Third Swartkops Catchment Engagement Report

Engagement Dates: 16,17 and 18November 2022

SDG-pathfinding project

Foreword

Summary: SDG-pathfinding (*Co-creating pathways for sustainable development in Africa*) is a transdisciplinary research project (2021-2023) aims at developing tools and capacities to support the localization of the SDG agenda in African countries using participatory bottom-up approaches. We have brought together natural and social scientists from three leading institutions, Rhodes University (South Africa), Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement (France), and The International Institute for Applied System Analysis (Austria), along with a leading local NGO, Groupe d'Action et d'Initiative pour un développement Alternatif (GAIA) to work collaboratively with a broad network of stakeholders including local policy makers, NGOs, grassroots, and private sector from the Fimela district (Senegal) and the Swarzkopt basin (South Africa) in order to: 1) Develop and test an innovative tools to lift local capacities for framing complex sustainability challenges using a system thinking approach and explore adaptative pathways to meet the SDG agenda at local level in these two case studies, 2) Foster multi-stakeholder collaboration to promote social learning and innovation on how to localize the SDGs, and, 3) Support the institutionalization of the sustainability agenda beyond the lifetime of the project. The project is a not-for-profit research effort and is part of the Belmont Forum initiative to support the development of international networks and collaborations to support the development of transdisciplinary research to develop and implement the sustainability agenda.

More information: https://iiasa.ac.at/projects/sdg-pathfinding-co-creating-pathways-for-sustainable-development-in-africa
Contact: Project Coordinator: Dr. Bárbara Anna Willaarts (IIASA)

Funding: This work was conducted as part of the Belmont Forum "*Transdisciplinary Research for Pathways to Sustainability"* collaborative research action for which coordination was supported by the Austrian Science Fund (FWF) under the grant number 5356N to the International Institute for Applied Systems Analysis (IIASA). The French partner INRAE is funded by The French National Research Agency (ANR). Rhodes University receives funding from the National Research Foundation from South Africa (NRF) and GAIA from Future Earth. Any opinions, findings, and conclusions, or recommendations expressed in this material do not necessarily reflect the views of the funding organizations.

Table of Contents

1. Introduction

1.1 Project background

This project uses the United Nations Sustainable Development Goals (SDG) framework as its theoretical guiding tool. The major business of the SDG framework is to guide both research and practice in order that they help society to achieve and enhance sustainability through, by and large, balancing society's livelihood needs and environmental integrity. Livelihood needs include social, economic and cultural, while environmental integrity is more complex comprising multiple elements such as biodiversity and well-functioning ecosystems. This framework is aimed at helping society to achieve sustainable development; a complex concept that is broken down into 17 goals.

The Sustainable Development Goals- Pathfinding project is aimed at providing a space for researchers and research participants to work collaboratively in co-creating pathways for sustainable development in the Swartkops Catchment in the Nelson Mandela Bay Metropolitan located in the Eastern Cape province of South Africa. This will be achieved by using participatory multidisciplinary approach which does not only open space for community voices to be heard, but more importantly, takes them as sources of knowledge that can be harnessed in order to find solutions sustainability problems. In pursuit of this approach, the project brings together various stakeholders from equally different sectors, including government, Non-Governmental Organizations, private sector, academia, grassroots formations and ordinary community members to discuss both related sustainability challenges and potential solutions thereof. Such collaborative gatherings are conducted in the form of workshops and Living Lab sessions. These are social innovation platforms that provide an opportunity to discuss and experiment innovative strategies that hold potential to solve societal problems (a comprehensive definition of Living Labs is provided in Report No. 1 of this project). Output from these stakeholder engagement processes are often multiple narratives which are analyzed using the STEEP-H framework. The framework assist in organizing interpretation of responses into social, technology, economic, environmental, political and historical factors that help shed insight into how some challenges came into being. In addition to this framework, there are three tools that are used in exploring and managing sustainable development goals. These tools are policy simulation tools, COOPlage and adaptive systematic approach. These tools are used complementarily to for allow stakeholder participation and collective action; both necessary for achieving sustainable development goals.

This report documents activities of the stakeholder engagement process that took place in November 2022 as part of implementing the Sustainable Development Goals (SDGs)-Pathfinding project. The engagement processes happened in the form of a workshop and a Living Lab session.

1.2 Project Progress

Two workshops have already been conducted in January and July 2022 respectively (refer to Reports No. 1 and Report No.2 for details). The workshops were followed by the inaugural Swartkops Catchment Living Lab session. In November 2022, a third workshop was held together with a Living Lab session for which this report is (see figs 1 and 2). The sections that follow provide summaries of both the workshop and Living Lab session. In addition, the sections provide a brief account of the Swartkops Catchment Tour that the research team undertook.

Fig 1: Workshop in progress

Fig 2: Workshop session in progress

2. Workshop

2.1 Aim and Approach of the Workshop.

The workshop was held on the 16th of November 2022 in the Nelson Mandela Metropolitan Bay Municipality with stakeholders from the local community, representatives from industry namely Coega Development, NGOs such as the Zwartkops Conservancy and local community based organizations that include Hlumani Nande. The workshop sought to explore ideas and aspirations about how stakeholders would want to solve some of the major sustainability challenge facing the metro. These include, water security, employment and livelihoods. Such ideas were organized in relation to the various linkages that exist among multiple social-ecological elements of the catchment. Collective effort was made to think through possible synergies and tradeoffs that may occur in the linkages between the elements. It was envisaged that a serious consideration of both the total sum and magnitude of these synergies and tradeoffs will inform the designing of a sustainable and realistic action plan by the research team working in collaboration with the stakeholders.

Among others, the importance of showing the interlinkages is that it allows for identification of critical leverage points that might have cascading effects across the catchment system. This would also allow for identification and exploration of possible unintended consequences. Furthermore, it is beneficial to show the linkage in that it helps stakeholders to think across sectors, hence potentially visualize multi-sectorial problem-solving strategies in which deferent sectors can work collaboratively to solve a problem. This can potentially resolve the tendency of sectors in the municipality of working in silos; a practice that has significantly contributed to inefficient service delivery. The linkages were shown through co-creating causal loop diagrams that show the various synergies and tradeoffs among elements, as well as possible pathways of the desired vision of the catchment. The causal loop diagrams provided a representation of how elements in the system are connected. The causal loop diagrams also showed whether the connections enable or constrain achievement of the vision and particular goals of the catchment.

2.2 Causal Loop Diagrams Representing Challenges in the Swartkops Catchment

The causal loop diagrams were predesigned each having a specific focus based on elements of the action plan that had been established by the Swartkops Catchment Living Lab members in previous sessions. The diagrams were for four elements namely; water security, poverty and jobs, ecosystems

and food and sustainable communities. The stakeholders were then divided randomly into four groups with each group working on one of the above stated topics. The first step for the groups was to add arrows showing the linkages between the various elements related to the topic on the diagrams. The next step was for groups to discuss and decide on which polarities to add to the linkages. The concept of polarities was operationalized as follows: a minus sign (-) for negative effects and plus sign (+) for positive effects. The groups were then given opportunities to add more elements and add linkages showing and representing the interconnections between various elements.

Group 1: Water Security and Infrastructure

This casual loop diagram was based and focused on the water security and infrastructure challenges experienced in the metro. Some of the major discussion points that the group engaged extensively were around strategies of increasing availability of water in the metro. These strategies included water reuse, rainwater harvesting and controlling demand, as well as reducing water leakage from conveying pipes (See Fig. 3). Participants cited two possible obstacles to efforts use the rainwater harvesting strategy. These are that it puts households with asbestos roofs in a health risk. The other obstacle is that excessive rainwater harvesting may disrupt some aspects of the hydrological system, especially groundwater and aquifer recharge.

In addition, the group discussed the need to strengthen reporting mechanisms so that residents can timeously report cases of water leakage to relevant municipal departments. Furthermore, the group explored strategies of capacitating the municipality's Water Division so that it can enjoy powers to criminally charge people that cause leakages, vandalize water infrastructure and steal water. The problem of anthropogenic drivers of water pollution were also discussed with much focus on informal settlements which are often unplanned, hence sometimes established on or very close to riparian zones. Yet another strategy the group explored is desalination of marine water. In this discussion, lessons from the 2017 Cape Town water crisis were cited, especially the technology very is expensive. Moreover, participants discussed the negative effect of invasive alien species such as black and white wattle that have colonized some riparian zones in the catchment. They recommended that the government needs to increase budget to fund programmes that clear alien invasive species such as the Working for Water program in which the NMBMM is an implementing agent.

All these strategies to increase water availability were looked at with cognizance to the reality of climate change and its accompanying phenomena of seasonal variability and Global Warming.

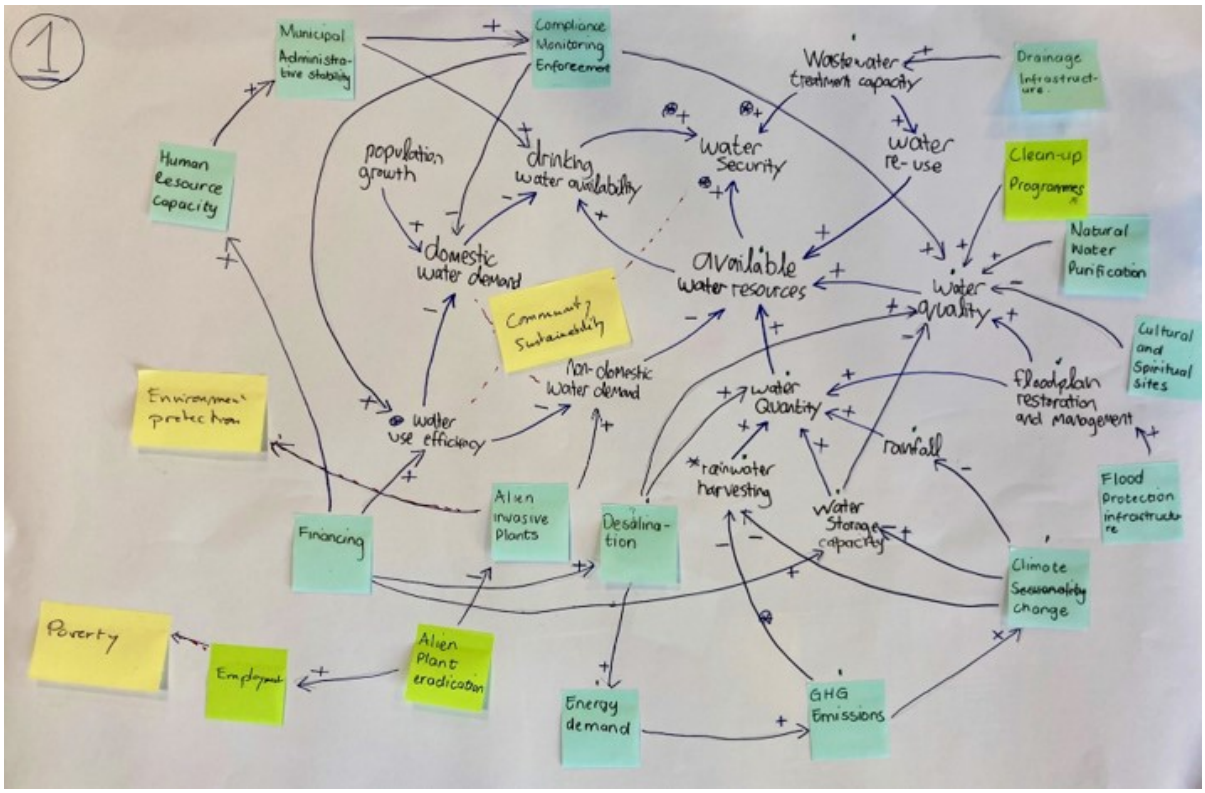

Fig 3: Group 1- Water security and infrastructure causal Loop diagram

Group 2: Poverty and Jobs

Discussions at this group and the remaining groups 3 and 4 followed the same approach with group 1 of which proceedings are reported above. For this reason we do not repeat aspects of methods and approach here and in subsequent sections. Instead, we focus on the major concepts and themes that were discussed. The discussion revolved around factors that make up the relationship between poverty and jobs, with the aim to craft strategies to increase jobs as a means to eliminate poverty within the catchment.

One of the major factors that contribute to the configuration of the current job-poverty relationship is the legacy of apartheid administration which was premised on racial segregation and the privileging system. In this administrative approach the people of the NMBMM, just as what happened elsewhere within South Africa, were grouped into races, black, coloured and white. Each racial group was allocated its residential area with its services. The white race was the most privileged, followed by coloured and the black race ws at the bottom end.

Participants said the apartheid segregation had multiple cascading effects that still significantly influence the nature of poverty and access to jobs, about three decades into democracy. The factors that influence poverty and access to jobs are education, availability of industries and employment or labour policy (see Fig 4). All these factors were negatively affected by apartheid policies, and hence it is mainly blacks that are unemployed, while the whites are the most employed per capita. The majority of black communities continue to get poor education today, which in turn makes not employable. In addition, because of racially skewed spatial planning inherited from apartheid, many black communities are situated far from employment opportunities such as industrial zones. All these factors contribute to the challenge of growing poverty in the metro.

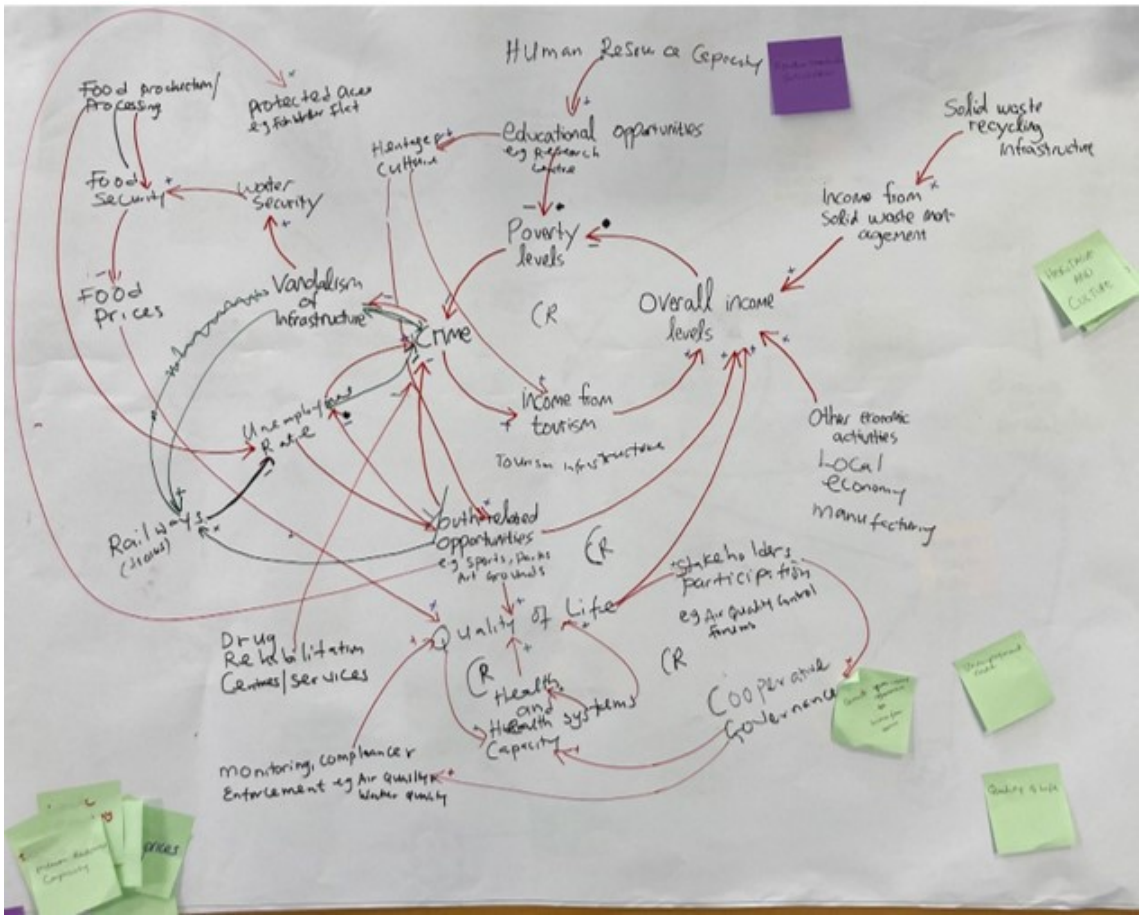

Fig 4: Group 2- Poverty and jobs causal Loop diagram

Group 3: Ecosystems

Group 3 discussed ecosystems within the context of human-nature relations. Participants stated that well-functioning and health ecosystems are important for the wellbeing of residents of the NMBMM and their surrounding natural environment. They supply multiple services that communities in the catchment depend on. Such ecosystem services include provisional services such as fisheries and water (See Fig.5). The participants noted that the increasing pollution of both fresh and marine water bodies is leading to decreasing amount of fish stocks from which the residents get food, and sometimes money through selling. Furthermore, pollution of water is progressively decreasing the amount of water available for human use including drinking, bathing and irrigation.

Participants also mentioned support services that the catchment gets from well-functioning ecosystems. Such services improve the quality of habitats, especially forests which in turn provide shelter to many faunal species such as birds and animals. The presence of these species attracts revenue through tourism and safari hunting. This in turn increases job opportunities and contribute to alleviation of poverty within the catchment.

Because of the realized to need to maintain well-functioning ecosystems, participants explored strategies for managing ecosystems. One such strategy is to increase the amount of protected areas, including game reserves, botanical gardens and parks. Another strategy is to strengthen the capacity of environmental Non-governmental Organizations.

Fig 5: Group 3- Ecosystems causal Loop diagram

Group 4: Food and Sustainable Communities

Discussions on food and sustainable communities largely revolved around finding strategies to increase access to food within the catchment. Participants pointed out that agriculture with its allied components, including land, water and distribution form the central cog of food access and sustainable communities (See Fig 6). In pursuit of tis argument, participants said that in order to increase food security, agricultural activates in the catchment must be expanded by, among others, promoting backyard gardening for production of vegetables to support household consumption. In order to have backyard gardens, the Department of Human Settlements must embed backyard gardening is an integral component of a residential plot when allocating land. In addition, the municipality needs to release agricultural land not only to large commercial farmers, but to subsistence farmers as well. This land must be parceled out on secure terms of land tenure.

Another major critical factor of food security is water availability. Water of sufficient amounts and suitable quality must be available to farmers to practise irrigation. Growing challenges of water shortage and pollution are constrain farmers' opportunities to grow agriculture and ultimately contribute to achievement of food security in the catchment. Another major factor is distribution of food from point of production to point of use, which is mainly the household unit. Participants argued that although food might be produced in big quantities by farmers at catchment level, individuals and households can still be food insecure. The main cause of this irony is lack of money by individuals and households to access the produced food. Shortage of money to buy food was

explained by the growing high rate of unemployment especially in black low-income communities of the NMBMM.

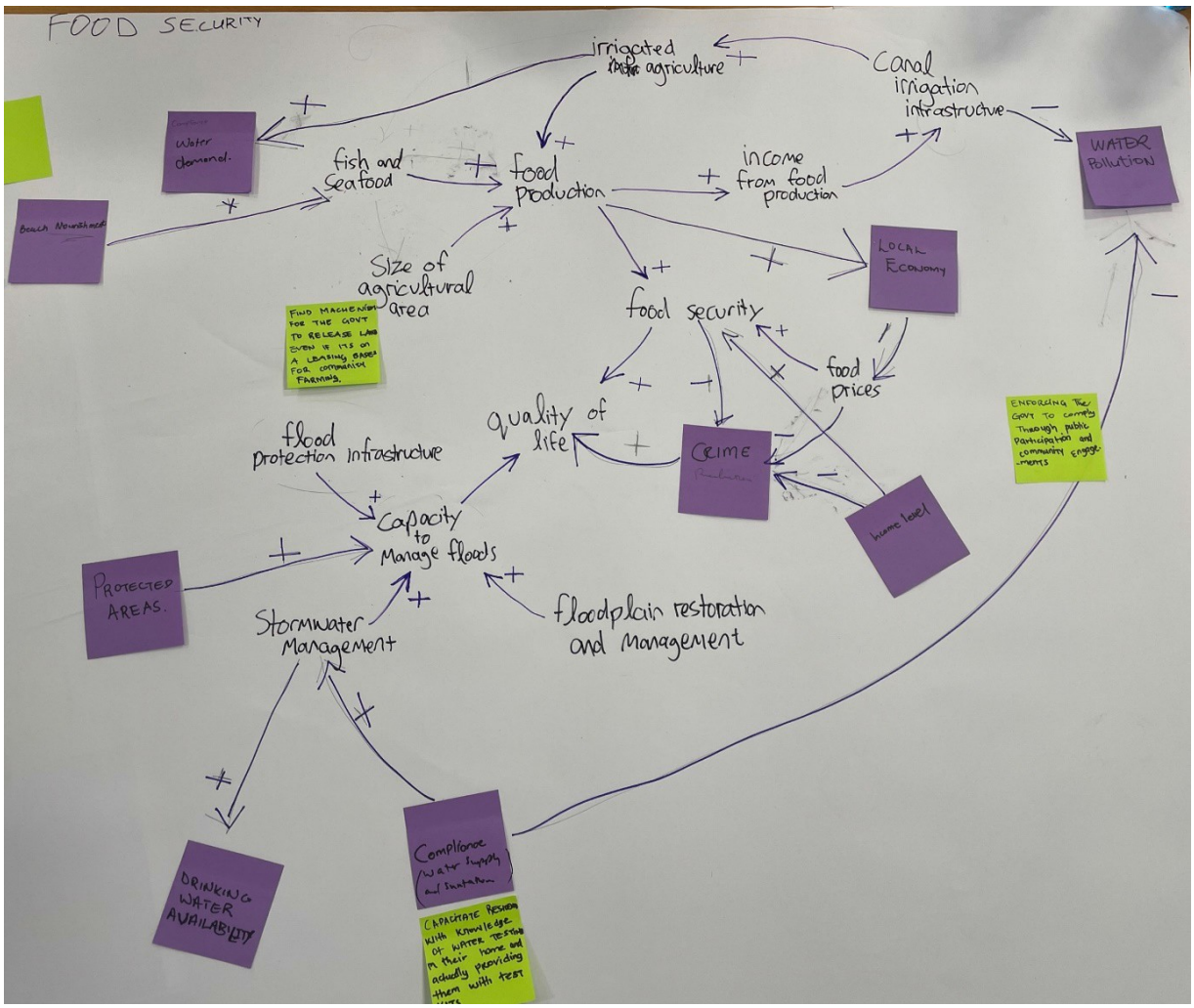

Fig 6: Group 4- Food and sustainable communities causal Loop diagram

3. Living Labs Session

3.1 Aim, objectives and approach

Living labs are social innovative platforms comprising multiple stakeholders representing various areas such as communities, academia, non-profit organizations, industries, and the public sector. This platform promotes innovation through experimentations, creating prototypes and testing new technologies, services and systems in real-life contexts. The Swartkops Catchment Living Lab was established on the 22nd of July 2022. The living lab held in inaugural session in September of the same year. The session was held virtually. The second session, one for which this report is about, was held on the 17th of November 2022. The Swartkops Catchment Living Lab had begun to develop an action plan based on the previous engagements. This action plan focuses on potential means and ways of bringing into realization the vision and aspirations that stakeholders proposed in the previous engagements.

3.2 Action Planning, Feasibility and Impact

During the engagement of the 17th November 2022, the Living Lab took further steps to refine some of the actions that had been identified in the previously drafted action plan. The focus of this engagement was the actions, with a specific interest on water security in the Swartkops Catchment. The members of the Living Lab further looked at, and focused on the feasibility and impact of the listed actions. The impact and degree of feasibility were obtained through conducting a ranking exercise. Below is a table and graphs of the actions as well as their ranking in terms of impact and feasibility.

Table 1: Water security action plan

Water Security			
Dimension	**Actions**	**Impact**	**Feasibility**
Drinking water supply and wastewater related services	Wastewater-Work with the DEA and the municipal wastewater division to assist with putting the sludge management protocol in place	2.25	2.75
	Wastewater- DWS, DEA, DoH to strengthen their compliance and enforcement power	2.25	2.75
	Stormwater management- Improve and correct the litter traps in the Motherwell storm water canal system	3.75	2.5
	Eco-rangers/ Reporting of illegal dumping	3	2.5
Water Resources Management	Encourage industries to invest part of their corporate social responsibility budget on community rainwater harvesting	2.57	2.62
	Liaise with DWS and DALRRD on activation of the policy of supplying Jojo tanks to communities for food and water security	1.51	3.83
	Awareness campaign on ways in which communities can diversify their water sources and reduce consumption	4.0	2.3
	Establish a citizen science network for testing water quality in the catchment; mini-SASS training	4.17	2.0
	Collaborate with DWS to fast track the development and roll out of the pollution incidence reporting system for the catchment	3.33	2.0
	Rainwater Harvesting	2.17	4.17
Governance and Institutions	Sustain and strengthening of Living Lab	4.29	3.86
	Living Labs collaborate with DWS as primary source of information dissemination about the Tsitsikamma Mvumbu Catchment Management Agency	3.57	3
	Joint investing between government agencies to ensure compliance (inter-government relationships IRG)	2.43	3.43

This information and ratings were used to plot the relative feasibility and impact of each of these actions. This produced a visual representation of the actions that are most feasible to achieve as well as the extent of the impact actions can potentially have (Figs 7,8 and 9).

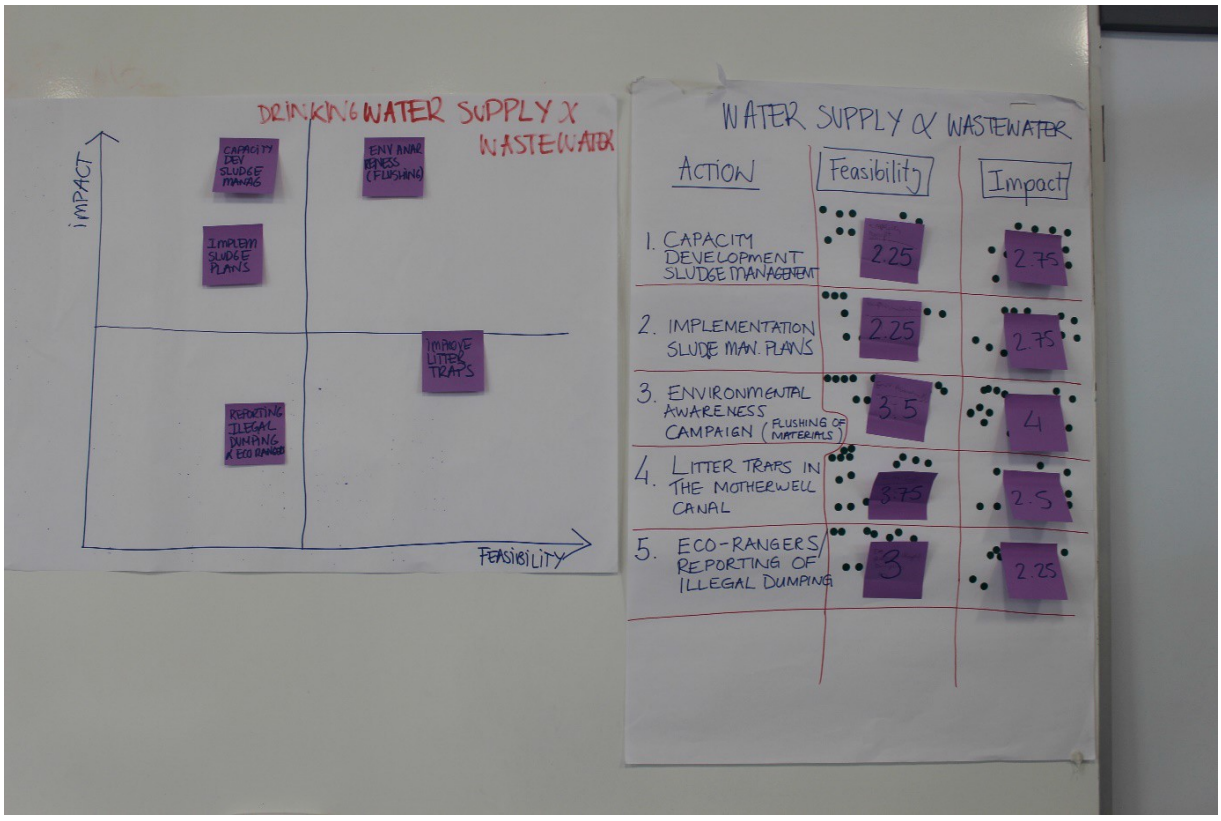

Fig 7: Impact and feasibility mapping of drinking water supply and wastewater action plans

Fig 8: Impact and feasibility mapping of water resource management action plans

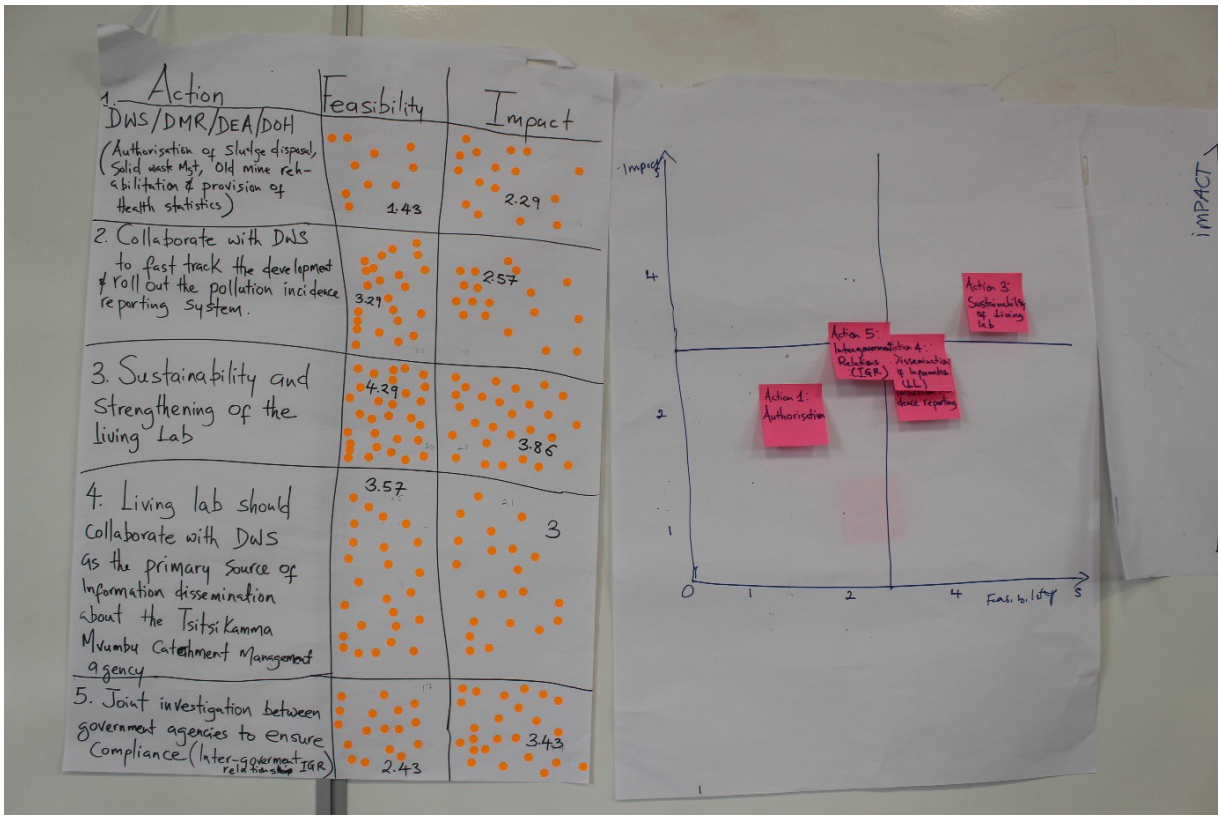

Fig 9: Impact and feasibility mapping of governance and institutional action plans

While some actions may be seen to have a bigger impact, this does not necessarily correlate with the feasibility. In action under the dimension of drinking water supply and wastewater related services, including capacity development sludge management and environmental awareness have the highest impact rating while the improvement of litter traps in the Motherwell Canal has a high feasibility rating. Under water resources management the actions around having rainwater harvesting and the supply of Jojo tanks in communities show the higher impact rating. Raising awareness and establishing citizen science networks had a high feasibility ranking. Under Governance and Institutions sustainability and strengthening of the Living Lab were seen as having high impact and feasibility.

Fig 10: Living Lab session in progress **LIVING Lab session in progress**

4. Tour of the Catchment

The field visit took place on November 18th 2022 and it was guided by Swartkops conservancy, a local NGO working to protect the estuarine of the Swartkops River. This basin is approximately 1000 km^2 and faces multiple water challenges, including physical water stress and deterioration of water quality due to pollution. The majority of these challenges are concentrated in the middle and lower sections of the basin, where settlements and human activities concentrate. The headwaters of the basin are protected and there is barely any agricultural or economic activity taking place there. This positively influences water availability in terms of both quantity and quality for downstream users.

Fig 12: Motherwell storm water canal

In the middle section of the basin, there are settlements abd agricultural activities take plce there, including irrigation to support horticulture and vegetable production. This negatively affect water availability in at least two ways; fisrt,it reduces water quantity because of abstraction, and second it reduces water quality due to the use of fertilizers and pesticides.

In the estuarine and lower section, the biggest challenges are related to the increasing deterioration of water quality. One major cause of this is growing population and which leads to multiple use of water, including disposal of solid waste and effluent. Tjis adversely affects availability of water for domestic use. Because of this problem and physical water stress, there is ned to implement inter-basin water transfer strategies in order to satisfy the growing demand for domestic water.

In addition, the challenges faced by domestic water users are further compounded by the reality that delivery of water services is very inefficient due to the high water losses through leakages. The high water losses are due to the low investment in infrastructure. The municipality is facing serious budget challenges, as a result it channels big chunks of available funding to the expansion of existing infrastructure in order to satisfy the demands of new users.

Along with the increasing quantitative water gap, there is also a serious water quality problem, especially pollution. The most important drivers of water pollution are related to the point source problems, caused by limited sewage collection (due to high number of informal settlements), as well as the limited capacity of existing wastewater infrastructure to treat the collected sewage. The level of treatment is supposed to be secondary and in some cases tertiary, but in many instances wastewater treatment plants are not working properly due to limited maintenance and frequent power outages.

Poor management of storm waters is also impacting the quality of water at the estuarine, since in many cases the water is discharged directly into the river and estuarine, carrying with it large amounts of garbage. A particular case in point is the Motherwell storm wate canal which collects storm water and discharge it into the estuarine. Motherwell is a low-income settlement with waste disposal points spread across the area. Despite this service, many residents dispose litter directly into the canal due to limited environmental awareness. Filters are fixed on the canal in an attempt to prevent the direct discharge of litter into the river, but due to the high amounts of litter and limited resources for proper maintenance, the canal gets filled quickly, and water along with large volumes of litter are discharged into the river. Deterioration of water quality is also driven by the obstruction of the sanitation network due to the disposal of sanitary towels into the stoem water canal and sanitation network. In some cases sanitation networks dispose directly into these storm water canals.

Fig 13: Estuary

Some strategies to solve these complex water quality challenges, including the development of natural wastewater treatment plant, as an ecosystem based approach. The strategy was implemented by the Swartkops Conservancy in collaboration with the municipality. The nature based waste water treatment plant is a natural pond covered with an an artificial reef bed located at the bottom end of the Motherwell storm water canal where it discharges into the estuary. Close to the estuarine, canal has a trap that holds the litter and diverts a large proportion of water into the artificial pond. This water goes through a process of purification thanks to the reefs and then is discharged into the river with a much higher water quality. However, of late, the pond has progressively decreased its capacity to purify water due to poor maintenance.

Fig 14: Artificial pond/wetland

Another nature based solution that is now being explored is to use abandon salt pans to re-filter the water coming out of the reef bed. This helps them achieve two objectives simultaneously: 1) improve the quality of the water discharged by enhancing the purification capacity, and 2) increase the volume of water in the estuarine, hence helping many species to breed again, since over the years and due to the water stress situation many parts of the estuarine dried up. One important lesson learned through this embarking on this tour is that despite the availability of low cost technologies to improve water quality of the estuarine, there is low appetite to adopt and implement them. Awareness campaigns need to be conducted. In fact, the Swartkops Conservancy is going to start a project to conduct surveys at household level in Motherwell to better understand why residents do not make use of waste disposal points.

5. Conclusions and Lessons Learnt

The workshop, Living Lab session and the tour proved to be important engagement opportunities that resulted in surfacing of useful insights both to the research team and participants. The workshop helped the stakeholders to et an understanding of the bigger picture regarding the challenges and opportunities in the catchment. Specifically, stakeholders were introduced to discussions on how challenges such as water security, degradation of ecosystems, poverty and jobs, as well as food security and sustainable communities are both influentially and causally related. And depending on how a community handles them both as individual factors and collectively as a system, sustainability can be achieved or may not. Yet another insight that came from the workshop is that by filling in the causal loop diagram, both participants and the research team members were alerted to the reality of causation that plays out between different aspired action plans. The causal effect may be positive, in that the proposed action plan possesses power to promote achievement of another related action or desired goal. On the other hand, the causation may be negative, in that a proposed action may constrain achievement of another related or desired action or desired goal. Among others, the importance of this insight is that it introduces both stakeholders and research team to look at the world (reality) in an integrated way; that the world and its associated social-

ecological challenges are integrated. For this reason, efforts to find and design solutions, likewise, should follow an integrated thinking approach.

The living Lab session was an opportunity for both stakeholders and research team members to take a deep dive into the complex concept of water security and its accompanying components such as water quality, water access and water quantities. One of the major take-home messages from this session is that different action plans have different magnitudes of impact and equally different degrees of feasibility. This is an important insight that can significantly influence how stakeholders prioritize action plans when designing implementation programmes. The tour of the catchment was an opportunity for members of the research team a real-life feel of the state of the Swartkops River system. When engaging with stakeholders, concerns about pollution of the river system and collapse of the water infrastructure had been consistently raised.

Some of the key lessons learnt include that water availability has become a criticalchallnge in the Swartkops catchment. In order to solve the challenge, aspects such as water quantity and water quality need to be improved. However, unless awareness campaign intiatives are embarked on to conscientize residents on the need to adopt wise water use and management practices, these aspirations will remain a mirage.

Another important lesson learned is that the water challenges in the Swartkps catchment is so multifaceted and complex so much that attempts to solve them need to be multi-disciplinary in approach, involving collaborative partnership of the municipality, province, national, residents and relevant NGOs. Such multi-disciplinary efforts wil, among others, address matters such as budget allocation, maintenance and construction of water infrastructure, water resource governance, environmental knowledge and behaviour,as well as responsible water use practices.