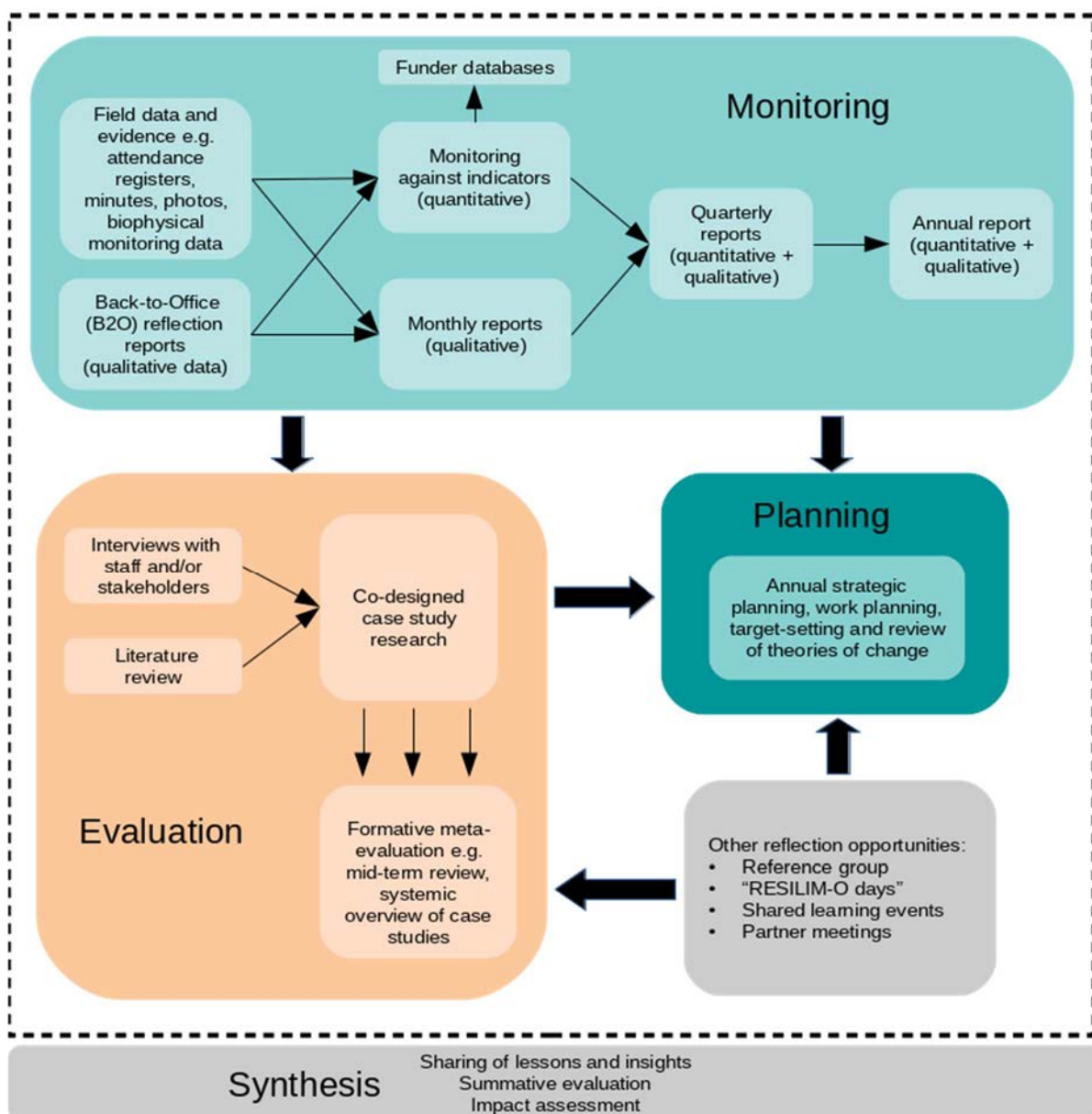


Figure 31: Overview of the RESILIM-O MERL system indicating key components and practices

The key indicators selected for the program are shown in Table 7. Full indicator descriptions and performance indicator reference sheets can be found in the RESILIM-O MERL Framework.





Table 7: RESILIM-O Program indicators

INDICATOR NAME
<b>Biodiversity</b>
Number of hectares of biologically significant areas showing improved biophysical conditions as a result of USG assistance
Number of hectares of biologically significant areas under <b>improved NRM</b> as a result of USG assistance
Number of <b>laws, policies, or regulations</b> that address biodiversity conservation and/or other environmental themes officially proposed, adopted or implemented
Number of <b>institutions with improved capacity to address NRM and biodiversity conservation</b> issues as a result of USG assistance
Number of <b>people trained in sustainable NRM and/or biodiversity conservation</b> as a result of USG assistance
<b>Climate Change - Adaptation</b>
Number of stakeholders (individuals) with <b>increased capacity to adapt to the impacts of climate change</b> as a result of USG assistance
Number of <b>institutions with improved capacity to assess or address climate change risks</b> supported by USG assistance
Number of <b>laws, policies, regulations, or standards addressing climate change adaptation</b> formally proposed, adopted, or implemented as supported by USG assistance
Number of <b>people trained in climate change adaptation</b> supported by USG assistance
<b>Cross-cutting</b>
Number of people reached by the <b>Our Olifants campaign</b> including social media
<b>Science, Technology and Innovation / Research</b>
Number of <b>peer-reviewed scientific publications</b> resulting from USG support to research and implementation programs

### 5.9.1 Data Management

Data sources included attendance registers (numbers of people and institutions) and Back-to-Office and monthly reports by program staff (capacity development processes and their significance in light of project objectives as well as highlights, challenges and learning). Media and communications outputs and publications were tracked by the MERL team. Areas (hectares) under improved biophysical condition or natural resource management were calculated using Geographical Information Systems and backed up by ongoing annual narratives and evidence detailing the calculations and the nature of the improvements.

Attendance registers were scanned and stored both electronically and in hard copy. All MERL data and evidence was stored on the AWARD server. Microsoft Excel spreadsheets were used to collate and analyse data across the various projects.

MERL data was shared with AWARD staff on a regular basis. Besides the fact that all staff were involved in contributing data through Back-to-Office and monthly reports as well as collaborative target-setting and case study design, MERL data was shared and discussed at quarterly reflection sessions and occasional reflection events focusing on more in-depth analysis (for example, of progress in relation to resilience-building principles, intended and unintended outcomes and key innovations and learning emerging from our work). MERL data was shared with stakeholders, partners and with USAID through the quarterly and annual reports, published on the AWARD website.



## PART 2

# 6 Results

In this section we present the results of the seven-year resilience building process. They are presented under the headings of Phase 1 and Phase 2 in keeping with the way the processes were designed. As indicated earlier Phase 1 was dedicated to a collaborative understanding the context for resilience building specifically in order to design appropriate ‘project-based’ responses and Phase 2 focussed on the collaborative design and implementation of resilience building activity systems.

## 6.1 Phase 1: Understanding Context for Resilience Building

The overall process for Phase I comprised collating information for a systemic understanding through multiple means as shown in Figure 32 (syntheses from scientific or technical reports, in-house research and collaborative scoping with stakeholders).

### 6.1.1 Collaborative scoping of risk

Key for Phase 1 (the first two years of the program) was building a collaborative systemic picture of risk<sup>37</sup> and vulnerability of natural resources associated impacts on ecosystem and human health and well-being. The systemic, social learning design to collaborative research and assessment used a learning process with stakeholders known as the Collaborative Resilience Assessment Process (ColRAP) to identify potential areas of work for Phase II. An overview of this process is given in Figure 32. Largely preparatory in nature with an ‘internal’ scoping of the context from a social, technical, environmental, economic and political perspective (i.e. using VSTEEP framing). Using various systems thinking approaches, this laid the foundation for the scoping of context and risk with stakeholders. Once these outputs were consolidated into integrated and systemic renditions, a “mirror-back” process with stakeholders deepens the collaborative understanding of risk and facilitates collective action as an **expansive, social learning process**. We then drew closer to what we consider the **resilience analysis** which comprised a broad-level analysis against four to five criteria as well as an attempt to use the resilience criteria (i.e. a more ‘formalized’ resilience analysis). Once risks, impacts, nodes of resilience and leverage points were identified, the basis for **resilience-building action plans** (i.e. Phase II ‘projects’) was in place.

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<sup>37</sup> As opposed to the more conventional but less collaborative risk assessment processes normally used

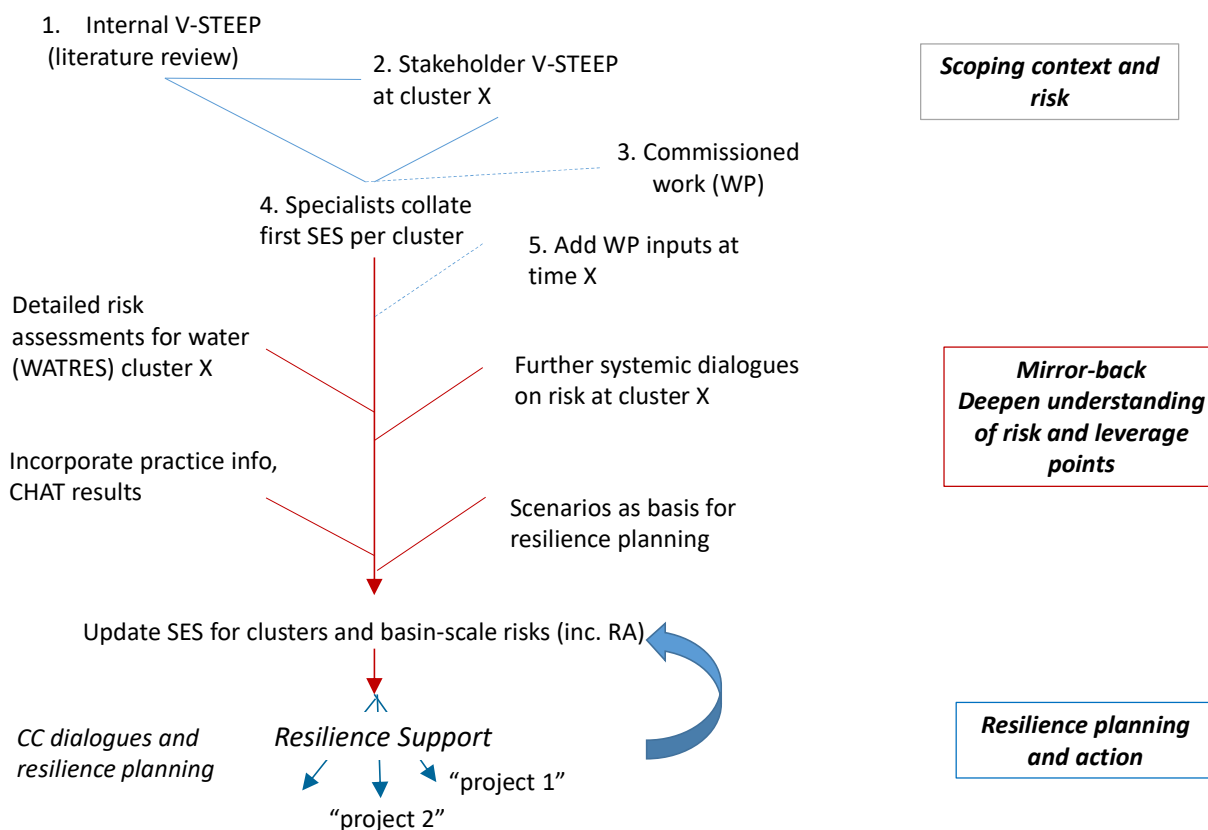


Figure 32: Schematic overview of the ColRAP process. RA = “formalized” Resilience Analysis; CC = climate change; cluster x refers to sites or sub-systems (often sub-catchments); WATTRES = water-related ecosystem services; CHAT = Cultural Historical Activity Theory



Figure 33: Stakeholders in Groblersdal scope out the context of the middle Olifants for water resources management





*Figure 34: Residents of Penge develop the elements of a systemic understand of water-related ecosystem services and vulnerabilities through the WatRES process which deepens the understanding of risk*

## 6.1.2 Assessment Reports under Phase 1

There are critical areas of information foundational to a systemic understanding of the Olifants Catchment. Overarching studies, principally describing major drivers of change, underlie resilience building for the catchment. The technical reports resulting from these studies focus on governance of natural resources; climate change; and vulnerability and livelihoods. Additional studies such as land reform and mining in the catchment were identified by stakeholders and were the focus of minor and internal reports not listed here.

A variety of sub-contracts and work packages were co-ordinated under Phase 1 to develop contextual understanding - not only in terms of the scientific understanding of the catchment but also in terms of institutional structures and constraints; stakeholder engagement (which include issues of power and agency); and trans-boundary opportunities and challenges. This work was awarded to a variety of consulting agencies, research groups and partners who specialize in particular areas. AWARD coordinated research and synthesis. A summary of the assessment reports is provided in Table 8.



Table 8: Assessment studies conducted under RESIL O with specific purposes for each

TITLE OF ASSESSMENT	PURPOSE OF THE ASSESSMENT
Collaborative Resilience Assessment Process (ColRAP) for the Olifants catchment	The was the foundational resilience assessment process that was conducted with stakeholders from different sites in the Olifants catchment (South Africa and Mozambique).
Spatial assessments of the Olifants catchment: support for the integration of biodiversity, water resource management, climate change, and socio-economic issues into spatial planning	A set of spatial indicators and GIS representations developed (quantitative and qualitative) to monitor the current state of the catchment, and the impact of current and changed practices to support the systemic institutionalization of spatial priorities into land-use planning and decision-making processes
Governance of natural resources in the Olifants catchment Mozambique and South Africa	To understand how institutions have developed and are developing in the different socio-economic and environmental settings in the basin within the context of increasing scarcity of natural resources (water and biodiversity)
An Overview of the Olifants River Catchment 2014	This study provides a comprehensive overview of the Olifants catchment with facts and figures from 2014
Potential impacts of climate change as a driver of change in the Olifants catchment	Increase knowledge on potential impacts of climate change (and other drivers) on water, biodiversity and resilience
Livelihood dependencies and vulnerability in the Olifants catchment	Increase knowledge of livelihood security within the basin so as to inform action plans and to consider how institutions may incorporate resilience planning.
Water Balance: A systemic understanding of the status of water resources and requirements and the key drivers of change under different scenarios in the basin	Increase understanding of the status of water resources under different scenarios. To engage with stakeholder platforms in order to support the incorporation of resilience plans into institutions and strategies (so as to support adaptive capacities)
Water Quality: a systemic and participatory understanding of water quality issues and practices in the basin	Develop a collective understanding of water quality issues and practices, and how they relate to resilience; and to build activity systems with stakeholders for the management of water quality that contribute to resilience of the basin
Ecological Water Requirements and DRIFT (Downstream Response to Imposed Flow Transformations) in the Olifants catchment	Increase understanding of social-ecological water requirements under different scenarios and drivers
Governance and institutional arrangements for biodiversity conservation in the Olifants catchment	Increase understanding of governance/ institutional arrangements for protected area management and conservation for the Olifants catchment
Protected area management effectiveness in the Olifants catchment	Developing appropriate evaluative processes to improve management effectiveness for protected areas and stewardship
Priority ecosystems and species: integrating land-use practices, livelihood security, and ecosystem services into governance structures	To identify priority ecosystems and species, and understand how different land-use practices affect the provisioning of various ecosystem services. This includes identifying appropriate indicators for land-use practices, and incorporating the value of biodiversity and ecosystem services into traditional governed communal lands.
Historical Trends & Climate projections per Climate Region for the Olifants River Catchment	A climate analysis pertains to the five climate regions delineated based on historical rainfall and temperature data. Each climate region represents an area with similar seasonality, inter-annual variability and combination of both that is distinct from another climate region. In the process, CSAG examined effects of temporal patterns alone and effects of temporal patterns with magnitude.
Maruleng Municipality: A Profile of the Municipal Area	This overview of Maruleng Municipality is focused on how to make environmental planning more explicit within the integrated spatial planning processes. A systemic approach identifies the complexity and interconnectedness of the major drivers in the area.
Review of Socio-Ecological Issues in Municipal Planning Instruments - Olifants Catchment	A full report on the inclusion of environmental and biodiversity issues municipal planning instruments for the Olifants catchment
Protected Areas in the Olifants Catchment	This technical report provides an overview of the protected areas in the Olifants Catchment in 2015.
Summary of Natural Resource Management Laws & Policies relevant to the Olifants Catchment [South Africa & Mozambique]	A summary of natural resource management laws and policies relevant to the Olifants catchment in South Africa and Mozambique



### 6.1.3 Other products from Phase I

- a. Research and analysis reports covering a broad range of topics including policy, laws, practices and techniques
- b. Key maps and underlying data on the Olifants catchment in South Africa and data from Mozambique where available
- c. A detailed stakeholder database was established for the catchment
- d. Frameworks for natural resource, and specifically, water governance and practices

## 6.2 Summary of Key Findings from Phase 1

A significant outcome of Phase I was improved understanding of the drivers of change in the catchment, particularly climate change, and the potential impacts on ecosystem services and livelihoods. This understanding was developed collaboratively with stakeholders and specialists into a systemic picture of risk and vulnerability (the collaborative risk assessment) to be used as the basis for planning. The Phase I basin-wide assessments provided key contextual features which can be summarized as follows.

### 6.2.1 Biodiversity

1. A number of ecosystems are considered either critically endangered or endangered and many more are vulnerable. Intact river systems are limited to the Blyde (although at risk from mining) and some tributaries of the Steelpoort and upper Selati in the the lower Olifants.
2. In Mozambique, the estuarine area is classified as a National Maritime Ecosystem Priority area. Equally, the mainstem of the Olifants River is regarded as critically endangered from its source to the protected areas in the Lowveld (Figure 2). Almost all westerly-flowing rivers in the high and middle-veld are critically endangered.
3. With over 600 former or existing mines<sup>38</sup> (coal and platinum in particular), impacts are felt in both the terrestrial and aquatic systems and on human livelihoods. The discharge effluent from many of the 100 plus wastewater treatment works (public and private),<sup>30</sup> many of which are struggling to meet national standards, impacts on the aquatic systems downstream and again on people's livelihoods. Indeed AWARD's work suggested that the most vulnerable livelihoods in terms of the direct dependencies on ecosystem services are in the former homelands which cover about half of the Olifants Catchment.
4. From both an aquatic and terrestrial biodiversity perspective, the assessments showed that the Olifants River Catchment is a rich and diverse landscape and home to areas of endemism and high biodiversity, particularly along the Drakensberg Escarpment including Blyde and Legalameetse Nature Reserves and some tributaries of the Olifants River (all Strategic Water Source Areas). Other biodiversity hotspots occur where the Olifants River flows into the Limpopo River and the Maputoland-Tongoland Ecoregion, an area of rich biodiversity that includes the Limpopo River estuary.
5. Assessments identified a wide range of habitat types in the grassland and savanna biomes. Climate change is likely to see a major transformation of the already threatened grasslands to savannas.

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<sup>38</sup> AWARD data under RESILIM-O





*Figure 35: The fruit of a wild fig species – a symbol of the wide variety of species still occurring in the biodiversity rich areas of the Olifants catchment*

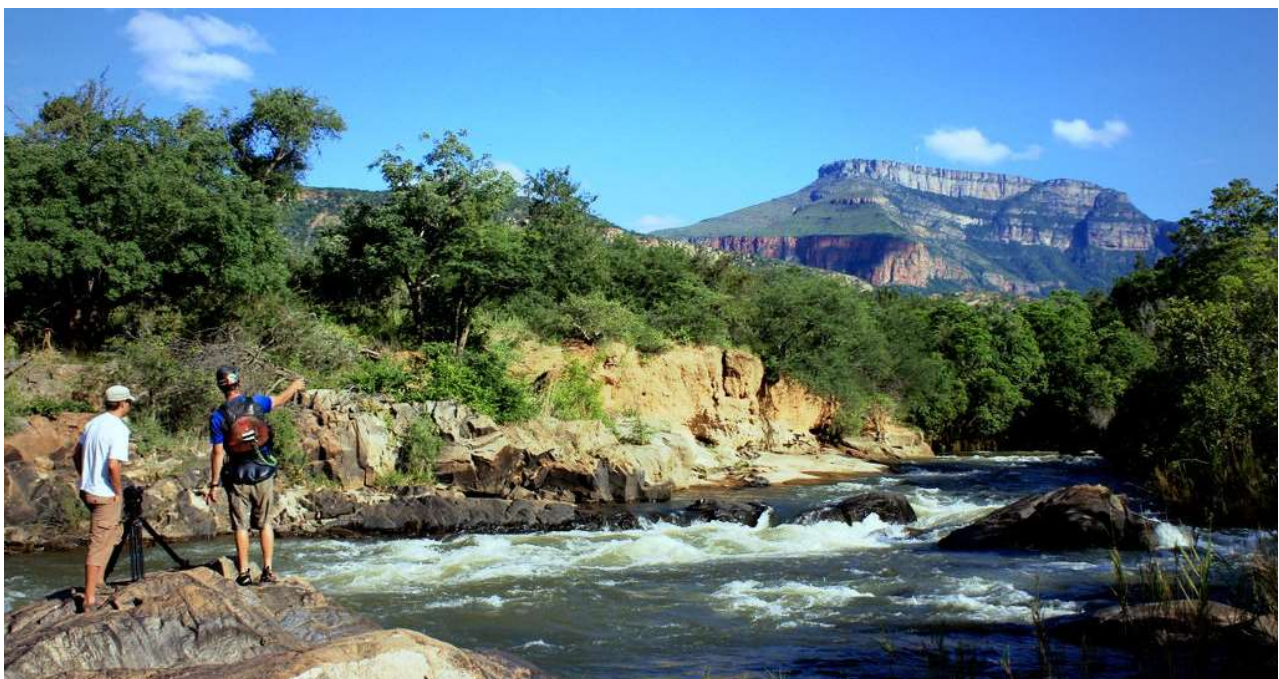
6. There are substantial areas of natural landcover especially in the Lowveld, along the escarpment and Blyde River Catchments. Nonetheless many of these are threatened by a range of drivers including mining, urbanization, afforestation and invasive alien plants.
7. Declining water quality and decreased flows threaten aquatic systems along the entire Olifants River within South Africa and to the Xai-Xai estuary in Mozambique.
8. Large areas of the Catchment have been substantially modified and the upper Catchment is almost totally transformed through agriculture and mining with the latter increasing significantly in the last decade even across former agricultural areas (Figure 36).

## 6.2.2 Water

1. Currently, the Olifants River is the only tributary that sustains flows of the lower Limpopo River in the dry season, indicating the critical role that the Olifants plays in sustaining the basin.
2. The delays in implementing catchment-based governance through the Olifants-Letaba CMA has significantly impacted on the resilience of the system and should be a focus of Phase II.
3. The lack of a bilateral flow agreement between Mozambique and South Africa for the ORC is needed to ensure systemic transboundary management.
4. Lack of integration between water resources management and water supply continues to result in non-systemic approaches to protection and use.
5. The catchment is “closed” (supply meets demand) or reaching closure in most sub-catchments indicating the constraints for further expansion of the resource base.



6. There is evidence of reduced flows, water balance deficits and major water quality degradation in certain sections of the catchment.
7. The Present Ecological Status falls below class D in many river reaches which is regarded as unacceptably degraded (Figure 4). Much of this is due to reduced flows, and poor water quality conditions (see above) due to land and water-related practices (mining, waste-water treatment works, agriculture, erosion).
8. Climate change will exacerbate these vulnerabilities most likely through increased temperatures and more extreme climatic events (e.g. floods), but this is not generally considered in planning.
9. There is a high concentration of wetlands in the Upper Olifants (B1), Wilge (B2) and south-eastern section of Steelpoort (B4) secondary catchments. The intense coal mining activities in the Upper Olifants and Wilge secondary catchments pose a large threat to the important number of wetlands in the area. Much of the lower Limpopo (in Mozambique) also has considerable wetland resources.
10. Groundwater is poorly understood, presenting a limitation to the potential role of groundwater in building resilience.
11. Data is inadequate for systemic planning and mitigation: There is an urgent need to update water use data in the WARMS database and the need to ensure validation and verification is properly completed for the Olifants before further water use licenses are issued.
12. The Reconciliation Strategy does not adequately reflect reality and since WULAs are being issued on this basis, this renders the Catchment more vulnerable.
13. Monitoring of water resources requires strengthening. There is no ability to monitor in real-time (status/ compliance) for regulation and no Early Warning systems in place.
14. There is uncoordinated management by the authorities (national, regional and satellite offices) which requires integration
15. Stakeholder involvement is weakening with some stakeholder platforms meeting (e.g. CMFs) but no actions are taken.



*Figure 36: The waters of the Blyde River as still some of the most pristine and clean in South Africa yet these are under threat from proposed mining developments upstream*





## 6.2.3 Climate change

The historical analysis indicated the following

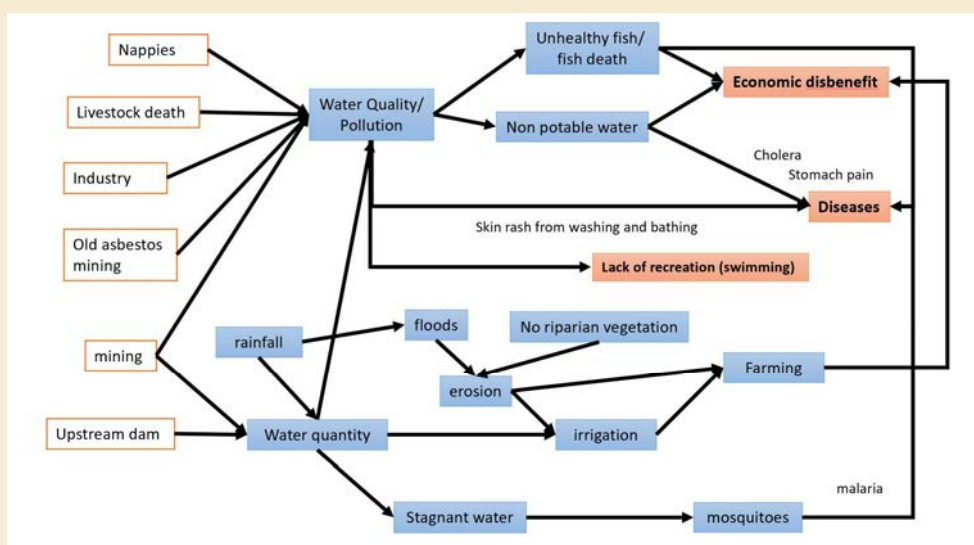
1. The Olifants River Catchment (ORC) can be delineated into five climate regions: (a) Northern Highveld; (b) Southern Highveld; (c) Escarpment; (d) Lower Limpopo; and (e) Coastal.
2. Historically, the Lower Limpopo and Coastal regions have the highest mean annual temperature, while the Escarpment and the Coastal regions have the highest mean annual rainfall.
3. In all five climate regions except for the Coastal region, the mean daily maximum temperature has increased in the last three decades.
4. The Lower Limpopo and Coastal regions have experienced a significant increase in the mean daily minimum temperature in the last three decades.
5. Only the Northern Highveld has been experiencing an increasing number of extreme-heat days.
6. The mean annual and daily rainfall, the number of days with heavy rainfall (amount exceeding 20 mm/day) and the duration of dry spells have not changed significantly in most of the ORC in the last three decades except for the Coastal region.

The analysis of projections under climate change indicated that:

- Almost all models agreed on increases in temperature in the medium and long-term **pointing to the urgent need for adaptation.**
- There was less certainty with regard to rainfall although the intensity of events (e.g. rainfall showers) and seasonal patterns would likely lead to higher risks of flooding and drought periods.

### Systems Diagrams

Systems thinking behind the formulation of the RESILIM-O activities aimed to address, through a participatory approach, shared conceptualisations of the key drivers (and consequences) in the Olifants catchment. Systems diagrams showing the links were used as a tool for understanding interactions at the catchment scale. These were of value for capturing a number of important features including: how the systems function, the interconnectivity of key components, understanding positive and negative reinforcing loops, understanding historicity and the changing dynamics of the system.







*Figure 37: Climate change could devastate food production in the Olifants catchment. The middle part of the catchment is home to the second largest irrigation scheme in South Africa.*



## 7 Phase 2: Towards Resilience in the Olifants Catchment

### 7.1 Taking the Resilience Assessment Process into Action

As noted, Phase II was designed from the findings of Phase I although ‘project-based’ work had already started. This resulted in a range of projects related to the key thematic areas (Figure 38) and after a seven-year program for building resilience in the Limpopo Basin, AWARD is able to report on a broad and rich set of findings for future basin or catchment-based programs in the region. Indeed, the diverse activities, processes and learnings from the program present us with ways to support transformation towards resilience.

Most notably, we highlight that research in this context is of little value if it does not feed into practices and ultimately, change. Emphasis was therefore placed on identifying critical practices related to natural resources management and protection and teams identified key areas from the Phase 1 assessments that could function as sites for change. The purpose was to understand multiple natural resource management practices, the coherence between these and to explore whether this conferred or undermined resilience. The key was to adopt a systemic view of practices and to see them as part of an activity system where it is the combined and synergistic plans and actions that will collectively bring about change and ultimately deliver resilience at a catchment scale. Furthermore, the process of building resilience is a social one where perceptions, opinions, values, interests and priorities intercept in negotiation of a way forward.

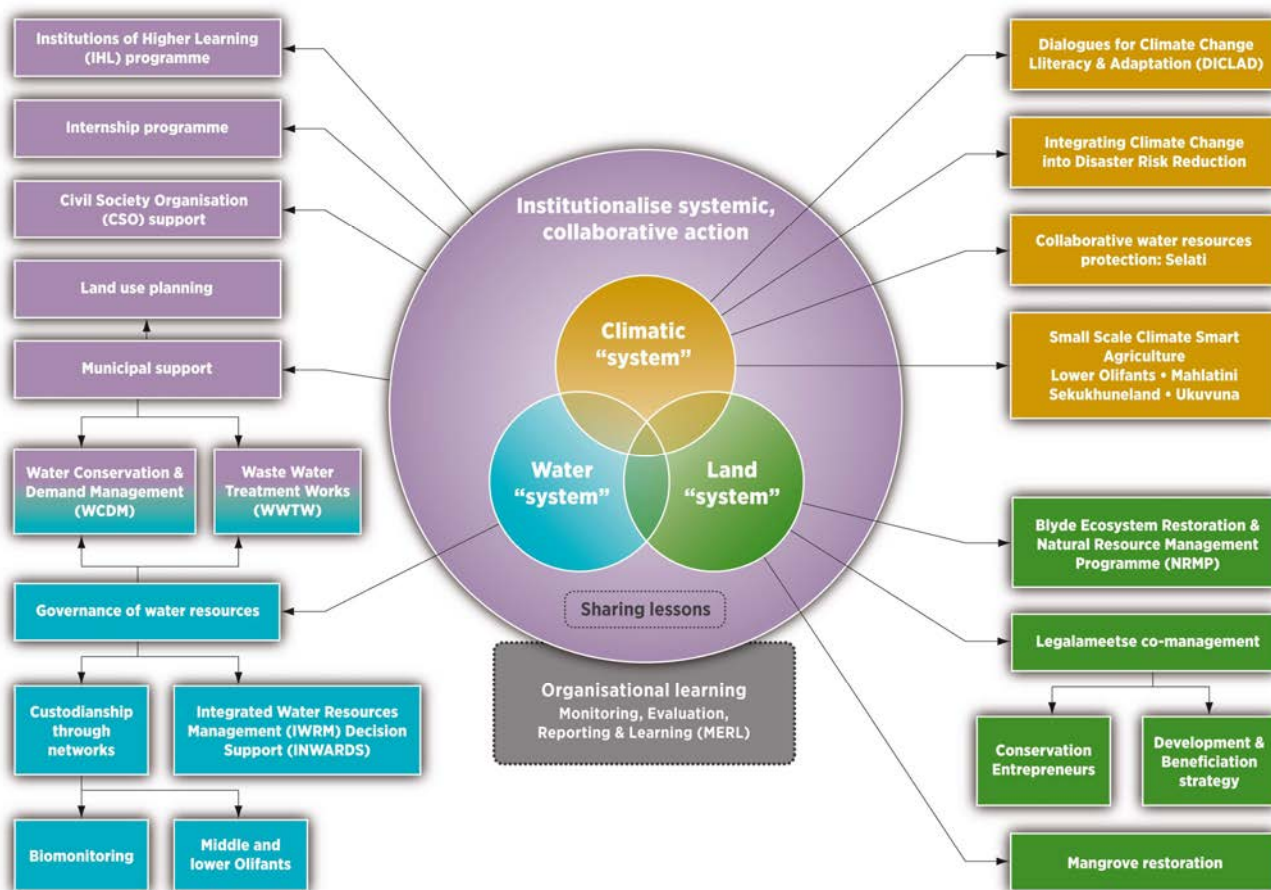


Figure 38: Schematic of key programmatic areas with associated projects under each for RESILIM-O Phase 2

## 7.2 Water

It goes without saying that water is a basic necessity in people’s livelihoods and well-being and the foundation for this is healthy water resources. The benchmark in South Africa for this is the ‘Reserve’ and other Resource Quality Objectives (RQO). Thus, securing the ‘Reserve’ (comprising water for both basic human needs and the environment) and RQOs was key for ensuring a viable and sustainable catchment, now and into the future. However, we also adopted a fundamentally different approach, namely that of systemic, social learning for integrated water resources management (IWRM<sup>39</sup>) and governance, since without a viable governance system, achieving water resources protection is not possible. The objective was to support catchment-based water resources governance through systemic, collaborative and adaptive approaches that focus on the development and uptake of tenable institutional arrangements, strategies, practices and tools, for water resources protection and climate change adaptation.

Working under conditions of great institutional uncertainty where the Olifants-Letaba CMA was put on hold in 2017, and weakness of government structures, the program succeeded in strengthening water governance by the state and other organizations (especially regarding systems approaches, monitoring and regulation) as well as supporting decentralization of water resources management through enhanced stakeholder participation.

<sup>39</sup> A process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment - Global Water Partnership (GWP) [www.gwp.org](http://www.gwp.org).





A major success was the use of our collaborative networks and tools to **keep the Olifants River flowing throughout the drought that has affected the region since 2015** (see Box 1). The interventions through this collaborative effort to secure flows were systemic in nature, representing a mix of social, institutional and technical responses.

*“From Blyde and especially the Agricultural sector in the area, the releases from De Hoop had the effect that farmers could produce a crop for the coming citrus and mango season. Without the releases, taking into account the level of the Blyde dam since September 2015, no water would have been available for agricultural use. The resulting loss of income for the farming and labour sector would have had a devastating effect on the social and economic welfare in the region.”* (Message from member of the commercial agricultural sector)

Water governance was strengthened through **consolidation of extensive yet patchy scientific data**<sup>40</sup> and by **new research** designed to understand critical gaps. This included potential impacts of climate change on water resources and the impacts of present and planned water resources developments in the lower and middle Olifants.<sup>41</sup> On the water demand side, our research revealed extremely high water consumption figures in both Hoedspruit and Phalaborwa and we worked both with municipalities and water users to raise awareness and plan for water conservation and demand management measures.<sup>42</sup> AWARD engaged with and contributed to numerous other related projects in the region for improved systems understanding and coordination.<sup>43</sup>

In support of good governance and the protection of freshwater resources, AWARD developed a suite of management tools and protocols as part of the **INWaRDS decision-support system**.<sup>44</sup> This allows for an integrated approach to flow and water quality monitoring in the Olifants, to ensure compliance with RQO standards and is a first for the country and the region. An **early warning system** alerts water resource managers when flow or water quality conditions are non-compliant, allowing for greater responsiveness. The **near real-time flow and water quality monitoring system** installed in the lower Olifants through RESILIM-O also provides important redundancy for the aging DWS monitoring network. The **FlowTracker mobile application**, which allows users to monitor flow and dam levels and includes a weather forecast facility, had at the time of writing been downloaded 814 times. FlowTracker was designed for use by the general public to support greater knowledge, awareness and involvement by stakeholders in IWRM (see Box 2).

Since information and tools can only contribute to building resilience if they are used to transform water resource management practices, AWARD adopted a collaborative approach from the start, working with stakeholders to understand these practices, identify needs and respond to opportunities. Responding to needs in context enabled the institutionalization of new systemic practices. These were both social and technical in nature, with the latter enabling the former.

Initial work focused on supporting and **building capacity within the newly establishing Olifants Catchment Management Agency** or CMA, the key water governance institution in the South African part of the catchment, through the collation of information and development of tools described above as well as extensive training in IWRM.<sup>45</sup>

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<sup>40</sup> See, for example, “Overview of Water Quality and Quantity in the Olifants River Catchment”.

<sup>41</sup> See the resources “Predicted Impacts of Climate Change on Water Resources of the Olifants River Catchment” and “Historical Trends & Climate Projections for Local Municipalities”.

<sup>42</sup> See “Using what we have Wisely! A Water Conservation and Water Demand Management Strategy for Maruleng Municipality”, “Water Conservation and Demand Management Under Climate Change” and “A Water Balance for Municipalities - Made Easy”.

<sup>43</sup> Including MOSA (Integrated Water Resources Management in the Middle Olifants River Catchment of SA), the Integrated Water Quality Management Plan, the Kingfisher Project and the IWAGSS (Integrated Water Governance Support System) project.

<sup>44</sup> Integrated Water Resources Decision Support System.

<sup>45</sup> Training included support for developing a Catchment Management Strategy and capacity development on a systemic understanding of the catchment, implementation of the Reserve and RQOs, compliance monitoring and regulation, cross-boundary co-operation, and planning under climate change.



However, after the Catchment Management Agencies were “put on hold”<sup>46</sup> in 2017, followed by ongoing institutional uncertainty,<sup>47</sup> we turned our attention to strengthening stakeholder networks and supporting the DWS regional office in performing the governance functions of the CMA. In resilience terms, this is a form of polycentric governance.

Support for the DWS regional office was largely for regulation of increased water use in the lower Olifants and mining activity in the upper Blyde catchment (a strategic water source area and Class 1 catchment), due to the potential impacts on water quality and quantity. This work started to bear fruit when several directives against unlawful users were issued by Compliance Monitoring and Enforcement officials.

Three important networks for water governance were established through RESILIM-O which increased participation, learning, collective action and stewardship of water resources in the catchment:

- The **Lower Olifants River Health Forum**, made up of private nature reserves in the lower Olifants. This network facilitates stewardship of water resources through increasing capacity for biomonitoring and inclusion of aquatic biodiversity and health into reserve management plans (which previously only focused on terrestrial biodiversity). The forum also includes key supporting organizations which can link the data collected by the private protected areas to broader regional and national aquatic and terrestrial monitoring programs (e.g. KNP, SAEON and MTPA).
- The **Lower Olifants River Network**, which brought together government (national and provincial DWS) and water users from various sectors (conservation, mining, agriculture, community members and water bodies such as Water User Associations) to address the critical water governance issues facing the lower Olifants. This built upon stakeholder networks for water governance which emerged in the earlier years of RESILIM-O, namely the OLLI Forum and the Lower Olifants River Operations Committee (LOROC).
- The **Middle Olifants River Network**, a cross-sectoral network for collaborative, systemic learning and collective action in the Middle Olifants<sup>48</sup> which includes representatives from a range of sectors including mining, agriculture, conservation, research and government at local, provincial and national levels. This network has started to address the impact of water transfers out of the catchment to Polokwane and beyond.

Within the above networks the program supported stakeholders to confront and consider the multiple, systemic impacts of climate change on their practices. A collaborative dynamic modelling approach, piloted in the Selati catchment and later extended into the middle Olifants, supported **scenario thinking and planning** in the region. This combined a tailored stakeholder engagement process with development of an underpinning, integrative system dynamics model for scenario and policy analysis. Stakeholders were able to identify leverage points for change through understanding the dynamics of the system, as well as to appreciate the alternative realities of stakeholders from other sectors.

In addition to the above, the RESILIM-O program also supported **greater participation by civil society in water resources management** by supporting Catchment Management Forums (CMFs). These are an important mechanism for stakeholder participation. CMFs need to structure participation from stakeholders in a way that is meaningful, open and democratic. This has not happened effectively in the past, and “capture” of these forums by particular interest groups has been a common problem. The program assisted in strengthening CMFs by introducing guidelines for developing a CMF charter with clear functions and purpose.

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<sup>46</sup> With Minister Mokonyane’s announcement of a potential move to establish a single CMA for the whole country, the Olifants-Letaba CMA effectively became dormant (with no staff or budget), pending a decision (E. Bofilatos, *Institutional Oversight*, Sep 2020). Some 67 staff were moved back to DWS (W. Ralekoa, former CEO of OLCMA, pers. Comm. May 2016, Nov 2017).

<sup>47</sup> Little guidance was provided on processing the implications for RESILIM-O despite attempts to clarify. In 2018 the new Minister, Mr Nkwinti, announced that the establishment of the 9 CMAs would go ahead, but this process was still underway in 2020 and there was still no active CMA for the Olifants.

<sup>48</sup> See the resource “Networks for Collaborative, Systemic Action in the Middle Olifants River Catchment”.



The guidelines are not specific for a particular geographic area but general enough for inputs to be made relevant and appropriate. CMF charters were developed and adopted in the upper, middle and lower parts of the catchment through RESILIM-O.

To further address the injustices in access to water in the Olifants catchment, the program supported a model for the Mopani District Municipality's Water and Sanitation Committee designed to be piloted in all five local municipalities, to support rapid escalation of community issues to the appropriate level. Local civil society organizations were supported to be more effective "watchdogs" through two week-long "Water Clinics". These provided an introduction to water resources concepts to build their capacity to understand and articulate issues as the basis for their own action (see also Section Institutional Support).

In Mozambique, the program supported improved management of water resources and biodiversity as well as resilience to climate change through **restoration of mangroves in the Limpopo estuary** (see Box 3). **Improved governance and management of the mangroves** in two communities were achieved through establishment of two capacitated Natural Resource Management Committees and completion of the delimitation process for the two communities, contributing to better natural resource management of a total area of 38,590 ha. **Capacity was improved in schools and the local community** regarding mangroves, sustainable use and development, climate change adaptation and livelihood alternatives. This was achieved through training of 78 primary school teachers (62% women) from 11 schools, integration of thematic content on mangrove ecology and climate change into the school curriculum, involvement of more than 350 local primary school students in field lessons and mangrove planting, and community awareness campaigns. **Networks for co-learning and sharing** supported other organizations involved in mangrove restoration in Maputo and Inhambane through supply of seedlings and knowledge transfer. The capacity of AQUA<sup>49</sup> staff to **communicate climate change** and the role of mangroves in climate change adaptation was also increased through interactions with AWARD.

The work in the Olifants Catchment blossomed over the five-year period to include uptake in new areas (the Inkomati-Usuthu Water Management Area) as well as several **new partnerships and institutional arrangements** with the IUCMA and more recently, WWF.

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<sup>49</sup> Formerly CDS





## Box 1

### DROUGHT RELIEF!

#### Working with partners to keep the Olifants River flowing

The eastern region of South Africa has been in the grips of a crippling drought since 2015, with more days exceeding 40°C than ever recorded. Flows in the Olifants River – supplying water to over 3.6 M people in South Africa and sustaining livelihoods in Mozambique – have persistently reached alarmingly low levels since 2015. The Association for Water & Rural Development (AWARD) together with SANParks, who both monitor and analyse flows, have continuously warned that the river could stop flowing without urgent and immediate action.

Drought is a natural characteristic of this area, as long-term residents of the Lowveld know. However, by law, a minimum flow is required for all rivers of South Africa - both to meet basic minimum human needs and to ensure a river resource that is sustainable. In the case of the Olifants, a minimum drought flow has been gazetted but with flows often at less than 30% of the minimum legal requirement, the system is completely and consistently non-compliant. In addition to the drought, factors such as weak water resources management, poor controls over unlawful use and massive losses through poor infrastructure maintenance all contribute to the growing crisis. This situation places downstream users at risk, including 10,000 permanent and seasonal jobs in the agricultural sector, water for Phalaborwa and surrounds and flows into the iconic Kruger National Park and Mozambique's Massingir Dam.

In response, AWARD, together with our partners SANParks & Water Resources Planning (Department of Water and Sanitation), worked towards keeping the lower Olifants River flowing during the drought. A major success was the use of our collaborative networks and tools to analyse flows and to recommend releases from the De Hoop Dam in such a way that it would benefit downstream users while not depleting the dam's water supplies. The first release was made on 23 September 2016 using AWARD's Integrated Decision Support System (INWARDS). Since then, AWARD has been given the responsibility of monitoring flows, liaising with stakeholders and running the model when necessary to recommend further releases until we are out of the emergency state. The releases from De Hoop Dam significantly improved the condition of the Steelpoort and Olifants Rivers. Releases were made in 2017, 2018 and again in 2019, resulting in the minimum flows being achieved in the Kruger National Park and into Mozambique – a major success in a time of drought!

This experience has given planners and users a window into a future of reduced flows, especially under climate change and illustrated how collaborative action can work. The drought has highlighted the fact that in times of stress, good governance and stakeholder involvement are critical.



*The Olifants River at the height of the wet season in 2016*



*The Olifants River during a 'normal' wet season*

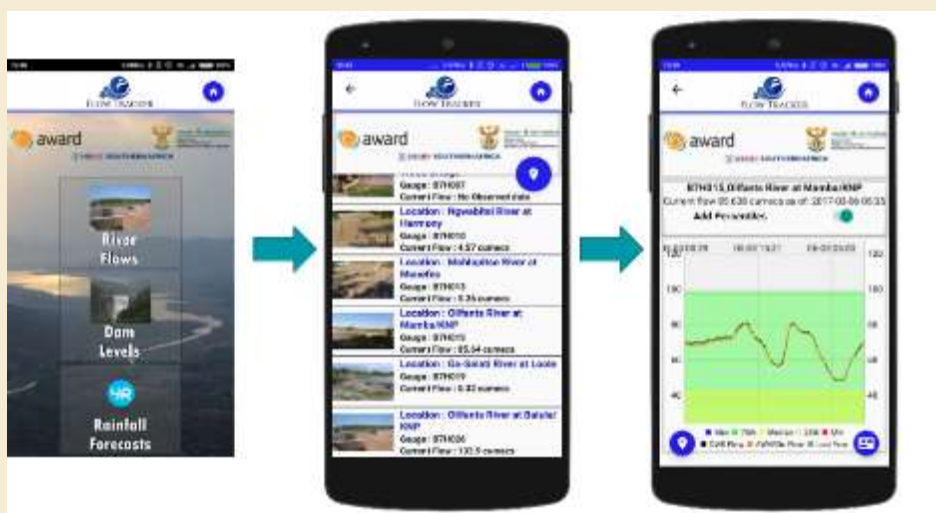
## Box 2

### New tools for integrated water resources management in the Olifants Catchment

An exciting development was the completion of our **FlowTracker app** and associated tools which allow one to track flows and dam levels in the Olifants in real-time – to our knowledge a first for South Africa. This has provided much needed support as an **early warning system** for flow and water quality problems. The system has been further enabled by USAID-funded independent flow and water quality loggers in the lower Olifants. AWARD’s long-term partnerships with SANParks and other partners have successfully improved water resource management by strengthening monitoring, data redundancy, information flows and responsiveness – all important aspects of resilience. In times of crisis, such as drought, DWS can now manage the “catchment system” more effectively by linking upstream and downstream water-related activities and impacts.

The FlowTracker app for Android is downloadable from the Google Playstore:

<https://play.google.com/store/apps/details?id=flowtracker.award.org.za.flowtracker>



AWARD also developed and tested an Integrated Water Resources Decision Support System known as InWaRDS (Integrated Water Resources Management Decision Support System). This is designed to support an integrated approach to flow and water quality monitoring, to ensure compliance with standards set by government and stakeholders. InWaRDS incorporates the gazetted resource quality benchmarks and integrates pollution loads for the lower Olifants. A first for the country, it supports monitoring, analysis and decision-making through an integrated, hybrid, opensource and user-friendly system.



Flow Tracker for the Olifants River is the first of its kind. It enables **near real-time flow** and **dam monitoring**, and includes a **weather forecast** facility.\*



\*Visit <http://award.org.za/inwards/> for a demonstration, or scan the QR code to download the app



Flow tracker is designed for use by residents to improve catchment awareness.



### Box 3

## Improved resilience of mangroves in the Limpopo Estuary in Mozambique



Partner organisation AQUA (formerly known as CDS) in Mozambique engaged local community members (80% women) in restoring mangrove vegetation in the Limpopo estuary. Hydrological connectivity was restored by re-excavating channels silted up during floods, re-establishing the conditions needed by mangrove seedlings across a 15 ha area. A total length of 1,190 m of channel was excavated by 264 local community members, and 3,570 m<sup>3</sup> of sediment was removed.

Community members, including school children, also participated in planting around 60,000 mangrove seedlings, thereby starting the process of recovering the ecological functions provided by mangroves. Mangroves are notoriously difficult to cultivate yet the team at AQUA under Snr Henriques Jacinto Balidy have built up a wealth of experience and have a good success rate at germination. They are currently maintaining an enormous mangrove nursery.



Snr Agostinho Nhamzimo has become a regional expert in mangrove cultivation and is dedicated to establishing the mangroves that were destroyed in the 2000 and 2012 floods.



The head of the Village is Salimina João Mahiele. She recalls a time before the erratic floods of recent years destroyed the mangroves.

*"When the mangroves were in good condition, we had more resources to use, like fish and crabs. When I was young, the mangroves were very big and covered large areas. We used to harvest some for use, but now, there are not enough."*

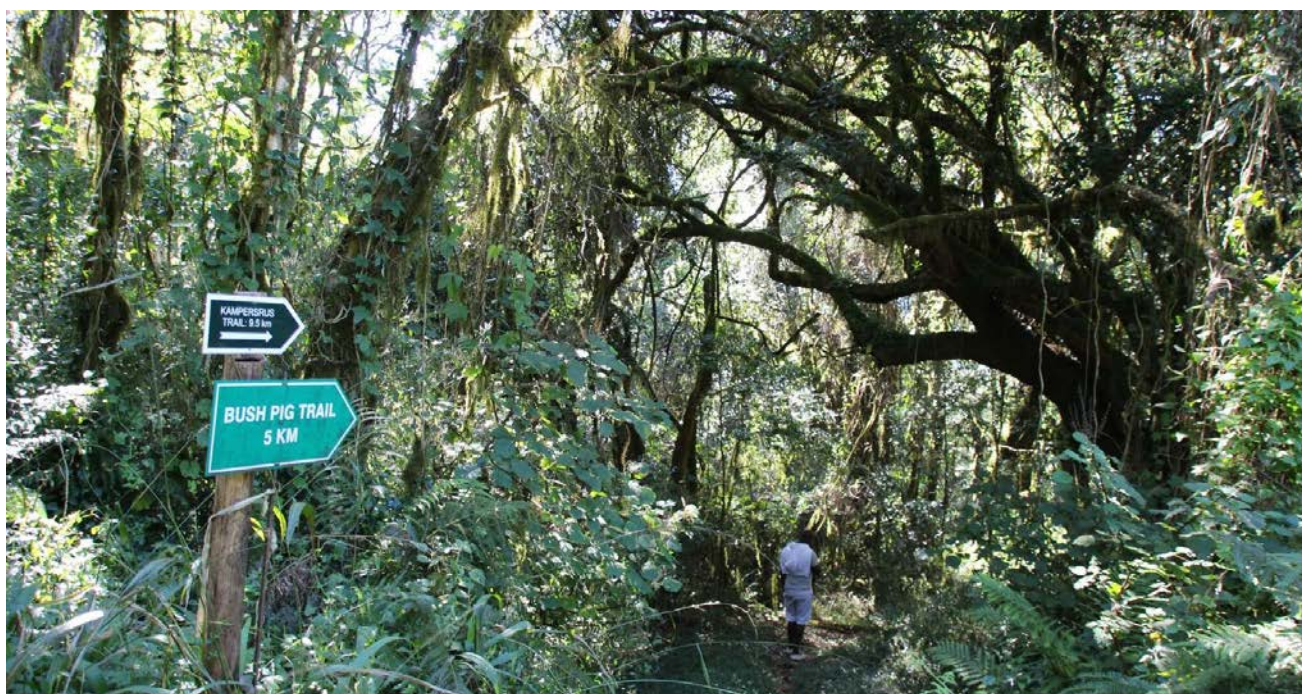
The project directly involved approximately 250 people and indirectly benefitted more than 27,000 people living in the Limpopo Estuary.



## 7.3 Land and Biodiversity Management

Work under this area addressed the objective: *To conserve biodiversity and sustainably manage high-priority ecosystems by supporting collective action, informed adaptation strategies and practices and tenable institutional arrangements.*

Spatial land-use planning is a key avenue through which to conserve and sustainably manage high priority biodiversity areas. Until recently the mandate for land-use planning was the domain of conservation authorities and provincial environmental departments, and care for biodiversity was primarily through protected area proclamation. However, with the gazetting of Biodiversity Bioregional and Sector Plans initiated by SANBI,<sup>50</sup> there was a precedent-setting shift to include local government as key players, as well as a broad spectrum of other stakeholders in land-use management decisions. This includes spatial planners, whose educational backgrounds do not typically include the biological sciences. Through the RESILIM-O program, AWARD provided tools and capacity to develop and sustain these roles in a way that promotes integration by embedding biodiversity into spatial planning in the region.



*Figure 39: The Afro montane forests of the north eastern Drakensberg are home to a massive species diversity yet they are under threat from commercial plantations and climate change. Integrating them into local economic activities offers a way of protecting them.*

**Biodiversity and climate change adaptation were successfully integrated into spatial planning** in the lower Olifants region through raising awareness about the Critical Biodiversity Area (CBA) maps and land-use guidelines among spatial planners and other stakeholders involved in biodiversity-based activities, as well as through the development of resources and tools (see Box 4). The inclusion of biodiversity into spatial development frameworks in the region allows for more meaningful consideration of biodiversity during land-use decisions and more effective protection of high-priority areas, thereby maintaining future options under climate change.

<sup>50</sup> The South African National Biodiversity Institute





In terms of our work on invasive alien plant control and **restoration of the biodiverse, strategic water source area of the Blyde Catchment**, highlights included the institutionalization of short- and medium-term collaborative planning amongst the partners engaged in clearing invasive alien vegetation in the area and the emergence of an **integrated landscape approach to restoration**. Based on agreed priorities, different organizations and different types of clearing teams now routinely plan and work together – a significant change from the uncoordinated situation which existed a few years previously (see Box 5). This resulted in an area of **91,800 ha under better management**<sup>51</sup>, with **18,061 ha under improved biophysical conditions due to clearing of alien vegetation**. Alien vegetation clearing was mainly in grassland areas and the species cleared included pines, gums and silver and black wattles, which are all high-priority invasive species of grasslands in South Africa<sup>52</sup>. By 2019, integrated restoration had begun to address all parts of the landscape, including inaccessible areas (1,078 ha cleared through the innovative partnership between the High Altitude Teams, AWARD, and the K2C Restoration Champions team – see Box 5), remote areas accessible on foot (160 ha cleared by “intermediate” teams such as the Restoration Champions), accessible areas (5,895 ha cleared by “normal” clearing teams), and also wetlands.

**New and unique peatlands were discovered** and mapped in the upper Klaserie and Sand Catchments by AWARD, K2C and DAFF in partnership with wetland specialists. Peatlands are highly valuable wetland ecosystems and are critical for biodiversity conservation, water security and climate change resilience, representing the largest terrestrial carbon sinks on Earth.

The collaboration in the Blyde River Catchment blossomed over the five-year period to include new areas of collaboration as well as several **new partnerships and institutional arrangements** (Box 5). This work made an important contribution to the praxis of integrated landscape and catchment restoration by demonstrating the value of establishing effective social learning processes early on in the project life cycle as a catalyst for increasing collaboration, experimentation and learning within the group – foundational principles for resilience. These experiences produced many lessons and recommendations to share with other catchment partnerships<sup>53</sup> and contributed to momentum in the region which will continue into the future.

The program also helped to build **custodianship amongst the new landowners** (communities who have reclaimed land under South Africa’s land restitution program<sup>54</sup>). Local youth were employed as “Restoration Champions” and piloted a new model for invasive species control in remote areas, which included capacity development in computer skills, GIS and climate change (besides the “usual” training in clearing methods, health and safety) and included opportunities for in-field learning from other clearing teams. Working in remote and rugged areas, this team of eight young people cleared a phenomenal 136 ha in the Mariepskop and Upper Klaserie catchments.



*Figure 40: The Blyde Restoration Champions, on top of the world!*

In support of the above work on invasive alien species, the program supported **sustainable forest management** through improving capacity for compliance, monitoring and enforcement in the plantation

<sup>51</sup> Improvements included strengthened relationships and new partnerships between the Blyde CPAs, NRMPs and downstream landowners, addition of more clearing teams including “intermediate teams”, institutionalisation of collaborative, integrated planning of clearing operations, and collaboration between HAT, SANDF and K2C to clear inaccessible areas.

<sup>52</sup> CSIR national prioritisation (Le Maitre et al., 2012)

<sup>53</sup> These lessons have already been shared at several conferences and events and with several other catchment partnerships.

<sup>54</sup> Organised into four Communal Property Associations or CPAs





forestry industry and producing a number of important **policy tools and guidelines** including (see Appendix 10.2).

The RESILIM-O program provided important **lessons for praxis and policy on the co-management of protected areas** in South Africa. Existing nature reserves are legally required to remain under conservation, with some form of co-management between the provincial conservation agencies and the communities (new landowners) involved. While national protected area legislation<sup>55</sup> recognizes that protected areas can – and should – contribute positively to the livelihoods of local people, and government and conservation bodies have identified co-management as a key mechanism for overcoming the highly contentious issue of land claims on protected areas, there is mixed evidence for whether such initiatives are succeeding. Despite longer-standing regional and international practice, support for the practice of co-managing in South Africa is very weak. Without proper processes in place for good governance through co-management, we are at risk of losing prime biodiversity areas as well as their benefits to the new landowners.

In this context, the program made a major contribution to understanding **co-management as a transformative social process and a new practice** unknown to both parties – requiring co-learning and co-adaptation as well as a re-orientation away from the view of co-management as a technical or contractual procedure. Besides the “tools” – principally the co-management agreement which is the focus of government support – attention must be given to what is needed to support both parties to engage in a new social process of co-managing, including governance and institutional arrangements at various levels for appropriate development and benefit-sharing, the role of community dynamics and expectations, and the wider socio-political and environmental context. Several guidelines as well as a Policy and Practice Brief are now available.<sup>56</sup>

The program **supported governance and co-management arrangements for the Legalameetse Nature Reserve** (LNR) in the upper Selati sub-catchment, working with the six CPAs<sup>57</sup> to strengthen communication, trust, collaboration and good governance in order to make the co-management agreement more sustainable and effective (see Box 6). This included **institutionalising youth participation** in the Legalameetse Management Committee (LMC). An eco-literacy program used interactive activities to help the LNR youth and elders to understand the land and the natural and cultural assets in the reserve, thereby **building socio-ecological identity**, a sense of belonging and appreciation of the land. Through the eco-literacy program, the leadership of one of the communities initiated the **incorporation of a portion of their land into the protected area** to curb biodiversity degradation. Despite the fact that the co-management agreement has yet to be signed and the four land claims yet to be resolved, the chances of successful co-management of the reserve have been significantly advanced.

Beneficiation is a critical part of co-management and work at LNR supported communities in identifying **opportunities to diversify livelihoods through capacity development** on beneficiation models and conservation-based enterprises that can contribute to biodiversity conservation and climate change adaptation. A major outcome was the first LNR cultural festival, held in October 2019 and organized by the Legalameetse Management Committee themselves. The capacity for proactive planning and management was enhanced through development of important tools: a Development Framework, a Beneficiation Framework and support for a Reserve Management Plan. These tools were collaboratively developed with landowners to help them to evaluate future development and benefit opportunities in an integrated, systemic and equitable way. This is especially important given continued inequitable or non-transparent developments in the Reserve<sup>58</sup>.

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<sup>55</sup> *National Environmental Management: Protected Areas Act (NEMPAA) (Act No. 57 of 2003)*

<sup>56</sup> See the RESILIM-O resources: *Systemic Social Learning Support for the Co-Management of the Legalameetse Nature Reserve, A Guideline to Legislation Influencing Co-Management, Community Participation and Engaging with Government, and Policy and Practice Brief: Co-management of Protected Areas. The core contribution was in informing and influencing processes for co-management as a co-learning ‘journey’ for all parties, and in providing details around the objectives outlined in NEMPAA, namely delegation of powers, apportionment of income, benefit-sharing, use, access and development, and capacity development.*

<sup>57</sup> *Communal Property Associations are an institutional form designed to represent land claimants.*

<sup>58</sup> Pollard, S.R. C. Chikunda, T. Mohale and L. Goredema. Submitted. *Power taken, power given: Lessons for praxis and policy on the ‘conservation & livelihood’ marriage from land reform and co-management in the Legalameetse Nature Reserve (South Africa). African Handbook on Sustainable Development. W. Leal and L. de Sousa. Eds. Elsevier.*

## Box 4

### Getting biodiversity on the map: Successful integration of biodiversity into land-use planning

Land-use planning practitioners and consultants who develop the Spatial Development Frameworks (SDFs) required by municipalities, are now able to integrate biodiversity into SDFs effectively through using the Critical Biodiversity Area (CBA) maps – something which many did not know how to accomplish since it is not typically part of their training. This new practice has potential to spread to other parts of the country in which these practitioners work. If the concept is taken to scale it will be a game-changer for how biodiversity is integrated into municipal land use planning.



A comprehensive Critical Biodiversity Areas (CBA) resource pack was developed as well as the prototype “Biodiversity Guru” mobile app (supported and endorsed by LEDET). Successful institutionalisation was clearly evident through input into the recent Spatial Development Frameworks (SDFs) for Mopani District Municipality and Ba-Phalaborwa Local Municipality as well as the Greater Kruger region. The Maruleng and Ba-Phalaborwa local municipalities both adopted the CBA map as a guiding document for land-use applications and by-law development.

The mobile app concept holds promise for practitioners evaluating land-use change applications because it was developed together with spatial planning practitioners. It will also be useful for prospective landowners, conservation planners, estate agents and many others.

Resources to support biodiversity planning in the lower Olifants region:

- Biodiversity Sector Plan Handbooks for Ba-Phalaborwa and Maruleng local municipalities
- Critical Biodiversity Area Mapbooks for Ba-Phalaborwa and Maruleng
- The CBA brochure series:
  - #1 Caring for Our Biodiversity - made easy
  - #2 Brief Land Management Guidelines
  - #3 A Step by Step Guide to Integrating Biodiversity into Land Use Planning
  - #4 Developing Environmental Policies
  - #5 Biodiversity integration into Municipal Spatial Planning
  - #6 Glossary of Biodiversity & Spatial Planning Terms
  - #7 Biodiversity & Climate change





## Box 5

### The Blyde Restoration Working Group: A journey of increasing collaboration and integration in restoration practice



The journey of the Blyde Restoration Working Group started in 2015 when AWARD brought together representatives from the natural resource management programs involved in controlling invasive alien vegetation in the rugged and mountainous upper Blyde River catchment.

Over the years, this group established itself as an extremely effective forum for collectively understanding context and co-designing restoration responses. The increasing diversity of participants, the number of new partnerships and institutional arrangements that emerged and the increasing scope of work undertaken by the group over time are a testimony to the effectiveness of the social learning approach that was followed.

New or better coordinated restoration practices that emerged among NRM agencies working in the area included:

- Collaborative planning of alien clearing activities (now institutionalised as a routine annual activity for the last four years).
- Use of collaboratively developed tools, plans and strategies (an invasive species inventory map, a timber biomass assessment, a plan for clearing inaccessible areas in the Blyde Canyon, a restoration strategy for the Lowveld Plantations, a streamflow and vegetation monitoring network, and wetland mapping and health assessments).
- New clearing approaches and interventions, including clearing of inaccessible remote areas with helicopter transport and camping, and remote area clearing with “intermediate” clearing teams whose members are fit enough to access these areas on foot.
- Integration of different approaches across all parts of the landscape.

*“The only real way to fight alien plant infestations is to integrate clearing across all parts of the landscape, starting at the top,” says Silindile Mtshali, spatial planner for the restoration project at AWARD.*

*“This means getting into inaccessible mountainous areas to complement clearing efforts in other parts of the landscape is key for coordinated and effective restoration at a catchment level.”*

New or improved institutional arrangements supporting restoration practice:

- Improved relationships between the Blyde CPAs and the restoration, conservation and forestry entities operating in the area;
- The Blyde CPA-K2C-AWARD partnership under the Blyde Restoration Custodianship sub-grant, continuing with new funding from the Land User Incentive (LUI) program and the Resilient Waters Program;
- The Upper Sand Restoration Partnership, bringing together CPAs from the upper Blyde, Sand and Klaserie catchments with downstream landowners Sabi-Sand Wildtuin to support ecosystem restoration; and
- Increased feedbacks between national and regional levels within DEFF and DEFF Forestry (ex DAFF), and more involvement and investment from DEFF national.

Two rounds of inaccessible area clearing were carried out in 2018 and 2019, resulting in removal of invasive trees from 800 ha of difficult-to-reach mountaintops, cliffs and steep slopes. Helicopter transport was provided through a new partnership between the SANDF and the Blyde Working Group partner organisations. The RESILIM-O team assisted with spatial planning for this exercise so that clearing was focused, systematic and effective! (Photo Credit: HAT)







## Box 6

### Power taken, power given: Equitably co-managing Legalameetse Nature Reserve

A solid foundation was established for tenable co-management of the 19,200 ha Legalameetse Nature Reserve, a high-priority biodiversity and strategic water source area in Limpopo Province, through developing tenable institutional arrangements, building capacity and agency for natural resource management, collaborative development of planning frameworks and guidelines and promoting custodianship of the land by the new land owners.

- The **capacity of the Legalameetse Management Committee (LMC) to engage with and negotiate co-management processes was increased**, as shown by the drafting of their own version of the co-management agreement and negotiation with the provincial conservation body (LEDET) for a more inclusive agreement. Their increased capacity to act as landowners and partners in co-management, rather than passive “beneficiaries”, was evident in their increased participation in meetings, negotiation and conflict resolution skills and self-organisation. As a result of extensive capacity development with the LMC, a fully-endorsed LMC constitution and clarification of the roles and responsibilities was drafted and adopted. This also clarified roles and responsibilities of the long-overdue Co-Management Committee (formed in 2019) and the CPAs.
- In terms of the relationship between landowner communities, there was **increased cohesion amongst the six communities** as they understood the importance of working together and managing LNR as a unit. This was institutionalised through the signing of a MoU between the six communities.
- Communities were empowered to understand their context and demonstrated **agency in following up on the finalisation of their land claims** with DRDLR and the Makutšwe CPA, and in organising their wider members during the verification process. Technical support was provided to the four communities and the LMC in finalising the land claims and the co-management agreement through the involvement of the Legal Resources Centre (LRC).
- Another important outcome in terms of institutional arrangements was the establishment of a functional LNR Youth Forum and **greater youth participation** in the CPA committees and LMC.



The project’s engagement with the individual CPAs, LMC and LEDET equipped them with many tools that can be used in co-management going forward, such as the development and

beneficiation frameworks, the co-management roadmap, roles and responsibilities of the various parties, information on relevant legislation, and exposure to other co-management models and functional co-management case studies.

Resilience was built by increasing connectivity and information flow through sharing information on co-management within and between the LNR communities and other groups, by promoting self-organisation amongst the new landowners, and by increasing diversity through introducing new service providers into the co-management system (such as organisations providing legal support). Participation was increased and diversified with more members of the community participating in co-management processes (including youth) and equity and transparency were promoted through the inter-CPA MoU and through involving the communities in activities such as the youth selection interviews.



## 7.4 Climate Change and Climate-Smart Agriculture

Work under this part of the program addressed the objective *to reduce vulnerability to climate change and other factors by supporting collective action, informed adaptation strategies and practices and tenable institutional arrangements.*

During Phase I it was determined that an understanding of and access to information on climate change and its impacts on water resources, biodiversity and associated ecosystem services were generally low in the Olifants River Catchment. AWARD therefore recognized that planning for climate change adaptation actions in the Catchment would require contextualizing the impacts of climate change on local communities and understanding the institutional context for climate change.

To this end, ongoing research and networking was undertaken to understand the **regional, national and international context of climate change policy and adaptation for the catchment**. This built connection and rapport between AWARD and important research institutions and policy-developers working on climate within South Africa, and increased the internal capacity of the AWARD team to communicate and translate climate change information from theory into practice within the RESILIM-O program.

Downscaled localized climate change projections were developed for the Olifants River Catchment through a partnership with the Climate Systems Analysis Group (CSAG). **Climate change narratives for specified climate regions in the Olifants River Catchment** were developed and technical briefs were also prepared for selected local municipalities (Ba-Phalaborwa, Elias Motsoaledi, Maruleng, Lepelle-Nkumpi, and Greater Tzaneen).<sup>59</sup>

Climate change cannot be addressed through conventional approaches to “awareness raising” because the nature of climate change as a risk is cognitively difficult for humans to engage with, and climate change is usually conceptualized and introduced as a highly technical subject. With little practical meaning, it is hard for already overloaded stakeholders to plan for tenable adaptation practices. AWARD therefore put considerable effort into testing different approaches and tools for communicating climate change to diverse stakeholders who did not all have the technical skills to engage with the science of climate change. Clear messages and communications materials were developed on how the climate is changing in the Olifants River Catchment, simplified for ease of communication but retaining a level of scientific rigor and substance.<sup>60</sup> An effective **dialogue-based approach for communicating climate change** to a range of stakeholders was an important innovation of the program (see Box 7).

The program worked to integrate climate change into local government’s Integrated Development Plans (IDPs) through identifying and building the capacity of “climate change champions” within Maruleng and Ba-Phalaborwa local municipalities. Climate change was integrated into the IDP situational analysis in both municipalities; however, **integration of climate change adaptation into the planning processes of municipalities** was found to be challenging, mainly related to the fact that institutional arrangements are inadequate and climate change is an unfunded mandate within local government. These insights were submitted to the DEFF on the draft Climate Change Bill (now passed into law).

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<sup>59</sup> *The use of climate regions captures more nuance than using political boundaries for climate change analysis and allows the heterogeneity within the large catchment area to be considered. These outputs provided clarity on the feedbacks and slow variables within the climate system of the region, to support more informed natural resource management and implementation of suitable adaptation interventions.*

<sup>60</sup> *See “How is the Climate Changing in the Olifants River Catchment?”, “Predicted Impacts of Climate Change on Water Resources of the Olifants River Catchment” and “Climate Change: Understanding Scenarios, RCP and PPM”. A brochure entitled “Core Concepts for Climate Change Thinking in the Olifants Catchment” uses simple graphics to convey the important concepts behind climate change (available in English and Sepedi).*



A more successful route for integration of climate change adaptation into local government was through the Disaster Management function. A 2016 amendment to the National Disaster Act mandated all local and district municipalities to incorporate climate change concerns and climate change adaptation into their disaster risk reduction plans. Through RESILIM-O, **two peer learning networks for disaster managers from Limpopo and Mpumalanga provinces** were established.<sup>61</sup> Learning exchanges across municipal and provincial boundaries supported an increased sense of agency among disaster managers to address climate adaptation within their practice, and to lead and manage learning networks and collective planning processes. In Maruleng Local Municipality, AWARD facilitated a process with the Disaster Management Advisory Forum to collaboratively assess flood vulnerability and develop **flood risk reduction recommendations**. Integration of climate change into land-use planning within municipalities was also highly successful, as described above.

Falling under the **Resilience Support Initiatives**, the Agri-SI (Agricultural Support Initiative) was designed to strengthen resilience and adaptation of small-scale farmers to climate change through a number of collaboratively-designed options. These included improved soil and water conservation techniques,<sup>62</sup> learning, collective action and livelihood diversification. These strategies were underpinned by two sub-grants to support small-scale farming in (a) the lower Olifants (Mametja area) and (b) two areas in the middle Olifants (Sekhukhune and Capricorn).



*Figure 41: Farmers celebrate and build their identities as small-scale farmers at a shared learning event*



*Figure 42: Farmers sharing knowledge, innovations, experiences and produce at an Open Day in March 2019. Many aspects of these days were organised by the farmers themselves*

The Agri-SI increased **networking, self-organization and cross learning for collective action amongst smallholder farmers**. Strong agroecology networks were established which helped to create more integrated farmer support systems. The shared learning and networking events were very successful in building increased capacity, peer learning, **motivation and farmers' identities**, as well as establishing more integrated support networks for farmers and partners engaged in similar work in the region.

The Agri-SI promoted **increased uptake of agro-ecology as a strategy for soil and water conservation and climate change adaptation** (see Box 7). Both the

number of farmers implementing agro-ecology and the range and diversity of agro-ecological practices adopted by farmers increased as a result of RESILIM-O, with tangible benefits for the farmers despite the difficulties they face with accessing water.

The farmer learning groups established in the middle and lower Olifants (involving 336 farmers in 24 villages; 74% women) were successful in developing agency among small-scale farmers, including confidence to experiment. This was achieved through development of leadership at village level and the creation of simple interaction platforms to facilitate knowledge sharing and adoption. Groups began to grow organically as farmers invited others to join.

<sup>61</sup> Kong et al., 2020

<sup>62</sup> In the case of small-scale farming, agro-ecological approaches are widely considered to support farmers to be responsive to and adapt to change. These approaches not only focus on the technical aspects of soil and water conservation but also on social processes of learning and collective action.





Through the evolution of these functional local institutions, **new interaction platforms for community members to discuss agricultural production** emerged – something which did not exist before.<sup>63</sup>

Around 50 youth received training in agro-ecology, although many did not sustain their involvement and left to pursue other opportunities. AWARD therefore focused on identifying and supporting a few motivated and innovative young people with the aim of setting up a network of ‘youth influencers’ who could become examples for others to follow and contribute to changing the predominantly negative perceptions held by young people of farming as a career option.

A significant step in improved social agency was the **initiation of water committees** within three of the learning groups in the lower Olifants<sup>64</sup> to explore and implement water provision systems for agricultural activities. One group collected enough money to pay for a borehole. The program also raised awareness among farmers around their **right to seed saving and sharing** in light of new legislation.



*Figure 43: Water committee mapping out water supply options and scouting for water sources in the mountains*

The Agri-SI also **increased livelihood diversification opportunities** for participating smallholder farmers through organic herb, fruit and vegetable production, market access support and value addition (see Box 8).

Another important outcome was the **understanding of climate change and agroecology as a relevant climate change adaptation** in a local context where very little understanding was present before. The impact of the climate dialogues held with farmers (see Box 9) is evident in the way that most of the smallholder farmers can now talk about climate change and the way the agro-ecological practices they are implementing help them adapt to the challenges of increased temperatures and uncertain rainfall patterns.

The Agri-SI is considered widely adaptable to other rural situations and is a suitable model for scaling up interventions in community-based climate change adaptation to the national level.

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<sup>63</sup> External evaluation report on the Agricultural Support Initiative in the Middle Olifants

<sup>64</sup> Including 98 participants

## Box 7

### Making climate change accessible through climate dialogues

Our Dialogues for Climate Change Literacy and Adaptation (DICLAD) showcases a new approach for making climate change “everyone’s business” by facilitating conversations with stakeholders about potential climate impacts and adaptation options. It makes an important contribution to the emerging science of effective climate change communication by providing an example of a process that is embedded in rural development and which focuses on adaptation rather than mitigation (most of the information and research on communicating climate change more effectively is based on climate activism and mitigation efforts in Europe or North America).

The innovation here was designing systemic dialogues around people’s areas of focus, values and interests, allowing them to construct new meaning from what is relevant to them. It helps people to understand and engage with complexity and a systemic view of the impacts of climate change on their own practices - to “see their way to taking action”. As such, it is potentially transformative and contributes to resilience-building.



**Evaluation of the climate dialogue process confirmed that it:**

- i) Supports participants’ engagement with and understanding of complexity;
- ii) Is a step towards transformation at the level of creating a sense of agency for stakeholders; and
- iii) Supports the emergence of a systemic view of impacts despite using a context-based entry point.

Dialogues were held with **432 individuals from 88 different institutions**, contributing to a more visible discourse on climate change in the catchment.



*Environmental Monitors from K2C discussing the far reaching and interconnected impacts of increased temperatures on our natural resources, health and economy under climate change.*

As part of our contribution to sharing lessons from the DICLAD process, AWARD actively contributed towards policy development on climate change. This included being part of the public consultation process of eight documents at the national level (including the National Climate Change Adaptation Strategy and the Draft Climate Change Bill) and four documents at the provincial level (including an Ecosystem-based Adaptation Action Plan for Mpumalanga and the Mpumalanga Environmental Outlook). Lessons were also shared as part of the National Planning Commission’s “Pathways to a Just Transition” dialogues.

## Box 8

### Small-scale farmers increase their resilience to climate change



Under the Agricultural Support Initiative, 336 farmers from the middle and lower Olifants region increased their resilience to climate change by increasing the diversity of crops grown, adopting climate-smart agro-ecological practices, reducing their reliance on external inputs such as seed and fertiliser, and building their capacity to learn, experiment and monitor progress. These practices were increasingly understood as relevant and appropriate climate change adaptations through the climate dialogues process.

Building on existing local good practices, farmers experimented with and added several new practices, including use of trench beds, mulching, stone bunds, run-on ditches, check dams, liquid manure, composting, mixed cropping, crop diversification and seed saving and sharing. Innovations including shade cloth tunnels, bucket drip irrigation kits, underground rainwater tanks and small dams were also piloted and found to be highly successful – although uptake was limited to participants who received some financial assistance and those who could afford to try out these practices themselves.

#### Indicators of improved resilience:

- 86% of participants implemented more than three climate-smart agricultural practices
- 44% showed increased knowledge (using farmer experimentation as a proxy)
- 41% engaged in collaborative activities with other farmers
- Food production through gardening increased by 120%, field cropping by 15% and livestock production by 9%
- Water use efficiency (access, availability, water holding, water saving) increased by 45%



## Box 9

### Farming for the future: Livelihood diversification



The Agri-SI supported farmers to diversify their livelihoods through:

- **Increased diversity of crops** for food production and local sales: Participants included a wider range of vegetable types for both summer and winter cropping, expanded their field cropping options and started to grow a range of culinary herbs.
- **Organic marketing of herbs and vegetables:** Farmers were assisted with access to organic produce markets by partners Hoedspruit Hub and through the Participatory Guarantee System (PGS) for product endorsement (herbs, vegetables and mangoes).
- **Processing: drying, milling, juice and bottling:** These activities, although considered a good idea, were limited in implementation to the more innovative participants. They included production of juices, sauces, pesto and dried herbs.
- **Diversification into small livestock:** Two groups of farmers undertook poultry initiatives – one for layers and one for broilers – assisted through increased incomes from their vegetable production as well as increased confidence in farming activities derived from their participation in the Agri-SI.
- **Other entrepreneurial activities:** These included establishment of nurseries and sales of trees, vegetables and flowers.

Indicators of improved resilience:

- 77% of participants have indicated an increased availability of food
- 56% indicated an increase in income
- 30% indicated an increase in livelihood diversification

#### *Livelihood diversification and value addition*



From left to right: Dried coriander; Facebook page for organic veggie marketing scheme; selling at the Hoedspruit Farmers' Market; grain and legume milling; mango juice; chicken layers in Turkey village



### 7.4.1 Building Institutional capacity for resilience

Work under this area aimed to institutionalize systemic, collaborative planning and action for resilience of ecosystems and associated livelihoods through enhancing the capacity of stakeholders to sustainably manage natural resources of the Olifants River Basin under different scenarios.

In order to give meaning to our systemic, social learning approaches within capacity development, AWARD designed a number of **Resilience Support Initiatives** including support for municipalities, civil society and farmers. Through these initiatives we provided support to key institutions through training, capacity building, and building and strengthening networks to provide technical and moral support to those wishing to bring about change, walking alongside them in an ongoing learning process.

The **Municipal Support Initiative (MSI)** focused on improving preparedness and responsiveness of two local municipalities, Maruleng and Ba-Phalaborwa, to deal with natural resource degradation and climate change vulnerability. As a professional learning process, it supported practitioners through workplace support, tool development and application. An important innovation was the use of our “wagon wheel” framework which connected the technical and political spheres of local government through continuous feedback and engagement and encouraged a systems view of practices rather than a linear, hierarchical view. The MSI model proved robust for institutionalization of social learning and improved practices even in the very fluid and contested municipal space. The main areas of support were:

- Participation in the Maruleng Local Municipality’s Integrated Development Plan (IDP) process
- Support for land-use planning which integrates biodiversity and climate change (see Section 7.3: Biodiversity)
- Supporting capacity development around water conservation and demand management and wastewater treatment works (which speak to both municipal capacity development and better water resources management as an adaptation to climate change)
- Support for Disaster Risk Reduction and Disaster Management (see Section: Climate change)

The program supported the two municipalities to achieve **better water conservation and demand management**. Studies revealed exceptionally high water use in both Hoedspruit and Phalaborwa whilst rural settlements continue to struggle for access to water. Capacity development involved both local municipalities, Lepelle Northern Water and the Department of Public Works and covered a range of practices: water scheme assessments, flow monitoring, leakage and wastage tracking, awareness-raising, a schools programme, training of staff, water tariff setting, billing, high consumption management and metering. **A water conservation and water demand management business plan was developed for the Maruleng municipality.**

Wastewater treatment plants in the Mopani District are major contributors to poor water quality in the lower Olifants. Through RESILIM-O, **turnaround plans were developed for three municipal wastewater treatment plants**, which all scored under 25% in Green Drop compliance. Such action will see an improvement in the discharge effluent of wastewater treatment plants which impacts on water quality and aquatic diversity into the Kruger National Park.

Since many of the effects of climate change and natural resource depletion are experienced directly by civil society, the **Civil Society Organization Support Initiative (CSO-SI)** supported the sector by mobilizing civil society, supporting diversity and providing opportunities for exploring self-organization and collective action. The CSO-SI engaged a broad spectrum of stakeholders from across the catchment including NGOs, community-based organizations, church and religious groups and citizen organizations. These are key actors in holding public structures to account.



Capacity development was focused on developing **preparedness and responsivity to climate change and environmental vulnerability**, through helping CSOs to remain relevant within their contexts, engage in collective action, think and work systemically, and develop action competence, commitment and motivation.<sup>65</sup> CSOs engaged in a coordinated learning process and gained access to networks, information and support materials through six sets of networking events or “indabas”<sup>66</sup> in the upper, middle and lower parts of the catchment as well as a “clinics” program focusing on building capacity to engage with water, climate change and legal issues relating to the environment. A collective vision and position statement was developed for the whole catchment, with inputs from 150 organizations. **The CSO-SI increased the competence and confidence of 45 CSOs to participate in public participation processes and to act on environmental problems in their communities.**

The Changing Practice course provided intensive capacity development, mentoring and peer support for 17 activists from seven civil society organizations spread across the upper, middle and lower catchment (see Box 10).

In addition to the Resilience Support Initiatives, Phase 2 focused on several other capacity development initiatives in response to the scarcity of professional skills in the climate change, water and biodiversity sectors in the catchment.

Through our **interns and mentors project**, AWARD provided an important workplace-based learning space to build the capacity of **21 young professionals** through providing experience in resilience and systems thinking, multidisciplinary approaches, and “learning by doing” in the areas of water, biodiversity and NRM, climate change, institutional strengthening and stakeholder engagement (see Box 11). A complementary mentors’ capacity development program and learning network was developed and implemented between 2016 and 2018. Eleven young people from four partner organizations also benefited from training associated with the internship program, as did the 24 members of the Legalameetse Youth Forum who received training from the AWARD interns. Eight interns funded through the Green Skills Program also gained valuable experience at AWARD during Phase 1 of RESILIM-O.

The **Moletele Youth Project**, an eco-literacy and capacity development program, provided training and mentorship for eight young people from the Moletele CPA. As relatively new owners of some 77,000 ha of high biodiversity land, the Moletele CPA is an important custodian of natural resources and biodiversity in the lower Olifants (see Box 12).

The **Limpopo Basin Curriculum Innovation Network** established through RESILIM-O is a platform for institutions of higher learning across the South African and Mozambican parts of the basin to share ideas and research on climate change resilience in the Olifants and Limpopo Basins and develop innovative curricula for the higher education system. This network is a vehicle for continued collaboration and development of future generations of researchers and managers in the catchment. A critical mass of 27 learning program developers<sup>67</sup> now exists in the LBCIN, with the **attitudes and capacities to design, teach and apply science-based strategies that enhance the resilience of people and ecosystems** through systemic and social learning approaches. This work resulted in strengthened institutional capacity within the six institutions for both horizontal (across departments and faculties) and vertical (across organizational hierarchies) collaboration, as well as a good foundation for future collaboration between the six institutions through Memoranda of Understanding (MoUs) covering a five-year period.

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<sup>65</sup> The learning process was guided by the learning outcomes framework for resilience building; see the resource “No Civic Action without Support”.

<sup>66</sup> The term “indaba” means “business” or “matter” in the Zulu and Xhosa languages of South Africa.

<sup>67</sup> Academics including heads of departments and lecturers who participated in the curriculum review and revision process





*Figure 44: Mobilising disenfranchised youth in the catchment (with almost 35% youth unemployment)<sup>68</sup> is one of the major challenges for resilience building and system transformation*

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<sup>68</sup> Stats SA PO211 report 2019

## Box 10

### Changing Practice: Support for civil society organisations

In a context of profound inequality and rampant, unregulated environmental destruction, we recognized the important work that community-based activists do to monitor and challenge the environmental injustices occurring in their communities, and also, their difficulties in being ‘seen’ and ‘heard’.



The Changing Practice: Olifants project took 17 community based activists from 7 civil society organisations in the Olifants catchment through an in-depth transformative learning process in the form of a short course developed and accredited by Rhodes University in partnership with the Environmental Monitoring Group. Participants developed their skills of inquiry, research, analysis, communication and critical reflection, as well as emotional skills such as confidence, discernment, compassion, empathy and solidarity. Through understanding the impacts of local practices on the health and resilience of the Olifants Catchment, they were able to critically reflect on their own practice as civil society organisations. They also strengthened their own networks for knowledge and support.

#### Achievements included:

- Graduation of 17 (11 female) participants with NQF Level 4 certificates accredited by Rhodes University, and certificates of attendance for a further two participants.
- Active and creative engagement with the seven “change projects” developed through the course, on issues ranging from pollution of water sources to corporate compliance with environmental legislation, to empowering communities through food gardens. These projects all led to better relationships with communities and other stakeholders. One project catalysed a growing women’s movement in the middle catchment.
- Publication of seven case study booklets and seven knowledge network booklets by participants, many of whom were first-time authors. These resources will help them to take their cases forward.



## Box 11

### Developing young professionals

Of the 21 AWARD interns that worked on the RESILIM-O program:

- Six went on to be employed by AWARD;
- Three went on to do PhD degrees;
- Four undertook Masters degrees; and
- Eighteen (86%) are still working in the environmental sector.

Our former interns are currently employed in a range of positions, including an Environmental Management Coordinator for SANBI, a Project Coordinator for a GreenMatter project on climate change education, an Environmental Health specialist, a Project Manager for the WWF Water Risk Filter, a Monitoring, Evaluation and Learning Officer at DAI (Development Alternatives International), a Freshwater Specialist at an environmental consulting company, a Stewardship Coordinator for Conservation SA, a Social Inclusion and Stakeholder Engagement Officer at CRIDF and a Senior Freshwater Health Index Coordinator for Conservation International.

The internship program therefore achieved its objective to develop human resources and address the scarcity of skilled personnel in the climate change, water and biodiversity sectors. Unfortunately, only four of the young professionals (19%) are still working in the Olifants catchment, although several are working for organisations with national reach.



*Workplace-based learning included fieldwork, planning and facilitation of events, individual work and mentorship*

*“I was challenged and moved out of my comfort zone and these challenges have really sharpened my way of thinking and shaped me as a person... For me personally, climate change used to be a very passive and scientific concept that I thought could only be tackled by natural scientists but through social learning processes used by AWARD, my horizons have been broadened. I am able to draw strong links between climate change and development.”*

*“I learnt a great deal around stakeholder engagement and resilience work to the point that these two are part of my lenses in action research work.”*

*“I have learnt to apply critical thinking with regards to analysing, conceptualising, reflecting, observing and responding to the tension, dynamics and conflicts among stakeholders and liaising with stakeholders in a professional manner.”*

*“I learnt about self-learning practices, through reflections and keeping track of my learning journey.”*



## Box 12

### Moletele Youth: Supporting custodianship as a basis for sustainable natural resource management

The Moletele Youth Project supported young people from the Moletele CPA to begin to consider the opportunities that biodiversity has to offer as a basis for the beneficiation of the claimant communities. These young people had little or no knowledge of the affairs of their community and most had not formulated ideas around what it meant to be a beneficiary or landowner. There were no platforms or avenues for them to participate as future custodians. Through the program, they explored biodiversity as a concept, visited and learnt about enterprises on their land, gained spatial literacy and understood the need to develop a much deeper understanding of the institutional arrangements and to mobilize other young people (who make up the majority of the population) to participate in various processes and contribute development ideas. A field book for learning was developed and facilitated through practical and exploratory sessions.





## 7.5 Results: Overview

The following section reports results against key indicators. This indicates that the biological condition of over 31,000 ha of biologically significant areas was improved; whilst over 584,000 ha of land experienced better natural resource management as a result of RESILIM-O. Almost 2,000 people (57% women) increased their capacity to adapt to the impacts of climate change.

Our MERL approach enables an in-depth understanding of why targets were exceeded or not met. This is often extremely valuable for programmatic design along the course of the program and to inform future initiatives. Details of such discussions are given in our annual reports.

### 7.5.1 Program Area: Biodiversity and NRM

RESILIM-O activities contributed to **improved biophysical conditions in 31,812 ha of biologically significant areas**. This was made up of 18,197 ha of high-biodiversity land cleared of invasive alien vegetation in the Blyde sub-catchment, 13,600 ha of river and riparian zone along the Blyde, Steelpoort and Olifants Rivers which benefitted from flow releases from the Blyde and De Hoop dams over 4 years (see Section: Water), and 15 ha of restored mangrove vegetation in the Limpopo River estuary. The target for this indicator was 92% achieved, with a discrepancy of -8%.

A total of **584,665 ha of biologically significant areas experienced improved management** through the program. This target was 107% achieved, with a discrepancy of +7%. The total was made up of 395,332 ha of biologically significant areas within Maruleng and Ba-Phalaborwa municipalities with improved protection due to the institutionalization of the Biodiversity sector plans, Critical Biodiversity Area (CBA) maps, landuse guidelines and other resources developed through RESILIM-O. In the Blyde sub-catchment, 91,800 ha of highly significant biodiversity area was better managed through improved coordination of alien vegetation clearing operations, addition of extra clearing teams, clearing of previously inaccessible areas and improved governance arrangements (see Section: Biodiversity). An area of 16,120 ha of forestry plantations were more sustainably managed. Management of the 20,373 ha Legalameetse Nature Reserve was improved through support to resolve governance challenges, collaboration between CPAs, development of a Beneficiation Framework and Development Guideline as well as updating of the Reserve Management Plan.

River and riparian areas under better management included the 13,600 ha of river in the Lower Olifants reported above, 3,850 ha of riparian zone within private nature reserves, and 5,000 ha in the Middle Olifants (see Section 7.2: Water). In addition, 38,590 ha of land surrounding the Limpopo estuary in Mozambique was formally delimited for community natural resource management through NRM committees – an arrangement that promotes custodianship and enables better NRM.

A total of **5,410 people received training in sustainable natural resource management (NRM) and/or biodiversity conservation**, 54% of whom were women. This target was 97% achieved.

Program activities **increased the capacity of 286 institutions (organizations) to address NRM and biodiversity conservation issues**. These included government and parastatal entities at various levels, civil society organizations, universities and other research organizations and private companies. Institutions were only counted under this indicator if significant capacity-building occurred through training, mentoring or development of enabling tools and processes. This target was 113% achieved (discrepancy of +13%).

A total of **182 laws, policies or regulations relating to biodiversity conservation or environmental themes** were recorded as proposed, adopted or implemented through RESILIM-O. This was 40% above the target.

## Biodiversity and NRM

### Life of Project: Results Against Targets



Figure 45: Summary of results related to Biodiversity and NRM indicators

## 7.5.2 Program Area: Climate Change Adaptation

A total of 1,981 people (57% women) increased their capacity to adapt to the impacts of climate change through the RESILIM-O program. This included national and provincial Department of Water and Sanitation officials, municipal disaster managers, spatial planners, wastewater process controllers, protected area managers, small-scale farmers, environmental activists, teachers, environmental monitors and university academics. The target for this indicator was 105% achieved, with a discrepancy of +5%.

## Climate Change Adaptation

### Life of Project: Results Against Targets

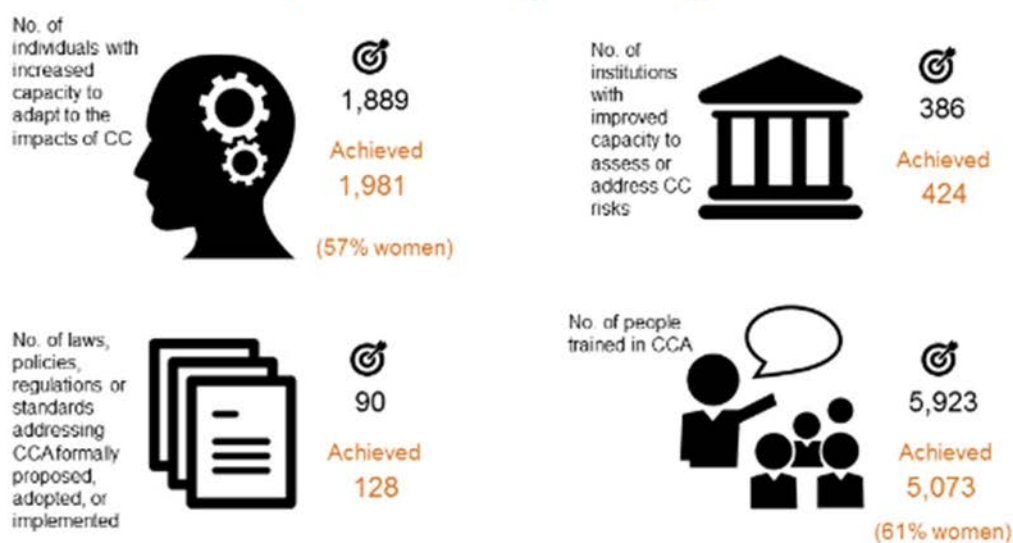


Figure 46: Summary of results related to Climate Change Adaptation indicators





A total of **5,073 people** received training in climate change adaptation, 61% of whom were women. The numbers here fell slightly short of the target with a discrepancy of -14%.

The capacity of **424 institutions** to assess or address climate change risks was improved. This target was 110% achieved (discrepancy of +10%).

The number of laws, policies, regulations or standards proposed, adopted or implemented exceeded the target by 42%, with **128 laws, policies, regulations or standards** addressing climate change adaptation.

### 7.5.3 Cross-cutting Indicators

The Our Olifants media campaign reached **31.5 million people** through websites, social media, newspaper and magazine articles, radio and television as well as through our communications materials and awareness campaigns (see Appendix). Reach was calculated from website and social media reach statistics as well as readership, listenership or viewership figures published by the various print media, radio and television stations which featured stories on RESILIM-O.



*Figure 47: Summary of results related to cross-cutting indicators*



*Figure 48: Joint AWARD-Tsitsa Project symposium at the Society for Ecological Restoration conference in September 2019*



## 8 Discussion: The Resilience-Building Process

Our work under RESILIM-O has significantly increased resilience in a number of ways as outlined above. This has included both an improved understanding of key issues and establishment of new or improved practices which better incorporate the principles of resilience. In this discussion we summarize key aspects that have emerged from a resilience-building process and we synthesize what one might hope to achieve in embarking on such an endeavour.

### 8.1 The Olifants as a *Socio-Ecological System (SES)*

A systemic approach is easy to talk about but very difficult to put into practice, for a number of reasons. We reviewed and distilled multiple frameworks to guide the RESILIM-O programme (see introduction covering social learning, activity systems, complexity theory and resilience). One of these involved viewing the basin as a socio-ecological system or SES. Taking a systemic approach means recognizing that “the system” is a social construct for sense-making. This requires bounding the system (i.e. the SES), carefully and explicitly to help focus on the area and content of the work. Asking the key question “resilience of what, to what?” is a helpful anchor throughout the process. Bounding the system also helps define endogenous and exogenous factors and to articulate connections and inter-relationships between systemic ‘variables’. Whilst being mindful of oversimplification, for example to issues of power, governance and agency, RESILIM-O supported project partners and staff as well as other stakeholders to see – at a very high level – how their ‘area of interest’ fits into the whole and to identify major strengths and gaps in understanding. For example, a relatively outdated understanding of water availability undermined a systemic understanding of water-related ecosystem services and revealed a major gap in understanding of how these contributed to peoples’ livelihoods, particularly of the poor and marginalized. It also revealed, for example, the need to look at often forgotten drivers in the system such as land reform.

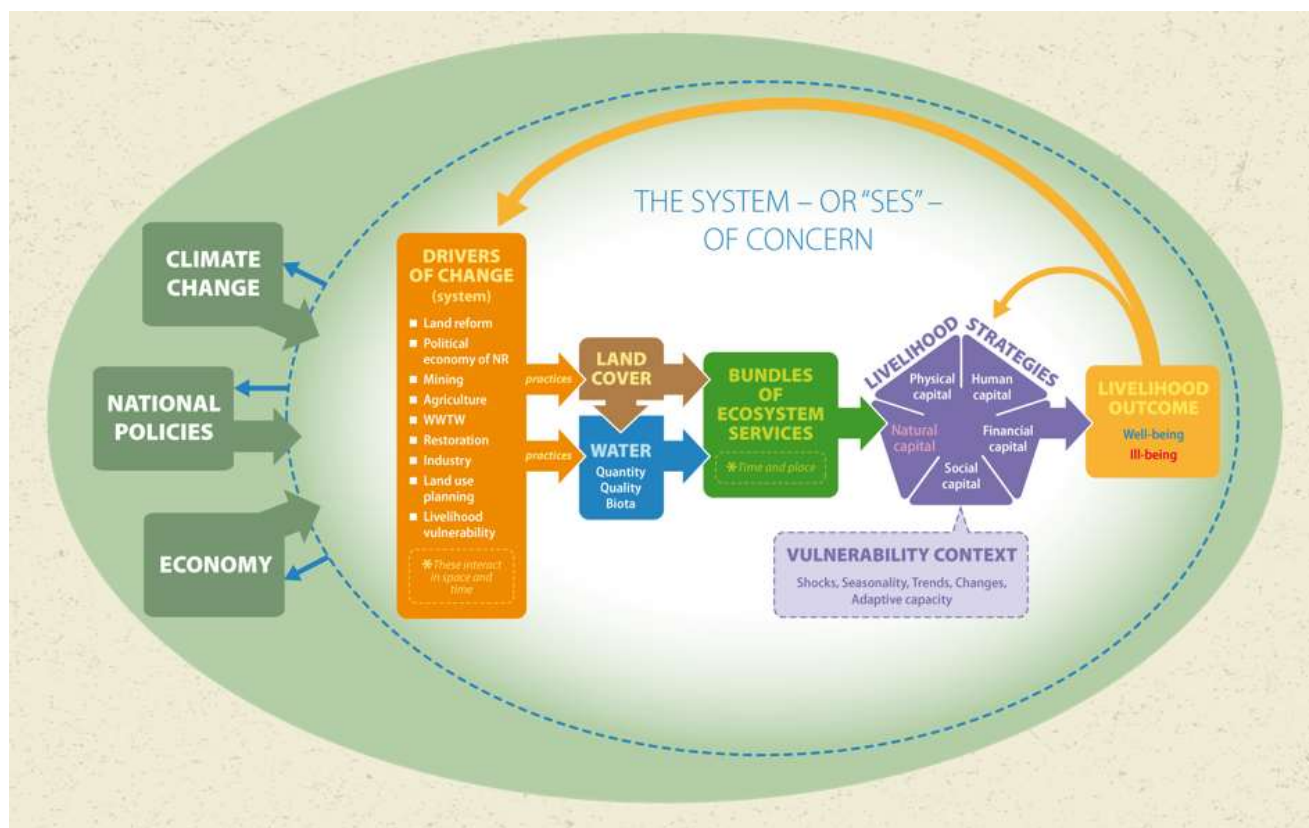


Figure 49: One of the SES frameworks developed for the Orange River Catchment used to guide the systemic, collaborative inquiry (Pollard et al., in prep)

## 8.2 Resilience and Water Security

The program facilitated an improved understanding of key issues and practices relating to water security (e.g. water quantity, quality and load, water balance, water demand, unlawful use). Additionally, a number of practices for water governance and IWRM have been improved including EWR or Reserve implementation, monitoring, regulation, integrated dam operation, rehabilitation (invasive plants and mangrove restoration), advocacy, and stakeholder inclusion.

An understanding of water resources and challenges has been developed across stakeholder groups, and polycentric governance arrangements have been enhanced through strengthened non-state networks. A number of stakeholder networks have been established or supported which has contributed to national policies of decentralization and stakeholder engagement and empowerment. Unfortunately the institutional uncertainty in late 2017 regarding CMAs, water management and oversight in the Olifants has continued to close-of-project although there are signs that this is being addressed with moves to revitalize six CMAs in South Africa. With a CMA in place governance arrangements both in South Africa and with Mozambique can hopefully be strengthened. All the tools developed to enable compliance monitoring and flow management have been successfully used to track flows and mitigate against flow cessation in the lower Olifants during the five-year drought. Models have been developed for the very high water demands in the lower Olifants and turnaround plans for wastewater treatment works have been developed. We have successfully developed an understanding of the potential impacts of climate change on water resources and shared this with stakeholders, including governments in both South Africa and Mozambique.





## 8.3 Resilience and Biodiversity

The loss of biodiversity through disturbance or development has impacts on ecosystem functioning and reduces the delivery of ecosystem services and as a result, health, livelihoods and economic growth (see Figure 35). It is within this framing that RESILIM-O embarked on a range of resilience building actions that look at managing biodiversity to sustain and improve the availability of ecosystem services. At the local level, one of the most effective ways of mitigating against climate change is to manage land-use in biodiversity rich areas (Critical Biodiversity Areas and Ecological Support Areas). This was achieved through the application of the CBA Map, Biodiversity Handbooks, land-use guidelines and associated resources within the context of local municipalities as a basis for maintaining nature's valuable ecosystem services for sustainable economic and social development.<sup>69</sup> Through the Municipal Support Initiative, we focussed on securing the CBA network, maintaining intact riparian (river bank) vegetation to avoid flooding and to protect water resources, protecting water resources and encouraging water conservation, recycling and re-use of water, restricting development in high biodiversity areas by influencing land use decision processes and ensuring that biodiversity data is included in the Spatial Development Frameworks of local government. All these activities were supported by training and professional support for spatial planners and consultants. Although we worked intensively in two local municipalities we believe that this work can be translated across to the province and into national frameworks, hence our involvement in SANBI's National Biodiversity Planning Network and others.

Land-use management for biodiversity was also a priority in the Legalameetse Nature Reserve where new co-management arrangements, if properly supported, based on our recommendations, will play a significant role in securing high priority biodiversity and enhancing livelihoods. The area is also a Strategic Water Source Area. Land-use management support was also provided in the mangroves of the Limpopo estuary and through the removal of alien plants in the high-biodiversity Blyde sub-catchment. Improved water resources management also enhanced biodiversity along the lower Olifants as shown through our river health scores.

Biodiversity protection also requires skills and capacity which we supported both in the immediately but also in the longer term through active engagement of young professionals and in support to students in post-graduate institutions in the basin.

## 8.4 Resilience and the Co-Management of High Priority Protected Areas

Our work has significantly increased resilience in a number of ways. A systemic, social learning approach improved collective understanding of the role of context, key challenges and the need for a collaborative co-management vision, strategies and practices. Co-management was better understood so that in addition to the normative Park Management Plan, a Beneficiation Plan and Development plan were collaboratively developed. New joint institutional arrangements were agreed on and some of the roles and responsibilities outlined. With landowners, institutional arrangements were strengthened generally and through inclusion of the youth, and a business entity established to enable inclusion in Reserve commercialization. Enhanced eco-literacy was developed regarding the value of LNR and moves initiated to include additional land in LNR and to protect an adjacent wetland. The Legalameetse Management Committee representing land claimants/ owners grew in terms of understanding processes and procedures. Enhanced capacity in state

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<sup>69</sup> For example, in Ba-Phalaborwa local municipality it was found that biodiversity contributes significantly to economic development through the provision of ecosystem services, such as water, food, fuel, fibre and medicines. It is the basis for nature-based tourism, such as in the Kruger National Park and Selati Game Reserve. The fruit of the Marula tree (*Sclerocarya birrea*) is an important economic driver. Biodiversity is also particularly important in terms of providing grazing land for livestock and insect pollination for agricultural crops, such as citrus cultivation along the Blyde and Olifants Rivers.



employees tasked with supporting co-management from LEDET was also evident as the process shifted from a focus on the *co-management agreement* (the tool) to understanding the practice of co-managing as a collaborative learning journey.

As requested by the state, the work now offers a framework and guide for the co-management of protected areas in South Africa, particularly under a part lease/ part co-management model.

### Resilience support initiatives: Improving preparedness and responsivity

AWARD conceptualized its systemic, social learning approach through so-called Resilience Support Initiatives (RSI) that aim to institutionalize resilience building in the region. They were based on a model of ‘workplace learning’ that draws on existing or new practices that saw the growth and institutionalization of resilience practices within a particular institutional setting.

Since resilience building draws attention to the need for being prepared for uncertainty (and the unexpected), there is a need to develop this competence. Also, preparedness is augmented by quick response times in the event of a crisis. This means that there is usually a need to develop these skills which might include having resilience strategies, scenario-based planning, risk assessment and mitigation plans, modelling, tools for rapid response, information and communication management, early warning systems, drills for preparedness, simulations in support of readiness

In most cases the “institutionalization” process required the engagement of leadership and/or management structures for the ‘new’ practices to be sanctioned and adopted. For example, in the case of local government, the project team needed to focus on both governance structures and technical directorates in local government. Working with decision making structures within the municipality meant focus on EXCO (executive committees), councillors, mayors, chief whips, chief financial officers and office bearers under the mayor. Activities for the technical directorates focussed on directors, managers, practitioners and workers within the municipality. The nature of activities for each was very different.

As part of institutionalizing resilience building and commitment from local government, AWARD signed memorandums of understanding (MoUs) with municipalities, both agreeing to have feedback sessions that inform important decision-making processes. During these sessions, there was an opportunity for AWARD to table its findings, present evidence and assist the institution with the reprioritization of actions if required.

Three main RSIs were developed under RESILIM-O, namely the Municipal Support Initiative – MSI (dealing with sustainable services delivery), the Agricultural Support Initiative – AgriSI (dealing with food production) and the Civil Society Support Initiative – CSO SI (dealing with building resilience within civil society). All the RSIs were characterized by *skills development and ‘workplace’ support for resilience specific to these different areas.*



## 8.5 Resilience and Local Government

Local government is an important institution as it is a nexus for the integration of a number of practices that are likely to be foundational to catchment resilience. For example, local government holds three important mandates: namely that of land-use planning, water and sanitation programmes and disaster management. Resilience theory<sup>70</sup> tells us that landuse conversions and irreversible actions that reduce diversity and variability in the landscape lead to vulnerability – not resilience – and unwise landuse practices that reduce ecosystems services are likely to require costly technological interventions to address catchment degradation. For example, the water holding capacity of a catchment area is reduced by the removal of vegetation, which reduces water supplies downstream. This also leads to erosion and heavy silt loads which then necessitate increased municipal spending (e.g. dredging etc.). Water becomes more expensive to supply, reducing finances for other service delivery.

The RESILIM-O Municipal Support Initiative (MSI) was designed as an institutional resilience building process that took local government as a functional system. This meant that the MSI supported both practitioners and municipal councils – through workplace support, tools development and application, training and policy formulation and implementation of communication and feedback systems. The outcome of the MSI is a framework for establishing more resilient local governance that can be applied elsewhere.

## 8.6 Resilience, Livelihoods and Food Security

A key vulnerability which was identified by RESILIM O was the potential for increased food insecurity under climate change, especially for the people in the communal tenure areas of the catchment. Small-scale farming is an important component of livelihood security and in particular, offers important safety-nets (resilience) in times of crises as seen during the COVID-19 pandemic of 2020.

The Agriculture Support Initiative (AgriSi) made considerable contributions to resilience building in that it worked with over 350 farmers in middle and lower sections of the Olifants River catchment to promote agroecological practices. Participant farmers used farmer experimentation methodologies to implement their own improved farm design and learn about adaptation strategies in an ongoing way. We engaged farmers in collective and collaborative efforts through networks to share information, resources and learning, ease the workload of some of the activities, save funds jointly for larger infrastructural input requirements and promote the involvement of their broader communities in these actions. These practices contribute to resilience (diversity of options, social support networks, learning and experimentation, increased income,.. etc.)

## 8.7 Resilience and Civil Society

We recognize that CSOs are an important stakeholder in ensuring there is reasonable and effective implementation of public policies under a democracy – without which vulnerabilities emerge. This includes the participation in, and implementation and monitoring of regional and local policies. CSOs also play a key role in holding public structures to account when it comes to prioritising matters of public interest. This means they play an important ‘watchdog’ role in making sure that environmental challenges and issues are addressed. In doing so they ensure that adequate plans are in place to protect precious resources and ecosystem goods and services, as well as making sure that climate change preparedness plans and actions are in place and functioning effectively. Ultimately resilience building is unlikely to succeed without the involvement of civil society.

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<sup>70</sup> See Resilience Alliance principles for resilience





## 8.8 Learning and Resilience

One of the key challenges identified at the outset of RESILIM-O was the need to ‘develop capacity’ through learning. The program needed to consider the role of learning as a key process for moving the catchment towards more resilient, stable and sustainable states. Complexity theory teaches us that a resilient catchment cannot be built with a single focus or single set of actions alone. Rather it is the combined and synergistic set of plans and actions that will collectively bring about change and ultimately deliver resilience. Furthermore, the process of building resilience is a social one where perceptions, opinions, values, interests and priorities intercept in negotiation of a way forward. Resilience needs to be well understood and be high on this negotiation agenda. Since in most management spheres resilience is a new concept there is going to be a need for considerable learning.

RESILIM-O focused on social learning as the basis for driving catchment transformation. Here understanding factors that enable or constrain actions towards building a more resilient catchment was a point of departure. For a people-centred approach that is guided by sustainability, we also need to find new ways of understanding, collaboratively, the benefits associated with resilience building in a variety of institutional settings. Such thinking needs to extend across boundaries – be they upstream-downstream, sectoral or international. This is because we need to find ways of sharing our scarce resources, collectively. Since catchments are complex physical and socio-economic environments, they are not always predictable, thus making it impossible to implement “blue-prints” or present people with formulaic lessons for success. This means building the resilience of the system to adapt to change in a complex and not-always-predictable environment, so that it is responsive, must incorporate new ideas and be prepared to learn “what is not yet there”. We must not only learn to understand the system but also be prepared to learn new ways for managing the system.

To this end we believe RESILIM-O holds valuable lessons for framing programs for SES management. The application of social learning processes where collective understanding and collaborative development of systemic approaches (through causal loop diagrams for example) can present us with a way forward. Likewise, understanding particular practices as parts of activity systems offers not only a way of understanding practice but also a way of learning to improve practice.

Other opportunities for collective learning are presented through the establishment of networks, bringing stakeholders from different sectors/organizations/communities together. Once established, these networks can build on the relationships they develop to address new problems and issues that arise, leading to sustained learning, which is important for resilience (seen in Biodiversity and Blyde working groups, CSO SI, and LOROC partners, amongst others).

Formal education too can be harnessed to ensure that there is a cadre of new graduates entering natural resource career paths. Here RESILIM-O can offer lessons from the Limpopo Basin Institutions of Higher Learning (IHL) Curriculum Innovation Network<sup>71</sup>. Workplace learning was also supported through the interns program reported earlier.

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<sup>71</sup> AWARD BROCHURE ELRC Curriculum Innovation for Institutions of Higher Learning 2020 v1



## 8.9 Financial Results and Analysis

The following section provides an overview of key financial matters related to expenditure and management of the award.

### 8.9.1 Duration

AWARD was, through a co-operative agreement, awarded initially a five-year grant by USAID southern Africa. The obligated funds amounted to USD 9,766,855 over five years. The program was subsequently extended to 7 years and 7 months (1 December 2012 to 30 June 2020) under a no-cost extension. Part of the reason was that the close-out period of the project fell within the COVID-19 pandemic outbreak making it impossible for the program to complete its close-out audit.

### 8.9.2 Audits and accountability

The RESILIM-O program has closed out with the final audit report to USAID in October of 2020. AWARD has managed the RESILIM funds according to the GAGAS USA Government audit requirements. AWARD has received unqualified audits for each year of the RESILIM-O award with no material findings reported in the Annual Financial Statements. Audited financial statements reports for AWARD are available as it is a public funded entity.

### 8.9.3 Sub-grant facility

Part of the conditions of the RESILIM-O award included a provision for sub-grants that were intended to provide capacity to regional and local organizations operating in the specific natural resources management and climate change areas. An amount of USD 1,748,424 was disbursed for the sub-grants component of RESILIM O. A total of 22 sub-grants were awarded to a variety of organizations (some received more than one grant) over the period, October 2016 to end June 2020. A list of the sub-grants is provided in Appendix 10.1

### 8.9.4 Program monitoring and evaluation

The innovative MERL (monitoring, evaluation, reporting and learning) framework was conducted by a combination of in-house reporting activities by staff, project evaluations by consultants and commissioned case studies. A total of USD 351,949 was allocated for MERL specific activities but it does not account for the activities conducted by staff on routine reporting tasks. The total expended on MERL specific activities translates to 4% of the total expenditure.







## PART 3

# 9 Challenges and Recommendations

In this section we summarize the major findings and challenges, and make recommendations from our work under the themes of water, biodiversity and climate change. We then synthesize recommendations for specific areas of resilience-building practices deemed important for future work. Importantly the findings and recommendations reflected here are high-level and should be read in conjunction with the detailed project technical reports, guidelines and summaries available at [www.award.org.za](http://www.award.org.za). Secondly, the recommendations are formative rather than conclusive so that they guide further research and action both in the Olifants and beyond.

## 9.1 Resilience as the Rationale for Long Term Management of Basins

‘Resilience’ was relatively new as a framing concept at the start of RESILIM-O and none of the institutions articulated resilience building as a management priority. Given an understanding that the catchment was degrading and that risks and vulnerabilities presented major threats to the system, the process of resilience-building offers an important link between degradation and sustainability. The key challenge therefore was – and still is in many respects – the mainstreaming of resilience in management discourse and readers are referred to the previous section for a detailed analysis of resilience-building for sustainability.

Governments need to lead the way through cohesive strategic plans that include frameworks, tools and management systems to enact resilience building. This means embedding such designs and processes in catchment-scale plans and policies. Various approaches described by the RESILIM O program for natural resource management, livelihood support and climate change adaptation - such as the monitoring of river flows, operation of dams in the Olifants, mainstreaming of climate change, the integration of biodiversity into spatial planning and support for sustainable food security practices - offer models for elsewhere.

## 9.2 Challenges to Water Security and Sustainability

A number of challenges that pose risks to water security and that undermine resilience have emerged from this work. The research and analysis in the middle Olifants have revealed concerns from some stakeholders on the implications of increased abstraction from the middle Olifants to other catchments for mining and increased demand from Polokwane through the ORWRDP. These plans do not take account of predicted



climate change impacts on water resources of the Olifants, and the measures proposed to mitigate impacts on water balance within the Olifants were deemed untenable.

These developments therefore put both the middle and lower Olifants, at considerable risk of increased water insecurity. Equally, increased – and often unauthorized - abstraction is a concern.

Our work has highlighted the urgent need for a revised reconciliation strategy that takes into account climate change and increased water use in the Olifants. This requires urgent attention to V&V (validation and verification) of water use, particularly in the lower Olifants. The lack of adequate regulation of unlawful use will also contribute to greater water insecurity. This should precede any plans to move water out of the system such as for the ORWRDP since this will simply put the Olifants at risk and require the state to act to mitigate such risks. Water quality continues to pose a major challenge in the Olifants and whilst significant strides have been made in this regard (both through RESILIM-O and state-led activities), much remains to be done. This will continue to be a challenges without integrated, harmonized and transparent approaches for land and water management.

The risks imposed by climate change on water resources, even in in the near future, are alarming and require urgent attention. A systems approach that allows managers and stakeholders to understand - and most importantly to act as custodians of the catchment as a whole is regarded as essential.

The need for a systemic approach to water resources management in the ORC is central to recommendations for enhanced water security. The aforementioned challenges can only be addressed through a basin-wide approach as intended by policies in both Mozambique and South Africa. The urgent need for decentralized water governance in South Africa, through a CMA, is highlighted. Clearer institutional arrangements that also integrate water resources management and water supply, and then strengthen transboundary arrangements, will greatly enhance the resilience-building endeavour. Equally, the need for systemic governance through decentralized, polycentric governance arrangements is needed and much of this has been established by RESILIM-O and must receive continued support. Addressing water insecurity and building improved resilience to drivers of change require actors beyond the state alone, to work together and to be supported by up-to-date information and tools, much of which has been provided by RESILIM-O. Tools for managing systemically have been developed, and used and now need to be adopted in the ORC. Many of these, such as INWARDS, were developed through RESILIM-O and are now being tested elsewhere. However, the institutionalization of practices and tools requires tenable governance arrangements.

### 9.3 Giving Biodiversity Higher Priority

Until recently the mandate for conservation and biodiversity planning remained the domain of conservation authorities and provincial environmental departments. Much of care for biodiversity was through protected area proclamation. However, with the gazetting of Biodiversity Bioregional and Sector Plans initiated by SANBI, there is a precedent-setting shift to include local government as a key player through their spatial planning directorates. This means that land-use planners will have a central role to play in the oversight and custodianship of biodiversity. This is set to be a “game-changer” in that spatial planners will be able to approve or decline land use applications that affect or impact on biodiversity within a specific municipal boundary. Given that well over half of all biodiversity is estimated to occur outside of national and provincial parks in Southern Africa,<sup>72</sup> there is indeed an important role for municipalities and landowners (farmers, business and developers). Yet biodiversity planning has never been a key competence of municipal “town planners” – the incorporation of biodiversity practices into spatial planning therefore presents a very real challenge if adequate workplace support as well as technical training is not forthcoming.

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<sup>72</sup> Estimates by SANBI

The development of enabling tools, provision of professional support and the continuous strategic engagement with decision makers have all contributed to an increased capacity to plan better in relation to biodiversity. However, without the formal adoption of the tools by municipal councils, the effectiveness of the tools is undermined. Biodiversity compatible outcomes need also to be ‘institutionalized’ in municipal by-laws to be effectively applied.<sup>73</sup> However, this is not likely to be successful if there is not adequate support for new practices and new priorities that recognize biodiversity at the municipal level. RESILIM-O has contributed to the development of an enabling environment for biodiversity planning as part of spatial planning practice and presents a viable framework for application in other municipalities in South Africa and the region.

Again, new land ownership or custodianship models for the protection of land and biodiversity have been tested under the restoration (e.g. Blyde, mangroves) and co-management projects (see below). A number of challenges persist and require urgent resolution particularly in the area of land rights and land ownership. Moreover, beneficiation and development within protected areas is an area that requires ongoing support if biodiversity protection is not to be undermined. None of these challenges are receiving adequate attention although RESILIM-O has provided significant tried-and-tested approaches to build on.



*Figure 50: It's all about place. Interns learn about locating critical biodiversity within a municipal boundary enabling them to support biodiversity-sensitive planning and development*

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<sup>73</sup> Through the adoption of biodiversity sector plans, spatial planners have the legal backing with which to regulate landuse with biodiversity taken into consideration. Equally, the adoption of a spatial development framework that outlines where all the critical biodiversity is located, allows for the careful implementation on projects to align with the spatial vision of the municipality and sustainable development.





## 9.4 Climate Change in Context

Understanding the threats and vulnerabilities in the catchment with regard to climate change was a cross-cutting concern. Approaches were designed and tested to address challenging concepts and data (sometimes seemingly contradictory) for the Olifants Catchment. This is an essential but time-consuming endeavour that requires skills and expertise from various ‘disciplines’, not only climate science. That climate change messages are perceived as disempowering was highlighted early in the program. To support this, the program looked at climate change impacts on water resources as a point of departure, as this offers an important entry point into water security, food security and disaster management. Moreover, many of the practices supported by RESILIM-O have now been recognized as important climate change adaptation practices (such as, for example, the control of invasive alien plants and co-management and decentralized natural resources management (IPCC 2018)<sup>74</sup> and this broadened conceptualization is important going forward. While climate change planning and adaptation has improved markedly in various sectors through RESILIM-O (see above), much remains to be done.

One of the main challenges is that there are still very few institutions in the Olifants Catchment that are thinking about climate change in practical terms. In the water sector, climate change projections and adaptation still need to be integrated into water resource availability assessments, and in practice such as through water conservation and demand management for example. Integrating climate change thus remains a priority for the Olifants Catchment.

## 9.5 Co-management of High-Priority, Protected Areas

Co-management through stewardship or custodianship arrangements is a theme that runs throughout natural resources management in South Africa and Mozambique. In particular, co-management in the context of land reform is extremely topical and sensitive in South Africa’s political landscape and so requires mentioning.

A number of challenges that undermine resilience have emerged from our support to co-management in the Legalametse Nature Reserve and offer important insights. The work was bedevilled by (still) unresolved land rights for four out of six claimants communities, unresolved conflict and power struggles between claimant communities and within and between the state, and the lack of clarity on what co-management actually entails. Distrust caused by the infrastructural developments in LNR without endorsement by landowners needs to be addressed as a matter of urgency. Much of this could be resolved through attention to changing power relationships, the need for a shared vision and tenable institutional arrangements, and detailing roles and responsibilities of co-management activities.

A number of important reflections emerge if one is to deploy co-management of protected areas within the context of land reform. First is the acknowledgement that this is a transformative process for all parties involved, including those supporting and facilitating it, and thus it must be designed as a facilitated learning process with the humility and interest that this requires. Facilitators are needed to build trust and ensure transparency. The second relates to framing the praxis of co-management as both influencing – and being influenced by – values and context which underscores the need for integrated systemic, social learning approaches (see Pollard et al 2014). Moreover, co-management is a new practice unknown to both parties, and so co-learning is key. Beneficiation lies at the heart of many areas of conflict and must be attended to.

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<sup>74</sup> IPCC, 2018: *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)], in press].



Within a land-reform context, co-management requires a shift from a contractual process to one that is socially and politically embedded and that has an important role to play in developing agency, dignity and respect while also contributing to people's livelihoods. Doing this means committing resources and capacities to the praxis of the co-learning journey. Without adequate and appropriate support for both parties, and an orientation towards co-learning for new, largely unchartered governance arrangements, the co-management endeavour is likely to fail (Pollard et al., submitted).

## 9.6 Governance and Policy

### 9.6.1 The need for strong, tenable and robust governance arrangements

Institutional flux and dynamics were hallmarks throughout the RESILIM-O programme. Changes in water governance, detailed above, led to institutional uncertainty, distrust and even apathy. For example, while excellent systemic tools were developed to support IWRM, WCDM and wastewater treatment, their effectiveness remained a challenge because of institutional uncertainty and weakening governance. Equally for example, weak governance arrangements between the state and land claimants in both the Blyde and Legalametse (both SWSAs) undermined sustainable practices to a large degree. While in most projects we strengthened polycentric governance arrangements, persistent challenges due to institutional uncertainty remained a concern.

Functional, robust and tenable governance systems are key to resilience and sustainability. In this regard it is notable that despite excellent intentions, the best tools in the world will not lead to transformation without good governance. This should be a priority consideration in any new initiative in the ORC.

### 9.6.2 Giving effect to policy intentions

A key outcome of our work has been to analyze the complexities of giving effect to policies like EWRs (environmental water requirements) and critical biodiversity conservation. Within the area of biodiversity and conservation, some key institutional 'disjuncts' were identified and AWARD worked strategically with partners to increase alignment between policy and practice.

Although beyond the scope of this section, it is worth noting that challenges remain for all key thematic areas in terms of putting policy into practice. For example, the intention to ensure a sustainable water resource base has been overshadowed by the need for development so that it is often not fully considered. Another key challenge is that of land claims which is a significant driver in the ORC but one that needs to be addressed with greater depth and support.

### 9.6.3 The importance of leadership and governance FOR transformation

Leadership of a particular kind is key for transformation as it requires leaders to drive transformation with a particular vision. In general, this was weak although pockets of transformative leadership were identified and supported. Nonetheless, much remains to be done in this regard. For example, a strong and functional River Basin Authority with local Catchment Management Agencies would provide leadership and strategic direction as far as water resources are concerned. We suggest that in the case of the Limpopo and Olifants, it may require urgent, fast-tracking the revitalization of the Olifants CMA as well as developing an integrated plan for the basin as a whole. Despite localized efforts, research and development initiatives must consider governance arrangements for guiding transformation away from a degrading catchment.



#### 9.6.4 The importance of a lawful and regulated system

We contend that resilience cannot be achieved without a compliant or lawful catchment-based system. It is therefore imperative that adequate skills and resources are available for compliance monitoring and enforcement (see point below) and all major stakeholders are drawn into the responsibilities for monitoring, reporting and rectification of transgressions. In this regard, self-regulation is an essential building block of feedbacks and ultimately resilience.

All of the Olifants Catchment is bedevilled by non-compliance creating a situation of vulnerability – this despite strong legal instruments and policies. That the “regulator cannot regulate” was raised in earlier work by AWARD (Pollard and Du Toit 2011) – even by regulators themselves who noted the lack of legal back-up, fear of antagonism and insufficient experience.

Legal provisions without monitoring systems for tracking compliance renders them meaningless. As pressure on catchment resources grows, so does the need to monitor for compliance. This requires investment in and maintenance of monitoring systems which, in the case of water, includes technical hardware requiring urgent attention. In addition to this, there is the need for competent staff who have powers vested in them to follow due procedure and seek legal remedy if need be.

The lack of incentives to comply with legislative requirements, particularly in the case of local government, is an obstacle to compliance. RESILIM-O noted major issues with regard to municipalities whose lack of wastewater and effluent management is problematic. Despite legal obligations to do so, not planning within the context of water resource constraints currently carries no consequences. With little consideration of the constraints imposed by the water resource base, this puts the sustainability of water resources of the Olifants into question.

Limitations to legal recourse provided by the Intergovernmental Relations Framework Act (RSA 2005) was identified as an obstacle for one government department tasked with regulating another. That staff described themselves as “lacking teeth” is troubling for the enforcement of compliance. Instances where this is acute pertain to local government and land use authorization, expansion of unregulated mining activities, unlawful water use and discharge of effluent into the Olifants system.

#### 9.6.5 Lack of continuity in elected governance and access to legal support

While democratic governance structures have been welcomed, they have also introduced problems associated with continuity of leadership and decision making. This is protracted in the case of local government councils elected every four years. Although this is supposed to be mitigated for by the appointment of permanent government officials there still remains problems associated with a democratically elected council holding authority for technical decisions.

RESILIM-O found that local governments in the Olifants are driven by motives other than sustainable resources management, a function they believe resides with the Departments of Environmental Affairs, Agriculture and Mineral Resources. Local government sees the need to address the disparities of the past inadequate access to land and water for the majority as foremost. Whilst this is in keeping with national policy, it is the uncoordinated manner in which it is being undertaken that is problematic.

The conflict of legal intent warrants serious investigation by legal authorities and academic institutions. The establishment of collaborative relationships with law faculties to develop research expertise and enhance experience and case studies for natural resources management, and hence sustainability and resilience building, amongst new lawyers entering the profession is urgently needed.





## 9.7 Integrated, Systemic Approaches

### 9.7.1 Systems approaches

The proposed shift from linear, technicist approaches to systems thinking poses new challenges for governance and management, not least of which is the discomfort of many politicians and practitioners with uncertainty and the lack of a blueprint that guarantees some success. Nonetheless, proponents of complexity theory and systems approaches recognize that despite unpredictability, management actions do need to be taken (Johnson 1999). Adaptive management, in which one learns while doing and adapts management processes and goals, is regarded by many as the alternative (see, for example, Biggs and Rogers 2003; Pollard et al. 2014) and RESILIM-O provides many examples in which this framework has been developed and tested.

Integration is key to developing systemic practice. At the start, there was little evidence for integrated approaches at the basin or catchment scale and despite significant gains, this still persists in some quarters. For example, the lack of integration between protection of water resources and use continues to pose significant challenges (see also Pollard & du Toit 2011). That few of the existing water services development plans of local government refer to – or plan against – water availability creates a highly vulnerable state. Likewise, the disregard for biodiversity in land-use zoning and authorizations which leads to a loss of critical biodiversity habitats is a challenge. This situation is unlikely to change unless there are appropriate institutional arrangements, platforms and mechanisms for integrated planning together with commitment from leadership.

Nonetheless, successes using systemic approaches offer important frameworks and learnings for other initiatives at different scales such as, for example, in biodiversity planning, water resources protection, disaster management, co-management of protected areas and within agro-ecology. These are discussed in technical reports and Phase 2 above (see the reports on Agriculture Support Initiative, disaster management and Water Security).

Resilience building through systemic approaches also seeks to elucidate collective benefits at a catchment scale in a way that holds meaning for stakeholders. Efforts to make resilience planning a collective benefit and responsibility are therefore essential. Without multiple stakeholder platforms where the *status quo* of the catchment can be discussed, together with a sustained program – not once-off awareness raising campaigns – this is unlikely.

### 9.7.2 Ensuring requisite simplicity

Supporting systemic approaches for resilience planning and actions requires being aware of the difficulties of introducing over-sophisticated concepts and technologies into practice. Methods such as river classification, systematic biodiversity planning and climate modelling can potentially become complicated and fractured processes, particularly given the skills constraints in the region. Such complication does little to garner support; rather it creates opposition and antipathy and people often revert to easier and more familiar options (see 1). Complexity theory teaches us that it is important to seek the *requisite simplicity* in managing systems (Holling 2001) and also to consider the *practicalities* of resilience building.

Again, RESILIM-O offers many examples of where complicated ideas and procedures have been developed and tested. Readers are encouraged to look at resources pertaining to biodiversity integration into land-use guidelines, river flow monitoring, designing systemic social learning approaches to water resources and climate change, frameworks for working with municipalities around natural resources management and support for principles in soil and water conservation in agroecology, amongst others.



### 9.7.3 Support for self-organization and feedback

Functional, responsive multi-scale feedbacks are essential for management of complex systems such as catchments since they provide the basis for learning, reflection and response to an ever-evolving context (Pollard & du Toit 2011). Leadership (see above) and the ability to self-organize where various parts of the systems set up their functional networks (self-organization) and nurture localized practices appear to be central. Leadership that is in control of decision-making needs to be linked into coherent, robust and functional feedbacks from self-organising entities that provide the basis for action and learning. Also, self-organization is not likely to evolve unless responsibilities are delegated under the relevant legal instruments. To this end, government departments can, and should, provide an enabling environment for self-regulation to emerge. Examples include water use monitoring and regulation undertaken by WUAs/irrigation boards and in certain industrial enterprises as well as where tourism and agriculture play an important role in biodiversity conservation.

## 9.8 A Focus on Practices

### 9.8.1 People, tools and practices are parts of activity systems

Policy intentions and outcomes are mediated by practices, more formally known as ‘activity systems’. Activity theory<sup>75</sup> (Engelstrom, 1999) tells us that practitioners, tools and practices are parts of activity systems. The application of activity theory in RESILIM-O was appealing in that it is an approach that addresses the “whole” – in this case the Olifants catchment. This approach aided the RESILIM-O program in identifying key activity systems that could act as a nexus for resilience building. The areas of application included land-use planning for the inclusion of biodiversity, co-management of protected areas, water-use regulation and wastewater management by local government. We recommend the activity systems approach as it offers considerable value for basin resilience building.

## 9.9 Learning Systems for Resilience and Sustainability

### 9.9.1 Meaningful learning, networks for collective action and engagement

A key principle of RESILIM-O is that ‘transfer’ models of knowledge<sup>76</sup> are not only inconsistent with contemporary learning theory but they are also not appropriate for the kind of learning needed for catchment resilience. The resilience, and hence sustainability of a catchment, is a collective endeavour where learning networks function effectively to support resilience.<sup>77</sup>

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<sup>75</sup> It is a cross disciplinary approach offering conceptual tools and methodological principles which need to be concretized according to a particular area of study (e.g. catchment resilience).

<sup>76</sup> The extensive use of media campaign methods (T-shirts, posters, marketing materials) and particular language (“buy-in”, “uptake”) are potentially problematic, wasteful of resources and do not deliver the desired results. They also place the ‘project team’ outside of the social context of understanding and transformation – creating linear, non-responsive environments that are not conducive to meaningful social learning.

<sup>77</sup> A system where networks are able to experience events, reflect on them and so learn is responsive and capable of adapting to changes that are inherently part of complex systems.

A major challenge that has been addressed by RESILIM-O is addressing stakeholder frustrations related to public participation. Rather than using the transfer-of-knowledge model, multiple networks were supported over time through a social learning approach (see [www.award.org.za](http://www.award.org.za)), to developing a collective understanding and reducing resource related conflicts and vulnerabilities (see Ison 2004<sup>78</sup>; Wals 2007<sup>79</sup>; Muro and Jeffrey 2008<sup>80</sup>). Networks were established in various sectors and between sectors (held by the Resilience Learning Network concept). We recommend that these be maintained and strengthened so that future efforts need to move beyond simplistic awareness-raising campaigns’ which are a naïve response to building catchment resilience. A strong network, however, does not necessarily lead to resilience as cautioned by Capra (cited in Wals 2007) who pointed out that diversity offers strategic advantage for a community only if there is a free flow of information through the network. When the flows are restricted, power imbalances, suspicion and mistrust are created and diversity becomes an obstacle rather than an advantage. This remains one of the challenges of building a democratic basis for governing a catchment. Where networks do not function or where there is fragmentation, self-interest or singular profit-motivation, escalated resource exploitation and degradation can lead to an increase in vulnerability – not resilience.

### 9.9.2 Inclusivity and working with vulnerable people

An area that needs ongoing attention is linked to what it means to work with the poor and the vulnerable which often tends to be simplified as ‘once-off’, stakeholder participation events. The RESILIM-O program explored a number of ways of working with people who are not part of the formalized structures and who may struggle to be heard. We recommend that continued work build on the considerable effort spent on creating platforms for consultation outside of the traditional channels that ultimately informed resilience building activities.



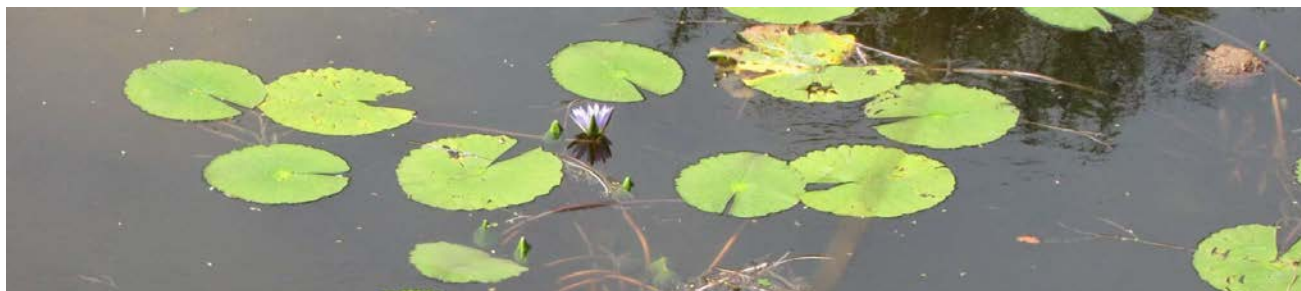
*Figure 51: Resilience demands diversity and ability to adapt under adverse conditions. Programs that support diversity are more likely to have a positive long term effect – we need to challenge what is regarded as the norm!*

<sup>78</sup> Ison R, Steyaert P, Roggero PP, B. Hubert B and Jiggins J (2004) *Social Learning for the Integrated Management and Sustainable Use of Water at Catchment Scale. Final Report, SLIM August 2004* (accessed from <http://slim.open.ac.uk>).

<sup>79</sup> Wals AEJ (ed) (2007) *Social learning towards a sustainable world*. Wageningen Academic Publishers. Netherlands

<sup>80</sup> Muro M and Jeffrey P (2008) *A critical review of the theory and application of social learning in participatory natural resource management processes. Journal of Environmental Planning and Management* 51 (3), 325-344.





## 9.10 Conclusions

The RESILIM-O program provided a rare opportunity to put into practice the often nebulous and theoretical concept of resilience-building in a river basin context. A hallmark of the program was the strong emphasis on systemic social learning to guide and to connect activities taking place in different parts of the catchment and at different scales under the thematic areas of water, biodiversity and climate change. This sort of systemic, social-ecological systems approach is easy to talk about but very difficult to put into practice. For this reason, the experiences, lessons, successes and challenges reported here have immense value for resilience-building endeavours elsewhere.

Our work under RESILIM-O has significantly increased the resilience of people and ecosystems in the Olifants River Catchment in a number of ways, as outlined in this report. These include both an improved understanding of key issues and establishment of new or improved practices which better incorporate the principles of resilience. Improved protection and better management of water resources and biodiversity were achieved through supporting collective action, informed adaptation strategies and practices and tenable institutional and governance arrangements – leading to reduced vulnerability to climate change and other factors.

Improved capacity for understanding and acting on water resources, biodiversity and climate change challenges was developed across more than 400 institutions and 2000 individuals, and polycentric governance arrangements were enhanced through establishment or strengthening of 11 stakeholder networks. RESILIM-O offers many examples of where complicated ideas and procedures were reframed in simpler terms to allow for successful institutionalization. The fact that more than 100 laws, policies, regulations or guidelines were influenced, proposed, adopted or implemented through RESILIM-O indicates the success of our collaborative approach to working with stakeholders throughout the seven years to co-develop and institutionalize new, resilience-enhancing practices.

However, a number of factors continue to undermine resilience in the Olifants Catchment. These primarily relate to weak and uncertain governance arrangements, poor monitoring and enforcement of legislative requirements and standards and the long-standing failure to resolve land claims on protected and other areas. While the strengthening of polycentric governance arrangements is an appropriate response in this context, functional, robust and tenable governance systems are essential for resilience, sustainability and transformation. Continued support for governance is needed in several areas going forward, including municipal service delivery, water governance, co-management of protected areas, involvement of new landowners in restoration initiatives and community-based governance arrangements in the Limpopo Estuary in Mozambique. A focus on governance should therefore be a priority consideration in any new initiative in the Olifants Catchment.



AWARD's complexity-sensitive and learning-oriented Monitoring, Evaluation, Reporting and Learning system enabled organizational learning and reflection throughout RESILIM-O. Important learnings about resilience-building include: supporting leadership and self-organization are key; functional, responsive multi-scale feedbacks are essential for management of complex systems as they provide the basis for learning; viewing practices as parts of an activity system supporting an intended outcome helps to develop a realistic understanding of what is needed to 'implement' policies; and a resilient catchment cannot be built with a single focus or a set of disconnected projects, but requires a synergistic set of plans and actions that collectively bring about change. Networks that are supported over time to develop a collective understanding through a social learning approach are more effective in reducing resource-related conflicts and vulnerabilities than a "transfer of knowledge" model of capacity development.

We would like to express our sincere gratitude to USAID for their vision, encouragement and support in allowing us to experiment with the innovative approaches to resilience-building described here over a seven-year period. It has been enlightening, and a privilege, to be able to put learning and systems thinking at the core of a catchment-scale program. Also, to have the freedom to respond and adapt to what we learned along the way, together with all our stakeholders. While the approach was inherently uncertain in the sense that there was no "blueprint" for success, we believe the results speak for themselves and that the program has contributed enormously to strengthening the practice of resilience-building in catchment or landscape contexts.



*Figure 52: The prospect of accessing clean water is declining in southern Africa. It is imperative that water resources protection is given immediate priority for the sake of current and future generations and for the irreplaceable biodiversity of the region.*



# 10 Appendices

## 10.1 List of sub-grants under RESILIM-O

Grantee	Type of entity	Description
Aves Africa	Company	Shared Learning Events
Aves Africa	Company	Shared Learning - Follow on
CDS-ZC	Parastatal	Mangrove Restoration Project (Mozambique)
CSV	Company	Media & Communications
EMROSS	Company	Support for Strategic Natural Resource Management & Environmental Regulation in Priority Areas of the Olifants Catchment
Environmental Monitoring Group	NPC	Building civil society's capacity for NRM in the ORC under climate change
Environmental Monitoring Group	NPC	Building civil society's capacity for NRM in the ORC under climate change - Follow on
Institute for Natural Resources	NPC	Capacity development for enhancing sustainable forestry natural resource management in priority biodiversity areas.
Institute for Natural Resources	NPC	Unlocking conservation-based entrepreneurship to enhance biodiversity conservation and the resilience of ecosystems and people in priority areas of the Olifants River basin
Institute for Natural Resources	NPC	Capacity development for co-management of the Legalameetse Nature Reserve: Administrative skills and support for the establishment of a business entity
K2C	NPC	Blyde Restoration & Custodianship Project
Legal Resource Centre	NPC	To provide support for institutional arrangements for six communities that own land within Legalameetse Nature Reserve and assist them to enter a co-management agreement
Mahlathini Development Foundation	NPC	Support for Small Scale Climate Smart Agriculture (Lower Olifants)





Mahlathini Development Foundation	NPC	Support for Small Scale Climate Smart Agric. (Lower Olifants) - Follow On
Rhodes University	Institute of Higher Learning (IHL)	Capacity Development through Institutes of Higher Learning
Rhodes University	Institute of Higher Learning (IHL)	Capacity Development through Institutes of Higher Learning - Follow On
Rhodes University	Institute of Higher Learning (IHL)	Networks for collaborative, systemic action in the Middle Olifants River Catchment
Rhodes University	Institute of Higher Learning (IHL)	Networks for collaborative, systemic action in the Middle Olifants River Catchment - Continuation
Ukuvuna Harvests	NPC	Support for Small Scale Climate Smart Agric. (Sekhukhune)
Ukuvuna Harvests	NPC	Support for Small Scale Climate Smart Agric. (Sekhukhune) - Follow On
Water Group	Company	The development and implementation of a Turnaround Plan for Mopani/Ba-Phalaborwa Municipal Wastewater Treatment Works.
Water Resources Planning	Company	Capacity Development for Water Conservation & Water Demand Management as a Climate Change Adaptation Strategy - Maruleng & Ba-Phalaborwa Municipalities.

Key: NPC: Not-for-profit company; IHL: Institute of Higher Learning



## 10.2 RESILIM-O Resources Library

### 10.2.1 Technical reports

Report Number	Title	Authors	Description
Tech Report 1	Capacity Development for Water Conservation & Water Demand Management - Maruleng Municipality	WA Wegelin & Derick du Toit	This brief summary provides an overview of the water conservation and demand management support provided in Maruleng municipality
Tech Report 2	Integrating Biodiversity & Environmental Issues into Municipal Landuse Planning in the Olifants Catchment	Karen Kotschy & Derick du Toit	This report provides an overview of the assessment of how well municipalities in the Olifants are integrating biodiversity and environment into their planning instruments
Tech Report 3	Co-Management: Reconciling Land Restitution, Biodiversity Conservation & Poverty Alleviation in Olifants Catchment	Karen Kotschy, Sarah Findlay & Chris Williams	The emerging global discourse on community-centred conservation and co-management provides a framework within which poverty problems can be addressed, with clear benefits for sustainable development and resilience
Tech Report 4	Ecosystem Restoration DEA Natural Resource Management Programmes: A case study	Jan Graf & Fonda Lewis	This report profiles available information on the main NRMPs operating in the Olifants catchment. It includes processes and operations around planning/prioritization, implementation, monitoring, evaluation and feedback.
Tech Report 5	Enhancing Alien & Invasive Species Identification & Control - Resources & training opportunities	Jan Graf & Fonda Lewis	We introduce some resources to assist in the identification of alien and invasive plant species.
Tech Report 6	Improving Transboundary Alien Invasive Species Management & Securing Gains Supporting strategy for developing a post-handover agreement between DEA-NRMP & landowners	Fonda Lewis, INR	This document explores opportunities and partnerships for successful transfer of plantations to communities.
Tech Report 7	Overview of Forestry Management Legislation & Standards	Jan Graf & Fonda Lewis	This document provides an overview of the South African Principles, Criteria, Indicators and Standards [PCI&S] for sustainable forest management, and of national legalization relevant to sustainable forest management [SMF].
Tech Report 8	A Tool for Drafting Invasive Species Monitoring, Control & Eradication Plans - Enhancing the identification & control of alien & invasive species	Fonda Lewis	The law requires the drafting of Invasive Species Monitoring, Control and Eradication Plans. Here we explain the requirements in simple terms.
Tech Report 9	Exploring Opportunities & Partnerships for Successful Transfer of the Lowveld Plantations	Fonda Lewis	In this report we explore opportunities and partnerships for transfer of the Lowveld Plantations to communities
Tech Report 10	Literature Review of Climate Resilience in the Mozambique Portion of the Limpopo/Olifants River Basin	Verde Azul	This document presents an analysis of environmental and social issues arising in literature related to the Limpopo River Basin in Mozambique.



Tech Report 11	Review of Socio-Ecological Issues in Municipal Planning Instruments - Olifants Catchment Part 1: Evaluation methodology	Deborah Vromans	A methodology for analysing municipal planning instruments for the inclusion of environmental and biodiversity issues is presented.
Tech Report 12	Data Report for RESILIM Olifants: A Case Study 2014 Methods & summary of key data	Stephen Holness	This study examines the spatial patterns of poverty and local direct natural resource dependency for the South African portions of the Olifants Catchment. The study also collates basic census data on demographic characteristics for use in other components of the RESILIM project.
Tech Report 13	Literature Search: Biodiversity and related issues in the Olifants Catchment	Alan Gardiner	A partial overview of biodiversity related literature for the Olifants catchment including South Africa and Mozambique
Tech Report 14	Capacity Development for Water Demand & Water Conservation Management Ba-Phalaborwa Municipality	WA Wegelin & Derick du Toit	This brief summary provides an overview of the water conservation and demand management support provided in BaPhalaborwa municipality
Tech Report 15	Water Conservation & Water Demand Management in the Olifants Catchment - A Pilot Project	WA Wegelin & Derick du Toit	In this technical report we introduce a pilot study that was launched to understand water loss and its management within local municipalities in the Olifants catchment.
Tech Report 16	Municipal Support Initiative Impacts of Urbanization on Catchments & Mitigation Measures Under Climate Change [Ba-Phalaborwa & Maruleng Local Municipalities]	Sam Braid, Linda Rossouw & Derick du Toit	As landuse activities directly impact on the environment, local government must consider these impacts, including water runoff, quantity and quality. The consequences of non- or poor management have impacts on our riverine systems and potential negative impacts on human settlements downstream.
Tech Report 17	The Role of Municipal Spatial Planning in Managing Water Quality Impacts [Ba-Phalaborwa & Maruleng Local Municipalities]	Sam Braid, Linda Rossouw & Derick du Toit	Local governments are responsible for stormwater management and as such they are responsible to ensure the quality of the stormwater reaching rivers or a water resource body does not pollute the resource. Here is an introduction.
Tech Report 18	Monitoring, Evaluation, Reporting & Learning for the USAID RESILIM-O Program	Eureta Rosenberg, Karen Kotschy, Jane Burt, Derick du Toit, Sharon Pollard & Vhutshilo Mudau	This document describes the approach taken to Monitoring, Evaluation, Reporting and Learning (MERL) in the RESILIM-O (Resilience in the Olifants Basin) program which is implemented through a cooperative agreement between USAID Southern Africa and AWARD
Tech Report 20	Protected Areas in the Olifants catchment	Karen Kotschy with Brandon Anthony, Samantha Gerber & Kgomotso Thomas	This technical report provides an overview of the protected areas in the Olifants Catchment in 2015.
Tech Report 21	Natural Resources & Land Use: Ga-Mametja village in Olifants catchment	Shonisani Netshishivhe & Jan Graf	The report documents land use, natural resource use, and governance arrangements in the Ga-Mametja village with potential implications for environmental degradation and livelihoods of people
Tech Report 22	AgriSI - Farmer Baseline Report, Sekororo-Turkey village	Kruger & Sylvester Selala (MDF)	A baseline assessment of water, livelihood security in Turkey Village, Sekororo, Limpopo





Tech Report 23	Climate Change Adaptation Option Review Global, National & Olifants Catchment	Taryn Kong, Ancois de Villiers, Kgomotso Thomas, Sharon Pollard, Coleen Vogel	A comprehensive review of climate change adaptation options through a global, national and catchment lens.
Tech Report 24	Historical Trends & Climate Projections per Climate Region Olifants River Catchment	Taryn Kong, Sharon Pollard & Ancois de Villiers with Climate System Analysis Group (CSAG)	Climate change projections per climate region of the Olifants catchment
Tech Report 25	Historical Trends & Climate Projections Ba-Phalaborwa Local Municipality, Olifants River Catchment	Taryn Kong, Sharon Pollard & Ancois de Villiers with Climate System Analysis Group (CSAG)	Climate change projections for BaPhalaborwa Local Municipality, Mopani District
Tech Report 26	Historical Trends & Climate Projections Maruleng Local Municipality, Olifants River Catchment	Taryn Kong, Sharon Pollard & Ancois de Villiers with Climate System Analysis Group (CSAG)	Climate change projections for Maruleng Local Municipality, Mopani District
Tech Report 27	Historical Trends & Climate Projections Greater Tzaneen Local Municipality, Olifants River Catchment	Taryn Kong, Sharon Pollard & Ancois de Villiers with Climate System Analysis Group (CSAG)	Climate change projections for Greater Tzaneen Local Municipality, Mopani District
Tech Report 28	Historical Trends & Climate Projections Lepelle-Nkumpi Local Municipality, Olifants River Catchment	Taryn Kong, Sharon Pollard & Ancois de Villiers with Climate System Analysis Group (CSAG)	Climate change projections for Lepelle-Nkumpi Local Municipality, Mopani District
Tech Report 29	Historical Trends & Climate Projections Elias Motsoaledi Local Municipality, Olifants River Catchment	Taryn Kong, Sharon Pollard & Ancois de Villiers with Climate System Analysis Group (CSAG)	Climate change projections for Elias Motsoaledi Local Municipality, Mopani District
Tech Report 30	TBD		
Tech Report 31	Resilience: Questions of Language, Power and Agency	Leigh Price	This technical report describes the discourses surrounding the use of the word “resilience”. It divides these discourses broadly into three groups: naturalistic discourses, anti-naturalistic discourses and discourse hybrids.
Tech Report 32	Overview of Community Based Natural Resource Management in Mozambique & Literature Review	Alan Gardiner, South African Wildlife College	This report focuses on CNRM efforts in Mozambique and includes a comprehensive literature search
Tech Report 33	Supporting Learning: The Spiral Approach to Professional Support Initiatives	Derick du Toit	The technical report introduces a reflexive learning approach to professional support initiatives for natural resource practitioners
Tech Report 34	Municipal Support Initiative: Guidelines for Spatial Planners in Stormwater Runoff Management	Sam Braid, Linda Rossouw & Derick du Toit	These guidelines provide the basic principles for municipal stormwater management



Tech Report 35	Municipal Support Initiative: Guidelines for Spatial Planners in Managing Riparian Zones under Climate Change [Ba-Phalaborwa & Maruleng Local Municipalities]	Sam Braid, Linda Rossouw & Derick du Toit	These guidelines provide the basic principles for managing riparian zones for spatial planners
Tech Report 36	Monitoring Progress Farmer Field Visits under the AgriSI Project	Bigboy Mkhabela & Cryton Zazu	The AgriSI shares a visual report of its visits to small holder farmers in Sekororo, Limpopo
Tech Report 37	Support to Farmers and Local Facilitators AgriSI Project	Bigboy Mkhabela & Cryton Zazu	A report from AgriSI sharing the monitoring of progress, challenges & successes of smallholder farmers
Tech Report 38	Summary of Natural Resource Management Laws & Policies relevant to the Olifants Catchment [South Africa & Mozambique]	Clara Bocchino	A summary of natural resource management laws and policies relevant to the Olifants catchment in South Africa and Mozambique
Tech Report 39	Review of Socio-Ecological Issues in Municipal Planning Instruments - Olifants Catchment Full Report	Deborah Vromans	A full report on the inclusion of environmental and biodiversity issues municipal planning instruments for the Olifants catchment
Tech Report 40	Overview of the Olifants catchment 2014	Sharon Pollard & Ariane Laporte	This documents provides a comprehensive overview of the Olifants catchment with facts and figures from 2014
Tech Report 41	Farmers are Doing Things in the Lower Olifants - AgriSI program	Betty Maimela & Erna Kruger (MDF)	The AgriSI showcases a range of agroecological practices to improve food production, build resilience to heat and water stress in food gardening and field cropping situations.
Tech Report 42	Overview of Wastewater Treatment in South Africa	Katy Hansen	Based on a literature review, this report explains key concepts and practices associated with wastewater treatment and outlines wastewater management and governance in South Africa
Tech Report 43	Governance & Co-Management in the Legalameetse Nature Reserve: Development of a Collaborative Vision, Institutional Arrangements & Roles & Responsibilities	Sharon Pollard & Thabang Mohale	Record of the Comanagement “Visioning & Governance Workshop” held 4-7 November 2019
Tech Report 44	Catchment Management Forums - Report on the Forum of Forums	Victor Munnik, Jane Burt, Derick du Toit & Leigh Price	This report emanates from a two-day workshop which brought together researchers and participants in Catchment Management Forums (CMFs) under a WRC collaboration
Tech Report 45	Review of Environmental Water Requirements & Related Information for the Olifants Basin	Alison Joubert & Cate Brown Southern Waters Ecological Research and Consulting	This report contributes to integrated systems and resilience analysis by describing, modelling and quantifying the links between changes in flow in the river and changes in ecosystem condition and ecosystem services and benefits



## 10.2.2 Other Resources

Full title	Authors	Description
<b>Resilience building - general</b>		
Our Olifants: Resilience in the Limpopo Basin	AWARD	This first overview brochure of the USAID:RESILIM Olifants project as implemented by AWARD explains the project during Phase 1.
Reducing the vulnerability of people and ecosystems in the Olifants catchment	AWARD	An overview of the USAID:RESILIM Olifants project as implemented by AWARD
Our Olifants Overview brochure	AWARD	First overview brochure of the USAID:RESILIM Olifants project as implemented by AWARD in Portuguese
Understanding the Olifants as a system. How people think affects what they do.	Charles Chikunda & Derick du Toit	This brochure explains activity systems theory and how it can be applied to the Olifants catchment for building resilience
Harnessing monitoring & evaluation for learning. Experiences from the RESILIM-O Program 2019	Karen Kotschy, Vhutshilo Mudau, Eureka Rosenberg	The Monitoring, Evaluation, Reporting and Learning (MERL) system was developed by AWARD, MERL staff and members of the program's reference group, with support from USAID. This brochure describes the basics of the MERL system in this brochure.
Summary of Natural Resource Management Laws & Policies relevant to the Olifants Catchment [South Africa & Mozambique]	Clara Bocchino	The summary of legislation and policy as provided in an easy access Excel format
<b>Institutional support</b>		
Who are we? Profiles of Civil Society Organizations of the Olifants Catchment	Derick du Toit, Stella Horgan, Tebogo Mathebula, Admire Mohlala	We introduce some of the members of the Civil Society Organisation Support Initiative and the work they do in the Olifants catchment.
No Civil Action Without Support: Principles for Practice: The Civil Society Organisations Support Initiative	Derick du Toit, Stella Horgan, William Mponwana & Tebogo Mathebula	This guideline is for supporting civil society organisations (CSOs) to develop action competence in addressing community problems. The principles are gathered from CSOs in the Olifants catchment, South Africa.
A consolidated vision for the Upper, Middle and Lower Olifants catchment Civil Society Organisations	AWARD	This easy to access EXCEL worksheet provides a consolidated vision statement for civil society organisations of the Olifants catchment.
Olifants River Catchment Civil Society Organisations Position Statement Jan 2018	Olifants CSOs	This booklet provides a statement of position developed by over 80 CSOs operative in the Olifants catchment.
Capacity Building for Civil Society Social Learning for Management of the Olifants Catchment	EMG	This project summary explains the details of the Changing Practice - Olifants course run by the EMG, ELRC and SAWC with AWARD.
Corporate Compliance of the Twickenham Mine	Elton Thobejane & Provia Sekome	This project investigates corporate compliance with environmental legislation.
Calcite Legacy Dump on the Highveld	Elvis Komane & Nthabiseng Mahlangu	This project investigates management of a calcite dump on the Highveld.
Waste and Water Context and New Knowledge	Tshepo Sibiyi, Kedibone Ntobeng & Chistina Mothupi	This project investigates the impact of disposable nappies on water resources in the Olifants catchment.
Sustainable Food Security in Four Villages	Thelma Nkosi with Bernerd Ngomane	This project investigates what needs to happen with regard to food security in four rural villages.
Water and Mines Context and New Knowledge	Mmathapelo Thobejane, Tokelo Mahlakoane, Eustine Matsepane	This project investigates the potential impact of a mine on local water resources.
Being a Voice for the Brugspruit Wetland	Susan Boledi, Lorraine Kakaza & Collen Jolobe	This project investigates the potential impacts of a shopping mall on local water resources.



Food Security to Reduce Poverty	Caroline Rathakolo & Nelson Thaba	This project investigates the food security options in rural residential areas.
LBCIN: Limpopo Basin Curriculum Innovation Network	Rhodes ELRC	This fold-up brochure explains how the institution partners are involved in the LBCIN.
Curriculum Innovation for Institutions of Higher Learning	Rhodes ELRC	This project summary provides an overview of the curriculum innovation in six institutions of higher learning.
Maruleng Municipality: A Profile of the Municipal Area	Wehnke van der Merwe & Derick du Toit	This overview of Maruleng Municipality is focused on how to make environmental planning more explicit within the integrated spatial planning processes. A systemic approach identifies the complexity and interconnectedness of the major drivers in the area.
<b>Water systems</b>		
Systemic, Social Learning Approaches to Water Governance and Sustainability in the Olifants River Catchment (Limpopo)	Sharon Pollard, Hugo Retief & Jai Clifford-Holmes	A booklet for water resource practitioners and managers interested in the theories and practice of systems and social learning approaches. A new whole-catchment approach that sees people as part of governing water.
Keeping the Olifants River Flowing: Systemic, collective action during the most severe drought on record	Sharon Pollard, Edward Riddell, Hugo Retief	Monitoring river flow and adjusting river operations is an essential management function but even more so during times of drought. We share the efforts of AWARD, SANPARKS & National DWS to keep the Olifants River flowing during the worst drought on record.
Overview of water quality and quantity in the Olifants River catchment	Hugo Retief & Sharon Pollard with Neil Griffin, Caroline Palmer, Stephen Mallory & Manuel Magombeyi	This overview presents an analysis of water quality and quantity for the Olifants River Catchment in a user friendly format.
Predicted Impacts of Climate Change on Water Resources of the Olifants River catchment	Sharon Pollard and Hugo Retief (Eds) with Tendai Sawunyama, Stephen Mallory & Taryn Kong	A user-friendly overview of the predicted impacts of climate change on the water resources in the Olifants Catchment
FlowTracker. A near real-time flow and dam monitoring app for the Olifants river catchment	Hugo Retief and Sharon Pollard	FlowTracker for the Olifants River is the first of its kind. It enables near real-time flow and dam monitoring, and includes a weather forecast facility.
An Integrated Water Resources Decision Support System for the Olifants Catchment: Facilitating real-time monitoring, early warning and systemic decision-making for water resources - INWARDS	Hugo Retief & Sharon Pollard	First real-time monitoring and integrated water resources management approach for the Olifants Catchment aimed at decision makers and water resource practitioners
Networks for Collaborative, Systemic Action in the Middle Olifants River Catchment	IWR Rhodes & AWARD	This project summary documents the establishment and running of networks for water management in the middle Olifants catchment
Mangrove Restoration & Livelihood Support in Mozambique [Limpopo River Estuary]	CDS (AGUA) & AWARD	This project summary explains the efforts of project partner CDS in the restoration of the estuarine mangroves in Mozambique
Catchment Management Forums: A Guideline for Developing Charters of Agreement	Derick du Toit, Derek Weston & Eddie Riddell	Guidelines to establish and run forums according to agreed principles
Status Quo of Wastewater Treatment in the Olifants River Basin	Katy Hansen & Sharon Pollard	A first summary of wastewater management on the basis of the Olifants catchment rather than municipal boundaries gives an idea of the waste-water load in the Olifants system
Using What We Have Wisely! A Water Conservation & Water Demand Management Strategy for Maruleng Municipality	WA Wegelin & Derick du Toit	Research indicates water losses are in excess of 50% in some municipalities. To address potential water shortages, reduce losses and increase security of supply, all municipalities need to develop a Water Conservation and Water Demand Management (WCWDM) strategy.





Water Conservation & Demand Management under Climate Change	WRP & AWARD	This project summary gives an overview of water conservation and water demand management in two local municipalities in the Olifants catchment.
A Water Balance for Municipalities ... Made Easy	WA Wegelin, M Raletjena & AWARD	This brochure provides a summary of the guidelines for calculating a municipal water balance with specific focus on the IWA methodologies adopted, basic information required, audit trails, components of authorised consumption, connections, shortcomings of various key performance indicators, interpretation of results and common errors.
Capacity Development for Water Conservation & Water Demand Management in Maruleng Municipality	WA Wegelin & Derick du Toit	Maruleng local municipality has no WCWDM programmes while its water losses and non-revenue water are in excess of 40% and it is unlikely that water services can be sustained unless urgent WCWDM interventions are undertaken. Here is how the RESILIM project approached this challenge.
Capacity Development for Water Conservation & Water Demand Management in BaPhalaborwa Municipality	WA Wegelin & Derick du Toit	BaPhalaborwa municipality has a non-revenue water profile in excess of 60% and it is unlikely that water services can be sustained unless urgent WCWDM interventions are undertaken. Here is how the RESILIM project approached this challenge.
The Silent Killer? Wastewater Treatment Plants	Water Group Pty Ltd & AWARD	A turnaround plan for wastewater management in Mopani District
A Turnaround Plan for Municipal Waste Water Treatment Ba-Phalaborwa Local Municipality	Water Group & AWARD	This project summary documents the development of a turnaround plan for Ba-Phalaborwa Local Municipality
<b>Land systems: Land restoration</b>		
Natural Resource Management Programmes in the Olifants Catchment	Jan Graf	NRMPs form part of the Expanded Public Works Programme (EPWP), a nationwide government programme aimed at creating labour-intensive employment and skills development for previously disadvantaged people. Here we introduce some of them.
Capacity Development of Restoration Practitioners in Geographic Information Systems [GIS]	Silindile Mtshali, Jan Graf & Reuben Thifhulufhelwi	This report summarizes the GIS capacity development and training of restoration practitioners carried out under the RESILIM O Blyde Restoration Project during 2019.
Capacity Development for Sustainable Forestry Management	INR & AWARD	This project summary outlines the capacity building programme for plantation managers in the upper Olifants catchment.
Blyde Restoration Custodianship	K2C & AWARD	Project summary of a collective partnership to restore the upper reaches of the Blyde River and Klaserie River catchments
<b>Land systems: Co-management of protected areas</b>		
Co-Management of Protected Areas	AWARD	The focus of this policy brief is on co-management of protected areas
Systemic, Social Learning Support for the Co-Management of the Legalameetse Nature Reserve	Sharon Pollard, Charles Chikunda, Thabang Mohale & Lilian Goredema	Co-management is potentially an innovative and exciting model for addressing issues of socio-economic redress and upliftment, land reform and past injustices, and conservation. Here is an overview of a project launched in Legalameetse Nature Reserve, Limpopo Province
Three Natural Resource-Based Beneficiation Models to Demonstrate Opportunities to Diversify & Optimise Benefits from Legalameetse Nature Reserve	INR	Natural resources can provide landowner with non-monetary and financial opportunities. This document summarises 3 beneficiation models aimed to address livelihood needs and re-connect communities to their environment.
Conservation-Based Entrepreneurship Enhancing Resilience of Ecosystems, People & Biodiversity [Olifants Catchment]	INR & AWARD	This project summary explains the exploration of conservation-based entrepreneurship in the Legalameetse Nature Reserve with claimant communities.
Community Participation and Engaging with Government	Lilian Goredema, Charles Chikunda, Thabang Mohale	These guidelines are for communities that have claimed land in protected areas within South Africa, and are in the process of negotiating or have already negotiated partnerships with the government management agencies for managing protected areas.



A Guideline to Legislation Influencing Co-Management	Lilian Goredema	The purpose of these guidelines is to provide an overview of the key laws and policies that influence co-management in South Africa, for communities who have claimed land in protected areas
A Guideline for Identifying and Planning Resource-Based Beneficiation Initiatives	INR	This Z-fold brochure summarizes a process for identifying and planning resource-based beneficiation initiatives.
Realising the Benefits from Nature: An introduction to business planning	INR	This Z-fold brochure summarizes how to develop a business plan for nature-based business.
<b>Land systems: Biodiversity and land use planning</b>		
Planning and Caring for Biodiversity in Land Use A Beginners Guide	Derick du Toit, William Mponwana, Deborah Vromans and Stephen Holness	The importance of integrating biodiversity and conservation into land use planning is demonstrated using the example of Maruleng Local Municipality, Limpopo Province
Planning and Caring for Biodiversity in Land Use -A Beginners Guide	Derick du Toit, William Mponwana, Deborah Vromans and Stephen Holness	The importance of integrating biodiversity and conservation into land use planning is demonstrated using the example of Maruleng Local Municipality, Limpopo Province
Caring for our Biodiversity - Made Easy. An overview of Critical Biodiversity Area (CBA) maps for the BaPhalaborwa and Maruleng local municipalities	Derick du Toit, William Mponwana, Deborah Vromans	The importance of integrating biodiversity and conservation into land use planning is demonstrated using the example of Maruleng Local Municipality, Limpopo Province
CBA series #2 Land management guidelines: an introduction	Derick du Toit, William Mponwana, Deborah Vromans	A summary of recommended guidelines for managing Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)
CBA series #3 A Step by Step Guide: Integrating Biodiversity into Land Use Planning	Derick du Toit, William Mponwana, Deborah Vromans	Integrating biodiversity into environmental impact assessments and land use change applications
CBA series #4 Developing Environmental Policies to Protect Biodiversity	Derick du Toit, William Mponwana, Deborah Vromans	Municipalities can develop policies or by-laws concerning spatial planning, land development and land use; and for enforcing its land use scheme. The CBA Map and land use guidelines can be incorporated into these policies. Here is how.
CBA series #4 Developing Environmental Policies to Protect Biodiversity	Derick du Toit, William Mponwana, Deborah Vromans	Municipalities can develop policies or by-laws concerning spatial planning, land development and land use and for enforcing its land use scheme. The CBA Map and land use guidelines can be incorporated into these policies. Here is how.
CBA series #5 Biodiversity Integration into Municipal Spatial Planning	Derick du Toit, William Mponwana, Deborah Vromans	The Biodiversity Sector Plan (as part of the District Bioregional Plan) should be used in various multi-sectoral planning procedures to promote sustainable development, especially at the municipal level. Here is how.
CBA series #5 Biodiversity Integration into Municipal Spatial Planning	Derick du Toit, William Mponwana, Deborah Vromans	The Biodiversity Sector Plan (as part of the District Bioregional Plan) should be used in various multi-sectoral planning procedures to promote sustainable development, especially at the municipal level. Here is how.
CBA series #6 Glossary of Biodiversity & Spatial Planning Terms	Derick du Toit, William Mponwana, Deborah Vromans	A comprehensive glossary of terms used in biodiversity and spatial planning
CBA series #7 Biodiversity and Climate Change	Derick du Toit, William Mponwana, Deborah Vromans, Ancois de Villiers	Municipalities are seen as key role players in developing climate change strategies and contributing to the green economy. Biodiversity protection is part of that process.
Ba-Phalaborwa Local Municipality Biodiversity Sector Plan Handbook 2019 v3	Deborah Vromans, Stephen Holness, Derick du Toit and William Mponwana	To ensure sustainable development, biodiversity must, by law, be taken into account when developing spatial planning tools (e.g. spatial development frameworks, land use schemes) or when authorizing land development applications (e.g. rezoning applications, environmental impact assessments). These guidelines aim to assist spatial planners with these tasks.



Maruleng Local Municipality Biodiversity sector plan handbook 2019 v4	Deborah Vromans, Stephen Holness, Derick du Toit and William Mponwana	To ensure sustainable development, biodiversity must, by law, be taken into account when developing spatial planning tools (e.g. spatial development frameworks, land use schemes) or when authorizing land development applications (e.g. rezoning applications, environmental impact assessments). These guidelines aim to assist spatial planners with these tasks.
Critical Biodiversity Areas Mapbook for BaPhalaborwa Municipality. Supporting landuse planning and decision-making in Critical Biodiversity Areas and Ecological Support Areas for susustainable development	Deborah Vromans, Stephen Holness, Derick du Toit and William Mponwana	This is a Mapbook for BaPhalaborwa municipality. It zooms into the municipal area allowing for non-GIS users to understand where CBA categories are located in the landscape for property in the municipal area. The mapbook can be used by all sectors and professionals involved in land use planning and decision-making, including non-governmental organizations and the public.
Critical Biodiversity Areas Mapbook for Maruleng Municipality. Supporting landuse planning and decision-making in Critical Biodiversity Areas and Ecological Support Areas for sustainable development	Deborah Vromans, Stephen Holness, Derick du Toit and William Mponwana	This is a Mapbook for Maruleng municipality. It zooms into the municipal area allowing for non-GIS users to understand where CBA categories are located in the landscape for property in the municipal area. The mapbook can be used by all sectors and professionals involved in land use planning and decision-making, including non-governmental organizations and the public.
A Guide to the Spatial Planning & Land Use Management Act [SPLUMA]	William Mponwana	An easy reference to the most important law governing spatial planning in South Africa
Understanding Land Use Planning as an Activity System A Guideline for Spatial Planners	Charles Chikunda, William Mponwana & Derick du Toit	The RESILIM biodiversity working group adopted an activity system approach for the integration of biodiversity into land use planning. This document summarizes this approach.
Field book: Exploring Biodiversity in Landuse Planning & Enterprise Development for the Moletete Youth Programme	William Mponwana & Derick du Toit	This is a fieldbook made up of six modules for exploring biodiversity, land use planning and enterprise development based on biodiversity.
A Guide to the Spatial Planning & Land Use Management Act [SPLUMA 2013]	William Mponwana & Peggy Mphethi	This simple guideline introduces the key principles behind the Spatial Planning and Landuse Management Act of 2013
Oli Enterprises, Integrating Biodiversity and Entrepreneurship in the Olifants Catchment	INR	This Z-fold brochure explains the links between biodiversity and entrepreneurship in the Olifants catchment.
<b>Climate systems: Climate change</b>		
How is the Climate Changing in the Olifants River Catchment?	AWARD	This flyer shares the results of an analysis of historical trends and climate projections for the Olifants River Catchment.
Climate Change: Understanding scenarios, RCP, PPM	Sharon Pollard & Ancois de Villiers	Climate change scenarios for the Olifants catchment and technical terms are explained in simple terms.
Embedding Climate Change Adaptation within Local Government	AWARD	The focus of this policy brief is on embedding climate change in municipal planning and actions.
Core Concepts for Climate Change Thinking in the Olifants Catchment	Ancois de Villiers & Sharon Pollard	Simple graphics convey the important concepts behind understanding climate change
Tabataba ya phetogo ya tlelaemete	Ancois de Villiers & Sharon Pollard	Simple graphics convey the important concepts behind understanding climate change
How is the climate changing in the Olifants catchment	Ancois de Villiers & Sharon Pollard	This document shares the results of a localized analysis of historical trends and climate projections for the Olifants River Catchment
<b>Climate systems: Climate adaptation – Water and food security through agroecology</b>		



Soil and Water Conservation in Agroecology - What can we as farmers do?	Sharon Pollard & Derick du Toit	For farmers and practitioners to support the practices of agroecology by providing a simple framework for remembering five key principles.
Climate Smart Agriculture - Lower Olifants Catchment	AWARD & Mahlathini Development Foundation	This booklet explains the RESILIM O AgriSI project in the lower Olifants Catchment
Agriculture Support Initiative Lower Olifants: Project Summary	AWARD & Mahlathini Development Foundation	Summary of a project for increased adaptive capacity and climate change resilience in eight villages of the Lower Olifants River
Climate Adaptation in Small-Scale Agriculture [Middle Olifants Catchment]	AWARD & UKUVUNA	This is a project summary of the AgriSI project in Sekhukhune District, Olifants Catchment
Medicinal & Edible Herbs used by Farmers in the Lower & Middle Olifants Catchment (English and Sepedi)	Bigboy Mkhabela	Here is a simple guide to some of the edible medicinal herbs that small-scale farmers in the Olifants are growing. It is also in Sepedi.
Farmers' stories of change, knowledge and practices for climate change adaptation in agroecology and permaculture	John Nzira, Derick du Toit and Bigboy Mkhabela	Farmers share their stories of how they have experimented with agroecology and permaculture in preparation for climate change scenarios





# award

The Association for Water and Rural Development

AWARD is a non-profit organisation specialising in participatory, research-based project implementation. Their work addresses issues of sustainability, inequity and poverty by building natural-resource management competence and supporting sustainable livelihoods. One of their current projects, supported by USAID, focuses on the Olifants River and the way in which people living in South Africa and Mozambique depend on the Olifants and its contributing waterways. It aims to improve water security and resource management in support of the healthy ecosystems to sustain livelihoods and resilient economic development in the catchment.

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## About USAID: RESILIM-O

USAID: RESILIM-O focuses on the Olifants River Basin and the way in which people living in South Africa and Mozambique depend on the Olifants and its contributing waterways. It aims to improve water security and resource management in support of the healthy ecosystems that support livelihoods and resilient economic development in the catchment. The 5-year programme, involving the South African and Mozambican portions of the Olifants catchment, is being implemented by the Association for Water and Rural Development (AWARD) and is funded by USAID Southern Africa.

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