Alignment, Scaling and Resourcing of Citizen-Based Water Quality Monitoring Initiatives

Report to the
WATER RESEARCH COMMISSION
as part of the
Research into Alignment, Scaling and Resourcing of
Citizen-based Water Quality Monitoring (CBWQM) to
Realising the Integrated Water Quality Management Strategy Project

by

Heila Lotz-Sisitka[1], Mike Ward[2], Jim Taylor[3], Priya Vallabh[1],
Morakane Madiba[1], Mark Graham[4], Adrienne Louw[4] and Faye Brownell[5]
[1]Rhodes Environment Learning Research Centre
[2]Creating Sustainable Value (CSV)
[3]Independent, Research Fellow – UKZN
[4]GroundTruth
[5]Dusi uMngeni Conservation Trust (DUCT)

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Obtainable from
Water Research Commission
Private Bag X03
Gezina
PRETORIA, 0031

orders@wrc.org.za or download from www.wrc.org.za

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EXECUTIVE SUMMARY

This action-oriented research project seeks to address the policy-practice contradiction that exists between commitments and requirements for citizen engagement and involvement in Integrated Water Quality Management (IWQM) and a lack of sustainable support for scaling high quality Citizen-based Water Quality Monitoring (CBWQM) practices that exist in South Africa.

The project seeks to facilitate closer alignment with national and international IWQM, the National Development Plan (NDP) and Sustainable Development Goals (SDGs) in terms of CBWQM in the context of IWQM. It also seeks to support and inform approaches that can lead to an enhanced understanding at the national level of CBWQM practice, and how this can be scaled in support of improved IWQM practice in South Africa, where water quality management and monitoring is in crisis as indicated by the Department of Water and Sanitation (DWS) IRIS data. The research project adopted an action-oriented research strategy that not only sought to uncover and address the policy-practice contradiction in some depth, but also to strengthen enhanced action for scaling CBWQM in South Africa via a co-engaged action-oriented research approach in which we undertook sector-based questioning, in-depth analysis of cases, policy and literature, and co-engaged clarification and further analysis of the situation with national stakeholders involved in CBWQM. We developed model solutions for scaling of CBWQM practice (outlining a recommended differentiated scaling approach), and a resourcing strategy for this approach. This was tested via the *Amanzi Ethu* project during the COVID-19 pandemic and via a report and respond instrument that elicited valuable additional guidance. This process informed a number of recommendations, listed below and detailed in the final chapter. Additionally, through the process, strategic funding and resourcing relationships were built and increased for CBWQM, but these were still found to be short term, and in need of further commitments to ensure a more sustainable resourcing structure for CBWQM.

At the heart of the study lies a substantive desktop policy review and analysis of the (2017) IWQM policy, strategy, implementation plan and monitoring and evaluation framework, read in relation to the NDP and the SDGs and South Africa's commitment to build a democratic society and advance social justice and sustainable development. This review focuses specifically on the targets, aspirations and potential for citizen-based water quality management within these plans, and identified key gaps or absences, which also point to leverage points for transformative change in the policy and resourcing sphere.

Equally important was the ongoing reflexive co-engagement with CBWQM practices which involved inter alia an initial scoping of the practitioners and practices in the field, case study analysis, workshop engagements with CBWQM stakeholders to share the emerging research findings and to shape next steps in the action-oriented research process, and actual piloting of the scaling model and resourcing strategy, which provided job opportunities for 300 young people during the COVID-19 pandemic.

The study also involved substantive engagement with literature, partly informed by development of two PhDs that fed into various parts of the study on an ongoing basis. Literature reviews helped to a) contextualise CBWQM practice in South Africa and clarify concepts in use, b) deepen the framing of CBWQM as a democracy building, social justice practice in South Africa that needs to be ethically engaged, c) articulate the science-policy-practice interface, d) sharpen and ground the policy analysis, e) identify potentially suitable approaches to scaling to inform proposed approaches to scaling CBWQM as a multi-actor practice, and f) inform a resourcing strategy, as well as g) an orientation to considering principles that can underpin evaluation and monitoring of the scaling of CBWQM.

An action orientated research process shaped the research process *as a process of expansive learning.* This means that the research itself was conducted to expand and enhance learning of how to scale CBWQM praxis in the field of IWQM. Data produced at various stages was used as 'mirror data' to inform the unfolding process in a reflexively engaged manner. This research approach used reflexive review and evaluation of policy and existing initiatives to stimulate social learning processes that were generative within the field while the research was being undertaken.

This research report therefore brings together and indicates:

1) How CBWQM practice can be supported to facilitate achievement of priorities and potential within national and international plans and policies for IWQM, national development and the sustainable development goals;
2) Best practice examples of CBWQM and CBWQM scaling, based on existing and emerging local initiatives;
3) A methodology pilot tested for scaling CBWQM initiatives in multiple contexts based on local and international research; and
4) A resourcing strategy based on business and funding models and possibilities identified through strategic meetings and consultation that are aligned with the proposed and pilot tested scaling approach.

Innovations

From an innovation point of view, throughout the project the potential and dynamic ability of scaling processes related to CBWQM, and indeed, catchment rehabilitation, were modelled and demonstrated. This occurred through consistent feedback from a wide range of stakeholders as well as substantive practical evidence of progress on the ground. By differentiating the different forms of scaling, the research into scaling, and the practical actions required for scaling, CBWQM became more focused, engaging and achievable.

Additionally, from an innovation point of view, it was encouraging to see how the action-oriented research design involving multiple stakeholders in diverse dimension of the process provided an enabling environment for participants from all walks of life (including semi-literate community members to top level government officials and business partners) to gather together and articulate, engage with, and to some extent, overcome or at least model how to address at a practical level some of our water resources challenges while also attending to principles of social justice, inclusion (especially job creation and capacity building for youth), and democracy building. Multiple, complementary funding partnerships were shown to be critical to this process, and while difficult to set up and co-ordinate, are an important orientation to resourcing that was proposed and pilot tested. This pilot testing indicated that more work is required on a more sustainable approach and set-up for such a model for resourcing CBWQM.

Furthermore, also from an innovation perspective, despite the challenges of COVID-19, a number of opportunities emerged for the research processes. One example of this was how the Presidential Employment Stimulus through the Department of Science and Innovation (DSI) was able to support the lead research implementor, DUCT, in implementing a large-scale pilot project in the uMngeni Catchment. As can be seen in the details of this project report, this pilot project, *Amanzi Ethu Nobuntu* (Our Water and Common Humanity) involved 300 young people working in the catchment which provided considerable practical evidence and research feedback on scaling, with their participation at this scale being evidence of the potential of the scaling orientation as developed in this research project.

Additionally, the processes have shown that the citizen science tools consistently strengthened agency and competence across all socio-economic levels of application. An analysis of these tools against the reporting

requirements for monitoring water quality around Wastewater Treatment Plants (which are in crisis across the country with inadequate monitoring processes in place as shown in IRIS data) shows that they have considerable relevance and capability to assist local governments especially with water quality monitoring mandates. This work should be supported in the interests of job creation for youth, and expanding democracy and local accountability; hence it should be supported within a multi-actor structure.

With regard to future grounding of a wider scaling strategy and approach which can emerge from this research, one immanent development may have a major impact on the further scaling of this work. The United Nations Committee responsible for SDG6 approached the research team to explore whether miniSASS, one of the research tools developed with WRC support, could be applied in all parts of the world, as a Level 2 Indicator for SDG 6.3.2. To develop this concept further, and understand it better, a paper was compiled by the research team in partnership with the UN Committee members as co-authors. It would be a travesty for South Africa if the work done on CBWQM in South Africa gets global traction of this kind, while not being scaled internally in South Africa to all its river systems and involving all its communities. The report has indicated that this requires **operational** commitment in monitoring the participation indicator of SDG 6b in support of SDG 6.3 monitoring in the SDGs, resolving of the policy-practice contradiction in IWQM policy in South Africa, and stronger accountability and democracy building commitments in NDP implementation, in order to facilitate governance *with the people,* not for or over the people in South Africa.

RECOMMENDATIONS

A number of recommendations are made in the study, listed below, and elaborated further in Chapter 6. As recommended in South Africa's IWQM policy, these need to be further executed via the DWS, DFFE, CMAs and WRC, with stakeholders involved in CBWQM.

RECOMMENDATION 1: POLICY DIALOGUE

Organise a policy dialogue (with follow-through actions) to carefully consider this research and its outcomes in relation to the IWQM policy mandate for strengthening CBWQM practice and citizen engagement:

- DWS, DFFE, CMAs, DPME and the WRC should consider the recommendations of this research project in order to address their mandate(s) to advance CBWQM practice in South Africa in support of improved IWQM.
- To this end, the WRC is well placed to, and should ideally convene a policy dialogue with these stakeholders to engage with the findings and recommendations of this research.
- The research team should also consolidate the key findings into a series of policy dialogues for consideration in such a policy dialogue event.

RECOMMENDATION 2: MULTI-STAKEHOLDER APPROACH AND INTERIM CO-ORDINATING STRUCTURE

Adopt and support a multi-stakeholder approach to CBWQM scaling, but support an interim structure for initial mobilisation of the scaling strategy (e.g. Amanzi Ethu learning network). The multi-stakeholder approach should be organised around the key activity groups that have roles within and across the CBWQM value chain and its supporting systems.

RECOMMENDATION 3:
POLITICAL ECONOMY

Undertake a strong drive to meaningfully integrate CBWQM practice into government budgets at all levels for longer term sustainability, especially to support local CBWQM practices in all South Africa's communities where water quality requires monitoring and regular reporting data for IWQM. As shown in the IRIS data, this appears to be a national priority given the problems being experienced with IWQM across the country in almost all municipalities. Consider this seriously as a Groen Sebenza / Working for EI4WS option in South Africa to create jobs and capacity building opportunities for youth.

RECOMMENDATION 4:
USE OF CBWQM TOOLS FOR ADDRESSING WATER QUALITY CRISIS AND SDG 6.3 AND 6.b

Improve and expand use of existing CBWQM tools to advance water quality monitoring practices in local government settings, especially WWTW monitoring for SDG Target 6.3 and 6.b. Specifically:

- CBWQM tools have potential to show not only how WWTWs are performing, but also the impact they are having on the environments into which they discharge. These tools are, however, not currently being used to their full potential. The current WWTW crisis in South Africa can act as a leverage point for the activity of scaling of praxis.
- Great potential exists for mobilising CBWQM groups and utilising CBWQM tools to monitor WWTW effluent. Encouraging citizen participation in monitoring effluent empowers communities to take ownership of water and sanitation management, and hold municipalities accountable thus creating meaningful involvement by communities and assisting government in achieving Target 6.3 of SDG 6, which is to "by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally" and Target 6.b which is to "support and strengthen the participation of local communities in improving water and sanitation management".
- The specific potential of the CBWQM tools should be discussed in the policy dialogue under Recommendation 1.

RECOMMENDATION 5:
TOOLS DEVELOPMENT

Expand citizen science tools development (including ICT-based innovations) as well as support systems for their use, in ways that also include capacity development.

RECOMMENDATION 6:
CAPACITY DEVELOPMENT

Identify existing and emerging courses and course development systems that can strengthen capacity building for CBWQM in partnership with local governments and multi-actor groups. Work with training institutions, the WRC EI4WS programme, the SETA system, as well as the Groen Sebenza / Working for institutional framework to develop and support an intensive capacity building process or course over 3-5 years for depth scaling, use of CBWQM tools, and development of the CBWQM community of practice at national level. Include more communities, rivers, and local governments than are currently involved in the practice.

RECOMMENDATION 7:
DATA COLLECTION AND REPORTING PLATFORMS

One of the main findings of the CBWQM scaling research to date is that the ICT-based approaches (e.g. heatmapping) need to be strengthened, supported via capacity building, but also via more sustained resources to

maintain and further develop these innovative data collection and reporting platforms. This is an interesting area of innovation that could tap into funding sources for supporting communities to make use of ICTs for monitoring.

RECOMMENDATION 8:
COMMUNITIES OF CBWQM PRACTICE SCALING FROM SMALL TO MEDIUM ACTIVITY AND COMMUNICATION OF THEIR WORK

The work on tools development, capacity building, data reporting and uptake of data, should also focus on strengthening communities of practice to scale CBWQM from smaller to medium scale activity, as recommended in the scaling models put forward in this study. It should also involve capacity building for integrating the data into local government, and other compliance monitoring systems and structures so that the monitoring data is supported into management action. Producing data for the sake of it is not helpful, therefore there must be a strong intervention to support the uptake and use of the data within compliance monitoring systems, and management action. In this context, communication of the results and outcomes of the CBWQM practice will be crucial for raising awareness of the importance of the work being done and the way in which the data generated can facilitate improved governance. In other words, the communication approach should be aligned with the reporting of results and mobilising of further agency for change, and not be an exercise that is disembedded. The role of different partners, and achievements along the way will also be important to share across different communities of practice and into the capacity building programme.

RECOMMENDATION 9:
DATA AND DATA MANAGEMENT WITHIN A COMMONS PROPERTY LICENCING SYSTEM

As indicated above, the area of data and data management and ownership within a commons property licencing system is an important area of development and innovation in the CBWQM environment, and is also attracting funding. This component of CBWQM can also provide significant advantage and interest in resource mobilisation. Care will have to be taken, however, to maintain the foundations of shared intellectual property and open access / open-source data in order to avoid commodification of this practice.

RECOMMENDATION 10:
MONITORING AND EVALUATION FRAMEWORK THAT SUPPORTS DIVERSITY OF SCALING APPROACHES AND PRINCIPLES OF SOCIAL INNOVATION SCALING

Design a Monitoring and Evaluation Framework for CBWQM that aligns with the differentiated scaling approach model, underpinned by principles of scaling social innovation. This should be done collaboratively at sector level, and involve CBWQM stakeholders so that it can also become a MERL (monitoring, evaluation, reporting and learning) tool.

RECOMMENDATION 11:
APPROACH TO RESOURCING SCALING ACCORDING TO DIVERSIFIED MODEL AND TYPES OF SCALING ALONG THE CBWQM VALUE CHAIN

A differentiated approach to resourcing CBWQM practice is needed, but this needs to be a co-ordinated approach. There will be little value in designing innovative tools if they cannot be used widely in support of IWQM, etc. There is also little value in engaging at policy level if there is no practice occurring and so on.

Thus, we recommend the following for potential partners to get more involved in resourcing of CBWQM projects and programmes:

- **Government:** should support and fund the roll-out of CBWQM programmes within a job creation framework (e.g. Groen Sebenza)
- **Business:** should support local communities of practice to establish themselves and learn how to contribute to local IWQM via CBWQM practice; and they should allocate resources to capacity building, and innovation of tools, communication and network formation activities.

- **International funders:** should support governments to integrate principles and practices of CBWQM into policy systems and funding structures; and should support innovations in the whole system of CBWQM praxis. Piloting a scaled-up system of CBWQM by giving attention to all of the elements along the value chain, and all dimensions of scaling practice may also be a good focus for international funders as a key intervention around SDG implementation.
- **Education and research institutions:** should get involved particularly in supporting innovation along the CBWQM value chain through engaged research, tools development and social learning support, including the design and management of capacity building programmes across the sector; can also support learning network formation in partnership with civil society / NGOs and government partners.
- **Civil society/NGOs (e.g. WWF):** should continue to be the primary actors in the CBWQM system, at the forefront of monitoring and reporting practices and the actors who help to define the needs of the sector as these emerge from their experiences in practice. They should continue to attract funding for implementation but aim to continue to work synergistically with the range of partners along the value chain.

RECOMMENDATIONS FOR FURTHER RESEARCH

In addition to these recommendations, we make recommendations on further research in four areas:

1) To extend the action-oriented, learning-centred research approach to CBWQM scaling initiated by this research project
2) To extend research into the dimensions of scaling (depth, horizontal and vertical) with emphasis on how these align to expand CBWQM practice in ways that address the policy contradictions identified in the study
3) To extend research along the seven scaling pathways identified in this study, namely political economy and policy, knowledge commons and tools development, communication and profiling, data access and use, capacity building, building communities of practice and monitoring, evaluation and learning.
4) To conceptualise CBWQM as a process of transformative innovation, and align it with transformation innovation policy thinking and practice
5) To develop a series of policy dialogues from the research to share the core insights and findings with the diversity of actors and activity systems involved in CBWQM in ways that can advance policy engagement as well as practice development.

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Project Team:

Heila Lotz-Sisitka (Rhodes University – Environmental Learning Research Centre)
Mike Ward (Creating Sustainable Value)
Jim Taylor (Research Fellow – UKZN)
Priya Vallabh (Rhodes University – Environmental Learning Research Centre)
Morakane Madiba (Rhodes University – Environmental Learning Research Centre)
Mark Graham (GroundTruth)
Adrienne Louw (GroundTruth)
Faye Brownell (Dusi uMngeni Conservation Trust)

Reference Group Members:

Mr J Dini (Chair)	Mr G Maponya
Dr M Dent	Ms Z Nkuna
Ms K Govender	Dr C Thirion
Ms M Hiestermann	Dr AV Munnik
Ms N Jafta	Prof. J Goldin
Mr A McNamara	Ms M Thwala
Mr A Khan	Mr N Tandi
Ms L Rossouw	Mr P Viljoen
Mr M Mukhawana	Ms MJ Wilkinson

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AOS - Acacia Operations Services

ASSAf - Academy of Sciences South Africa

AWARD - Association for Water and Rural Development

BMZ - Economic Cooperation and Development

CBWQM - Citizen-based Water Quality Monitoring

CC - Creative Commons

CFF - Cities Finance Facility

CoGTA - Cooperative Governance and Traditional Affairs

CS - Citizen Science

CSI - Corporate Social Investment

CSV - Creating Sustainable Value

DAM - Data Acquisition Management

DBSA - Development Bank of Southern Africa

DEA - Department of Environmental Affairs

DEFF - Department of Environmental Affairs - Forestry and Fisheries

DHSWS - Department of Human Settlements - Water and Sanitation

DPME - Department of Performance Monitoring and Evaluation

DS - Developmental Studies

DSI - Department of Science and Innovation

DST - Department of Science and Technology (Innovation)

DSW - Durban Solid Waste

DUCT - Dusi uMngeni Conservation Trust

DWA - Department of Water Affairs

DWS - Department of Water and Sanitation

ECIN - Environmental Collaboration and Intelligence Network

EI - Ecological Infrastructure

EMG - Environmental Monitoring Group

EPWP - Expanded Public Works Programme

ESD - Education for Sustainable Development

IDP - Integrated Development Plan

IWQM - Integrated Water Quality Management

IWQM - Integrated Water Quality Management

IWR - Institute for Water Research

IWRM - Integrated Water Resources Management

KSG - Khulumani Support Group

KZN - KwaZulu-Natal

MERL - Monitoring, Evaluation, Reporting and Learning

MOAT - Managing Outputs and Time

MSU - Municipal Services Unit (Msundusi Municipality)

MTSF - Medium Term Strategic Framework

MuSSA - (2019). Municipal Strategic Self Assessment

NAEHMP - National Aquatic Ecostatus Health Monitoring Programme

NDA - National Development Agency

NDP - National Development Plan

NIWIS - National Integrated Water Information System

NLB - National Lotteries Board

NPAT - net profit after tax

NRM - Natural Resource Management

NWA - National Water Act

NWRS - National Water Resource Strategy

NWSMP - National Water and Sanitation Master Plan

ODK - Open Data Kit

PABSSM - Participatory Agent-Based Social Simulation Modelling

PES - Payment for Ecosystem Services

PGDS - Provincial Government Development Strategy

PSC - Public Service Commission

REAL - Researching Education and Labour

RHI - River Health Index

SANBI - South African National Biodiversity Institute

SAWC - South African Water Caucus

SDG - Sustainable Development Goal

SDGI - SDG Policy Support Initiative

STS - Science and Technology Studies

SWPN - Strategic Water Partners Network

TSS - Total Suspended Solids

TTO - Technical Transfer Office

TVHR - Transparent Velocity Head Rod (Water Velocity Plank)

UEIP - uMngeni Ecological Infrastructure Partnership

UMDM - Umgungundlovu District Municipality

VEJA - Vaal Environmental Justice Alliance

WASH - Water supply – sanitation and hygiene

WRC - Water Research Commission

WSDP - Water Services Development Plan

WWTW - Wastewater Treatment Works

CHAPTER 1:
PROJECT BACKGROUND, AIMS AND ACTION-ORIENTED RESEARCH APPROACH

1.1 Contextual background: Why this action orientated research was needed?

The Department of Water and Sanitation's[1] Integrated Water Quality Management (IWQM) Policy (DWS, 2017a), Strategy (DWS, 2017b) and Implementation Plan (DWS, 2017c) describe an integrated, inclusive and adaptive approach to IWQM. This strategic thinking and planning tool builds on the various tenets of sustainable development and thus has relevance to the achievement of the National Development Plan (NDP) and the global Sustainable Development Goals (SDGs). Key to the implementation, monitoring and evaluation of the IWQM policy, the NDP and SDGs, will be a clarification and 'domestication' of targets, the development of scaling strategies and the securing of resources for strategic activities. The Department of Water and Sanitations National Water and Sanitation Master Plan (NWSMP) sets out an ambitious plan for government that will require support from civil society and business if it is to be achieved.

The above policies, strategies, plans and goals have a strong emphasis on the importance of citizen engagement in water quality management. The following strategic areas related to citizen capacity and engagement contained in the IWQM strategy (DWS, 2017b) provide a basis from which to build productive partnerships between government, community groups and business:

- Strategic Issue 4 (SO4b; SA14) with Department of Environmental Affairs (DEA) [now Department of Forestry, Fisheries and the Environment (DFFE)] and Catchment Management Agencies (CMAs) to develop an engagement framework that enables more active participation of civil society at transboundary, national and catchment level.

- Strategic Issue 10 (SO10b; SA47), with the Water Research Commission (WRC) and CMAs, to lead the development of a programme to create and support citizen-based monitoring programmes

- Strategic Issue 10 (SO10c; SA50) /DEA/CMAs to develop protocols and systems to ensure monitoring and evaluation (M&E) and new information to inform adaptive management decisions for IWQM motivation.

- Strategic Issue 11 (SO11a; SA52) /CMAs to expand capacity-building initiatives to civil society and the private sector.

- Strategic Issue 11 (SO 11c; SA58; SA60) /WRC to develop online tools for easy access to WQ and WQM related information, with other Department and sector institutions, to lead and roll out awareness creation campaigns.

The above extracts highlight the importance of Community-Based Water Quality Monitoring (CBWQM) if we are to address the strategic issues and objectives of IWQM in South Africa. The key role of the WRC is also

[1] In this report we use Department of Water and Sanitation (DWS) throughout despite a period of time in which the Department of Water and Sanitation was under the Ministry of Human Settlements, Water and Sanitation and there was some reference to a Department of Human Settlements, Water and Sanitation (DHSWS – 2019-2021) during the life of this project to refer to the DWS; this has recently returned to a Department of Water and Sanitation under a Ministry of Water and Sanitation (August 2021). The Department of Environmental Affairs (DEA) also underwent a change to become the Department of Environment, Forestry and Fisheries (DEFF) in this project reporting period.

highlighted within this framework. This action-oriented research approach is relevant to the existing integrated water quality management policies and strategies as well as important for the achievement of the emerging NWSMP.

Furthermore, the National Development Plan (NPC, 2011), Chapter 4 (Economy infrastructure) and Chapter 5 (Environmental sustainability) highlight water management. Similarly, in the SDGs goal 6 (Clean water and sanitation), goal 8 (Decent work and economic growth), goal 13 (Climate change) and goal 15 (Life on land) all contain a significant focus on the management of water. All these strategies, plans and goals highlight the importance of engaging citizens in the management of water, including developing understanding of issues, managing catchments, using water wisely and protecting water quality.

These strategic areas are currently being achieved through a number of separate but interacting CBWQM initiatives across South Africa. These include Adopt-a-River, the Mpophomeni Enviro Champs, Wise Wayz Water Care in Umbogintwini, the Water Hustlers in Nkanini, and the Witzenberg Water Savers in Ceres amongst others. At the start of this research programme, individual reviews of some of these programmes suggested that they provide outstanding examples of many of the strategic actions outlined in the IWQM, the NDP and the SDGs. These initiatives were also already being supported by many of the tools and processes that were developed in a former WRC project (Graham & Taylor, 2018) and require further research to see how best they could support CBWQM and the IWQM policy, strategy and objectives.

Shaping this research project, and informing the development of the action-oriented research approach adopted in this project, representatives from citizen-based water quality management initiatives convened a number of meetings in 2016-2018 to begin exploring:

- how best to align these initiatives with national and international plans and goals,
- how to scale these initiatives, and
- how to create sustainable funding or business models for this kind of work.

At one such meeting in Howick (in May 2017) it was agreed that the individual projects did not have the institutional mandate nor the resources to develop a national 'scaling' initiative. It was thus proposed that a submission be made to the WRC to support a joint research initiative that would inform the alignment, scaling and sustainable funding of CBWQM. This research project – reported on here – aimed to extend, expand and further inform this early consultation and scoping process and was grounded in this initial CBWQM engagement that identified the need for an action-oriented approach to informing the scaling of CBWQM practice in South Africa (see Figure 1 for a synthesis of discussions arising out of this consultation).

Figure 1: Initial scoping of CBWQM praxis in South Africa leading to this project (presented at the Inception meeting of the project and developed by stakeholders who put the proposal for this action-oriented scaling research together)

1.2. Project aims and orientation to this action-oriented research report

As outlined in the project proposal, this particular WRC project had the following aims:

1. Align CBWQM with the IWQM policy (DWS, 2017a), strategy (DWS, 2017b) and implementation plan (DWS, 2017c) to ensure the meeting of national and global commitments including the NDP and SDGs.

2. Identify best practice within CBWQM initiatives (e.g. Adopt a River, Enviro Champs, Wise Wayz, etc.) to enhance the capacity of existing and new initiatives to contribute to national and international commitments.

3. Action orientated research into the 'scaling' of CBWQM through engagement with international research groups focusing on 'scaling'. The research design enhances evaluative, social learning approaches within CBWQM learning networks that build capacity for scaling.

4. Research and develop sustainable funding models and explore business opportunities associated with CBWQM.

The action-oriented research approach developed in this project adopted *an evaluative and generative research approach* focusing on existing and emerging CBWQM projects and the activity of CBWQM to stimulate social learning processes that have also contributed towards the fostering of scaling of CBWQM processes. The research orientation supported the identification of underlying mechanisms that currently enable or hinder scaling across different dimensions. The dimensions of scaling (vertical, horizontal, depth and breadth scaling) were also articulated in this research process. The action-oriented scaling strategy was co-developed over time with key stakeholders involved in CBWQM processes.

The research process was supported by two in-depth PhD studies on CBWQM (Vallabh, in press; Madiba, in press) which have fed into the project and have also catalysed a Master's study (Sithole, in process) focusing on

the capacity building scaling pathway, which was identified as a critical depth scaling component of the action-oriented scaling research. It has further led to an international research programme on 'River Commons' with Wageningen University to be implemented in partnership with the SARChI Chair at Rhodes University, partners and stakeholders in the CBWQM project. The PhD research of Ward (in progress) has also provided key conceptual direction for considering the dialectical nature of the action-oriented research process.

This report synthesises the approach that was developed and shares the main outcomes at each stage of the research process, thus offering a 'consolidated vantage point' on the action-oriented research. It develops guidelines and a resourcing strategy (or market intelligence) as it unfolds. These are consolidated in brief in the final chapter, and will be elaborated into a set of policy engagement briefs (see Appendix B for proposed titles).

The report is informed by insights gained from a co-engaged 'report and respond 'process in which the action-oriented research approach was shared with key stakeholders who are engaged with one of the CBWQM flagship programmes *Amanzi Ethu Nobuntu* (Our Water and Common Humanity), thus offering a first step in an expansive learning process for furthering the action-oriented strategy for scaling of CBWQM in South Africa. This report and respond process was developed with stakeholders in the *Amanzi Ethu Nobuntu* programme as one of the learning actions following Engeström's (cf. below) expansive learning process.

This process shows that the tools and approaches developed via the action-oriented research processes have catalytic validity and offer potential for further enhancing CBWQM praxis[2] in South Africa.

Local and international experience have informed this research through links to current international scaling research initiatives. These include the T-Learning project under the International Social Science Council,[3] the Sustainable Lifestyles and Education Programme under the UNEP 10YFP[4] and the SWEDESD Resolve programme,[5] all of which have a specific research and implementation focus on scaling of citizen engagement with environmental issues.

Central to this active research approach is the notion of **expansive learning** (Engeström, 1987; Engeström & Sannino, 2010, 2016) that works through iterations of reflecting on existing practices, analysing enabling and hindering mechanisms, modelling new solutions, examining and testing scaling models, implementing new practices, reflecting on the process and consolidating and generalising the new practice (in this case scaling across multiple dimensions) – see Figure 2 below.

The research was also informed by a substantive literature review undertaken by Vallabh (in press) which draws on the sociology of absence and emergence in the citizen sciences and situates the research in epistemologies of the global South.

The research report is structured according to the expansive learning process of Engeström (ibid.) and Engeström and Sannino (2016) which involves engaging collaboratively with stakeholders through a number of 'learning actions' or stages of an expansive learning process. The expansive learning process is constituted as an action-oriented research process or cycle of expansive learning (cf. Figure 2 below). Each stage is viewed as a 'learning action' in the process of coming to expand shared knowledge and experience of CBWQM activity.

[2] By praxis we mean both the theory and practice of CBWQM, as it comes together in practice.
[3] http://transgressivelearning.org/
[4] http://www.unep.org/10yfp/programmes/sustainable-lifestyles-and-education-programme
[5] https://www.swedesd.uu.se/tools/resolve/

The purpose is to allow for a collective process of 'learning what is not yet there', and to collectively expand the object of activity, in this case CBWQM in South Africa.

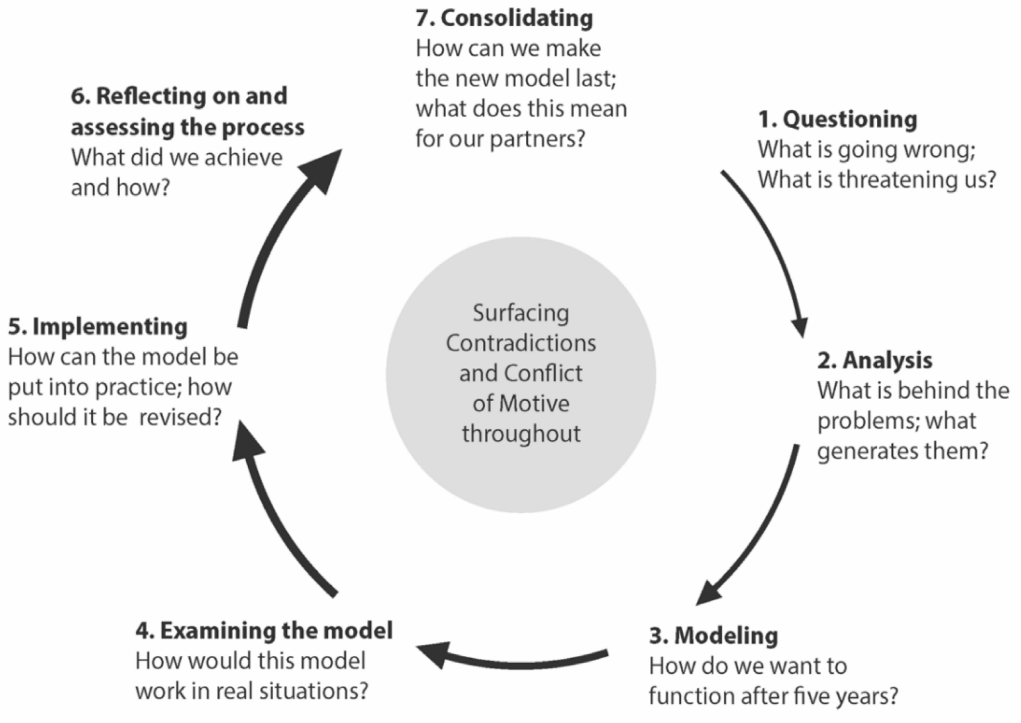


Figure 2: Engeström's expansive learning cycle involving seven learning actions (adapted from Engeström & Sannino, 2010)

1.3 Brief theoretical background: Why follow an expansive learning research orientation?

Central to our motive for designing this project as an action-oriented research process [that is also an expansive learning process] (cf. Figure 2 above) is the *dialectical method* that emerged from the work of Hegel, and which was later refined by key philosophers and sociologists such as Marx, Bhaskar and Ilyenkov and most recently in a decolonial context, by De Sousa Santos. Both Bhaskar and Ilyenkov reworked the initial concept of the dialectic which was an ideational dialectic in which contradiction in ideas was assumed to be resolved via other ideas, meaning that a better idea could replace a less good idea. This was, however, left wanting as it did not lead to changes in practice or activity, but rather simply led to change in ideas that became ideological impositions.

In response to the limitations of idealism (and ideological imposition), Marx, Illenykov, Bhaskar and De Sousa Santos have all reworked the dialectic to be based in, and emergent from existing material realities that change as a result of social engagements in and with contradictions in material realities (which reveal themselves as problems, tensions or difficulties in socio-material reality that are historically and culturally shaped and formed). In the case of this research project, the central contradiction lies between the need for widespread CBWQM as indicated by the massive problems of water quality and access to clean water in South Africa and the need for CBWQM in IWQM espoused in policy (cf Chapter 3), but not realised in practice to the extent that those who are volunteering and contributing to this practice do not have sufficient resources and capacity to launch a scaling process for their important activity. In other words, **we have a massive policy-practice contradiction in the area of IWQM involving the practice of CBWQM.**

Thus, the thesis of Marx, Illenykov, Bhaskar, De Sousa Santos is that **social engagements (e.g. learning, activism, cultures, etc.) can change existing *material realities of people, and that social change* thus emerges from and re-shapes the social and material life** as experienced by people and other life forms, e.g. biodiversity in rivers and landscapes. Important here is that human life is never only material; it is always cultural-material or social-material, because human beings have minds that are capable of reflexivity and reasoning, and for this reason *it is important to consider where the social/cultural and material are intertwined, which occurs in the socio-material context of practice or activity*. An example of such an activity, which is in focus in this action-oriented research approach, is ***the activity of scaling CBWQM,*** **which is the 'object of activity 'in focus in this research project**. Important here is not to confuse activity with actions; activity is a more substantive collective process of human engagement, involving multiple actors and activity systems at different 'levels' that interact around a shared object; constituting what Engeström (1987) referred to as a third generation of activity theory where interacting activity systems are in relation to each other to co-construct a new human activity, in this case the activity of scaling CBWQM in South Africa (cf. Figure 3). Such an interacting system of activity involves activity systems made up of subjects, rules, tools, communities and division of labour that produce rules that influence the central activity (e.g. IWQM policy activity systems); activity systems that are grounded in the central activity (e.g. CBWQM partners who are monitoring water quality at community level); and activity systems that produce tools for use in CBWQM practices (amongst others). In our research we sought to identify these diverse activity systems and to consider how they can be engaged in expansive learning pathways either together or in a diversity of expansive learning streams.

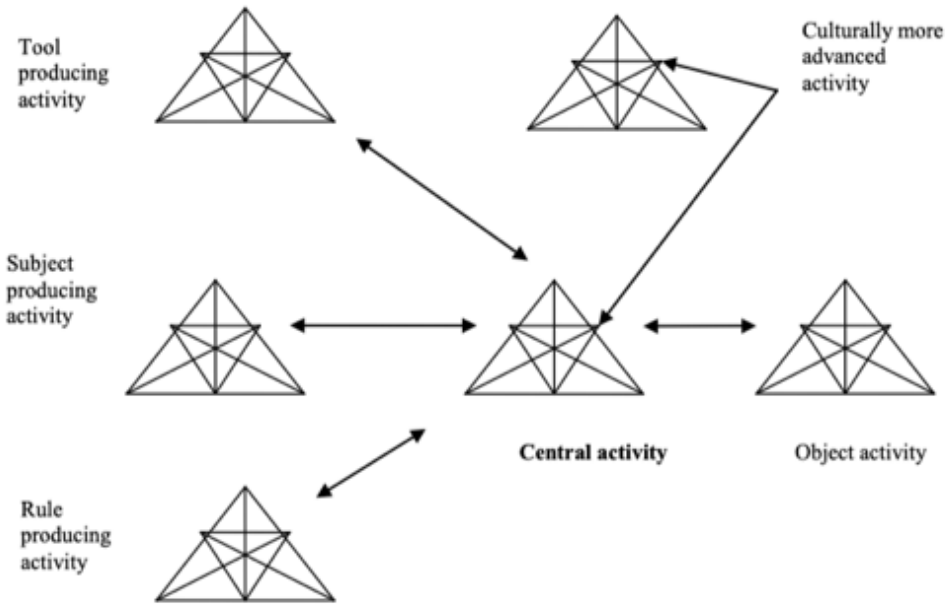


Figure 3: Third generation activity theory: Idealised network of activity systems (adapted from Engeström, 1987, p. 89)

In simple terms this means that problems in CBWQM activity (e.g. the lack of scaling capacity in CBWQM communities) cannot be resolved by good ideas only or the possibility of a process of 'thesis, antithesis and synthesis' in which the new idea as a form of synthesis has resolved the contradiction. It means that new good ideas need to be constructed out of engagement with the existing way that things are located in the social, economic and environmental realities of human activity (i.e. the socio-material reality of CBWQM activity). They then need to be further expanded, co-created, learned, implemented and evaluated via a dialectical process of social and material emergence and expansion of learning and changed activity over time in response to

immanent contradictions that arise in the activity itself, and that involve the diversity of activity systems that are engaged with the shared object of scaling CBWQM activity over time.

Co-learning or expansive learning emergent from such contradictions is necessary for an expanded form of activity to emerge. Hence expansive learning that is based in a socio-material dialectic of contradiction and absence (what is problematic and not there yet) and emergence (what can come into being) is a necessary foundational perspective for the emergence of transformative praxis (De Sousa Santos, 2014; Bhaskar, 1993). De Sousa Santos (2014) also argued that such a process should include a diversity of knowledges in what he refers to as a grounded sociological process of emergence involving an explicitly embraced approach to recognising and working with an ecology of knowledges (i.e. not simply the dominant often hegemonic knowledge forms that circulate in policy, science and modern institution contexts) – an aspect that Vallabh (in press) and Madiba (in press) have both identified as being critical to a transformative approach to CBWQM praxis in South Africa.

In this dialectical space which is always spatially and temporally bound, three dimensions of the object expansion can be observed (adapted from Engeström, 2020):

- **Socio-spatial dimension:** Which actors are involved? Does the actor configuration change and expand? Do actors' commitments to the transforming activity shift and expand in scope and contribution? What is the scope of involvement in relation to the scope and scale of the required activity (e.g. scope and scale of water quality problems in South Africa and scope of communities and partners involved?)
- **Temporal dimension:** How far into the future and into the past does the object reach? Is the activity sustainable and well supported in the longer term?
- **Ethical-political dimension:** What are the consequences? Who benefits? Who takes responsibility? How are injustices resolved? Whose knowledge(s) and practices are recognised and included? Are policy enactments realised in ways that resolve real contradictions?

In the context of our interest in CBWQM, namely action-oriented research for scaling CBWQM praxis in South Africa, these are all in themselves dimensions of 'scaling' or what Engeström would more accurately describe as expansions of the object via generative expansive learning processes which include concept formation that ascends from the abstract to the concrete and which then manifests as realised changes in the object of activity over time, observed via the expansions noted above.

Relevant to our commitment to an action-oriented research approach, as Ward (in press) outlines, is the insight that:

> *Illenykov noted that the goal of the dialectical method lies in "tracing, through analysis of new empirical materials, the emergence of reality in which an earlier established contradiction finds its relative resolution in a new objective form of its realisation" (Ilyenkov, 1960/ 1982, p 198). As we will see, it is this process of relative resolution of contradictions that leads to concept formation and movement. A process that Marx (1859/ 1973) described as moving from the abstract to the concrete. And it is in this sense that the dialectic can be described as a 'loosener', a learning process (Bhaskar & Hartwig, 2016, p. 122), expansionary (Harvey, 2010, p. 62) and the source of movement and change. (Sannino & Engeström, 2018, p. 49)*

Contradiction within the dialectical method is very clearly an inner contradiction within a unified whole. In our case, we are dealing with the contradiction between a policy imperative, and its (non) execution in practice while there is a dire need for community involvement in IWQM. These dimensions of the contradiction are therefore part of the same whole. This contradiction cannot be treated as a paradox where the contradictory elements are

perceived or portrayed as distinct and irreconcilable and thus best managed through acceptance and separation/ synergy or dualism (cf. Ward, in press; Bhaskar, 1998). They are connected internally and can therefore be engaged and resolved – or at least partially resolved – through co-engaged learning and expansion of the object of activity amongst people who are involved in or should be more involved in the shared object of activity. It is this that the action-oriented research in this project sought to generatively catalyse. Actively embracing, surfacing, interrogating and seeking to resolve contradictions, in this case the policy-practice contradiction that led to this project, is therefore a potentially productive way forward to resolving societal challenges, as noted below:

> *Contradiction is not in this case an insurmountable barrier in the way of the movement of the investigating thought but, on the contrary, a springboard for a decisive leap forward in a concrete investigation, in further processing of empirical data into concepts. But this leap, characteristic of the dialectical development of concepts, only becomes possible because contradiction appears in reasoning always as a real problem, the solution of which is attained through further concrete analysis of concrete facts, through finding those real mediating links through which the contradiction is resolved in reality. (Ilyenkov, 1960, p. 189, cited in Ward, in press)*

The expansive learning process offered by Engeström and Sannino (outlined in Figure 2 above) offered a broad methodological approach to this scaling research. It is not dissimilar to the scaling research framework of the SWEDESD RE-SOLVE approach to scaling, and embraces the recommendation by Micklesson, Kronlid and Lotz-Sisitka (2019) that views scaling as a collective learning process over time and builds on findings from the International Science Council research on T-learning (Lotz-Sisitka et al., 2019).

CHAPTER 2: UNDERSTANDING CBWQM PRACTICE IN SOUTH AFRICA (Questioning)

2.1 Collective concept clarification – the meaning(s) of CBWQM in South Africa

In this action-oriented research process we gave careful attention to *concepts and activity and the relation between them* as both are central to the way in which the scaling research unfolded. We realised it would be necessary to fully understand the meaning(s) of CBWQM in South Africa in order to develop a proper action-oriented approach to the research. We did not approach this academically, but also pragmatically from the contexts of practice where the research originated. In this section we report briefly on the some of the concept clarification that was involved in coming to understand the meaning(s) of scaling of CBWQM activity *in emerging reflection and praxis* through this action-oriented research, noting that this is still an ongoing process of emergence; in other words our understanding of CBWQM will change as the practice itself evolves.

2.1.1 Initial concept clarification: Basic terms and collective meaning(s)

In setting up the project, we started by seeking to co-define collective understanding of the concepts used in the project, with the understanding that these would expand and become enriched via the action-oriented process as they 'ascended' from the abstract to the concrete via the scaling praxis that formed the focus of the research.

Initially, we defined the following framing concepts to guide the first phase of questioning in the expansive action-oriented scaling research process:

- **Citizenship** and hence also the term **citizen** in the context of this project refers not only to a legal status but also to a normative ideal – that the governed should be full and equal participants in the political process. As such it is a distinctly democratic ideal and the intention of this project is that democratic processes surrounding water monitoring should be further enhanced or deepened. In the policy review (Deliverable 4), this understanding was confirmed and extended to include a notion of radical democracy in which governance *with* the people was framed as being a guiding notion for resolving the CBWQM contradiction in focus in this action-oriented study.

- **Citizen-based** in the context of this project signals that citizens take a lead role in the development and implementation of the projects. This does not exclude partnerships with government or business, in fact it encourages partnerships, but the citizens or community members must remain a driving force in the project/ process development. They are the 'central activity system' in the interrelated third generation activity system framework (Figure 3); their well-being also formed the focus of the social-ecological justice principles that came to inform and shape the study as it progressed (e.g. through the logics of mobilising resources for CBWQM praxis and jobs for those most marginalised in the praxis).

- **Citizen science** (CS) is described as a form of community participation in scientific investigations – seeking answers, collecting data or analysing results (Miller-Rushing *et al.,* 2012; Tweddle *et al.,* 2012). Citizen science can vary from a research technique that enlists the help of members of the public to gather scientific data, what Bonney *et al.* (2009) described as contributory citizen science, to co-created citizen science. Haklay (2013) described the latter as "a bottom-up practice that takes into account local needs, practices and culture and works with broad networks of people to design and build new devices and knowledge processes that can transform the world". It is this latter understanding of citizen science, expanded via a

strong commitment to the ethical-political expansion dynamics outlined above, that the project sought to support and scale.

- **Water quality monitoring:** While it is recognised that water quality, quantity and access are important, it was agreed that this project would focus on water quality monitoring. The intention was that this would help to contain the scope of the project. Having said this, where possible, the project also had potential to consider and address issues beyond water quality monitoring, such as enhanced supply of water through catchment management or demand management such as leak detection by community members. The broader term 'water management' is occasionally used to acknowledge this broader focus where appropriate. In the latter stages of the action-oriented research process, strong connections were also being made with the Ecological Infrastructure for Water Security (EI4WS) programme, showing potential expansion within this wider framing of water quality management in South Africa.

As the research progressed, these core concepts were elaborated, with further qualification and expansion. For example, relatively early on – in the questioning phase of the research – we identified that,

- **Integration** can be interpreted at a number of levels and in a number of different ways. The most obvious of these are in the IWQM policy itself. These emphasise integration of mandates across government departments insofar as there is need to collaborate on enabling IWQM praxis and outcomes, and integration of roles and responsibilities for IWQM amongst government, business and civil society stakeholders. There is also the social and ecological that are integrated in IWQM, as well as the past, present and future of water in South Africa. Within IWQM, science and management practice are also integrated, especially within an adaptive, systems-oriented management paradigm as is promoted in the DWS (2017a, b, c) policy framework. With the emphasis on citizen monitoring, there is also an implied integration of science and local action or local politics, of facts and values, and diverse forms of knowledge. Ultimately, one can also see that citizen science action, if integrated with appropriate management actions in more integrated ways, can also help with integration of human rights, ethics, dignity and deep democracy into society. *For the scaling research, we asked which of these we should focus on when using the concept of 'CBWQM within the wider notion of IWQM'?*

- **Participation** is also a key concept to be probed more carefully in the framing of citizen science praxis. Participation can manifest in manipulation or can lead to delegated power, citizen-led control, active or less active forms of engagement and so on. Here much has been written on the 'tyranny' of participation, and in environmental education there is a considerable amount of work on participation as a process of learning-led change and engagement that can be considered as foundational to collective agency development and social change processes. In this research, we extended the notion of participation to include a focus on participation in water governance.
- **Scaling** can also have different meanings in terms of the scope and focus of scaling praxis. For example, one can scale CS practice to strengthen existing communities of practice, or one can scale CS practice to build social networks of co-operating communities of practice, or more widely to establish interacting social networks linking communities of practice in wider landscapes of practice or catchments. There is also the question of whether there are geographical priority areas for scaling of CS practices (i.e. some catchments that are more critically in need of CS engagement than others in IWQM?) or is this self-determining? Can CS communities of practice be 'cultivated', or do they form naturally in response to matters of concern and levels of existing empowerment and intervention? In this action-oriented research we expanded the notion of scaling by differentiating between depth and breadth scaling, and horizontal and vertical scaling.

- **'Citizen'** can also be interpreted in different ways. Mahmood Mamdani (2018) famously wrote a book on 'Citizen and Subject' noting that for the past few hundred years, most African people have been 'subjects' rather than citizens in their own countries. His work raises the question of what is meant by citizen, and how such a role is to be conceptualised and taken up. In the context of water in South Africa, there are a number of different ways that citizens may see themselves, or experience their engagement with and participation in citizen science projects and associated matters of concern. These could be in the experience of being an affected citizen; a hopeful citizen; an angry citizen; a marginalised citizen; a citizen affected by inequalities; a young citizen in need of quality education, learning pathways, jobs and opportunities to flourish; and water stressed citizens. All of us are citizens in need of clean water and decent living conditions, comrades of the earth and the water we use. The implication of this for the scaling research is that we needed to develop a better understanding of who was participating in citizen science programmes and what interests were driving them to do so. Additionally, there is need to be careful of over-emphasising one modality of citizen science (e.g. volunteerism) over other modalities of citizen science (e.g. community-based employment) as also pointed out in Madiba's (in press) research. Importantly, understanding citizen's participation interests has consequences for the way in which citizen science practice is developed and scaled, ultimately also shaping the type of citizen science that is foregrounded and practised (e.g. single variable monitoring for a specific technical interest or purpose, public regulation, public education, public engagement, participatory governance, deliberative democracy or more). Each of these diverse purposes of citizen science can be seen in relation to the participation interests of citizens in citizen science projects or programmes. How this is shaped on the ground has implications for the scaling of CS praxis, as our action-oriented research also revealed.

- **'Citizen science'** also has diverse meanings. A tracking of the mainstream literature on citizen science shows two divergent literatures, and streams of articulating citizen science (Vallabh, in press). These are captured briefly in Figure 4 below.

Figure 4: Two divergent conceptualisations of citizen science in the literature

  - **Citizen science literature** (Vallabh, in press) variously emphasises citizen science as tools, citizen science as movement, and citizen science as social capability. Figure 5 below provides a synthesis of the terms and concepts that mark out this shift in emphasis, meaning, politics and intention associated with citizen sciences praxis:

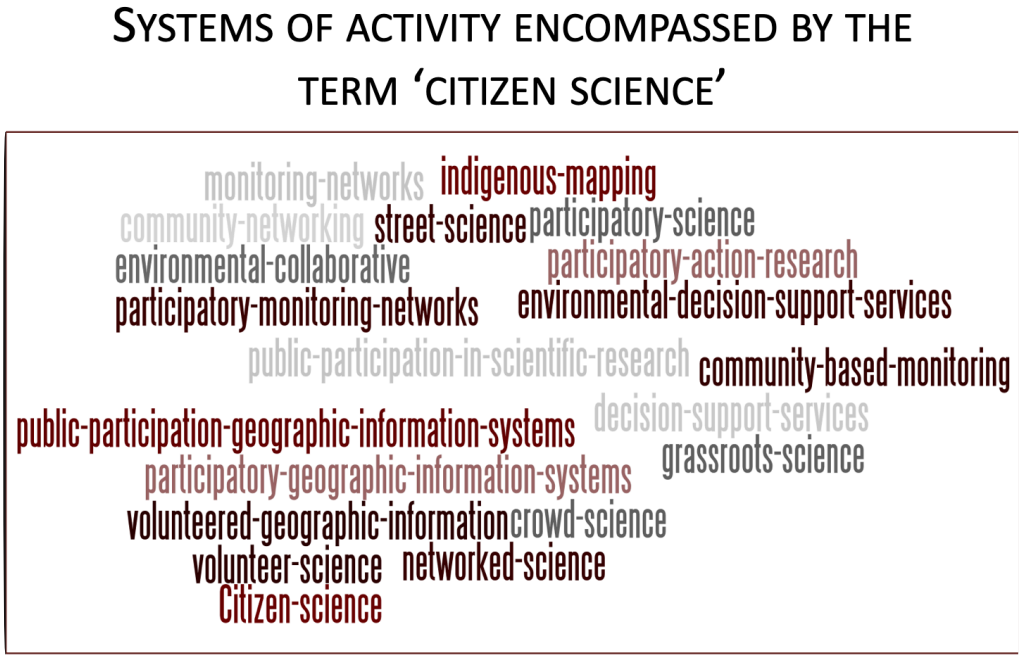


Figure 5: A shifting conceptual and political landscape within citizen science practice

The latter discussion has significant implications for the scaling of citizen science as use of tools for specific monitoring activities is related to, but different from, scaling of citizen science as social capability for water governance, use, access, distribution and management. For the scaling research, it is therefore important to define the conceptual framework guiding the notion of scaling of CS, as indicated in the brief exploratory engagement with some of the significant concepts guiding citizen science and its potential scaling. In this action-oriented research we extended the emphasis on citizen sciences to a decolonial, democratic practice (see Chapter 3 below, Vallabh, in press; Madiba, in press).

2.2 National review of CBWQM: Identification of best practices in CBWQM and mechanisms influencing scaling of CBWQM

2.2.1 First engagement with national stakeholders – questionnaire data and case study identification and analysis to produce 'mirror data' for the next phases of the action-oriented research

Out of our first engagement with national CBWQM stakeholders, we provided an **initial scoping** and **review** of existing CBWQM initiatives in South Africa, with the intention of identifying best practices to enhance the capacity of existing and new initiatives in order to contribute to national and international commitments. In line with expansive learning research and the intentions of Learning Action 1 (Questioning), this initial review was produced to provide 'mirror data '[i.e. synthesis information for further engagement] that informed ongoing field research and co-engagement with CBWQM projects and stakeholders as will be reported on in Learning Actions 2, 3 and 4 below.

This phase of the research involved the following methodological processes:

1. **Database development**, which involved consultative interaction with stakeholders to confirm and extend an initial database of CBWQM stakeholders in South Africa. Initially 21 groups were approached, which led to an expanded list of 64 stakeholders. A key finding from the expanding database activity indicated that there are a number of local level, small-scale 'Friends' groups that focus on local level data and river clean-ups and that these are an important dynamic of CBWQM activity in South Africa. This 'smaller scale' level of activity has not attracted either researchers or investments in evaluation in CBWQM praxis, hence they were not initially visible in the main database construction for CBWQM praxis in South Africa. Their 'invisibility' leads to a lack of recording of these activities within the wider CBWQM context nationally, and thus fails to recognise them as important actors that need to be included in CBWQM policy and strategy. These stakeholders were subsequently included in the expanding database and were involved in the action-oriented research programme where possible.[6]

2. **Design and testing of an online project review tool,** which involved development of a *Question-based CBWQM Project Review Tool*[7] that could be used by CBWQM projects. This was tested by entering information about ten different CBWQM projects. The first version of the question-based project review tool produced a more in-depth dataset of these ten projects, seven of which were selected for further analysis. The online review tool was refined after its initial use, and the project team continued to use it throughout the programme to elicit further data on CBWQM projects. By the time of the final report, the online review tool had captured data from 31 projects, of which 22 (71%) were still active, and 9 (29%) were completed. Twenty of the participating groups who completed the online question-based project review tool agreed to contribute to the ongoing CBWQM research as shown in Figure 6 below and were subsequently included in the follow-up phases of the research. This helped to verify and confirm the need for the CBWQM action-oriented research. The full set of data in the 31 responses is being further analysed by Sithole in her Master's research focusing on capacity building as a scaling mechanism for CBWQM projects (Sithole, in press).

The online question-based project review tool is a useful tool for expanding participation in the scaling of CBWQM in South Africa and should be iteratively used in the next phases of CBWQM scaling practice in South Africa (see recommendations in Chapter 6). It can also be usefully applied in an ongoing evaluative way for CBWQM praxis in South Africa and should be included in the 'tool set 'of CBWQM scaling praxis going forward.

[6] A link to the Living Database can be found here: https://docs.google.com/spreadsheets/d/1ozqeNp6v-u7HSbdh9TdGmJB5EgqYY-olwNG7Oxv6tsM/edit#gid=0

[7] Link to Online Project Review Tool**:** https://goo.gl/forms/pcZY54cKdhxrZ0432 . Deliverable 3 of this project offers further insight into the online review tool and its use, and provides a full example of a completed online review tool with questions indicated.

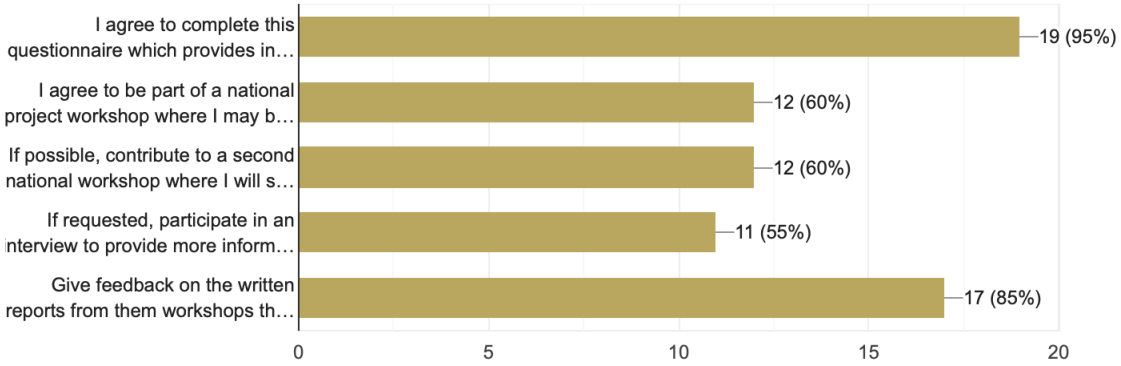


Figure 6: Willingness to participate in the CBWQM action-oriented research amongst the CBWQM practice community

3. **Development of initial analytical framework for scaling of CBWQM praxis in South Africa:** Initial analysis of data from the Online Project Review Tool pointed to a range of areas that required more depth of focus and analysis. Box 1 below summarises the initial analysis of the questionnaire data, and Figure 7 provides an overview of the initial scaling framework developed to guide the research process.

BOX 1: INITIAL ANALYSIS OF THE ONLINE REVIEW TOOL DATA

Policy engagement

Of the ten projects captured via the questionnaire, there was a mix of policy engagement, which included local, provincial, national and international policy engagement processes. Many of the projects are aligning to the Sustainable Development Goals, especially SDG 6 (Clean water and sanitation) and 14 (Life below water) (UN, 2015). From a national policy perspective, the National Water Act of 1998 (RSA, 1998), the National Water Resources Strategy II of 2012 (DWS, 2013), and the more recent National Integrated Water Quality Management Policy, Strategy and Implementation Plan of 2017 (DWS, 2017) appeared to be guiding projects. At provincial level, the Provincial Growth and Development Strategies (PGDS) appeared to be a key influence. At the local level, municipal Integrated Development Plans (IDPs) were an important policy focus. In some cases, Catchment Management Authority (CMA) strategy also influences praxis such as in the case of the Breede-Gouritz CMA. Those projects working with schools focused on the Curriculum and Assessment Policy Statements (CAPS) of the Department of Basic Education (2012), with citizen science activities aligning with curriculum content of Grade 6 Natural Science, Grade 6 and 7 Life Orientation, Grade 6 Life Sciences and Social Science.

The projects addressed policy in three ways: 1) through helping with monitoring (e.g. through the River Health Index), 2) through offering an enabling environment for people in leadership positions to address and meet the policy requirements of legislation, and 3) through holding and assisting local and national government to be more accountable for compliance monitoring.

Partnership structures

In almost all cases reported, CBWQM projects involve a range of diverse partner organisations who are collaborating to support community participation in water quality monitoring and management. Depending on the scope and scale of the project, one finds different levels of government support. For example, national projects tend to have stronger government support, while local projects at times have local government support, but this is not always the case. In most partnership configurations one finds environmental or water justice NGOs. In a few cases, the CBWQM projects are supported by wider structures that are mediating more sustainable systems of integrated water stewardship (e.g. in uMngeni and Berg River Catchments) where a range of powerful actors at regional level are coordinating more integrated partnership arrangements in which the CBWQM activities are located and supported.

Involvement of citizens

The projects all have different types of involvement of citizens. In some cases, CBQWM participants are employed, mainly with community works programme funding where they work in clusters normally with NGO or other support, to mobilise other community members to participate in CBQWM via structured programmes. The Enviro Champ model is gaining popularity as a means of creating both employment for CBQWM volunteers and for mobilising wider participation. In other cases, the CBQWM participants are volunteers who are engaged in more ad hoc CBQWM activities such as river clean-ups. In such situations, participation is often coordinated by NGO groups or research groups / academic organisations who facilitate participation and mediation of the CBQWM groups. Most often this is funding dependent, and can therefore 'disappear' or 'drizzle out' when the funding ends. Overall, for both the more formally employed and the voluntary initiatives, consistent and secure funding for CBWQM is a significant problem affecting practice.

Involvement of citizens also needs to be properly considered. As reflected by one NGO director, failure to do so can create problems for the citizens who are participating in the project in that a) their expectations of change may not be met as the routes for sharing the data may not be in place or functional, and b) sometimes the types of water quality tests required are incredibly complex and expensive (e.g. testing for heavy metals), and without adequate scientific equipment and resources the diagnosis could be incorrect and could therefore show communities in a poor light. There are therefore dangers embedded in skilling communities to participate in CBWQM projects unless there is adequate and sustainable support for the process, and unless there is adequate means of sharing the data into systems that do actually influence decision-making and change processes. It is important therefore that there are viable routes for reporting, so that communities involved in CBWQM can "see where the data goes". Thus, CBWQM projects need to be adequately embedded in viable and responsive governance frameworks with adequate political economies of support.

What projects do on the ground

The CBWQM projects are involved in a range of activities. Importantly, in most cases these include both **technical monitoring and management actions** to improve water quality, as well as **social learning interactions** that motivate, educate and empower people to become part of the process. The projects also involve **communication actions** to share results and engage authorities and the public in environmental risk management.

Some of the **technical monitoring and management actions** include clearing and monitoring of sewer lines, testing of water quality and reporting data to authorities, river clean-ups, removal of waste to avoid blocking of sewer lines and systems.

Communication actions: Communication actions range from 'live data' strategies where data collection is via a GIS process that is recorded in the Google Cloud using adapted GeoODK (Object Driven Knowledge) cell phone technology. At each siting social, numerical or spatial data is recorded to GIS coordinates using a smartphone. Youth clubs and other networking engagements are also important communication approaches, as is engagement of local media (local radio, and community newspapers). Their support often motivates and helps to expand participation in the CBWQM projects.

Some of the social learning approaches involve participating in training and leadership workshops and field-based monitoring activities, door-to-door engagement with community members, drama and street theatre, and projects involving schools and church organisations. Other strategies include use of face-to-face community workshops, or more sophisticated virtual workshops to share biomonitoring approaches. Fieldwork activities are core to the type of social learning and capacity building necessary for CBWQM so that participants can develop familiarity with the monitoring tools and learn how to use them at a practical level. For example, during such fieldwork people do a simple bio-monitoring test, known as miniSASS, in a natural river or stream and see if they can find macro-invertebrates (water insects that are indicative of pollution or water clarity). A simple dichotomous key is provided to identify insects that have been found. Based on the suite of insects identified a River Health score can be developed and loaded onto a Google Earth plane where the data is verified by GroundTruth. Participating in accredited training is also an important enabling strategy for social learning as it allows for continuity over time, and increased sophistication and expansive knowledge and action competence over time.

Innovations

Innovations in the CBWQM system were reported along three dimensions:

1. Innovations associated with the CBWQM tools, particularly in relation to expanding the scope of CBWQM tools, expanding the functionality and reach of the tools via Internet-based technologies (e.g. GIS and heatmapping); and innovations;
2. Innovations associated with social mobilisation, e.g. networking structures, partnership formations and ways of engaging participation (e.g. via street theatre approaches);
3. Innovations associated with the alignment between CBWQM and job creation opportunities, especially for entry level jobs. An example here is the SMME development of basic plumbing, education and possibly recycling activities into income-generating streams for the WWS in the Western Cape.

Learning and capacity building

There was a strong view that learning and capacity building was most effective when learning was situated in social context, and where it included fieldwork approaches and work-based learning approaches. Social learning approaches that engage a range of different actors who can learn from each other and the findings of the citizen sciences practice were also noted as being both useful and important. The role of leadership in facilitating and supporting co-learning was also noted.

Tools and processes for evaluation were also identified as being helpful in furthering learning and capacity building. Some examples mentioned were using SDGs as a lens to evaluate the CBWQM project, appreciative enquiries, and documenting most significant changes via authentic stories of change. Realist, depth evaluation methodologies are also helpful as they help to identify the more complex dynamics and underlying shaping factors of projects.

Another dimension of the learning and capacity building mentioned was the need for careful deliberation about issues. For example, when misunderstandings occur, e.g. "*Many people believed, for example, that they would die if they touched the body of someone who had died of cholera. Such assumptions and myths were addressed through careful learning processes*".

Tools and models that can be applied across a range of contexts, such as the miniSASS citizen science technique which "*can function in virtually all perennial rivers in the world including at over 4000 metres above sea-level"* were noted as being enabling of learning, and cross-site knowledge exchange. In an interesting development, the United Nations Committee responsible for developing indicators for SDG 6 approached our research team and requested support in terms of developing miniSASS as a research methodology in support of SDG 6.3.2. This has considerable implications for scaling as miniSASS has now become a recommended level 2 indicator for the SDGs in each country of the world. The concept is included in the UN Water Manual 2021. The manual recommends the miniSASS for the SDGs, Target 6.3, as a level 2 indicator, as well as for SDG 6b.

To explore this concept and further refine it, a joint paper has been written with the UN committee members led by Dr Jim Taylor. Means and approaches of easily sharing and generating data were also identified as being important for ongoing learning and capacity development. The article, *Social change innovations, citizen science, miniSASS and the SDGs* has recently been published in *Water Policy* journal.

Besides the emphasis on approaches to learning, and the role of tools in mediating and supporting the learning, there was also mention of other dimensions of learning and the relationship between learning and change, such as the importance of giving attention to confidence building and mutual trust development which can be enabled by "a positive and supportive ethos".

The roles of different actors and approaches in the learning process were also mentioned, e.g. "*The main learning activities were enacted through the water boards. These involved: school-based activities (including drama, clean-ups and other water and sanitation-related engagements, and miniSASS monitoring); community workshops (including water*

education activities – sometimes through street theatre, learning about civic rights, and improving sanitation practices); celebration of special environmental days and events."

There was also mention of different types of capacity development that have been successful, e.g. *"Training and implementation of community education and awareness (knowledge building 'door-to-door' intervention, street theatre/drama-schools educational awareness tool), training for Emerging Leaders, Basic Financial Management, Natural Resource Management (water quality measuring, leak and sewer spill monitoring)."*

Importantly, there was also mention of learning across different CBWQM projects and programmes. Evaluation reports and project reports were further helpful for co-learning across projects, e.g. *"The WWS have had extensive peer-to-peer learning from exchange experiences with other Enviro-Champ nodes from KZN and training from external partners such as DUCT and GroundTruth/i4Water".*

Enablements and constraints

A number of **constraining factors** were reported. These included a range of different types of constraints related to:

- **Practical issues** such as availability and access to adequate tools and resources for monitoring of water quality, and the challenges associated with the monitoring and reporting processes, including technological challenges, e.g. "*Many organisations involved in learning about water quality favour 'grab' sampling and are unaware of the power and advantages of biomonitoring"* and "*As the project grows the verification time is proving more and more time-consuming and costly. A government entity needs to be found to carry the costs of hosting the website, updating it and supporting the verification processes"* and *"Technological limitations – in terms of capturing data".*

- **Practical support for participation,** especially for volunteers who are also unemployed and who therefore don't have personal resources to support their participation in CBWQM, e.g. *"Volunteers struggled with transport and mobile airtime. A small stipend was finally secured, but was still inadequate to provide a sustainable income for the small team of almost full-time volunteers"* and *"Challenge to find funders to provide stipends to participants to build regular and reliable participation in activities."*

- **Practical support for planning and ongoing management** of the CBWQM projects, e.g. *"Lack of funding at the start of the project was an issue. Lack of capacity to manage funding became a significant issue towards the end of the project. The core team did not have the capacity to manage donor funding, which eventually led to mis-management, withdrawal of funding and termination of the project"* and *"Lack of a local project coordinator / senior volunteer to support the WWS on a full-time basis*" and "*Internal conflict within the WWS Lack of an on-site (full-time, local) professional Project Manager to support the nodes and co-ordinate daily activities especially at implementation start-up, hence momentum rests with WWF-supported occasional input, which is provided from a distance and only has means for periodic engagements. The challenge related to coordinating ongoing funding, financial and administrative oversight."*

- **Practical support for longer term coordination and sustainability** of CBWQM projects, e.g. *"It has not yet been possible to transition the group from being a volunteer-based group to being one where the groups are paid for the work they do. There are implementation challenges to effecting this transition, including the need for initial capital, project management, and capacity development. Lack of a sustainable funding strategy for operational and training needs (basic plumbing, SMME development), and continuous provision of incentives (e.g. airtime allowance, field trips), etc.*"

- **Institutional issues** such as municipal bureaucracy, political support and delays in project management, time constraints and availability of funding, e.g. "*Time constraints for people in leadership positions are always evident*", "*Funding for WESSA staff to conduct the training is always an issue"* and *"Funding can be a bit ad hoc"*, *"Gaining municipal buy-in", "Co-operative relationship with local municipality*".

- **Capacity issues**, related to know-how and adequate support for implementing new approaches to involving citizens and learners in field-based approaches to monitoring, e.g. "*The project was difficult for the teachers to integrate it into the daily activities of the classroom lessons, since it is perceived as an extra activity outside of the curriculum. The*

project could have worked had it had the follow-up and monitoring strategies", and "*Scientific capacity – citizen scientists skills level and scientific background and experience. Lack of suitable or sufficient support resources for citizen scientists*".

- **Wider ideological assumptions** about how change occurs, e.g. *"The assumption is often made that people must be made aware (informed) so that they will change. Our research and experience showed that without co-engaged learning that worked from the participants' living experience (mobilising their prior knowledge and understanding) little long-term social change would occur."*

- ***Tensions between participating groups.*** There were also cases reported where tensions between participating groups had created problems of continuity and trust amongst partners. These are very real and can have a big impact, especially on smaller projects that are heavily reliant on mutually supportive relationships and trust for the efficacy of the interventions.

The questionnaire data offered little in the way of understanding the *enabling* factors, as most emphasis was placed on the reporting on *constraining factors* as noted above.

Expanding projects

The following dimensions of strategies to expand projects were noted:

- **Communication and use of a diversity of means of communication and communication tools,** e.g. *"Although the project has been documented and researched the two-minute U-Tube style videos (designed to be smart-phone friendly) proved very helpful in sharing the orientations" … "Facebook has also proved a useful sharing mechanism*".

- Further need for **expanding interactions to new and influential stakeholder groups,** e.g. "*This work, including the innovations ..., needs to be shared through the CoGTA capacity building workshops that are offered to municipalities country-wide*". Unlearning superficial or unfounded assumptions about social change seems to also be very important if this knowledge is to be shared more widely.

- **Motivation and enthusiasm** (i.e. positive human interaction) were identified as being crucial for expanding CBWQM engagement and interest, e.g. *"Human enthusiasm is key. Ideally we need staff and enthusiasts (warm bodies with experience) working, trialling and experimenting with such techniques".*

- **Resource materials** and funding for resource materials development and management were seen to be a very important means of helping the projects to be shared and expanded, e.g. "*The project team is currently writing system-based learning resource materials and developing an exhibition which will be shared in various parts of the world. Much awareness will be created but it is necessary for applied and situated processes, in the field, if the ideas and approaches are likely to spread*" … and there is need … "*To fund the database and website management as well as the verification processes".*

Through this data synthesis of the ten initial project reviews (Box 1), and initial scoping of the CBWQM projects in this questioning phase of the research, a number of important **scaling mechanisms that can be explored for expansive learning along scaling pathways were identified**. These were then used to develop an analytical framework to support deeper probing of the case studies (see Figure 7). This provided a means of deepening understandings of best practice, while also identifying possibilities for expansive learning, improved support, capacity building, and viable scaling pathways. This process was crucial for the mirror data production that was then used in further co-engaged action-oriented research.

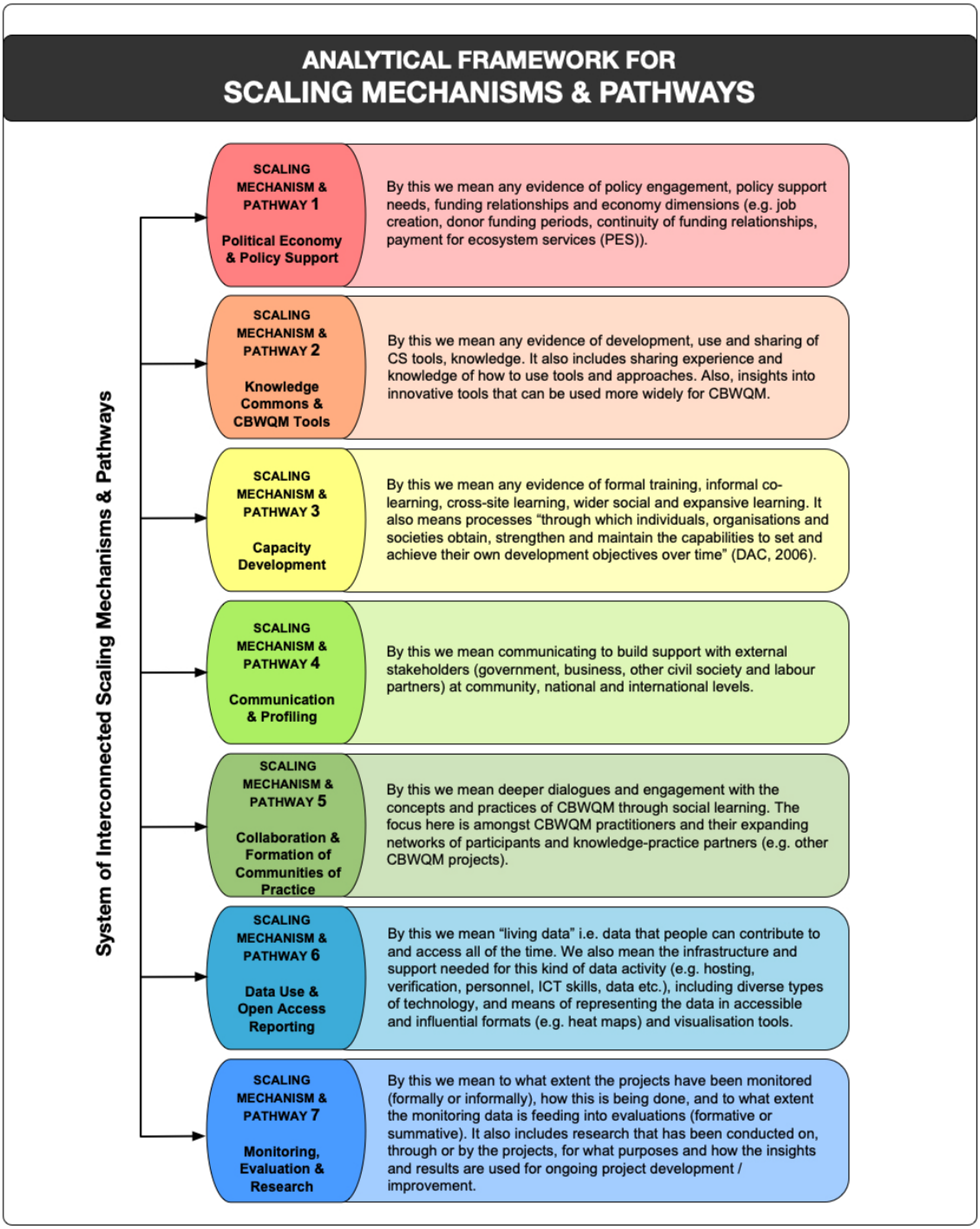


Figure 7: Initial Analytical Framework for CBWQM Scaling Mechanisms and Pathways

4. **Document analysis and review of selected case studies:** The process reported on above then informed the next phase of questioning and mirror data production analysis, which we constituted as a more in-depth analysis of a selection of seven case studies, carefully selected as best practice case studies for their relevance and potential to provide insight into the overall objectives of the project. The case studies were selected for their diversity and coverage of a range of different types of CBWQM projects. *An important finding here was that CBWQM projects in South Africa tend to involve multi-actors / and are configured via a complex and diverse range of partnership configurations (see Box 2 below), which are differentiated by a diversity of governance, leadership and partnership interactions and alliances which are all possible starting points for*

enabling CBWQM projects and programmes. These are important for the scaling pathways and also for the expansion of CBWQM projects in the context of IWQM policy. At this point of the action-oriented research, we identified seven main *types of CBWQM multi-actor partnership projects* (Box 2 below):

BOX 2: **DIVERSITY OF TYPES OF CBWQM PARTNERSHIP CONFIGURATIONS (with case studies selected for review according to this finding – cf. Appendix A)**

NATIONAL NGO AND SOCIAL MOVEMENT ALLIANCE
National organisation water activism programme located within a national water social movement
Case 1: Environmental Monitoring Group (EMG) / South African Water Caucus (national, but with focus on Vaal, Gauteng and Limpopo)

CIVIL SOCIETY LED MULTI-STAKEHOLDER PARTNERSHIP
Innovative local civil society driven projects (with multi-actor support)
Case 2: Mpophomeni Enviro Champs (KZN)

NATIONAL GOVERNANCE
National level CBWQM project (with strong government support)
Case 3: Adopt-a-River (CSIR, DWA)

CORPORATE SOCIAL INVESTMENT LED PARTNERSHIPS
Case 4: Wise Wayz Water Care (AECI, KZN)

ACADEMIC INSTITUTION AND NGO ALLIANCE LED CIVIL SOCIETY PARTNERSHIP
Case 5: Khulumani Water for Dignity Project (Rhodes University / Khulumani, Eastern Cape)

LOCAL GOVERNMENT LEADERSHIP FOR MULTI-STAKEHOLDER ENGAGEMENT
CBWQM projects led or initiated by local governments
Case 6: Municipal Services Unit (MSU) project (Pietermaritzburg, EC)

NATIONAL NGO – GOVERNMENT DIALOGUE (mainly provincial)
National CBWQM leadership dialogue (focus on governance mobilisation)
Case 7: Wildlife and Environment Society of South Africa (WESSA) Leadership Dialogues (KZN Provincial)

Best Practice cases were selected for review according to these diverse systems of governance, alliance formation and partnership structuring. We found that this way of articulating the cases would assist in illustrating the diversity of CBWQM formations in South Africa, and would also align with our wider interest in policy engagement. We reasoned that using the same framework for analysing the scaling mechanisms and pathways across this diversity of CBWQM alliance structuring would provide the best 'full coverage 'of the scope of CBQWM projects operating at present in the country. This could also provide insights into the diversity of dynamics associated with the notion of 'scaling pathways 'and help to identify those elements that might be most usefully 'scaled 'or expanded. An extensive analysis of the seven case studies is contained in Deliverable 4. In each case 1) a rationale for choosing the case, 2) data sources used for the case study review, 3) and a detailed analysis of the case drawing on the 7 scaling pathways identified in Figure 7 above was undertaken, and from this 4) a synthesis of key dimensions relevant for the 2019 scaling workshop was articulated (Box 3 below offers one example of a case analysis – cf. Appendix A for further examples).

BOX 3: **EXAMPLE OF A CASE STUDY REVIEW**

Mpophomeni Enviro Champs – KZN

Rationale for choosing the case

The township of Mpophomeni has a legacy of apartheid planning and poor infrastructure. It is situated in the uMngeni catchment that supplies water to numerous major towns and cities including Howick, Pietermaritzburg, Pinetown and Durban. Due to poor service delivery, such as sanitation and waste management, residents of Mpophomeni have had to struggle with spilling sewer manholes and solid waste issues for many years. Figure 8 illustrates issues being dealt with in this community. It was estimated in 2014 that while Mpophomeni constituted 3% of Midmar Dam's catchment, it contributed 51% of the *E.coli* and 15% of the phosphorus load in Midmar. This nutrient loading, along with agricultural runoff in the catchment and nutrients being introduced through the Mooi River inter-basin transfer scheme, is raising concerns about the water quality in one of the country's most important dams. The combination of internal quality of life issues for the community and external impacts on an important water source stimulated the formation and support of a number of community initiatives, including the Enviro Champs. The work of the Enviro Champs has become well known both nationally and internationally and has featured in a number of studies, in TV programmes and conferences. In addition, the Enviro Champs have supported community groups in other parts of the country to establish and enhance community-based water quality management initiatives.

Data sources

Main documents and literature reviewed:

- Dent, M. and Taylor, L. (2017). *Strategic developments that will support and strengthen the participation of local communities in improving water and sanitation management in South Africa.* Unpublished paper.
- Kolbe, A. (2014). *Citizen Science and Water Quality in the uMngeni Catchment Area, KwaZulu-Natal, South Africa*. Master's thesis, Queen's University, Canada.
- Ward, M. (2016). *Review of the Enviro Champs Project in Mpophomeni*. Hilton: GroundTruth.
- Jonsson, A. and Klasander, K. (2014). *Mpophomeni Enviro Champs: A qualitative study about an Environmental Champions project's attempt to manage water issues in a South African township. An evaluation study.* University of Jonkoping, Sweden.

Interview and interactive engagement processes:

- In 2016 Mike Ward undertook an evaluation of the Mpophomeni Enviro Champs. This involved a series of interviews with organisations working with the Enviro Champs (GroundTruth, DUCT, WESSA), with the Enviro Champs themselves, with local politicians, and with the local plumber. In addition, a number of field visits were conducted and an international meeting on citizen science that profiled the work of the Enviro Champs was attended. This resulted in an evaluation report, the findings of which were shared and worked with in Ceres and Stellenbosch with similar citizen-based water quality management groups. This work has informed other evaluations, has been taken up in national strategic planning (see TIPS) and included in the Presidential Jobs Summit Framework Agreement. More recently (2018), Morakane Madiba has engaged with the Enviro Champs as part of a PhD study that is developing deeper insights into the work of this group and their influence on CBWQM nationally.

Case analysis *[see scaling pathways in Figure 7 above]*

Scaling Pathway 1: Political Economy and Policy Support

The combination of poor infrastructure and the proximity to a key water source supported the mobilisation of funding from the Umgungundlovu District Municipality (UMDM) for the Mpophomeni Sanitation Education Programme in 2011. This project was supported by the Dusi-uMngeni Conservation Trust (DUCT) and was able to secure additional funding through the WWF-SA Nedbank Green Trust and the Expanded Public Works Programme (EPWP). In 2016 the programme provided work for over 20 Enviro Champs and was recognised nationally as a leader in its field. Despite the strategic location of Mpophomeni, the support from local government and national NGOs, and the impact of the initiative, funding for this citizen-based water quality management has been an ongoing struggle. At the time of writing this review

(2018), the Enviro Champs are operating without any external funding. This reveals a significant challenge in the political economy of this kind of work.

A key strength of the Enviro Champs has been their ability to engage politicians in a non-violent way. This has enabled an ongoing working relationship with eThekwini and uMgungundlovu District Municipalities, uMngeni Local Municipality and Ward councillors. A commitment to building networks resulted in the Enviro Champs being invited to present at 'war rooms' (local ANC planning forums) and at political events in the local Wards. Despite these links, a dysfunctional uMngeni Municipality was unable to respond to requests for service delivery. Through connections to external NGOs, the Enviro Champs were able to profile their work and ultimately get support from the District municipality and some recognition from the national Department of Water and Sanitation (DWS). This support, however, has not translated into a sustainable political economy for the Enviro Champs nor a concerted effort to address remaining service delivery challenges including sewerage infrastructure and solid waste management.

Scaling Pathway 2: Knowledge Commons and CBWQM Tools

The generation of information to support and empower community groups is an important part of bringing environmental challenges to the fore and helping to gain the recognition and influence required to bring about change. The Enviro Champs have used a range of tools to work more effectively with the generation and use of information. These include the use of cellular phones, the development and use of data gathering sheets and the transfer of this data onto electronic spreadsheets. A wide variety of citizen science tools, including miniSASS, the representation of data on platforms such as Google Earth, and various presentations including banners, poster, PowerPoint, Internet, etc. are also used.

Very significantly, the Enviro Champs were supported to take the information they were generating and upload it into Internet-based representations that allowed public access to the challenges and successes of their work. Some of the platforms used include: Matuba, miniSASS and Google Maps. The image below shows the use of 'heat maps' to portray the intensity and duration of sewage manhole spillages in the local community. This data was collected by the Enviro Champs. In addition to making the data accessible for a wide range of role players locally and nationally, the use of the Internet in innovative ways has raised the profile of the project and thus increased its ability to influence decision-making at many different levels.

The mapping process allows the identification of "Hot Spots" of high incidents of surcharging manholes.

In addition to Internet sharing, the Enviro Champs have been extremely active in working with emerging CBWQM initiatives in South Africa. This interaction was enabled through the connections with local and national NGOs that drew on the Enviro Champs to support similar initiatives in Ceres, Pongola, the Palmiet river, Stellenbosch and elsewhere (Box 1 above shows their influence into the Western Cape).

Scaling Pathway 3: Capacity Development

The Enviro Champs engaged in a wide variety of capacity building initiatives. This includes building both their own capacity and the capacity of various stakeholders within and beyond Mpophomeni. In addition to raising awareness of the issues, the Enviro Champs have developed an approach to capacity development that emphasises mutual engagement to build shared capacity to identify, understand and respond to local issues. This co-engagement has been evident in a wide range of capacity development initiatives including formal and non-formal education and training programmes, drama developed through the Mpophomeni Youth Productions, Enviro Clubs that worked with schools and door-to-door visits.

It is interesting to note that some of the capacity development initiatives drew on and were supported by external initiatives such as Eco-Schools, the Water Explorers, and accredited training institutions such as WESSA. Other initiatives were driven internally by the Enviro Champs such as local river walks and clean-ups, Enviro Clubs and engagement with the community through door-to-door interactions. The interplay between external and internal capacity building processes was both complex and learningful and is perhaps best captured in a quote that was included in the GroundTruth evaluation of the Enviro Champs:

> *"While trial and error is a great educator in itself, there exists knowledge in the outside world which people can adapt to their needs and thereby accelerate their own endogenous process of learning… Learning is a creative process that cannot be accomplished by a mechanical transfer of external knowledge. The latter has to be adapted by critical reflection and creative application in order to be internalised."* (Rahman, 1993)

Scaling Pathway 4: Communication and Profiling

The communication and profiling work related to the Enviro Champs took place at multiple levels and was closely linked to the network within which the Enviro Champs operated. In some instances, the communication and profiling was closely aligned with capacity development initiatives such as the door-to-door visits, the drama productions or the engagement with schools. These communication exercises raised the profile of the Enviro Champs and the work that they were doing. In some instances, simple 'marketing' tools such as the use of brightly coloured T-shirts or making a point of meeting at a visible place near the main entrance to Mpophomeni were important for raising the profile of the Enviro Champs and their work.

The links to national NGOs, such as WESSA and WWF-SA, meant that the Enviro Champs were involved in international events and national publicity processes. An example of this was the WWF-SA River Walk that involved national celebrities and was screened on national television. People who have been involved with the Enviro Champs continue to share their work into many local, national and regional planning processes such as the Presidential Jobs Summit and the Science, Technology and Innovation road map. This profiling motivates participants and enhances the impact of their work. However, it is not enough to either build capacity of the participants or guarantee political support for the change that is needed in Mpophomeni.

Scaling Pathway 5: Collaboration and Communities of Practice

The Enviro Champs are embedded within a strong network of environmental and water quality related organisations. By operating as a collaboration between UMDM and DUCT, the Enviro Champs are positioned at the interface between government, non-governmental organisations and the local community. In addition, the accessibility of Mpophomeni and the links to people connected to both the University of KwaZulu-Natal and Rhodes University has led to high quality research within and into the Enviro Champs. This networking has been enabled and enhanced by a strong collaborative disposition of some of the key partners in the network. This includes a recognition that the networked partners share a collective responsibility within the catchment, rather than being separate groups seeking to bring about change in 'the other'. This collaboration and shared responsibility has been a powerful enabling factor for the work of the Enviro Champs and for the work of researchers, government and NGOs working with the Enviro Champs.

In addition to the collaboration to address existing challenges within Mpophomeni, the network of individuals and institutions working with the Enviro Champs (and the Enviro Champs themselves) have had a strong learning orientation. This has been supported by course supported learning often focused through collaborative projects that relate to a particular issue or opportunity related to water or waste management. The Enviro Champs have also played an active role in supporting other communities and in this process have built up an extended community of practice that includes individuals and institutions from government, civil society, academia and business.

Although the above may look like the only way to work, there are instances within Mpophomeni (and of course elsewhere) where there is less collaboration and shared learning. As one of the Enviro Champs noted, there are instances where initiatives (not Enviro Champs) are set up within Mpophomeni and the implementing group seeks to remain distinct from other initiatives in order to retain the ownership and control of the initiative. This disposition inhibits the building of networks and thus the ability to work with a diversity of role players.

Scaling Pathway 6: Data Use and Open Access Reporting

The use of the Internet to represent data gathered through cell phones, spreadsheets and citizen science tools has been very important in terms of the use of the data. Google Earth has been used to map the manholes and miniSASS scores while heat-mapping (see Figure 6 above) visually represents the data gathered through the manhole monitoring and spreadsheets. In addition to making the data accessible for a wide range of role players, locally and nationally, the use of the Internet in innovative ways has raised the profile of the project and thus increased its ability to influence decision making at many different levels.

Finally, a range of other presentation techniques, such as PowerPoint, the development of posters, newspaper reports and various project reports, has also supported the uptake of the information by the many networked partners. This too has been a major enabling factor in terms of using the information that is being generated by the Enviro Champs. As one of the leading Enviro Champs noted, *"When we did not have the connection to the Internet we had so much data but people could not see what we were doing*."

Scaling Pathway 7: Monitoring, Evaluation and Research

Many examples of monitoring, evaluation and research linked to the Enviro Champs have been mentioned already. These include the actual monitoring of environmental issues, the external evaluation of the Enviro Champs and a number of research projects conducted by students from as far afield as Canada and Sweden. A current PhD study being conducted by one of the authors of this report focuses on Mpophomeni and the work of the Enviro Champs (Madiba, in press). These studies provide an affirmation of the work that is being done. It also provides an opportunity for reflection and learning. However, there is a risk of "research fatigue" as researchers come in, gather information, write a report and then disappear. This has led to community members wanting some direct compensation for the time that they spend with researchers. In addition, it would be useful to provide ongoing feedback to the Enviro Champs on how this research is informing policy, practice and the potential for supporting CBWQM and livelihoods for the local communities.

Synthesis of key dimensions relevant for the 2019 scaling workshop

- The political economy of initiatives such as Enviro Champs in resource-poor contexts is undermined by an assumption that these should be 'volunteer' based. There is a need to develop sustainable economies that recognise and compensate for the value that these groups and initiatives add to ecological, social and economic well-being.
- The positive, but informed and robust, engagement with political structures has built possibilities for collaborative action and change rather than service delivery protest and violence. This should however not be taken for granted and requires commitments from both sides.
- The ability to gather data with citizen science tools and collate this data through shared platforms such as miniSASS, has motivated the Enviro Champs and significantly enhanced their impact on water quality monitoring.
- Capacity development that highlights existing challenges and develops new perspectives on the scope and depth of these issues through courses, door-to-door engagement, and work in the field has been important for developing new knowledge, skills and agency. At the same time, capacity development initiatives that respect and build on local knowledge is also vital to ensuring relevance and building local confidence. The strong orientation to social learning that

has informed many of the capacity development initiatives linked to the Enviro Champs is important to take forward into future engagements with communities.

Figure 8: Typical issues that Enviro Champs have to deal with, and views of the natural areas surrounding Mpophomeni

5. **Synthesis analysis across data sources:** Following the case study analysis, a synthesis analysis was undertaken across the data sources which provided high level insights / mirror data for the next phases of the action-oriented research process. The synthesis analysis is included in Box 4. In this box we synthesise some of the more significant insights gained from the review undertaken in the questioning phase of the expansive learning process, providing mirror data for informing the scaling, alignment and resourcing of CBWQM in South Africa in order to address the central contradiction identified at the start of the project.

BOX 4: **SYNTHESIS ACROSS DATA SOURCES**

The emphasis in this analysis was on insights that can be used as 'mirror data' or as material that can be used for ongoing reflection in the sector that is engaged with and is supporting CBWQM practices, water stewardship, and environmental and social justice. In this analysis we continued to use the scaling pathways identified in Figure 7 to guide these reflections, and we highlight enabling and constraining factors where relevant (Cases referred to are found in Appendix A).

Scaling Mechanism and Pathway 1: Political Economy and Policy Engagement

Political Economy: In this study we have deliberately used the concept of political economy, as also used by Ager (2006) in the context of environmental risk and vulnerability (a condition created by poor water quality management):

> *… it is widely noted that vulnerability to environmental change does not exist in isolation from the wider political economy of resource use. Vulnerability is driven by inadvertent or deliberate human action that reinforces self-interest and the distribution of power in addition to interacting with physical and ecological systems.* (p. 270)

A recurrent theme in the case studies is the difficulty of creating sustainable economies for CBWQM. One dimension of this challenge links to whether citizen engagement is a requirement of policy. Munnik et al. (2011) have referred to 'invited spaces' where citizens have a mandate to participate in water management decisions. A second dimension related to those spaces is where citizens create and shape their own possibilities for involvement in water management. These are sometimes referred to as 'invented spaces' (Munnik et al., 2011). A third dimension is related to the underlying political economy of development and contradictions that exists between a neo-liberal and developmental state framework where it would either be in the interest of the state to fully support CBWQM in order to improve the well-being of people and protect the country's water resources for development, or to ignore these benefits as profits accrue to the few via either exploitation or corruption (Wilson et al., 2016). The high level of social protests in South Africa around service delivery efficacy would appear to indicate the latter rather than the former.

Where participation is a policy requirement there tend to be greater opportunities for resourcing these processes, although some of the processes may be superficial and may actually suppress citizen activity, especially in cases where the data may be revealing inadequate compliance or compliance management. Where civil society create spaces for engagement, there is a tendency for these processes of engagement to rely substantially on volunteer commitment. In addition, where multiple sectors of society recognise common areas of interest (such as access to quality water resources), possibilities exist for multiple resourcing options and thus the potential for securing less restrictive and more sustainable political economies. This **polycentric approach** to the political economy of CBWQM does, however, require a capacity and commitment to work with multiple resourcing options and to manage the underlying systemic structures and the power relations they shape between participating institutions. It also requires distributed forms of management and leadership, and distributed capacity and roles and responsibilities.

Policy Support: There is significant policy support at the international and national level for CBWQM. These 'invited spaces' form the subject of the next phase of the action-oriented research. It is, however, important to acknowledge that these policy openings may be latent, misunderstood or even deliberately subverted as was highlighted in Case Study 1.

Enabling factors:

- Policy references to consultation and collaboration between government and civil society enables spaces for engagement and potential funding.
- Legislative requirements related to corporate social responsibility and transformation in South Africa, as well as reputational issues, create opportunities for collaboration between business and local communities.
- The common interests between large international and national civil society organisations and local community-based organisations enable the flow of funding from large and complex funding mechanisms to local projects.

Constraining factors:

- Policy commitments to consultation and engagement may be misinterpreted or subverted due to political concerns related to service delivery and broader governance failure, or due to underlying contradictions in the policy framework governing water quality and development in the country [this is probed in more depth in the next phase of the action-oriented research].
- Corporate commitment to citizen-based initiatives tend to be limited to shared benefits, although it is often portrayed as 'social investment' in local communities. This funding is often insecure and tends to work on three-year funding cycles.

Scaling Mechanism and Pathway 2: Knowledge Commons and CBWQM Tools

There is a long history of CBWQM in South Africa, building on the early Project Green (early 1990s) and interactions with Bill Stapp which led to the adaptation of these citizen science tools for use in environmental education programmes in South Africa via Share-Net. Water quality test kits and tools are therefore a key feature of the South African CBWQM landscape. Share-Net also established an ethos of knowledge sharing, or the concept of a knowledge commons, which promotes the sharing and free access to knowledge and knowledge resources for the common good. In all CBWQM projects reviewed, this legacy is evident. In other words, the legacy of shared resourcing of a practice via provision of tools and materials that are easy to access, low cost and that can be used by more than one group without high costs or other access blockages (e.g. intellectual property constraints) is enabling of a field of practice such as CBWQM. Various efforts have been made to strengthen the accessibility and availability of these resources, but these also require ongoing maintenance and management support. For example, the potential exists for making better use of the www.catchments.org website and the landscape map for accessing the available CBWQM tools by a wider group of citizen science practitioners.

Another feature of the knowledge commons and CBWQM tool is the ongoing processes of innovation associated with these. In earlier years, the tools were mainly text- and material-based. Nowadays the use of ICT in conjunction with the material and text base of the tools allows for more sophisticated data capturing and reporting, e.g. via use of GIS mapping, etc. This ongoing investment in innovations around the CBWQM tools therefore needs to be supported and enhanced.

Another critical feature of a knowledge commons approach to CBWQM is a shared commitment to the common good amongst landscape or catchment-based project partners who are willing to share and adjust roles and responsibilities in response to the contextual dynamics, risks and opportunities within multi-actor and multi-institutional partnership frameworks. This requires both inter-sectoral co-operation and inter-institutional co-operation, as well as inter-disciplinary engagement. Co-operative competences, and sensitive leadership, as well as adequate capacity for co-engaged relational engagement appear to be important for establishing and maintaining such an ethos and knowledge commons practices.

Enabling factors:

- A key enabling factor for CBWQM scaling and alignment is the long history of developing citizen science tools for WQM in South Africa, from the earlier miniSASS to more recent innovations associated with ICT-based CBWQM tools.
- A second enabling factor is the many examples that show the diversity of potential partnership and co-operation structures and models, and the lessons that can be learned from these for scaling and alignment.

Constraining factors:

- Adequate resources are required for a) producing and sharing, and b) updating and innovating, and c) maintaining systems of support for the ongoing development and use of CBWQM tools from a platform (e.g. similar to the role Share-Net used to play in the past) that allows for expansion of the use and innovation of tools within a shared knowledge commons system and structure. With the loss of Share-Net, this is an urgent priority for CBWQM continuity and expansion in South Africa.
- Use of the CS tools, especially when set up to provide 'living data' and reporting (e.g. with the miniSASS), requires stable institutional support for verifying and managing the incoming data from the various monitoring sites. This is

critically important for ensuring that the CBWQM data is a) properly captured, b) visualised in accessible form, and c) shared in meaningful ways that d) inform decision-making and change processes.

- Not all water quality issues are easily dealt with by low-cost CBWQM tools. There is therefore a need for accessible systems of support for more complex water quality problems (e.g. testing of heavy metals). Here stronger alliances between CBWQM groups and universities, and relevant laboratories with capacity for this kind of WQM testing are needed with adequate resources provided for the full value chain associated with these processes.

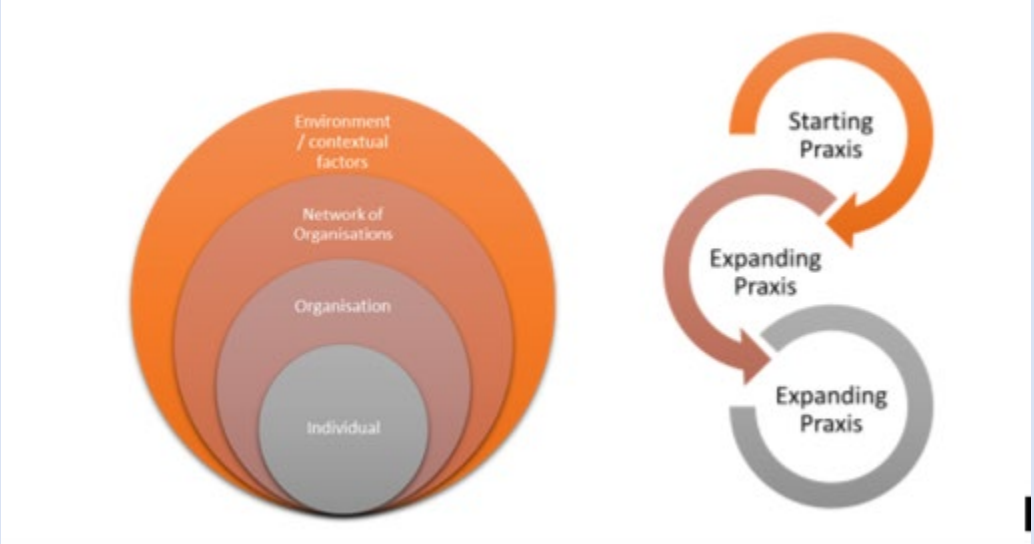
Scaling Mechanism and Pathway 3: Capacity Building

The cases, questionnaires and supporting data revealed a very strong commitment to capacity building in the CBWQM activity system in South Africa. Every project had invested greatly in capacity building in a range of different ways, from practical hands-on field training in how to use CBWQM tools, to more deep-seated transformation training and social learning processes supporting activists to develop confidence and capabilities for responding to very complex conditions in heavily polluted environments where power relations were also very skewed, at times impacting on the safety of the activists (as found in case study 1). Capacity building is also diverse and includes not only those undertaking CBQWM, but also those responsible for water quality management (e.g. government officials with compliance and leadership responsibilities). Overall, there is an understanding that responding to the seriousness of the water quality concerns affecting people and environments, will require a wide ***system of capacity building*** that involves technical aspects, as well as social, communication and advocacy aspects.

The active tension that exists between realistic expectations for core activities and expansion beyond core activities in CBWQM projects is also an important space for thinking about capacity building. This tension rests also at the interface between volunteerism, civic engagement, and jobs with a civic responsibility, each having different implications for capacity building and its purpose.

Project duration and a general project-based approach to CBWQM, especially amongst the larger NGO groups and organisations, affects the continuity and depth of capacity building opportunities. There is need for developing longer term, more sustainable social and economic infrastructure for CBWQM projects so that capacity building can also be conceptualised within longer time horizons and with adequately conceptualised learning pathways, especially for potential job creation options and occupational relevance (e.g. the environmental technician occupation could well provide a good longer term framework for CBWQM capacity building programmes). Important here though would be to maintain the ethos of the CBWQM sector's work and engagement, which is more aligned with an interest in capacity development for collaborative sustainability, not only for independent sustainability (individual or project-based mentalities). In such a collaborative sustainability capacity building model, the value of distributed capacity, distributed leadership and distributed resource base is crucial, as was modelled in the EMG social learning course activated learning network system of activity.

Importantly, as shown across the cases and contributions, there is need to enhance capacity to work across different levels and scales, as outlined in Figure 1 and 2 below. This framework has potential to provide a starting point for deliberating a sector-wide capacity building programme, modelled along the lines of the RU/EMG social learning course with Change Projects at the centre (case 1) which emphasises reflexive change-oriented social learning over time (Figure 2), which can also be aligned with the notion of different types of capacity building at different levels (the example of the leadership training – Case Study 7), and strong emphasis on use of CBWQM tools and knowledge commons and accountability monitoring and enactments (all cases).



Layers of capacity development: Reflexive capacity development
Both can be supported by situated praxis (use of CBWQM tools and approaches in specific contexts)

Enabling factors:

- The CBWQM community have a strong interest in, and a wide range of expertise to share to support ongoing capacity developments in the sector.
- A tradition of being willing to learn together and to support each other to learn is a strong enabling factor that can support scaling and alignment.
- Expertise exists in the sector for diverse types of capacity building at different levels of the capacity building sector. This is as yet not well aligned for sector wide impact.
- There are experiences of a wide range and diversity of types of capacity building activities that address different purposes across the CBWQM community. A strong inventory of these, together with more in-depth insights into their efficacy would assist with development of a wider social learning system for CBWQM in South Africa.

Constraining factors:

- Capacity building programmes are often in situ and are driven by immediate needs. Therefore, capacity building experiences and expertise are not always widely shared for wider sector benefit. This is impacted on by resources and availability of resources, as well as certain levels of fragmentation amongst CBWQM stakeholders, which is also influenced by geographical spread of initiatives.
- Adequate resources need to be made available for quality capacity building programmes. Experiences show that capacity building is not a once-off event, but a longer-term process over time which allows people to develop expanded areas of expertise, confidence, networks, new practices, scientific competence, social competences as well as ethics of care, justice and co-operation.
- Additional support and alliances should be in place for more complex forms of WQM that CBWQM programmes have access to when needed (e.g. testing of toxins).

Scaling Mechanism and Pathway 4: Communication and Profiling

Communication and profiling is an important dynamic in validating and expanding the work of the CBWQM projects. This takes a number of forms including use of video material, gaining exposure via television programmes and competitions, project websites and via the support of mediating organisations, such as national NGOs, who have capacity for profiling the work of grassroots CBWQM initiatives. However, communication and profiling is not only media-based or related to media exposure. It also involves direct contact with communities on the ground via door-to-door campaigns and interaction, and via linking up with other relevant local forums, networks and landscape level initiatives and governance and leadership structures, especially also the CMA structures where these are operating well. Thus, communication and profiling is both broadly oriented towards wider public media attention, and also targeted within relevant systems and

structures for ensuring more effective support, and for sharing the findings that are being generated by the CBWQM projects. Communication and profiling is also important for enabling cross CBWQM project interaction, so that projects can learn from each other.

Enabling factors:

- Links to high profile networks, national NGOs and government structures can help to facilitate improved communication and profiling of CBWQM activities.

Constraining factors:

- Communication and profiling activities need to be both targeted and broad. This requires investment and time, as well as relevant competences and skills for this work. This needs to be adequately supported.
- Institutions with stronger brands can co-opt smaller initiatives, and care needs to be taken not to appropriate the work of smaller institutions, but to adequately profile them within the larger partner brands and programme structures within networked partnerships.

Scaling Mechanism and Pathway 5: Collaboration and Formation of Communities of Practice

CBWQM projects are highly dependent on a diversity of partnership arrangements for their success. As outlined via the choice of the cases presented above, these can be variously initiated, i.e. out of civic action and citizen organisations, from local or national government, from business partnerships, or via university and national NGO partnerships. In all cases, there is a need to sensitively nurture these partnerships, and *relational, dialogical structures and sensitive and enabling democratic leaderships* are therefore a key feature of these projects. These relational dynamics need to be given special attention in CBWQM projects. The Enviro Champs model appears to be gaining ground as being a successful approach to establishing and maintaining relationships, building on-the-ground partnerships, and for mobilising community participation in CBWQM projects. This model, however, requires sustainable support both in terms of funding and in terms of capacity building and support for the relational, dialogical and co-engaged work that needs to be done in CBWQM.

Not all relational arrangements work and there are cases where relationships between partners are tension-laden, or break down. However, evidence from the cases show that new relationships and approaches can be enabled by these ruptures. The challenge and opportunity is to keep the bigger picture of community development and sustainability in mind within an expanded notion of collaboration and communities of practice.

Enabling factors:

- Partners who have a sensibility towards relationality and co-engaged partnership building appear to be able to foster the kinds of relationships necessary for successful CBWQM. This is, however, often a taken-for-granted aspect of the programmes, and requires support and also capacity building for building and sustaining these relationships and partnerships.
- Wider partnerships between powerful actors at landscape or catchment level can provide support for CBWQM projects and the building of CBWQM communities of practice within these wider structures.
- Learning networks and programmes that build links between smaller grassroots CBOs, NGOs, and local and provincial governments in social movement structures appear to also hold potential for strengthening CBWQM practices, i.e. investing in interlinked and multi-levelled structures and networks. However, as shown in Case 1, the practices of the CBOs should form the primary focus of the networks, and the networks and partnership building should be in service of these practices and their validity and expansion.

Constraining factors:

- Competing interests, especially competition for similar sources of funding can cause rifts in existing partnership structures.
- Short-term funding frameworks can lead to some partners not being able to participate in CBWQM projects, which can lead to a fragmentation or demise of relationality in projects.
- Partnerships and building of communities of practice can break down around a lack of clarity regarding different roles, or when one partner overpowers others (i.e. around poorly managed power relations).

Scaling Mechanism and Pathway 6: Data Use and Open Access Reporting

In all cases the collection of data on the status of rivers or water bodies, sewer lines and other CBWQM foci is crucial for the foundation and success of the CBWQM project. As shown in the cases, data can be generated via a range of CBWQM tools and approaches, and there exists a strong system of tools for data generation above. However, generating the data is not adequate for successful CBWQM. More important is the storage, representation and use of the data.

The CBWQM community in South Africa shows evidence of innovating to use mobile phone technology and the internet to capture and represent data gathered through the mobile phones, spreadsheets and citizen science tools. This has been very important in terms of the use of the data. Google Earth has been used to map the manholes and miniSASS scores while heat-mapping has been used to visually represent the data gathered through manhole monitoring. However, not all CBWQM sites have access to these technological innovations as yet, and there is need to build capacity across the system for a) using such approaches, b) strengthening the representation and data sharing aspect of CBWQM, and c) developing means of verifying and storing the data more centrally to build up more systematic views of WQM issues in South Africa. The miniSASS website and data representation system, and the heat maps are two important innovations in this regard.

However, these also need to feed into proper systems of decision making, and here local, provincial and national government capacity is crucial for making sense of the data and for responding to reported concerns. Without this, the data generation processes have little impact, and citizens involved in the CBWQM projects can become demoralised. This brings the need for strong relationships between CBWQM projects and local governance systems to the fore in a) supporting data generation and representation, b) using the data for decision making, and c) reporting back to citizens on actions taken. This value chain is currently not strong, and significant investment is needed to strengthen this relational value chain for CBWQM systems to operate at their full potential and impact.

Enabling factors:

- In addition to making the data accessible for a wide range of role players locally and nationally, the use of the Internet in innovative ways has raised the profile of the projects and thus increased its ability to influence decision making at many different levels.
- Creating living data tools for CBWQM is possible with Internet and cell phone technologies. Capacity to develop and share these is needed. They are, however, popular, and are a motivator for many who are involved in the projects, especially as they offer living data sets that can easily be represented.

Constraining factors:

- There are constraining factors associated with using the technologies above, not least is the cost of data in South Africa, and assumptions about availability and usage of smartphones at community level. These constraints need careful analysis, and reflexive engagement.
- There are also deeper underlying factors that constrain the recognition and use of CBWQM data, which are related to lack of compliance monitoring and management when vested interests or corruption skews normal practice. In such cases, data being generated by CBWQM activists could, at worst, create situations of danger and risk for them. While this could seem far-fetched at first glance, in a democracy there are many examples of cases where environmental activists are being threatened for their practices by more powerful interests.

Scaling Mechanism and Pathway 7: Monitoring, Evaluation and Research

As shown by the data generation, as well as the analysis of the cases, monitoring, evaluation and research are important for making CBWQM initiatives visible. Additionally, these processes are important for learning, and especially for cross learning across CBWQM initiatives.

There are different approaches being used to monitor and evaluate the CBWQM projects, including surveys, qualitative appreciative enquiries, stories of most significant change, and realist evaluations that probe enabling and constraining mechanisms and factors (as was done in this initial review). Overall, this mix of approaches offers useful insights into an important field of practice. It was noticeable that those projects with government and external donors, or larger NGO

support, were more likely to be monitored and evaluated than projects that are volunteer driven. Additionally, it was also noticeable that the M&E processes all had a similar interest in working out how CBWQM projects could be strengthened in the interest of the public good, as well as livelihoods and job creation opportunities, especially for those who were affected by unemployment and poverty related conditions. Although the M&E projects point to how this can be done, it is clear that a *system wide* response is required, both to strengthen the collective use of CBWQM tools and data systems, as well as creation of more sustainable political economies and systems of operation. Research, especially into the processes of capacity building, is also important as this helps to improve ways of working within and across projects. This aspect of CBWQM also requires more substantive and sustainable support.

Enabling factors:

- M&E expertise with a sensitivity to the practice of CBWQM and its potential benefits for the common good can go a long way towards strengthening the practice and facilitating co-learning across projects. M&E should therefore be conceptualised within a MERL (Monitoring, Evaluation, Reporting and Learning) framework.
- Research, especially action-oriented research, that supports ongoing improvements in praxis, both from a tools development and capacity development perspective, is proving to be a powerful influencer of innovations within CBWQM practices.

Constraining factors:

- The field of CBWQM lacks a synthesis of best practice from a M&E perspective.
- Research, M&E (conceptualised within a MERL framework) requires dedicated time and resources. There are a number of research institutions with capacity to undertake such research, but more synthesis work across the research initiatives is needed to strengthen the research platform. There is also a need to avoid over-emphasising certain case studies at the expense of others (also to avoid research fatigue), and for this a more substantive database is needed on CBWQM practice and better systems of communication for research, and MERL purposes. Research fatigue in communities can also be avoided through approaches to research that are co-constructive of the practice, rather than simply analytical (this does not mean that the research is not analytical, it means that the research practice needs to extend beyond analysis to include generative co-engagement components or approaches).

The initial review which constituted the first contextually located part of the questioning Learning Action in the action-oriented research process provided useful insight into some of the scaling, alignment and resourcing needs of the CBWQM sector and projects that are active within the sector. A range of different types of project arrangements were selected for case studies as this helped to show the scope of the CBWQM sector and how it is constituted in South Africa, i.e. via a wide range of partnership configurations. The review especially highlighted a number of scaling mechanisms and pathways where these refer to critical processes that need attention in the activity of scaling CBWQM that are relevant *across a range of projects,* and that can best support expansion of CBWQM projects *across the field,* i.e. not only in one particular project context, but rather within the more broadly framed **activity of scaling CBWQM**. The systematic use of these scaling mechanisms and pathways for analysis of the seven case studies in this initial questioning phase of the action-oriented research confirmed the usefulness of these as means of furthering the deliberation and debate on how the activity of scaling CBWQM can be strengthened in South Africa. Figure 9 summarises this first level of analysis.

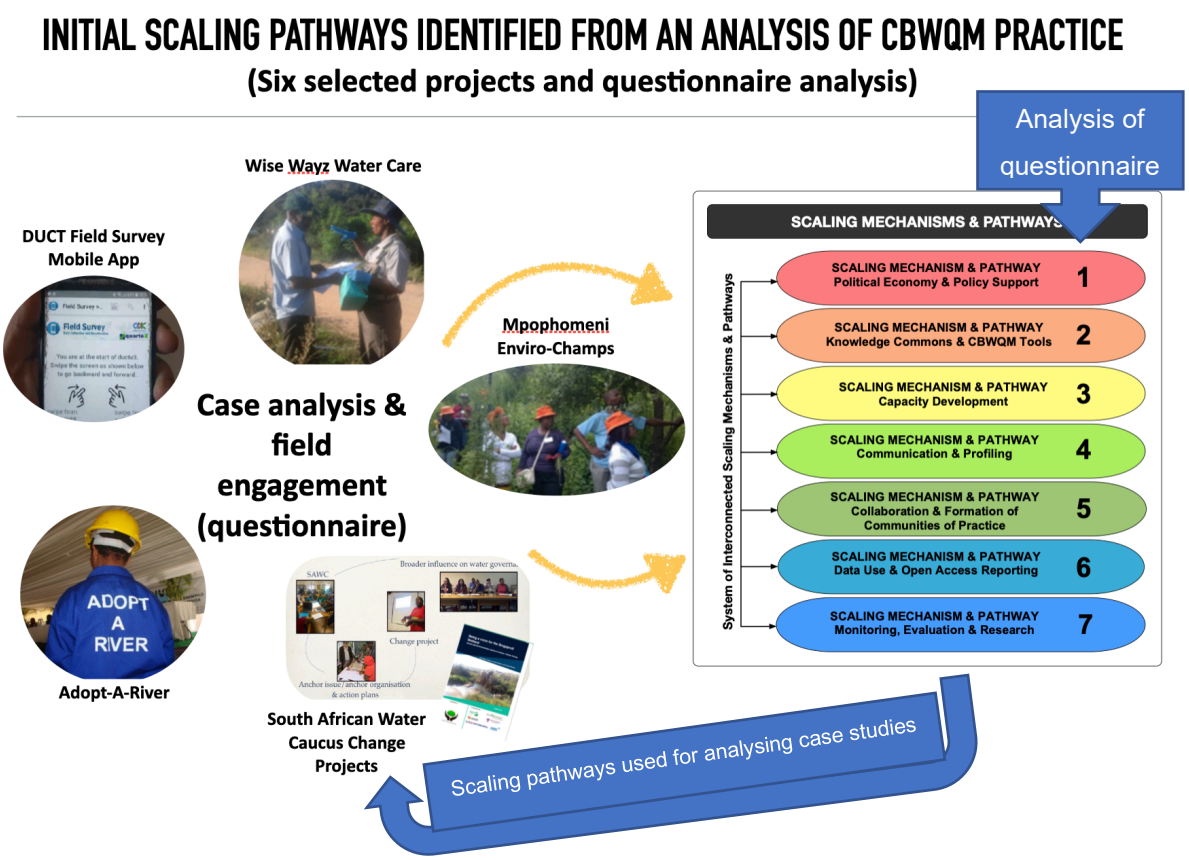


Figure 9: Summary of the first national engagement with stakeholders, associated questioning and first level of analysis for the activity of scaling of CBWQM praxis

The questioning phase of the action-oriented research was extended by a second process, which involved an in-depth review of relevant policies and strategies. This is discussed below.

2.3 Desktop review of relevant policy and strategies: Identification of priorities and potential within national and international plans in terms of CBWQM

The focus of this part of the questioning in the action-oriented research process was on developing a more in-depth understanding of the central contraction identified, namely the policy context that appears to embrace CBWQM as part of IWQM in South Africa, yet CBWQM practice remains a neglected practice with projects struggling to sustain themselves and find sustainable routes for their work. As Engeström (1987, 2016) has noted, contradictions are the result of deep-seated structural tensions – we needed to better understand these to produce mirror data that extended beyond the obvious tensions experienced as constraining factors identified via the empirical praxis review in the first phase of questioning. For this we required a deeper probing of historical contextual data and the ontology (realities) and epistemologies (discourses) of the policy system itself as it relates to CBWQM praxis in South Africa.

To further unpack this contradiction, we therefore needed to concentrate our questioning analytical work on the policy context in which CBWQM initiatives are emerging, with the aim of identifying how CBWQM initiatives can contribute to national and international commitments, and how CBWQM can be strengthened by policy systems.

At the heart of our inquiry in this questioning work was the assumption that there is a need for securing the integrity of participatory democracy and empowered co-engagement, both clearly a priority in contexts where social and ecological injustices and degradation continue to occur. This is true across South Africa, as a newly born society is working out its democracy, including the direction and functioning of this democracy. In such a context, citizen voices must be noticed and heard, including the voices of those affected by the social-ecological degradation, injustices and impacts of poor water quality, to which they were aiming to respond through their CBWQM praxis. This was based on the insights already gained through the study into the central contradiction that CBWQM is emerging as an important practice that helps to consolidate participatory democracy in South Africa, with much potential to enhance water quality management in the country if well supported. At this point we also noted that the recent Presidential Jobs Summit Framework Agreement (2018) recognised the importance of activities such as CBWQM within a framework for job creation in the context of national water stewardship, indicating one of many potential pathways for scaling of this practice. However, we did not see much policy movement to facilitate realisation of this item in the Presidential Jobs Summit Framework, despite the policy rhetoric, confirming the policy-practice contradiction.

While there was much avowal of the validity and importance of CBWQM practice in policy circles, including in the IWQM policy which also gave rise to this research project, the practice was identified as fragmented and neglected, suffering from neglect in policy implementation processes, with a number of complex structural and other problems affecting this practice as found and confirmed in the first part of the questioning in the action-oriented research. Drawing on cultural historical activity theory and the expansive learning research design adopted in the study, we reasoned that contradictions and discontinuities offer important opportunities for learning and change, hence the importance of adequately understanding the contradictions.

Our ongoing in-depth inquiries into the policy-practice contradiction involved a two stage engagement with policy involving an initial critically reflexive policy reading and a more in-depth probing of policy contradictions. These two stages are elaborated below.

2.3.1 Initial policy reading to identify approach to policy analysis and focus areas

The policy analysis started with an initial reading of relevant policy documents, which revealed that there are already a number of policy reviews that foreground public participation and citizen science and action in the water sector. We therefore decided to briefly synthesise the main points associated with these in our initial reading in order to identify key points for further analysis, i.e. to 'pull out the headlines' in summative / synthesis form. Importantly, we started our inquiry into the policy-practice contradiction with a critically reflexive ***policy reading***, i.e. reading policy from the perspective of what might be significant for the activity of *scaling* of CBWQM (looking at both positive indicators for scaling, as well as absences and contradictions). From this reading we noted further areas for ongoing probing as the policy review process progressed.

An initial reading of the IWQM policy (undertaken at the start of the project in the inception phase) highlighted the following aspects informing the conceptual framework for CS scaling research:

- The National Water Resources Strategy II of 2013 (DWA, 2013) indicates an urgency to get to grips with the critical nature of water issues in South Africa, it articulates a 'water crisis' and strong response plans. The NWRS II proposes a participatory approach and notes that "Water management operates within a social, economic and ecological environment, and for effective and integrated management of water resources, top-down consultation should be replaced by citizens' participation, which will be facilitated through community forums and civil society organisation structures to achieve the required balance in the decision making process within a developmental water management

agenda" (DWA, 2013, pg. 36). It also refers to the National Development Plan and its commitment to participatory governance, stating that "The NDP supports active citizenry and emphasises that the state cannot act on behalf of the people – it has to act with the people, working with other institutions to provide opportunities for the advancement of all communities. This is a critical approach underpinning and supported in the NWRS2" (DWA, 2013, pg. 36). The NWRS II (DWA, 2013) further offers a *rationale* for citizen participation in WQM as follows:

> • Water is to play an optimal role in poverty eradication and the reduction of inequality, growth and development, and in building a just and equitable society.
>
> • Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels.
>
> • The participation of the poor is critical in eliminating poverty and ensuring the political legitimacy of policies and strategies.
>
> • This participatory approach is fundamental in ensuring that development is localised and meaningful for ordinary citizens.
>
> • The meaningful participation of communities will broaden the responsibility for effective and sustainable water resource management and serve to strengthen accountability from all" (pg. 36).

The NWRS II also noted that ''Participation has evolved over the last 18 years from a passive model to a more action-oriented concept. Top-down consultation has been replaced by citizen participation, which is a critical approach underpinning and supported in the NWRS2 in addressing the issues of inequity and poverty." (pg. 72)

In *our scaling research, we were interested in probing the realization of this commitment to the furthering of citizen engagement, citizen science and participation in water management in practice. In our initial reading, we noted that there was a need to read this commitment for synergy with, and/or contradictions with the IWQM policy, and identified that this commitment to citizen engagement was an important precursor to the IWQM (DWS, 2017) policy intention to strengthen CBWQM.*

- Building on this, the IWQM Policy of 2017 (DWS, 2017a) appears to take further, and provide a strong platform for scaling of citizen science and is designed as a policy to strengthen government partnerships linked with civil society and business to improve water quality management. It therefore offers a strong platform for scaling citizen science activity for water management and governance in South Africa. It carries, and is influenced by, up-to-date social-ecological sciences research. It has a commitment to integration, cross sectoral engagement, partnerships, citizen's participation, citizen monitoring. It indicates an approach to water quality management that must be broadened, and that must be more reflexive within an adaptive management paradigm. Within this approach to management, citizen science is seen as an asset, and a method or approach to strengthen governance of water resources. The policy is elaborated at strategy and implementation plan levels. *In our initial reading, we noted that it was necessary to further analyse / read more deeply into the links between these levels of policy to track the transfer of the intention of the policy to implementation strategy level.*

- The IWQM Policy and Strategy of 2017 (DWS, 2017 a,b) positions adaptive co-management as a significant policy and process framework for integrated water quality management in South Africa. It defines this within an "integrated, inclusive and adaptive" (DWS, 2017 b, pg. v) approach in partnership with the private sector and civil society. It is in this policy framework that the scaling of CBWQM is situated. However, to make sense of this in relation to the contribution of CBWQM, there is

need to not only think about CS in the context of the evolution of IWQM management approaches, of which the adaptive, inclusive and integrated systemic approach is the most recent advancement. Rather this needs to be 'thought' into the wider societal context of democracy building, noting that the South African water legislation favours a deliberative democracy model in which representatives of the state engage with civil society in deliberative, co-engaged ways to realise the intentions of the policy in practice as also emphasized in the NWRSII (DWA, 2013 – see above). We noted in our initial reading that democratic perceptions in South Africa are bifurcated into resistance / popular democratic practices of protest, and state-based forms of representation which are failing to represent civil society interests adequately. There is therefore a need to think about the role of citizen sciences in contributing to the building of truly participatory democratic practice in South Africa. *For the questioning of the policy contradiction in our scaling research, we therefore found the need to ask: From what point of departure are we scaling citizen science praxis – from the point of adaptive management or the point of democracy-building? We noted that this vantage point has fundamental implications for the kinds of questions asked and worked on in the research, the focus taken by the scaling research overall, and the participatory and critically reflexive nature of the research process, and for further policy analysis and understanding of the central contradiction in the action-oriented research.*

- Another significant policy 'move' and orientation found in the IWQM policy of 2017 (DWS, 2017a) in our initial reading is a commitment to understanding water and water quality not only as a technical engineering or natural science issue, but also as a developmental issue. Here links are made, albeit still inadequately, to the significance of water as a developmental foundation and resource. We found in the initial reading that inadequate (and uncritical) links are made to the National Development Plan and to the Sustainable Development Goals. *We therefore identified a need to probe the 'strength' of the current developmental notions that are being used to articulate the relationship between water and its 'status' in development discourse. We noted that areas that can contribute here are stronger political-ecology and social justice perspectives applied to mainstream development discourse, as well as stronger perspectives on social change in the context of water and development discourses.*

- Our initial policy reading also revealed that another area that required further probing in the scaling research and policy analysis is the actual policy pillars, principles, goals and recommendations for institutional set-up for mediating and supporting CBWQM praxis. As identified in the set-up of the research, the policy proposes that, with the WRC and the CMAs, can play a "leading role" in the development of citizen-based monitoring programmes (DWS, 2017b, pg. 68). *We noted that the scaling research design must allow for generating further insight into this institutional framing of responsibility for CS activity, especially from a closer probing of the implementation plan that accompanies the IWQM policy, as well as a critical reading of the efficacy and current engagement by these institutions with CBWQM praxis in order to better assess the kinds of capacity building, role clarification, resource mobilisation capabilities, data-based support infrastructure, and co-engagement that is required for this institutional mandate to be realised in practice.*

- Another area that required further probing was the scope and focus of the citizen science practices that require scaling. This relates to the articulated priorities associated with water quality, and with the insights in the IWQM policy document (DWS, 2017a) on those that are more widely known and understood, as well as pollution forms that are less widely known and understood. It is also important to consider the relationship between water quality and quantity, as well as access in terms of the available citizen science tools and processes that can be / need to be included in the CBWQM action-oriented scaling research. We noted that this would seem to require a careful review of which tools are currently widely available, which are being used for what purposes, and what the demand is for citizen science tools. *For the scaling research design this indicates a need to not only look at the scaling processes but*

also at what is currently available for scaling as well as what might need to be further developed and what this might mean for partnership development and expansion of CBWQM praxis within the scaling processes.

- A further aspect that would require consideration in the context of the scaling research is related to the policy statement on data in the IWQM policy regarding its status as a 'strategic' asset that must be available in the public domain. *We noted that the current status of citizen science data and how this is being taken up into the mainstream systems of water quality management needs some probing, and what the needs are for data management and data system development and support requires some deliberation within policy systems focussed on M&E.*

- In addition to the above, our initial policy reading revealed that the focus in the IWQM policy on co-learning, co-engagement, co-adaptation, etc. as being 'central' to a shift in the philosophy and practice of IWQM required further probing. The IWQM policy indicates the need for integration into the education and training system, grassroots education and learning, capacity building, and support for active participation in IWQM. The exact nature of scaling such processes is not clear, but there are good examples noted in the policy to learn from, such as the 'Adopt-a-River' project. *We identified that further policy and practice inquiries should probe the nature of co-learning, co-engagement, and co-adaption in CBWQM projects to identify potential scaling pathways that are related to capacity building and co-learning components of policy.*

As can be seen from the above initial critically reflexive policy reading, there were many areas of the policy-practice contradiction that required further probing. This process helped us identify those dimensions to include in the more in-depth policy analysis process, elaborated below.

2.3.2 In-depth policy review, deepening initial policy enquiry and questioning

Based on the initial critically reflexive policy reading that we undertook outlined above, we identified four key areas (see points 1-4 below) to include in a more in-depth policy review in the questioning phase of the action-oriented research process. The policy review was constituted as a desktop review of multi-levelled policy – with the levels being defined by their proximity to the object of activity: namely scaling CBWQM praxis. The policy review is situated in a literature review that draws out dimensions of the science-policy-public interface. The emphasis of the review is on the 2017 IWQM policy and strategy and action plan of (DWS, 2017a, b, c) at the centre in Figure 10), the National Development Plan, and the Sustainable Development Goals. Within this framework, we reviewed the multi-levelled policy from the following three perspectives: 1) Orientation to policy as being enabling or constraining to CBWQM (drawing on the literature review on the science-policy-publics interface, 2) Contributions that can be made from CBWQM praxis to realising policy commitments, and 3) Implications for the activity of scaling of CBWQM praxis.

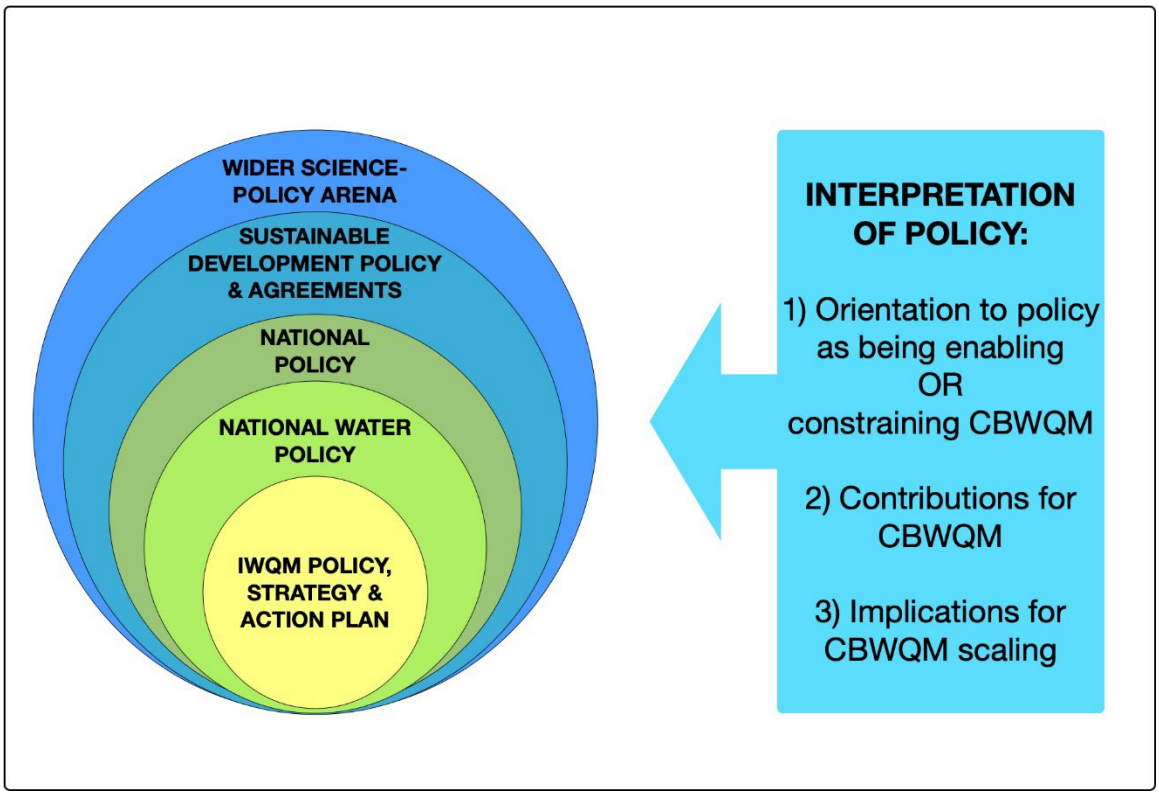


Figure 10: Framework for reviewing potential for realising national and international commitments through CBWQM, and for how scaling of CBWQM can be strengthened via policy implementation commitments (with concentric circles of policy review emerging from the proximity and relevance of policy to the object of scaling of CBQWM).

The main substance of the policy review is elaborated below in points 1-4.

1) Examining the Science-Policy-Public Interface

This section, constituted as an international literature review (further elaborated in Deliverable 4 of the project and in Vallabh, in press), assists with situating the rest of the policy review and helped with framing an understanding of the central contradiction under investigation in this action-oriented research. We identified that internationally two main fields of research have contributed to investigating and articulating science-policy-public relationships (Leech & Scoones, 2005), including the fields of:

- ➢ Science and Technology Studies (STS), arising through and theorising work within the global North; and
- ➢ Development Studies (DS), arising in and theorising work emerging within the global South.

STS initially focused on legitimising the success of science to the public through policy mechanisms and mediatory institutions, but later also engaged in challenging the assumptions and practices of science. Comparatively, DS emerged through a stronger focus on practice-based engagements between science (and its spokespersons), and public and local knowledges, and their socio-cultural underpinnings (Leech & Scoones, 2005).

Broadly speaking, the term ‘civic science’ is used to describe the range of approaches encompassing notions of civil, participatory, democratic, and stakeholder education and science, among other terms. Each approach is characterised by, and enacted through, particular institutional, normative and epistemological positions which predispose them to particular epistemic (knowledge) cultures and practices. Issues of participation,

representation, legitimacy, institutional culture, transparency and policy intention remain under-researched and/or problematic within many approaches. Bäckstrand (2003, p. 24) suggests that the concept of civic science,

> *alludes to a changing relationship between science, expert knowledge and citizens in democratic societies. In this perspective, citizens and the public have a stake in the science-politics interface, which can no longer be viewed as an exclusive domain for scientific experts and policy-makers only.*

Four main iterations of civic science dominate the literature, including,

➢ ***Deficit models*** of science education and scientific literacy, which frame citizens as deficient in their understanding of science, and in need of scientific literacy development. This highly critiqued model often frames citizens as overly emotive due to a lack of rational understanding of the principles of scientific work. Key strategies within such models focus on developing science education and literacy development programmes which seek to rectify this deficiency by providing citizens with correct scientific facts and explicating why such facts are trustworthy and reliable (for critiques, see for example, Árnason, 2013; Hess, 2011; Bickerstaff et al., 2010; Felt *et al.,* 2009; Bäckstrand, 2003; Elam & Bertilsson, 2003; Irwin, 2001).

➢ ***Citizen-consumer models****,* which are concerned with convincing citizens of the economic values of techno-scientific innovations, and mediating concerns over risk in light of such values (see, for example, Bickerstaff et al., 2010; Rose & Novas, 2004; Elam & Bertilsson, 2003; Irwin, 2001). Within these models the aim is to establish scientifically informed publics which are willing and able to make consumer decisions with incomplete scientific information within contexts of unknowable complexity. Such models leverage mechanisms of deliberative democracy towards privileging economic rationalities related to research investments and the establishment of new innovation-related markets, rather than public good outcomes. Elam and Bertilsson (2003, p. 240) pointed out that in such approaches,

> > *… the suspicion remains that those responsible for designing new public forums are ultimately doing so for their own purposes: that public experiments in the new democratic governance of science are ultimately more akin to highly sophisticated exercises in social or market research.*

➢ ***Deliberative democracy models****,* which emphasise deliberation and dialogue between publics and scientists and which, in theory, act as democracy-enhancing mechanisms. The intention here, is for the public to represent itself through mediated deliberative processes, and through deliberation, develop consensus regarding techno-scientific innovations and risks. In more conservative approaches, participatory processes are engaged to facilitate spaces for the public to express their concerns related to particular issue more superficially, when enacting more participatory forms of bureaucratic administration, deficit or citizen-consumer intentions through more engaged practices (Árnason, 2013). Irwin (2005) pointed out that such models can then resemble participatory extensions of more corporate models of governance. Opportunities are afforded for knowledge to flow both ways, between scientists and the public, there is some concession that scientific knowledge is not always primary, and that other forms of knowledge might make valuable contributions to understanding knowledge application contexts and inform deliberations. Within these models, Árnason (2013) challenged us to question whether the "mechanisms of public deliberation" (Irwin, 2001, p. 2) are able to authentically enable the promises implied in visions of public engagement and deliberative democracy, or whether they serve other purposes. Nor should deliberative democracy models be conflated with more direct models of participatory democracy which go beyond deliberation and towards collaborative management and power-sharing. Two strong critiques of deliberative democratic approaches include a

sceptical critique and a liberal critique (Árnason, 2013). The skeptical critique raises concerns about the potential for deliberative processes to reinforce existing power relations while reducing other spaces for dissent against techno-scientific innovation and associated risks (Elam & Bertilsson, 2003), as well as perpetuating a view of a homogenised public who represent consensus on behalf of society as a whole, without the need to engage substantively with other dissenting positions or absent publics (Árnason, 2013). The liberal critique foregrounds the rights of individuals over collective publics and resists 'illegitimate intrusion' into the private sphere; the position defends that individuals should be able to represent their own interests and views, rather than collective or public goods and perspectives. Árnason (2013) pointed out that this argument makes it possible to reap techno-scientific benefits without public 'interference', and serves to reduce democratic resistance to policy implementation systems while encouraging more passive formations of citizenship. Instead, Árnason (2013:934) argued that a "deliberative vision of the scientific citizen does not violate the right to privacy and freedom from politics but it emphasizes the face that in democratic society every citizen is partially responsible for public policy", and that the state bears responsibly for enabling and supporting the public to assume their democratic responsibilities. (For articulations and critiques of deliberative democracy models, see discussions by Árnason, 2013; Hess, 2011; Bickerstaff et al., 2010; Felt *et al.,* 2009; Bäckstrand, 2003; Elam & Bertilsson, 2003; and Irwin, 2001; and in the context of the National Water Act of 1998 (RSA, 1998) see Lotz-Sisitka & Burt, 2006).

➢ ***Participatory and radical democracy models*** seek to develop the foundations of deliberation, and seek to engage publics in processes of co-governance, through which mechanisms for facilitating consensus as well as authentically engaging with confrontation and dissent are actively sought and enabled through institutional processes (Elam & Bertilsson, 2003). Consensus and confrontation are brought into interaction with each other as a valued system of resourcing co-governance, and science is viewed as one form of relevant knowledge among others, and activism and advocacy are embraced as valid contributions to democratic infrastructures. Callon (1999, pp. 89-90) suggested that here, the dynamic of knowledge co-production,

> *… is the result of a constantly renewed tension between the production of standardised and universal knowledge on the one hand, and the production of knowledge that takes into account the complexity of singular local situations, on the other hand. These two forms of knowledge are not totally incompatible … nor are they produced independently from each other …[instead]… they are a common by-product of a single process in which the different actors, both specialist and non-specialist, work in close collaboration.*

Authors such as Árnason (2013), Felt et al., (2009), Wynne (2005) and Irwin (2001) brought to our attention that much of the focus of civic science (and therefore of policy consultation and implementation strategies) occurs at the point just before, or even during or after, techno-scientific innovations, or policy implementation enacting mandated state functions, have been engaged. This positions publics in contexts where they are only able to comment on, deliberate on, contribute to or protest the uptake of knowledge or implementation of policy decisions when they are already in process. Much public engagement is confined to risk-focused deliberation, rather than more systemic processes of knowledge co-production which provide opportunities to engage with stronger democratically relevant value interests, such as 'which types of society are implied through particular interests, choices and actions?', or 'which futures are enabled through particular approaches to knowledge-building or policy implementation?'. As Law (2004) pointed out, both empirical research methods and systems of knowledge-building, and the design of public engagement processes need to be carefully considered because both perform, represent and forward, particular visions of the world.

Felt et al. (2009) drew our attention to ethics and values as mediators within science-policy-public relationships (also see Wynne, 2005), and highlighted that careful attention is required to support robust systems of values clarification and ethical contestation within such relationships. They highlighted a number of 'closure mechanisms' which inhibit and constrain deliberation and effective participation, including 1) hierarchical arrangements which position facts above values in a dualistic relationship, and thereby diminish the legitimacy of values-based deliberations by publics; 2) displacement strategies, which shift ethical concerns and questions to either institutional forms of expertise or alternative times and venues which are deemed more appropriate for such deliberations; and 3) the absence of ethical questions which are potentially voiced in smaller, more homogenous groupings among participants, but absent during co-engaged deliberations among diverse groups (Felt, et al., 2009), which constitutes a form of silencing. Their concerns raise the need to strengthen public institutions in ways which address the dualism of facts and values in ways that enhance and value ethical and values-based deliberation, and enable such forms of deliberation to be engaged in conjunction with scientific and policy administration arguments.

To resolve this, Bickerstaff *et al.* (2010) point out that we need to recognise that many institutional rationalities are rooted in particular hierarchical conceptions of expert-layman (or science-society) relationships and are geared towards enacting and perpetuating such conceptions. The move towards more participatory and/or radical democratic models requires first that such conceptions be challenged and re-imagined. They argue that 'institutional rationalities' are often enacted in subtle ways which greatly impact democratic legitimacy and are evidenced through the ways in which particular forms of knowledge are generated and used, how rules are used to manage systems of policy development and implementation or democratic participation, and how such rules are acted upon or ignored, resisted or adapted (*ibid.*). They stressed the need to move away from simply evaluating deliberative or participatory processes towards a focus on, "teasing out the relations between new ways of engaging citizens [publics] and the dynamics of institutional cultures, values and, in the longer term, trajectories of scientific and technological innovation and decision making" (2010, p. 20).

In our praxis analysis above, which formed the first phase of our Learning Action 1 (questioning) in the action-oriented research, we indicated that CBWQM in South Africa is configured via a multitude of diverse relationships and partnerships which may or may not include direct State-civil society relations and partnerships (cf. Box 2 above). We highlighted that in all cases, there was, however, need for building stronger state-civil society relations and that various CBWQM projects in South Africa were attempting to do this via building relationships with local government, provincial government and/or national government structures, or quasi-state institutions such as universities. There were also cases where the relationship that was being established with the state was less collaborative and more critical, in attempts to hold the state more accountable for policy implementation. We also realised that, depending on the scope and scale of the project, one finds different levels of government support. For example, national projects tend to have stronger government support, while local projects at times have local government support, but not always. In most partnership configurations one finds environmental or water justice NGOs who are actively engaged with compliance monitoring and activism to strengthen more radical forms of democracy.

As noted above, there was a mix of policy engagement, which included local, provincial, national and international policy engagement processes. We found that many of the projects are aligning to the Sustainable Development Goals, especially SDG 6 (Clean water and sanitation) and 14 (Life below water). From a national policy perspective, the National Water Act of 1998 (RSA, 1998); the National Water Resources Strategy II of 2013 (DWS, 2013), and the more recent National Integrated Water Quality Management (IWQM) Policy (DWS, 2017a), Strategy (DWS, 2017b) and Implementation Plan (DWS, 2017c) appeared to be guiding projects. At provincial level, the Provincial Growth and Development Strategies (PGDS) appeared to be a key influence. At local level, municipal IDP plans were an important policy focus. In some cases Catchment Management

Authority strategy also influences praxis, such as in the case of the Breede-Gouritz CMA. Those projects working with schools were working especially with the Curriculum and Assessment Policy Statements of the Department of Basic Education (2012), with citizen science activities aligning with curriculum content of Grade 6 Natural Science, Grade 6 and 7 Life Orientation, Grade 6 Life Sciences and Social Science.

The projects addressed policy in three ways: 1) through helping with monitoring (e.g. through the River Health Index), 2) through offering an enabling environment for people in leadership positions to address and meet the policy requirements of legislation, and 3) through holding and assisting local and national government to be more accountable for compliance monitoring.

From the above, we identified that *CBWQM is a practice that is well positioned to strengthen deliberative, participatory and more radical forms of democracy*, and therefore also to assist the State with its functioning. However, we noted that this would require that the State should, *in practice,* more fully recognise those involved in CBWQM practices as legitimate actors or publics who are co-engaged in deliberating and contributing to a more democratic society. We noted that this has implications for how citizens or publics are positioned within the policy system, which we sought to elaborate further through our questioning inquiries in this phase of the action-oriented research process.

In South Africa, we noted that CBWQM is positioned more within the Developmental Studies (DS) trajectory at the science-policy-public interface since we found that there was, in general, not only a science-technology-society interest (i.e. how the use of citizen monitoring tools could enhance knowledge of water quality issues), but also a strong interest in how CBWQM can contribute to development of people and society, and especially how ecological infrastructure can be unlocked for job creation, an interest which is also articulated in the Presidential Jobs Summit outcomes noted in the case studies (cf Box 3 above). We noted for example, that "The Enviro Champ model is gaining popularity as a means of creating both employment for CBQWM volunteers and for mobilising wider participation … [and] … in both cases of the more formally employed, and in the voluntary initiatives, consistent and secure funding for CBWQM is a significant problem affecting the practice" indicating that there is actually a need to more clearly articulate CBWQM practice as *a developmental practice*, aligned with the National Development Plan, the Sustainable Development Goals, and water policy which views water as central to equitable development of society.

The rationale for this was articulated as being related to not only the practice of CBWQM as a developmental practice, but also *a social justice practice*. For example, we drew attention to the important point that involvement of citizens also needs to be properly considered. As reflected by one NGO director in our initial consultations, failure to do so can create problems for the citizens who are participating in the project in that a) their expectations of change may not be met as the routes for sharing the data may not be in place or functional, and b) sometimes the types of water quality tests required are incredibly complex and expensive (e.g. testing for heavy metals), and without adequate scientific equipment and resources the diagnosis could be incorrect and could therefore put communities in a bad light, and c) there are also health risks associated with CBWQM if not properly supported and resourced. There are therefore dangers embedded in skilling communities to participate in CBWQM projects unless there is adequate and sustainable support for the process and unless there are sufficient means of sharing the data into systems that do actually influence decision making and change processes. It is important therefore that there are viable routes for reporting, so that communities involved in CBWQM can "see where the data goes". There is also need for adequate resources and support for the practice to minimise social justice and health related threats to communities who are willing to undertake this important task in support of democracy building, and implementation of the country's water legislative intentions (i.e. to secure enough clean water for all and functioning sanitation systems). Thus, CBWQM projects need to be

adequately embedded in viable and responsive governance frameworks with adequate political economies of support.

Related to the analysis above is also the point that CBWQM practices need to be seen as an *integral part* of governance, and not as an afterthought or a reaction to risk. As noted by many of the CBWQM projects reviewed in the first Learning Action inquiry, they experienced a lack of practical support for planning and ongoing management, capacity building, and practical support for longer term co-ordination and sustainability, **indicating that CBWQM projects are not currently seen as being *integral to* development or water quality policy processes in South Africa, despite policy commitment**. In some cases, their practice was hampered by institutional issues such as municipal bureaucracy, lack of political will, and delays in project management.

In the next sections of our policy inquiry, we therefore critically considered how policy can be mobilised in support of CBWQM **within a more proactively constituted developmental orientation necessary for building a strong democracy**, in ways that also support **CBWQM as *integral to* pro-active IWQM practice**, rather than as an ad hoc, reactive, marginal and risk mitigation practice only. This does not mean that activism will not be necessary; rather, activism should be legitimated within a suite of CBWQM orientations, all of which can have potential to contribute to improved state functioning and democracy building.

2) Examining the Sustainable Development Goals, especially SDG 6

As mentioned above, and as outlined in Deliverable 3, many of the CBWQM projects already align with the SDGs, especially SDG 6. Similarly, policy also aligns with the SDGs, and there is a general commitment to addressing the targets of the SDGs in the , as evidenced by the number of working groups formed to consider how to coordinate implementation and ensure work can be reported against SDG targets and indicators. South Africa is also obligated to report on the SDGs to the UN General Assembly on an annual basis. The 2018 SDG Report[8] (UN, 2018, p. 3) states that, "The 2030 Agenda for Sustainable Development provides a global blueprint for dignity, peace and prosperity for people and the planet, now and in the future. Three years into the implementation of the Agenda, countries are translating this shared vision into national development plans and strategies". This is also happening in South Africa as the SDGs are gradually aligned with national policy and practice, including SDG 6.

There is enormous potential for CBWQM to contribute to South Africa's commitments to SDG 6 as outlined below, especially if CBWQM is also conceptualised within the developmental orientation described above, and as *integral to* IWQM and SDG monitoring and reporting in South Africa. CBWQM should be conceptualised as integral to the achievement of the SDGs, especially, but not limited to, Target 6.b which requires greater community involvement in water and sanitation management (see Figure 11 and Box 5).

[8] Note, all further references to the 2018 International SDG progress report draws on this reference.

Figure 11: SDG 6, conceptualised above as central to achievement of all of the other SDGs (LHS). SDG 6 has a number of Targets, illustrated above (RHS) – see also Box 5 which highlights the SDG targets most aligned with CBWQM practice.

BOX 5: **SDG 6 WITH TARGETS**

(those in bold are the ones most aligned with CBWQM practice)

ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.a By 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programs, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.b Support and strengthen the participation of local communities in improving water and sanitation management

Drawing on the global 2018 SDG report and national reporting on SDG 6 in 2017/18 by DWS, we captured critical insights related to the three highlighted targets in Box 5 above which we identified as being most pertinent to the activity of scaling of CBWQM praxis. Some key insights for engaging the policy-practice contradiction under study in this phase of the action-oriented research included:

- For **Target 6.5** it was noted that there was a need to 'redouble efforts' in most countries to better manage their water resources. The SDG report for 2018 articulates IWQM as a developmental concern and noted that IWQM policies were slow to be realised, hence the point that most countries need to "accelerate current progress to come close to the target by 2030, particularly regarding financing for water resources management" (UN, 2018, p. 20).

- For **Target 6.3** the international SDG report confirms the fact that "untreated household wastewater poses a risk to both public health and the environment" (UN, 2018, p. 19), noting that untreated wastewater from households degrades overall water quality. The report goes on to say that "it can contaminate drinking water sources and limit opportunities for safe and productive reuse of water. Preliminary estimates from household data in 79 mostly high- and high-middle-income countries (excluding much of Africa and Asia) show that, in 22 countries, less than 50 per cent of all household wastewater flows are safely treated" (UN, 2018, p. 19). Of concern, and of relevance to the activity of scaling CBWQM practice, is the lack of data on contaminated water for SDG reporting in most African countries, including South Africa, although the has reported that "56% of wastewater treatment works and 44% of water treatment works are in a poor or critical condition. 11% are dysfunctional" and that "35% of water is lost through leakage" (UN, 2018, p. 19). This issue has received recent public attention in South Africa via a Daily Maverick article which reported that "Billions of litres of poorly treated or untreated sewage, industrial and pharmaceutical wastewater are spewed into our rivers and oceans. By the government's own admission, 56% of the country's 1,150 treatment plants are 'in poor or in critical condition'. But this investigation reveals further that 75% of 910 municipality-run wastewater treatment works achieved less than 50% compliance to minimum effluent standards last year." (Kretzmann et al., 2021). They note further that "National data on the functioning of wastewater treatment works and their adherence to sewage treatment standards, however, do exist. Municipalities are responsible for operating wastewater treatment works and must submit monthly reports to the national Department of Water and Sanitation on the quality of the effluent they release into rivers and, in coastal towns, sometimes directly into the ocean. This is reflected on the department's Integrated Regulatory Information System (Iris) dashboard[9] (see Figure 12, which is a screenshot from the dashboard. The map indicates the scope of poor and bad compliance of wastewater treatment works across South Africa – the red markers indicate where compliance to minimum wastewater treatment standards is 'bad'). Disconcertingly, the map below is titled "South Africa's Effluent Discharge into Rivers Map".

[9] ws.dwa.gov.za/IRIS/myriver.aspx?c2VvcD0xJnNob3dfYWxsPTE=

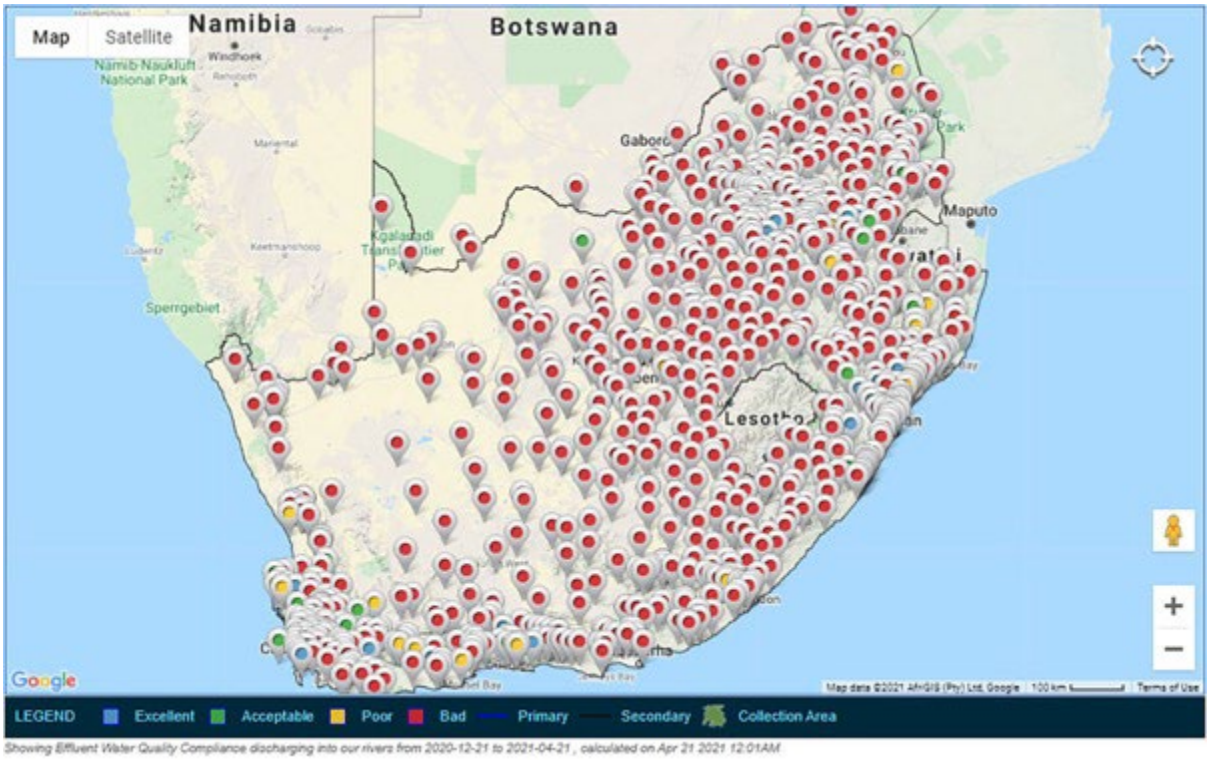


Figure 12: map of South Africa's effluent discharge into rivers (2020-12-21 to 2021-04-21) (Source: http:ws.dwa.gov.za)

We noted in our policy inquiry in this phase of the action-oriented research that the escalating scope of concern with risk associated with wastewater treatment works, sewerage leaks, and associated contaminated water resources, as well as the loss of water through leaks could be a strong catalyst for upscaling citizen engagement in water quality monitoring and water management activities in South Africa. However, the role of CBWQM in such a context is yet to be adequately conceptualised in South Africa, hence this research. Further probing of effluent monitoring data per municipality shows weak capacity for monitoring of effluent into the water systems. A dashboard view of this is provided on the Iris dashboard, which gives a per municipality overview of monitoring compliance:[10] (Fig. 14). The dashboard indicates types of monitoring according to microbiological, chemical, physical and operational, and indicates levels of monitoring as outlined in the screenshots below. **From the data across the country, and individually district by district, insight can be gained as to *how* CBWQM capacity building and tools can be deployed in support of national monitoring of IWQM, and *how* this can be done in partnership with the State, especially at local government and district governance levels.**

[10] ws.dwa.gov.za/IRIS/dashboard_waste.aspx

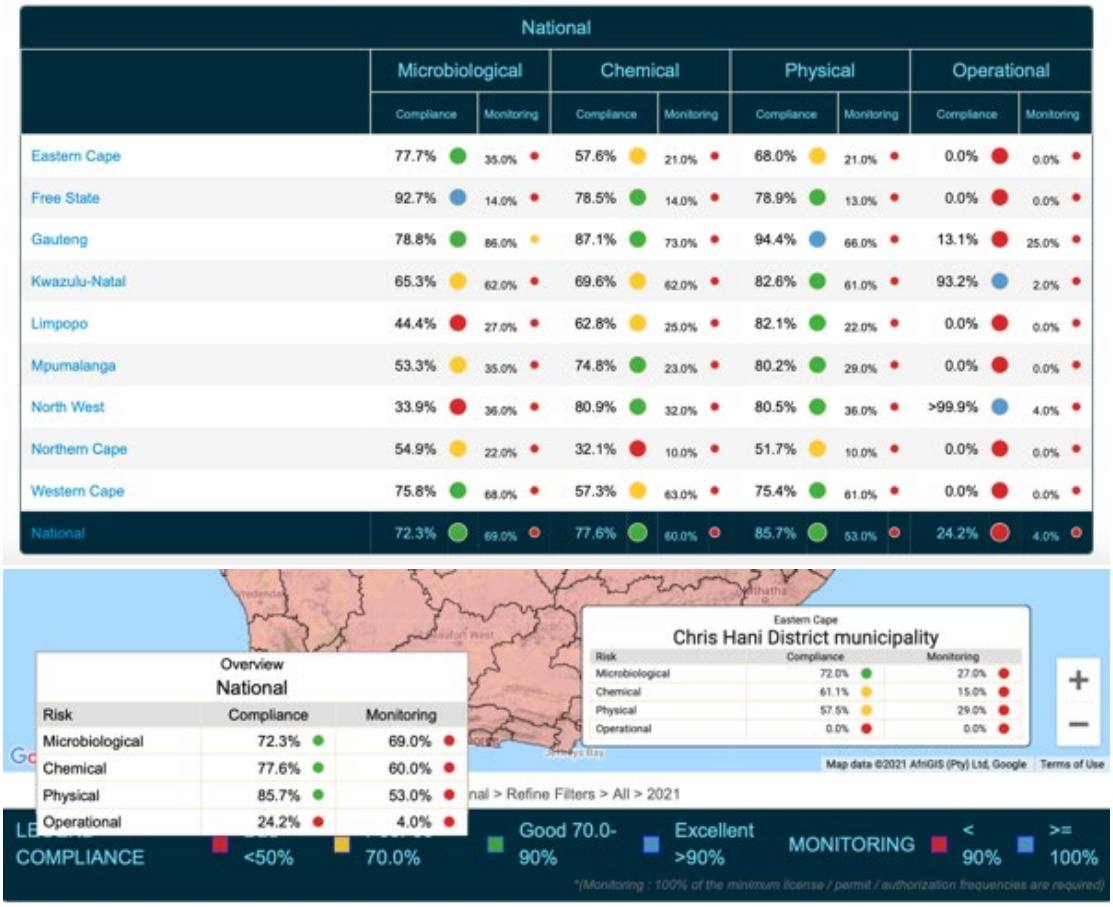


Figure 13: Water quality maps and data provided by IRIS dashboard showing that the scope of the problem that could be assisted by CBWQM praxis is nothing less than a national crisis

Target 6.b, which focusses on the involvement of local engagement in water and sanitation management, raised questions on the indicators and what is included or excluded from the indicators and the measurement approaches used to report on this indicator (e.g. the focus on **defined procedures in policy).** We identified that it is also important to examine the indicators from a CBWQM scaling perspective to identify how SDG 6 reporting by the could be enhanced by CBWQM practice, and *vice versa*, i.e. how CBWQM practice can be enhanced by SDG 6 reporting. To examine this, we focused in on the Indicator for SDG 6, Target 6.b as this is the one that is most likely to be of interest to the DWS when considering CBWQM praxis as a potential contributor to the expansion of both data and activity related to this Target. Indicator 6.b.1 provides definition for the notion of 'supporting and strengthening' the participation of local communities in improving water and sanitation management by focusing in on '**proportion of local administration units'** with **'established and operational'** policies and procedures for participation of local communities in water and sanitation management. The guidance provided to national governments for the monitoring of this indicator is instructive, and is helpful in conceptualising how to represent CBWQM within this system of monitoring and reporting on SDG Target 6.b. The **e-Handbook for SDG monitoring and reporting on the indicators** (Sapkota, 2019) offers further useful insight for CBWQM practice, and how to articulate it with the government's intentions and reporting demands for SDG 6, indicator 6.b. This handbook is being developed by UNSTATS to guide and support national government statistical units to set up the necessary data systems for monitoring against the indicators. It states this "addresses the **growing need for information targeted towards national statisticians** to collect, calculate, and monitor the SDGs using data produced by the national statistical systems" (Sapkota, 2019: home page). In

South Africa, the DWS have confirmed that they are working with STATSSA, using a system of working groups, to articulate the monitoring frameworks for reporting against the indicators (Bannister, March 2019, DWS presentation). There is a DWS working group for Target 6.b, that is giving attention to Indicator 6.b.1 which is where the work on CBWQM could feed into the system practically, with capacity building support, as also indicated by the DWS working group on Target 6.b who stated that "… achieving meaningful participation continues to be a challenge especially for the previously disadvantaged communities. It is therefore important that more emphasis be placed on the development of skills and capacity of participants to understand and make meaningful contributions, especially participants from disadvantaged communities" (DWS 2017/18, pg. 77-78). There is also some recognition that CBWQM programmes such as River Health programmes can contribute to this process.

However, for this to be adequately done, there is need to follow the detail surrounding indicators and how they are constructed, including the deliberations around meanings associated with the indicators and how they are conceptualised. In addition, the availability of data at the relevant scale to enable accurate reporting that complies with the standards set by the UN remains a significant challenge in light of the unavailability of data or the availability of data which is as yet non-compliant with the standards required for reporting. In this study, we do this within the paradigmatic framework that we have articulated for CBWQM in South Africa, guided by the international literature on conceptualising the science-policy-public interface outlined above.

Box 6 below illustrates guidance provided by the e-handbook, with sections of interest to the CBWQM policy relationship highlighted using bold text.

BOX 6: **EXTRACTS FROM THE E-HANDBOOK ON SDG INDICATORS, WITH REFERENCE TO INDICATOR 6.b.1**

Definition:
This indicator is defined as the percentage of **local administrative units (as defined by the national government**) that have established and operational policies and procedures **by which individuals and communities can participate in decision making on water and sanitation management**.

Concepts:
Local administrative units refer to **non-overlapping sub-districts, municipalities, communes, or other local community-level units covering both urban and rural areas** as defined by the government.

Policies and procedures for participation of local communities suggest **presence of formal/legal mechanisms to ensure participation of users in planning water and sanitation activities.**

Formal or legal mechanisms are considered ***operational*** **if they are implemented, with appropriate funding in place, and have means for verifying that participation took place.**

Water and sanitation-related activities and programmes include those for water supply, sanitation and hygiene (WASH) (targets 6.1,6.2), wastewater and water quality (6.3), water efficiency (6.4), water resource management (6.5), and water-related ecosystem (6.6).

Rationale and Interpretation:
Participation of local communities is vital to ensure the needs of all the community are met, including the most vulnerable and also encourages ownership of schemes which in turn contributes to their sustainability. **Defining the procedures in policy or law indicates a degree of formalization and consistency in the implementation of these procedures.**

A low value of this indicator would suggest that participation of local communities in water and sanitation management is low, whereas a **high value would indicate high levels of participation, indicating greater ownership and a higher likelihood of sustainable delivery and management of water and sanitation services.**

Potential Data Sources:
Potential data sources or monitoring mechanisms that could be used by national governments to collect this data include the following:

Census of municipalities (assuming municipalities cover both urban and rural localities, and the government already conducts or is planning to conduct periodic censuses of municipalities); alternatively through a survey with representative sampling of municipalities.

- Including one or more questions in a community module of a national survey.
- Including this indicator in administrative data or WASH MIS to be collected at the local administrative unit level.
- Using focus groups and/or community dialogues on local participation with key informants, members of the general public (See: UNDP. A user's guide to measuring local governance. Available at http://www.undp.org/content/dam/aplaws/publication/en/publications/democratic-governance/dg-publications-for-website/a-users-guide-to-measuring-local-governance-/LG%20Guide.pdf), and NGOs active in the community.
- **Collecting information through existing projects at local administrative unit level.**
- **Innovative data collection methods such as crowdsourcing or SMS surveys.**
- … There is a degree of subjectivity in what constitutes an "established and operational" policy or procedure, as well as on the definition of "participation". Further study is currently ongoing to better define these concepts regarding community participation.

Policies and procedures are often established at the central level, but operationalization is not always monitored centrally. In addition, **established and operational policies and procedures do not necessarily lead to high levels of participation**.

The indicator does not necessarily correlate with quality of water and sanitation management: High community participation does not always lead to better water and sanitation management, and low participation does not indicate that water and sanitation management is poor.

The indicator does not capture informal participation procedures, which may be just as effective as those that are formally defined.

The text in Box 6 above highlights the importance of developing scaling mechanisms for CBWQM that are ***operational at the local government level***, and that align with local government reporting systems (most notably the IDPs). The discussion on the indicator alludes to the possibility of using innovative approaches to data capture (e.g. some of the citizen science tools developed can provide useful data that can be integrated into IDP reporting) which can shed light on citizen participation in IWQM, especially perhaps in relation to the conceptual and practical framework outlined for monitoring in the context of the IRIS data outlined above in relation to indicator 6.3. Also, important to CBWQM scaling action-oriented research is to further clarify the notion of **operational procedures,** and as noted above, this includes appropriate funding, and appropriate means of verification that participation is taking place. These are key areas for further discussion in the CBWQM scaling process, especially with DWS and the working group for Target 6.b as the action-oriented process unfolds.

Significant therefore, is the process of engaging with the SDGs. Development Discourse (2019, pg. 1) [11] reported recently on the DWS engagement with the SDGs, noting that there are both positive developments and challenges with the engagement with SDG 6 so far. The media report noted that the "Global SDG 6 targets are being localised and adapted to the context of South Africa", and that "South Africa, besides other international participants have been given the authority on how to incorporate SDG 6 targets into national planning processes, policies and strategies, and set their own SDG 6 indicators, taking into account local circumstances". The Chief Engineer of DWS, Mark Bannister, cited in the Development Discourse report (2019, ibid), was reported to have said that "Sustainable management of water and sanitation underpins wider efforts to end poverty, advance sustainable development and sustain peace and stability", reflecting the **developmental orientation that we outlined above for CBWQM practice**. Commenting further on the engagement with the SDGs so far, Development Discourse (2019, pg. 1) notes Mark Bannister reported that "serious data challenges need to be overcome through synchronised data gathering and storage systems including regular monitoring by relevant stakeholders", and "This must include effective data management systems that allow us to monitor, evaluate, measure the performance of SDG 6 towards the 2030 Goal". It was also noted in the same media report that "There is lack of capacity and financial resources from DWS to conduct frequent monitoring", indicating a potential gap for CBWQM activities, especially as outlined above. Development Discourse (2019) further reported that the DWS have also launched a Development Cooperation Partners Platform for supporting the work on monitoring and implementation of the SDGs; it is possible that CBWQM could become a 'programme of government 'within this partnership framework.

As identified in our policy inquiry, currently the monitoring of SDG 6.b by DWS focusses on Water Services Planning within the IDPs, situated within Water Service Authorities. There is little mention of citizen engagement

[11] Citations below are from this report.

or participation in CBWQM initiatives beyond a recognition that this is needed in the SDG 6.b gap analysis (DWS 2017/18), or how this can be monitored within this framework at this stage.

Understanding further how this reporting is being undertaken can facilitate a dialogue about CBWQM initiatives within or extending from the current focus on WSAs, IDPs and WSPs as main units of analysis for this reporting (see Box 7 below). Of significance to this study is the DWS Working Group on Target 6.b's Terms of Reference and Action Plan, in which it is stated that they will be engaging with STATSSA to include an item on community participation in water management using IDP and River Health Monitoring Programme data (DWS, 2017/18). We identified that the CBWQM community of practice can engage with this data generating process to consider how data from CBWQM initiatives can feed into this system of data generation and thus enrich the reporting on community-based engagement with water quality management in South Africa.

BOX 7: **CURRENT SDG 6.b reporting from**

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SDG 6.b TARGET: "SUPPORT AND STRENGTHEN THE PARTICIPATION OF LOCAL COMMUNITIES FOR IMPROVING WATERAND SANITATION MANAGEMENT"

Indicator 6.b "Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management"

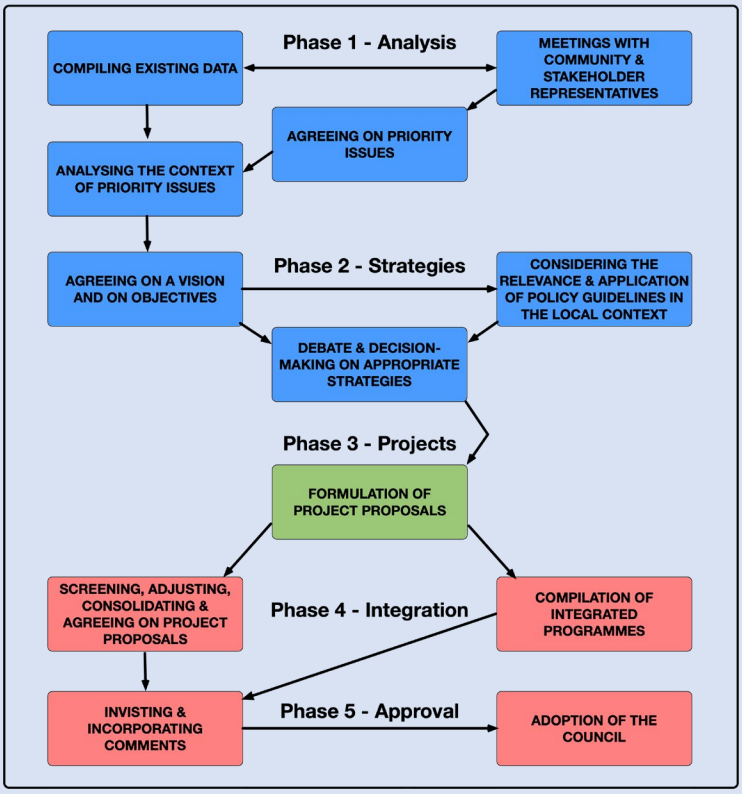
This indicator remains as given by the United Nations – no Domestication is taking place, however additional Indicators are recommended in future to close gaps that exist between the current Indicator and Target

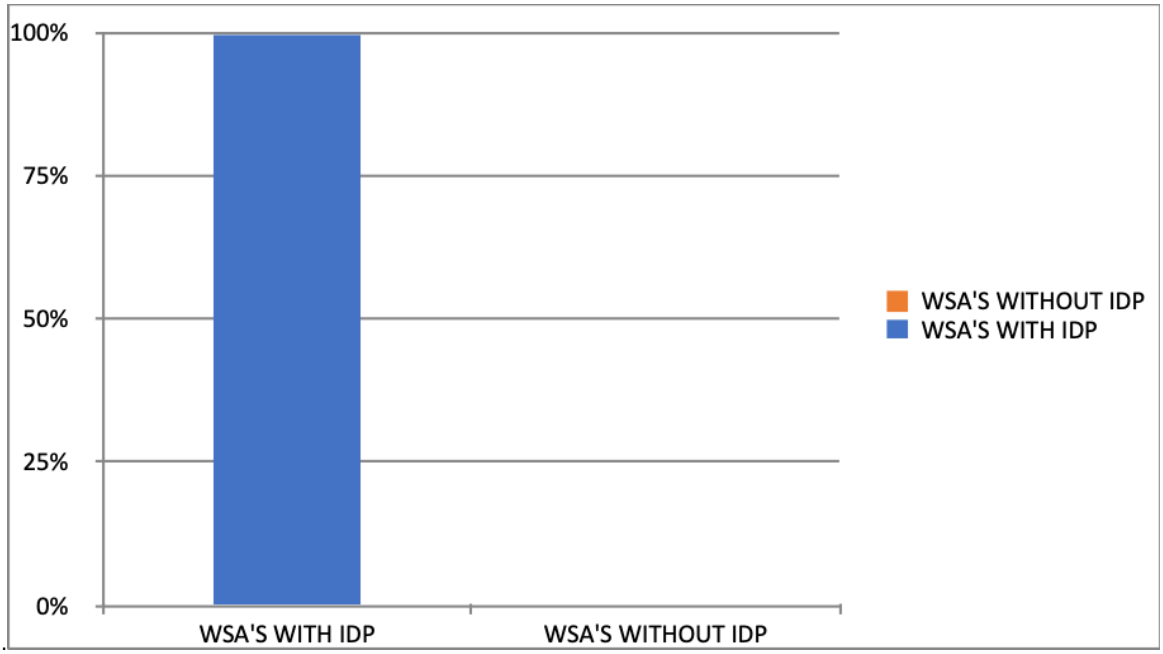
Definition: This indicator is intended to show the degree of participation of local communities in water and sanitation planning and management, which is essential for ensuring that the needs of all people are being met. It measures the country planning procedures to ensure that communities are involved in water and sanitation planning and management.

Method of Computation: There are 144 Water Service Authorities (both District and Local Municipalities) in South Africa. Each are required by law to develop their own "Integrated Development Plan" (IDP) as a method to plan future development in their areas. The 144 IDPs that are developed annually by the 144 WSA's will be used to check the degree of participation of local communities in water and sanitation planning and management. The formal structures highlighted in the IDP process are called 'Representative Forums' namely community stakeholder structures and ward committees. IDPs will not be approved by Government without a community participation policy in place. It is a mandatory document. The number of WSA's that have IDP's in place will be used versus those that do not have IDP's which will formulate the national picture for 2017/18.

IDP Process.

The flow chart below shows the process followed in the development of an IDP and highlights community participation and stakeholder representative analysis towards the planning process and as guided by the WSA policy for their area of jurisdiction.





Source: http://mfma.treasury.gov.za/Documents/Forms/AllItems.aspx

Comment:

- All Water Services Authorities have a legislative mandate to develop their Integrated Development Plan which culminate a Water Services Development Plan (WSDP). The findings are such that in South Africa all WSAs have an Integrated Development Plan approved which by default says that all WSAs will have community participation policies and procedure in place.

- The indicator, however, only tells part of the story – it is one thing having a policy or procedure in place, however the effective use of the same policy and the efficient quantitative participation of community participation is not considered within this indicator. The 6.b target talks to Stakeholder participation to ensure sustainable Water and Sanitation while the indicator only speaks to the existence of Policies and Procedures for community participation and defining the formal mechanism to ensure participation of users in planning for Water and Sanitation. The fact that the indicator does not cover effective participation issues, e.g. proof of participants, leaves it incomplete. This indicator is only addressing 20% of the actual target and additional indicators will be developed in the future to substantiate the usefulness and effectiveness of these policies.

- The Department of Water and Sanitation in collaboration with Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS) should unpack this indicator and the methodology of computation.

From the above (summarized in DWS, 2017/18, pg 75-80), it was clear that potential exists for integrating CBWQM practice into local government / local governance [indicating this to not only be inside government institutions] operational procedures, and associated reporting systems and procedures as these feed into national reporting and reporting on the SDGs, especially in this case, SDG Target 6.b.1, which as articulated above, contributes to the achievement of the other Targets, and via SDG 6 contributes to other developmental objectives of the country. The DWS (2017/18, pg. 80) notes that "The indicator, however only tells part of the story – there is one thing having a policy or procedure in place, however the effective use of the same policy and the efficient quantitative participation of community participation is not considered within this indicator." This 'policy monitoring space' would clearly form an important 'scaling pathway' for CBWQM practice, could more formally support CBWQM practice, but also assist government to report more substantively on this indicator and target of the SDGs, thus facilitating the achievement of national and international development goals and commitments.

This aspect of our policy inquiry focused mainly on SDG 6. However, it is important to note that the SDGs are inter-sectoral, and also intersect. For a social learning and participatory governance orientation to the SDGs to be fully realised, there will, for example, be need to develop stronger integration with SDG 4 (Quality education within a lifelong learning framework), and SDG 17 (Governance and partnerships). There are also important intersecting concerns, e.g. SDG 6 and SDG 11 (Sustainable human settlements) which also need to be adequately conceptualised at implementation level. The WRC has also since published a report on the interlinkages between SDG 6 and other SDGs (see Libala, Nyingwa & Griffin, 2021), which outlines some of the linkages. From an education point of view (SDG 4) the links are mainly to school – water infrastructure, and not to the role of education and training in providing capacity building for community participation in water quality management or CBWQM.

In 2020 the DWS released a SDG Gap / Action Plan, with two findings of importance to the scaling of CBWQM, notably the intention to re-introduce the Green Drop / Blue Drop monitoring system given the absence of adequate water quality monitoring actions at municipal levels (under Target 6.3, and an intention to upscale CMA and Water Users Association structures (under Target 6.b), which is where the emphasis on participation seems

to be lying. Significant to the scaling of CBWQM is the point made by Mark Banniser of DWS in a 2019 Academy of Sciences South Africa (Assaf, 2019) consultation that DWS were in the process of ensuring that "A new M&E indicator was being designed to measure, besides many other indicators, the impact of community and civil society involvement in decision-making, planning, design and implementation, and the operation and maintenance of systems."

Given the insights from the DWS IRIS data reported on under Target 6.3 above, it would seem that the scaling of CBWQM in support of, and in partnership with government would be a national developmental and social justice priority given the scale of water quality challenges in the country and the large numbers of people and substantive ecosystems that are impacted by the general national failure to manage water quality adequately. Hence we also turned to an inquiry into the National Development Plan.

3) Examining the National Development Plan and DPME tools

The Medium Term Strategic Framework and NDP

The ambition expressed in the South African National Development Plan (NPC, 2011) underscores the urgency for societies to transform towards a more livable, just and ecologically sustainable future. Accordingly, and aligned with the intentions of this study which is to inform the scaling of CBWQM in South Africa, Outcome 10 of the Medium Term Strategic Framework (MTSF) (DPME, 2014) indicates that in the period 2019-2024, the emphasis of government is on "the implementation of sustainable development programmes" to secure an "environmentally sustainable, climate change resilient, low-carbon economy and just society" (MTSF, Outcome 10, p. 1). To do this, the MTSF seeks to implement the following sub-outcomes:

- Sub Outcome 1: Ecosystems are sustained and natural resources are used efficiently.
- Sub Outcome 2: Effective climate change and mitigation response.
- Sub Outcome 3: An environmentally sustainable, low carbon economy resulting from a well-managed just transition.
- Sub Outcome 4: Enhanced governance and capacity.
- Sub Outcome 5: Sustainable human communities.

Targets for Sub Outcome 1 focus in on water conservation, management and protection, improvement of watershed services, stewardship interventions to reduce species loss, and integration of ecological infrastructure into decision making and developments (a potentially important focus for longer term sustainable resourcing of CBWQM initiatives). Integration into spatial development frameworks is emphasised. The targets emphasise monitoring of pollution, management of land degradation, enhancing compliance, and supporting integrated environmental assessments (relevant to the focus on citizen science and monitoring tools and capacity in this study). These interventions are all necessary to ensure a lasting, sustainable supply of clean water to South Africans and thus also influence objectives for food security, viable green economies and sustainable communities.

Sub Outcome 3 targets focus on promotion of a just transition, and articulate a need for high quality research that can inform the just transition process, which accommodates the focus on the developmental orientation to CBWQM proposed in this review. It further emphasises enhanced environmental education, training, green skills development and job creation, and skills planning in the Sector Education and Training Authorities (SETAs), also a focus that is relevant to CBWQM practice. Importantly for this CBWQM policy contributions review, Sub Outcome 4 notes that "Making the transition will require strong institutional and governance mechanisms that create an enabling environment for stakeholders to contribute to the transition". This emphasises compliance, and joint partnerships and co-operation with civil society and other stakeholders. Sub Outcome 5 targets

emphasise support for local government sustainable development initiatives, including climate change response initiatives.

The MTSF is a policy and strategic planning instrument that focuses on steps to be taken within a defined five-year period towards the realisation of the National Development Plan. The targets outlined above also aim to support realisation of the National Development Plan goal of implementing the NDP by "drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society". The NDP is explicit in recognising that the impact of climate change and environmental degradation disproportionately affects the poor, in particular poor women and children. Thus, the NDP emphasises an **inclusive**, integrated approach to sustainable development, highlighting the urgency of this process, as follows,

> *To make meaningful, rapid and sustained progress in reducing poverty and inequality over the next two decades, South Africa needs to fix the future, starting today. The new development approach seeks to involve communities, youth, workers, the unemployed and business in partnership with a capable state. The aim is to develop the capabilities of individuals and of the country, creating opportunities for all. The plan emphasises the urgent need to make faster progress on several fronts to sustainably reduce poverty and inequality. (p. 51)*

The statement above reflects the deliberative democracy / radical democracy orientations highlighted above, and also positions CBWQM practice as an approach that is well aligned with the intentions of the NDP to encourage government-civil society partnerships and co-operative, inclusive approaches to sustainable development. CBWQM practice is aligned with the following developmental objectives of the NDP, and can therefore assist the government with realising these objectives. CBWQM can be strengthened via a realisation of the policy commitments in the NDP, especially those highlighted below that relate to support for active citizens' engagement in governance systems.

- ENVIRONMENT AND SUSTAINABILITY, INCLUDING WATER AND CLIMATE CHANGE: "protect the natural environment in all respects, leaving subsequent generations with at least an endowment of at least equal value, enhancing the resilience of people and the economy to climate change" (p. 38). Relevant to the practice of CBWQM, the NDP states that "An essential feature of any well-functioning democracy is the ability of citizens to hold the government accountable for its efficient and equitable delivery of public services (p. 383) … South Africa is a dry country with limited fresh water resources. It will have to find ways of using water more sensibly... (p. 112). The NDP recognises that there are currently too few social platforms that allow citizens to engage with environment, sustainability and climate change issues (p. 210). At the same time, it recognises the potential for increased citizen engagement in planning and governance, noting that "Unleashing citizens' popular imagination, creative thinking and energies are needed to tackle the challenges and opportunities that settlements face." (p. 283)

- EDUCATION, SKILLS DEVELOPMENT AND CAPACITY BUILDING: improve quality and relevance of education and learning processes via curriculum innovation and transdisciplinary scientific praxis (which, as noted above, should include civic science praxis broadly conceptualised). The NDP notes that "inadequate human capacity will constrain knowledge production and innovation" (p. 40). Overall, the NDP promotes a commitment to a pro-youth orientation and a multi-facetted approach to capacity building. The NDP recognises the importance of capacity building and notes that "Low capacity aggravates the lack of citizen engagement in neighbourhood planning and development. There are few examples of communities initiating their own planning and problem-solving, and these efforts are often stalled due to the government's inability to engage and respond" (p. 275). Here, best practices in

CBWQM can help to show that it *is* possible for communities to initiate their own planning and problem solving (see examples in Deliverable 3) via approaches that also contribute to, and are based in transformative social learning potential. Past research into CBWQM practice shows its potential for promoting an environment for social learning, education and public/community participation in ways that also strengthen solidarity and quality of life (Graham, Taylor, Pesanayi & Bruton, 2014).

- INCLUSIVE, DIRECT AND IMMEDIATE MEASURES TO ATTACK POVERTY: promote more sustainable urban and rural development and enable citizens and policy makers to co-engage in participatory planning and development processes, i.e. **"actively support and incentivise citizen engagement".** The NDP states clearly, **"The state cannot merely act on behalf of the people – it has to act WITH the people, working together with other institutions to provide opportunities for the advancement of all communities"** (NPC, 2012, p. 27). The NDP furthermore proposes that there is need to "**provide incentives** for citizen activity for local planning and development of spatial compacts … [and] …promote citizen participation in forums such as Integrated Development Plans" (NPC, 2012, p. 73).

- CHANGING HUMAN SETTLEMENTS WITH ACTIVE CITIZEN ENGAGEMENT: One of the areas that CBWQM can contribute to, is improving human settlements, especially where CBWQM practices are directly related to the provisioning of clean water in human settlements. This is likely to become a key area of potential focus and activity for CBWQM practice support. Here, Chapter 9 of the NDP proposes that there is need to "support and incentivise active citizens in the field of spatial development through a range of interventions including properly funded, citizen-led neighbourhood vision and planning processes; youth planning processes; public works programmes tailored to community building and local needs; funding support for micro-initiatives at local level" (amongst others). The same chapter notes that "The message needs to be sent out that people's own efforts are important, and the state must assist with the resources needed for poor communities and civil society to participate in spatial governance" (NPC, 2012, p. 291). Municipalities are tasked with supporting citizen training in spatial competences, which would include management of local water systems, and there is a recommendation to create a national observatory for spatial data assembly and analysis, which could include CBWQM data which can help to connect IDP planning to planning at different scales. Monitoring water quality would be an important dimension of such a process of planning. There is need, however, to also recognise some of the existing limitations of IDP planning, and the NDP itself indicates that "Although IDPs are required to be participatory, engagement in planning processes and joint problem-solving often happens at a superficial level. Participatory processes are often formulaic and compliance driven, and there are few incentives for citizens to engage in community-building" (NPC, 2012, p. 175). This underscores the important points made in section 2 above about the types of participation and engagement in democracy building that need to be supported in order to change this status quo problem. The NDP recognises the problem that occurs when there is failure to establish adequate processes of participation and citizen engagement by noting that "Citizen dependence on a state with limited capability leads to confrontational protests by individuals who are waiting for the state to provide houses and services". The NDP proposes "A differentiated approach to spatial planning … which allows simple approaches to be adopted in uncontested areas but provides for mechanisms to address the conflicts that are likely to emerge in other cases more speedily than at present" (NPC, 2012, p. 275).

- PARTICIPATION IN BUILDING A STRONG DEVELOPMENTAL STATE: Chapter 13 of the NDP focusses on the processes that are needed for building a capable and developmental state. Recommendations relevant to scaling of CBWQM practice are: "Strengthen delegation, accountability

and oversight … Make it easier for citizens to hold public servants and politicians accountable, particularly for the quality of service delivery (NPC, 2012, p. 410). Various other recommendations are made, including the need to "Mainstream citizen participation" (NPC, 2012, p. 410) which is significant for the scaling of CBWQM practice, as it offers significant opportunities for mainstreaming citizen participation in water quality management. The emphasis on developing skills and career pathways for technical expertise in local government contexts is also potentially important for scaling of CBWQM practice, as this type of technical expertise is necessary in all local government contexts, and could offer a potential green skills pathway for those who get involved in the practice. An important recommendation made in this chapter is to "harness the energy and experience of citizens". Here the NDP promotes two *interrelated* approaches to accountability, namely the more traditional hierarchical model in which junior officials report to senior officials who ultimately ought to report to the electorate, and a complementary model of bottom up citizen monitoring of government service delivery. The NDP proposes that these forms of accountability monitoring are not mutually exclusive, and that they work best where there is active citizen engagement.

Important for the scaling of CBWQM activity, **the NDP notes that ultimately it is government responsibility to actively monitor the quality of service delivery, and notes that "Citizen groups cannot be expected to have the time or resources to fulfil a monitoring role, but can highlight shortcomings. Civil society can also play a role in scrutinising government data, while government can encourage such scrutiny by ensuring data is made available in suitable formats"** (NPC, 2012, p. 427). The NDP therefore also emphasises the role of the Department of Performance Monitoring and Evaluation (DPME) in regular monitoring using a hierarchical accountability structure. **It also, however, notes that citizen participation should be mainstreamed, especially at local government level where "Participation is critical for democratising governance processes and ensuring local government remains responsive to its citizens"** (NPC, 2012, p. 437). **Important for the integrity of CBWQM practice, is the warning here that participation can become "a formulaic exercise run by consultants and citizens have little confidence in the value of engagement". The NDP therefore promotes deliberation, co-engaged planning and monitoring at IDP level. Furthermore, it is recommended that the state should focus on "engaging with people in their own forums rather than expecting citizens to engage with forums created by the state"** … and "National, provincial and local spheres of government can enhance citizens' participation through a variety of two-way information gathering and sharing **forums** and **platforms** between citizens and government. While these platforms can enable government to inform, they also enable citizens to give feedback to government and to monitor performance. In addition, these channels will allow all development actors (the individual, communities, NGOs, government and even the private sector) to use this information flow to develop strategies together that enable citizens to best claim their rights and exercise their responsibilities as envisaged by the Constitution" (NPC, 2012, p. 474). An example of such a forum or platform would be the CMAs which would co-ordinate inputs from various Water User Associations (WUAs) and Catchment Management Forums, which ideally should include a strong focus on CBWQM practice.

In summary, the NDP clearly articulates the importance of active citizen engagement in bringing about transformation. It states that "South Africans need to use the avenues provided for in the legislation and others to help shape the development process and hold the government to account for the quality of services it delivers" (NPC, 2012, p. 474) **The NDP therefore is clearly committed to enhancing and mainstreaming active citizenship, of which CBWQM forms an important part. Claiming this policy space as a legitimate platform for scaling CBWQM would therefore appear to be an important dynamic of scaling CBWQM**

practice in South Africa in ways that both contribute to national requirements, while also benefitting from the support that ought to be forthcoming from the policy system for enabling active citizen engagements as evidenced in CBWQM practices. In other words, the policy-practice contradiction that has been identified as central to this study needs to be bridged.

One of the challenges of the NDP-aligned MTSF is that the MTSF is developed in five-year cycles. It is therefore key to ensure that a strong focus on CBWQM is adequately integrated into the five-year framework of the MTSF on an ongoing basis. Additionally, the coherent integration of the citizen engagement intentions of the NDP into all sector policies is necessary to ensure inter-sectoral coherence.

The DPME's framework for strengthening citizen-government partnerships

As noted above, the role of the Department of Performance Monitoring and Evaluation (DPME) is identified as being critically important to the realisation of the NDP and the MTSF. In 2013 the DPME developed "*A framework for strengthening citizen-government partnerships for monitoring frontline service delivery".* This document provides the legal and policy basis for linking service delivery and public participation, which align with the NDP's objectives and general sentiments as outlined above. This policy framework is also helpful for considering the relationship between CBWQM practice and national commitments, as it speaks to the need to integrate citizens 'experiences into government's monitoring and evaluation system for performance delivery as a form of evidence to improve performance. It argues that the need to do so is well-established within various policy frameworks, including Section 195(1)(2) of the Constitution which states that people's needs must be responded to, and (f) that public administration must be accountable. It also clearly aligns with the NDP's intention to support the use of citizens 'energy and experiences of service delivery as key to achieving a capable and developmental state (outlined above). In particular, this framework responds to the need for guidelines and training of officials in planning for and managing citizen participation in response to uneven practices across the government system, and in response to the largely absent voice of citizens in evaluation and monitoring processes, low levels of public trust in government service delivery, and citizens bypassing local complaints and participation systems to appeal to more senior officials. The framework aims to:

- "Provide a common understanding of citizen-based monitoring and its importance to government service delivery
- Provide guidance to government departments on how to strengthen the involvement of citizens in monitoring of citizens in monitoring
- Provide a set of principles, essential elements and set out roles and responsibilities
- Examine risks and mitigation strategies
- Present an action plan for strengthening citizen-government partnerships for monitoring frontline service delivery" (DPME, 2013, p. v)

The framework also offers a general definition of citizen-based monitoring: "Citizen-based Monitoring (CBM) is an approach to monitoring government performance that focuses on the experiences of ordinary citizens in order to strengthen public accountability and drive service delivery improvements" (DPME, 2013, p. v). Here, citizens are positioned as active participants in shaping what is monitored, how monitoring is done, and which interpretations and actions are derived from such data. It goes beyond data collection towards ongoing relationship building and performance improvement.

As the DPME is mandated to work across the government system, including national government departments, provinces and municipalities, the framework is intended to strengthen citizen-based monitoring across the system, and aims to support systemic uptake and strengthening of citizen monitoring approaches. A pilot ran

from 2013-2016, where the focus was on integrating citizen monitoring into existing structures and processes, rather than establishing new structures through providing methodology and tools. Important for the scaling of CBWQM, structures and processes are not required to be government-based or housed, and can include (for example), community development workers, ward committees, community policing forums, school governing bodies, etc., as well as through direct engagement with citizens or through findings from independently conducted research by civil society and community organisations. Overall the document, and the tools provided by it, highlights organised civil society as playing an important role in resourcing and supporting capacity development within citizens to articulate their needs and experiences.

Also useful for the scaling of CBWQM, and for conceptualising how CBWQM practice can contribute to, and be strengthened by the requirements of policy in South Africa, is the articulation of the intended outcomes of citizen monitoring, which include, a) enhancing and complementing government performance monitoring systems; b) improving service delivery; c) improving programme effectiveness; d) improving public expenditure efficiency; e) strengthening institutions, processes and systems; and f) fostering greater trust and public confidence in government. However, these should not be read as 'adding efficacy to governance and service delivery only', and should be seen as providing systematised opportunities for citizens to provide feedback on issues important to them. Citizen monitoring practices must ultimately be credible, accountable and locally driven for them to be a means of democracy building.

The DPME also outlines a number of citizen monitoring principles (DPME, 2013, pp. 16-17) which are useful for the focus of this report and the scaling of CBWQM practice in South Africa:

- As a democratic nation, the voice of citizens is integral to building a capable, developmental state in South Africa
- Government monitoring systems need to include the views and experiences of citizens
- Government departments must encourage independent monitoring by civil society
- Citizen-based monitoring is not simply about data collection, it is an ongoing process of relationship building and performance improvement
- Citizen participation in planning strengthens citizen participation in monitoring
- Citizen-based monitoring must form an integral part of service delivery improvement plans and management decision-making processes
- Monitoring mechanisms should be workable and suit the context in which they are applied
- Monitoring findings and planned improvements need to be communicated to citizens timeously
- Communication strategies must be informed by the target audience

The DPME piloting of this framework and process also produced a toolkit which outlines a mixed method (survey and facilitated community engagement) approach with support tools for government officials and other monitoring parties. **The toolkit includes a range of support tools for developing local monitoring systems and includes illustrative examples**. It could be of value for the CBWQM community to do a comparative review of their practice in relation to these guidelines and tools, and the urgent need for monitoring of WQM praxis as outlined in the SDG Target 6.3 discussion above, with a view to identifying what may be of value for the scaling of CBWQM practice, and how these tools can be used for capacity building. This will be taken further in constructing the final analysis of the action-oriented research.

4) Examining DWS IWQM Policy, Strategy and Action Planning

Integrated Water Resources Management

South Africa has adopted Integrated Water Resources Management (IWRM) as a tool for improving water resource management as regards both quantity and quality. IWRM emphasises public participation, and includes guidelines on how public participation should take place in the decision making of water resource management. IWRM principles have informed the establishment of Catchment Management Agencies (CMAs) in South Africa, which also encouraged significant water sector reform (Global Water Partnership, 2008). The CMAs are among the custodians of the National Water Resource Strategy (NWRS 1 & 2) which express IWRM principles. It was the hope that water quality and its management through the CMAs could be decentralised and localised, as well as enable capacity development towards the implementation of South African water quality governance strategies (DWS, 2017b). It was also with the hope that the accountability and responsibility to manage water (quality) resources is shared amongst those affected. More than anything CMAs were assumed to be bodies that can get closer to the water issues on the ground level where the citizens can have a platform to participate fairly and where their voices can be heard (RSA, 1998; WRC & DWS, 2012).

However, various reports have commented on the difficulties of implementing IWRM (Biswas, 2004; Mehta et al., 2014), and there have also been difficulties with establishing CMAs in South Africa. For example, in 2006 Lotz-Sisitka and Burt noted that the IWRM policy in South Africa had an implied commitment to deliberative democracy in which participatory practices are embedded in policy. At the time, they noted via an extensive review of participation in CMA formation that much attention had been placed on the formation of participatory structures, but inadequate attention had been given to participatory practices, and the capacity building and social learning needed to support agency for participation in the structures of IWRM. These issues influence implementation of IWRM, including IWQM, and in 2017 the DWS released the IWQM policy (2017a), which was accompanied by a Strategy (2017b) and Implementation Plan (2017c) (see below).

DWS Integrated Water Quality Management Policy (2017a)

The 2017 DWS IWQM Policy informs and is informed by various other international, regional, national, sectoral and local frameworks which are outlined in the IWQM policy, and are therefore not repeated below. A statement is made in the IWQM policy that "Cognisance must be given to the above when looking to implement any strategy or operational guideline that informs or is informed by this IWQM Strategy" (p. 38). It also states that:

> The IWQM policy brings together the best elements of existing WQM policy. These operational policies have been developed over time and include the 1991 Water Quality Management Polices and Strategies (DWAF, 1991), the 2006 Resource Directed Management of Water Quality (DWAF, 2006), the draft policy on Mine-Water Management Policy (DWS, 2016f, in progress), and the principles of the NWRS2. These instruments remain to provide insightful guidance on day-to-day operational approaches.

As reported on in the DWS IWQM policy and strategy, the IWQM Strategy, guided by the IWQM Policy is an integral part of the National Water Resource Strategy (NWRS) which in turn is implemented as a requirement of the National Water Act of 1998 (NWA). The NWRS (DWA, 2013) supports a paradigm shift in sustainable resource development in order to support inclusive growth. "Water quality is articulated throughout the NWRS as a core element of the strategy, but the role of water quality is not fully distilled and, therefore, the IWQM Strategy provides the strategic intent required to ensure that WQM supports the implementation of the NWRS" (DWS, 2017b, p. xi). The NWRS also mandates the CMAs to develop Catchment Management Strategies that are consistent with the NWRS. The document notes, however, that the complexity of the challenges of integrated water resources management in South Africa and the capacity needed for delivery on this approach have

"outstripped the ability of the country to deliver" (DWS, 2017b, p. 36). Water quality issues are included in the NWRS2, but the NWRS2 lacks strategy to deal with water quality issues, and water quality management. Consequently, a Strategy was developed to support the IWQM policy, the relevance of this to CBWQM is highlighted below.

Overall, the Integrated Quality Water Management Policy of DWS (2017a) appears to provide a strong platform for supporting and scaling of CBWQM practice, and is designed as a policy to strengthen government linked partnerships with civil society and business to improve water quality management. It therefore offers a strong platform for scaling CBWQM activity for water management and governance in South Africa. It carries, and is influenced by up-to-date social-ecological sciences research, and has a commitment to integration, cross sectoral engagement, partnerships, citizen's participation, citizen monitoring, and indicates an approach to water quality management that must be broadened, and that must be more reflexive within an adaptive management paradigm. Within this approach to management, citizen science is seen as an asset, and a method or approach to strengthen governance of water resources. The policy is elaborated at strategy and implementation plan levels (see below for comment on these).

The IWQM policy of DWS (2017a) positions adaptive co-management as a significant policy and process framework for integrated water quality management in South Africa. It defines this within an integrated, inclusive, adaptive and systems-based approach in partnership with the private sector and civil society. It is into this policy framework that the scaling of CBWQM is situated. To make sense of this with regard to potential CBWQM contributions, thought must be given to a) CBWQM in the context of the evolution of IWQM management approaches (adaptive, systems-based approaches being the most recent); and b) to think this into the wider societal context of democracy-building (recognising that South African water legislation favours a deliberative democracy model in which state representatives engage with civil society in deliberative, co-engaged ways (Lotz-Sisitka & Burt, 2006); see also Figure 14 below. Currently democratic perceptions in South Africa are bi-furcated into resistance / popular democratic practices of protest, and state-based forms of representation which are failing to represent civil society interests adequately, despite intentions such as those articulated in the NDP. This is seen in the high levels of social protest in South Africa, many of which are water quality and access related (SALGA, 2014), and in the lack of engagement with civil society contributions to the policies related to water monitoring, resulting in significant struggles experienced by CBWQM practitioners. As argued above, there is therefore a need to think about the role of citizen sciences in contributing to the building of truly participatory democratic practice in South Africa. As argued above, in our review of the literature on the science-policy-public interface, there is need to move beyond service delivery efficacy, or adaptive management paradigms **to**

encompass the broader perspective of democracy-building, and to position CBWQM practice within such a framework.

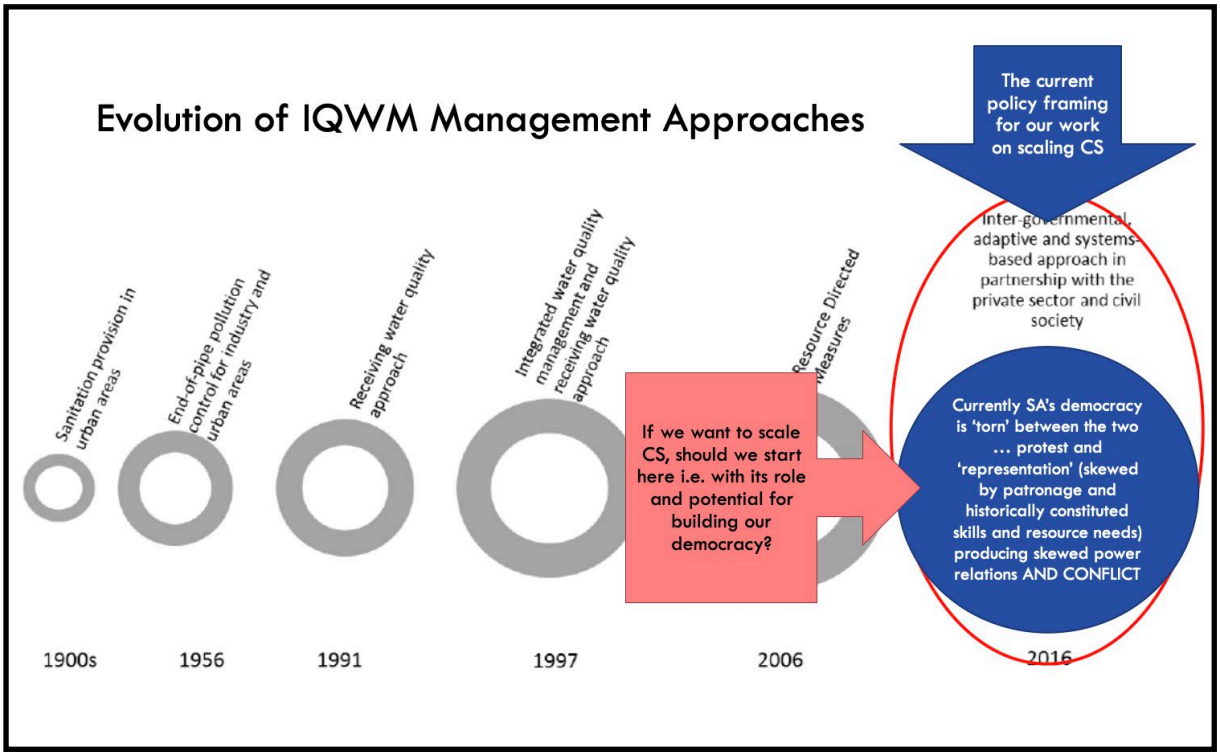


Figure 14: Evolution of IWQM approaches, and current 'point of focus' for CBWQM practice within these (adapted from DWS 2017a).

Aligned with the unfolding analysis of international and national policy frameworks above, is the significant policy 'move' and orientation found in the DWS IWQM policy of 2017 (DWS, 2017a) which offers a commitment to understanding water and water quality not as a technical engineering or natural science issue only, but rather as a developmental issue, aligned with the orientation of SDG 6. Here links are made to the significance of water as a developmental foundation and resource. While in the IWQM links are made between CBWQM, the National Development Plan and the Sustainable Development Goals, detail of this can be further defined (as outlined in this report). Additionally, the social learning or social science contribution of CBWQM is not fully developed, all of which provided impetus for the more detailed analysis of these aspects in sections 1-4 above.

The 2017a DWS IWQM policy pillars, principles (see Figure 15 below), goals and recommendations for institutional set-up for mediating and supporting citizen-based monitoring processes and practices also need to be considered in the light of the above analysis. Currently the policy proposes that the DWS, with the WRC and the CMAs must lead the development of citizen-based monitoring programmes as follows:

- D.1-3: the WRC and other key partners will drive **monitoring innovation**.
- D.1-4: **with the WRC and CMAs, will lead the development of citizen-based monitoring programmes**.
- D.1-5: will make water quality data available to the public.
- D.3-1: will develop and drive **capacity building programmes** to develop sector capacity.

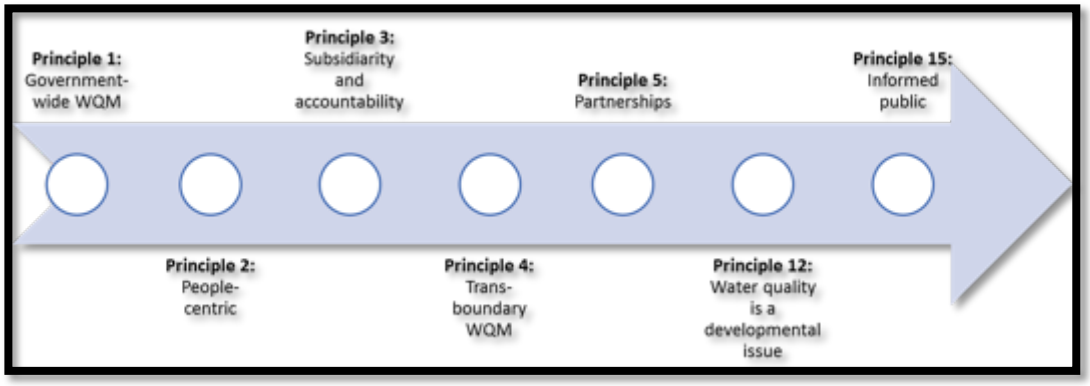


Figure 15: IWQM principles, showing a strong developmental orientation, with public engagement processes recognized (Source: DWS 2017a)

These institutional arrangements require critical engagement from a CBWQM policy enabling perspective, especially given the emphasis on local government structures in the SDGs around community engagement in water management, and the NDP. It would appear from the analysis so far (see above) that **further research is needed into the institutional dynamics of realising the responsibility for CBWQM activity as found in the IWQM policy**. There is also need for **a more in-depth reading of the roles and current engagements by these institutions with CBWQM praxis**, in order to better assess the kinds of capacity building, role clarification, resource mobilization capabilities, data-based support infrastructure, and co-engagement that is required for this institutional mandate to be realised in practice, especially as it relates to the SDGs and NDP monitoring processes outlined above. Some of this is further specified in the DWS IWQM Strategy (2017b) and Implementation Plan (2017c), as will be discussed below.

Another area that requires further probing from a CBWQM policy perspective is the scope and focus of the citizen science practices that require scaling. This relates to the articulated priorities associated with water quality, and the monitoring framework being used by local government: biological, chemical, physical and operational (cf. above). Figure 16, drawing from the IWQM policy (DWS, 2017a), shows that certain types of water quality impactors such as sedimentation and eutrophication are 'high impact 'and there are already high levels of knowledge of these. There are, however, other types of water quality impactors such as nanoparticles, metals, hydrocarbons, pathogens and agrochemicals that are less 'well known' or for which we have lower levels of knowledge. **Citizen science monitoring tools tend to mainly cover a few of the high impact, high knowledge issues**. This opens the question as to whether citizen science tools for CBWQM can be developed to expand the practice, and if so, the question arises as to how this science and technology is to be developed and supported into use. Many citizen science tools also focus on the pollution impacts, and potential therefore exists to develop CBWQM practice to also include water access, justice and rights monitoring processes in a more integrative framework. This may be important in a context where human settlements and water quality are likely to be more closely aligned in IDP implementation, and also in the light of the NDP focus on citizen engagement and action to strengthen civic participation in settlement planning practices, of which water quality and civic water monitoring concerns could form a key focus, as argued above.

Deepening this aspect of potential CBWQM contribution to realising policy, and strengthening potential via policy, would require a more careful review of which CBWQM tools are currently widely available, which are being used for what purposes. What is the demand for a wider range of CBWQM tools? Associated research is necessary to design and develop a more comprehensive range of CBWQM tools, conceptualised within the democracy building, developmental orientation outlined above, and supported in the SDGs, NDP and IWQM policy

frameworks. For the activity of scaling of CBWQM, we therefore need to look at what is available for scaling from a CBWQM practice point of view, as well as what gaps can potentially be addressed.

One of the grey areas in the DWS IWQM policy (2017a), as it relates to CBWQM, is the issue of data, and data availability. The DWS IWQM policy (2017a) notes that data is a 'strategic' asset that must be available in the public domain (see Principle 16 and 17 in Table 1 that follows). Similarly, the SDGs and the NDP emphasise the importance of availability of data in the public domain. The NDP also emphasises the need to make government data available to citizens for monitoring and government accountability purposes. Figure 16 illustrates water quality issues mapped against knowledge/understanding. Based on the IRIS data and monitoring framework, it will be important to assess current CBWQM tools against their ability for monitoring biological, chemical, physical and operational dimensions required to support a) monitoring practices, b) reporting, and c) capacity building against such a framework.

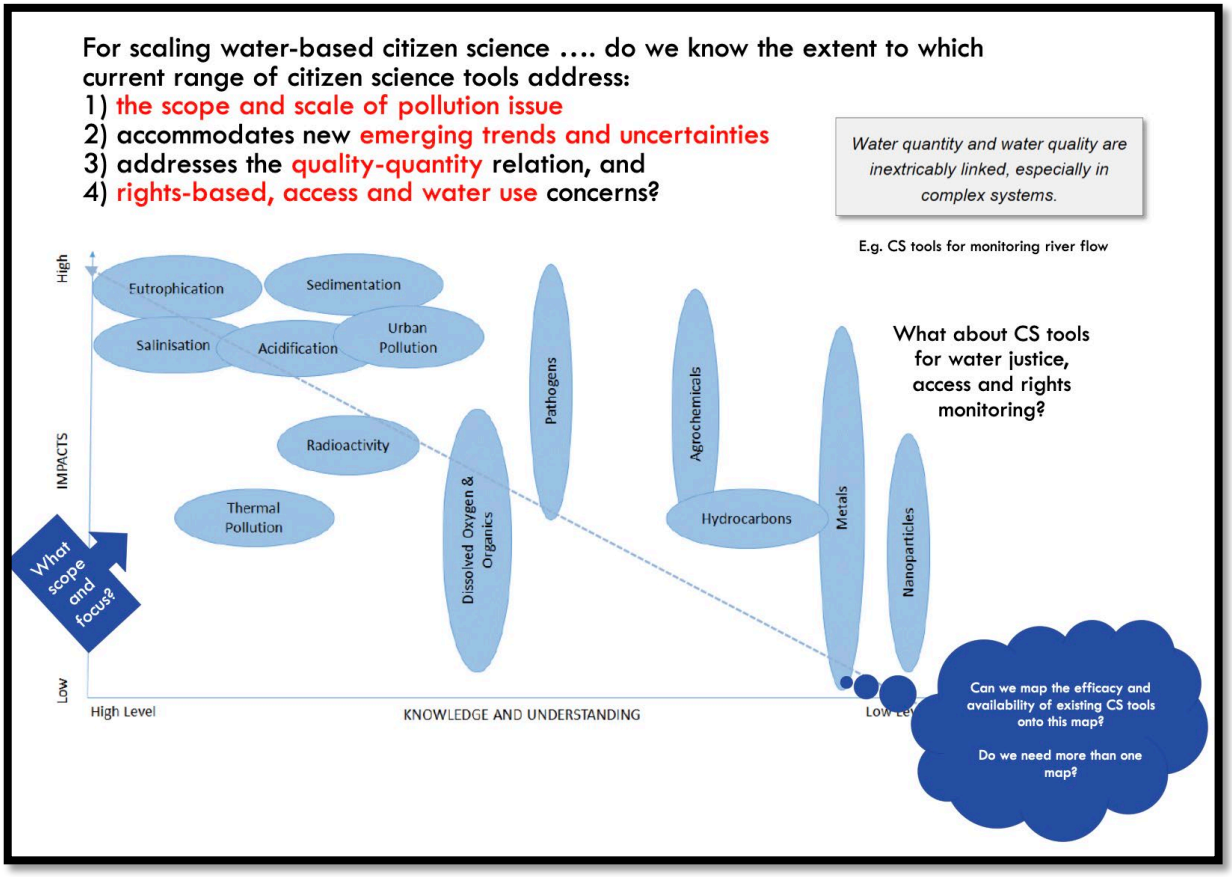


Figure 16: Water quality issues mapped against knowledge / understanding (Adapted from DWS 2017a)

Table 1: Extract from the IWQM policy, outlining principles 16 and 17 on data and accessibility of data. (Source: DWS 2017a)

POLICY PRINCIPLE	POLICY POSITION	POLICY AND LEGISLATIVE ENVIRONMENT
PRINCIPLE 16: DATA IS A STRATEGIC ASSET	Data on water quality must be standardised, reliable and scientifically defensible and must be collected, managed and protected as a strategic asset for monitoring, management, legal actions and research purposes, while also being used to support co-learning and adaptive management.	This is a new Policy position.
PRINCIPLE 17: PUBLICLY AVAILABLE INFORMATION	Information and data on water quality and waste discharges must be available in the public domain[1] and should be used to enhance public awareness and education, and to support adaptive management approaches.	This Policy is in line with the Constitution, Promotion of Access to Information Act (Act No. 2 of 2000), Promotion of Administrative Justice Act (Act no. 3 of 2000) and in line with international best practice.

In this context, and in relation to the contribution that CBWQM can make to achieving policy commitments, is a need to develop a more in-depth understanding of citizen science data produced via CBWQM processes, and how this is being taken up into the mainstream systems of water quality management. It is also necessary to develop more insight into data management and data system development and support for CBWQM practice; Our initial review of CBWQM practice (reported on above) stressed the importance that data generated by citizens in CBWQM practice is adequately synthesised, shared and made visible in and for decision making processes. The issue of data access, sharing, communication, storage, visibility and use is of utmost importance for developing CBWQM practice as a democracy building and development practice.

The DWS 2017 IWQM policy (2017a) also has a focus on co-learning, co-engagement, co-adaptation, etc. and this is seen as being 'central 'to a shift in the philosophy and practice of IWQM as outlined in the statements below:

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

> *"Promoting joint custodianship of the water resources through education from grass roots level, to ensuring that the public are informed and capacitated to care for the scarce water resources, and to actively participate in its protection and management, are steps in ensuring the much-needed behavioral change. The 'adopt a river' health programme, and programmes of this nature promote this shift in philosophy." (DWS, 2017a:8)*

The policy indicates the need for integration into the education and training system, grassroots education and learning, capacity building and support for active participation in IWQM. Here a range of other policy frameworks would need to be considered, for example the DBE (2012) National Curriculum and Assessment Policy framework for alignment between this intention and the education policy statements and how they are being operationalised. In her research on CBWQM tools and their uptake in the education policy environment, Madiba

(in press) notes that it is important to consider how CBWQM is relevant and impactful in contexts such as schools. CBWQM programmes must clearly define their learning and education focus areas in schools (e.g. for primary or secondary schools). Madiba notes the potential impact of channeling CBWQM projects through schools due to their longer term impact on society; it is, however, important to also understand the structures and cultures that govern schools, which includes understanding the scope of policy and legislative structures that shape what teachers can and can't do when it comes to CBWQM practices. She also notes the potential for integrating CBWQM into skills development systems, especially in the context of seeing CBWQM as a developmental practice, which can assist with addressing the shortage of scientific and technical skills in South Africa and the water sector, as also noted by the NDP.

This raises the issue of the meaning of 'integrated' as used in the DWS IWQM policy (DWS 2017a). **Integration** can be interpreted at a number of levels and in different ways. The most obvious of these are in the IWQM policy itself which emphasises integration of mandates across government departments insofar as there is need to collaborate on enabling IWQM praxis and outcomes, and integration of roles and responsibilities for IWQM amongst government, business and civil society stakeholders. There is also the social and ecological that are integrated in IWQM, as well as the past, present and future of water in South Africa. Within IWQM, science and management practice are also integrated, especially within an adaptive, systems oriented management paradigm as is promoted in the DWS (2017a) policy framework. With the emphasis on citizen monitoring, there is also an implied integration of science and local action or local politics, of facts and values, and diverse forms of knowledge (suggested as significant for CBWQM in our literature review and review of the SDGs and NDP in relation to CBWQM). Ultimately, one can also see that CBWQM action, if integrated with appropriate management actions can also help with integration of human rights, ethics, dignity and deep democracy into society, and if integrated into other policy frameworks such as the education and training policy framework, can also contribute to longer term and wider forms of social learning and social transformation.

DWS IWQM Strategy (2017b) and Implementation Plan (2017c)

The task of policy review for the CBWQM programme in South Africa is daunting as outlined above, due to the complex interweaving of levels and orientations to policy, and their meaning for CBWQM praxis. Also, policy is multi-facetted, and often suffers from internal contradiction or transformations that are not easy to identify or make sense of in practice. For instance, in February 2017, the Department of Water and Sanitation published three potential collaborative documents – the IWQM policy (DWS, 2017a) discussed above, and its accompanying Strategy (DWS, 2017b) and Implementation Plan (DWS, 2017c). As outlined in the review above, the IWQM Policy (2017a) has a strong commitment to citizen engagement and participation, and is aligned with the sentiments of the SDGs and the NDP in this regard, and tends towards supporting deliberative and more radical forms of democracy building.

Some of the dimensions of the IWQM Strategy (2017b) (which aims to provide guidance for implementation of the IWQM Policy) that are relevant to the focus on CBWQM are briefly reviewed below. Firstly, the values of the policy, three of which are selected below (see Figure 17), for their relevance show commitment to competence, empowerment and informed civilians. The principles, and the strategy overall tends towards foregrounding the importance of technical competence in government (e.g. 'officials are empowered to act'), but the empowerment discourse does not carry as strongly through to empowerment of civil society, and civil society actors are viewed more in terms of an 'informed population' rather than an actively engaged population. While these comments may seem 'small', they reflect a slight narrowing of commitment to supporting an active civil society engaged in water quality monitoring and management, as expressed in the need to mainstream civil society participation.

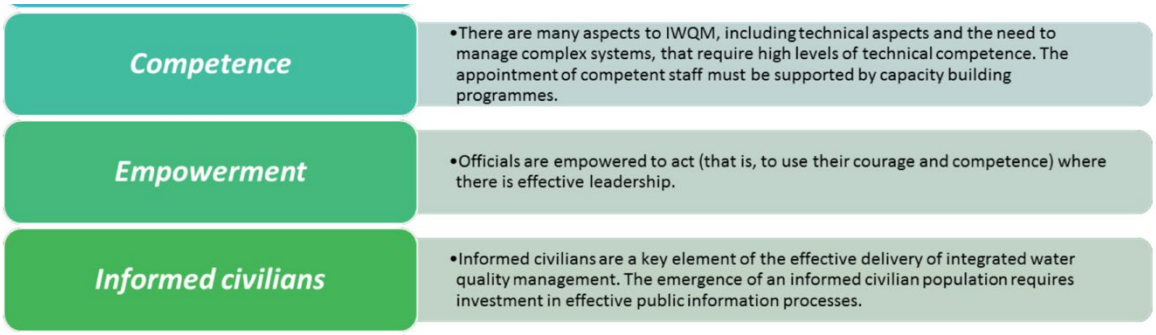


Figure 17: Selected values in the IWQM Strategy reflecting emphasis on empowerment of government officials, and with less emphasis on empowerment of citizens, beyond a commitment to 'informed citizens'

(Source: DWS, 2017b, pg. 40)

The mission of the DWS IWQM Strategy (2017b) shows a continued commitment to government working more closely with the private sector and civil society, to fostering co-operative and integrated approaches to WQM, to strengthen the adaptive management approach in which "co-creation and co-learning by key players is entrenched and supported by the exchange of data and information" (pg. 42), which in turn requires capacity building for longer-term improvement in water quality. Principles developed for the Strategy include an ongoing commitment to viewing water as a developmental issue, creating an 'informed public', using data strategically and seeing data as a strategic asset that is publicly available. Out of this a number of IWQM Strategic Issues were defined which align with the IWQM Strategic Goals as outlined in Figure 18 below (DWS, 2017b, pg. 45). In particular, Goal 2 (Strategic Issue 4) and Goal 5 (Strategic Issues 10 and 11) are pertinent to CBWQM practice, while Strategic Issues 8 and 9 of Goal 4 are pertinent to the longer-term sustainability of CBWQM practice and its recognition.

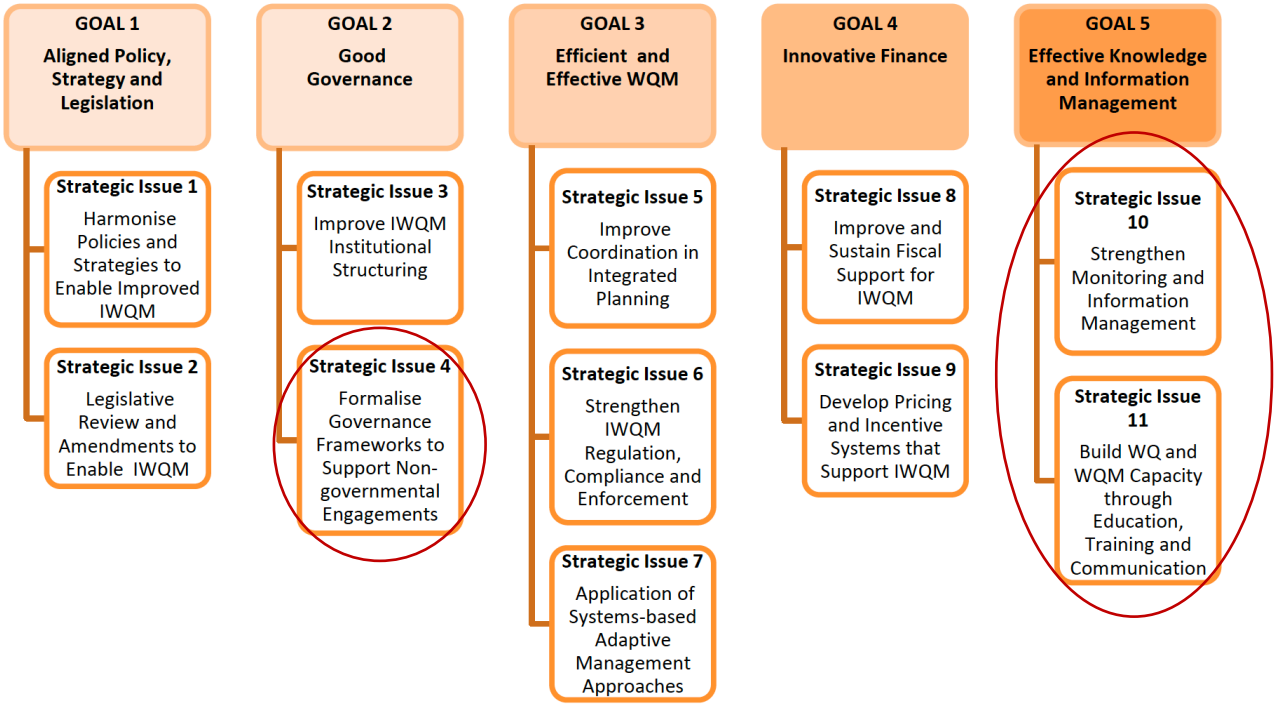


Figure 18: The Eleven Strategic Issues in the IWQM Strategy (Source: DWS, 2017b, p. 45)

Strategic Issue 4 is discussed in more detail in the DWS IWQM Strategy (2017b), given the complexity of managing water quality that requires more active engagement of stakeholders. The policy notes that both national and international experience shows that active engagement with the private sector and civil society can contribute substantively to IWQM, and these groups are recognised as important **'strategic partners'**. Linked to the NDP policy intentions, the DWS IWQM Strategy states that: "This supports the concept of developing local solutions for local problems, and enables cooperative and coordinated actions that reduce the burden on government for command and control style compliance. Supported by improved reporting systems, these partnerships can enable timeous, efficient and effective response to water quality issues" (DWS, 2017b, pg 51). The Strategic Issue is further defined via Strategic Objectives and Strategic Actions as outlined in Table 2 below, extracted from the DWS Strategy (2017b) document. This puts the responsibility for establishing an appropriate **governance framework** for citizen engagement in IWQM with governments and the CMA; government is tasked with establishing partnerships (SA 12, SA 13), and the DWS, the DEA (now DFFE) and CMAs are tasked with the responsibility for "establishing an engagement framework that enables more active participation of civil society at transboundary, national and catchment levels" (SA 14). This requires these institutions to "**support and drive functional platforms"** for CBWQM practice nationally and within catchments. Significant here is the focus on **catchments** as the preferred scale of operation; which differs from SDG 6.b's focus on local institutional units (e.g. municipalities). Some alignment is required here in terms of the scale of focus of CBWQM intervention and support platforms if CBWQM is to contribute to national commitments, and if CBWQM is to be adequately supported by policy. The objective of the Strategy furthermore seeks to establish a framework for interaction that is non-adversarial, and that is based on "**active partnership and engagement"** (DWS, 2017b, pg. 80).

Table 2: Strategic objectives and actions to formalise governance framework to support non-governmental engagements (Source: DWS, 2017b, p. 52)

STRATEGIC ISSUES	STRATEGIC OBJECTIVES	STRATEGIC ACTIONS
STRATEGIC ISSUE 4: Formalise governance frameworks to support non-governmental engagements	**SO4a:** Partnerships/stewardships established and maintained	**SA12:** Government to develop a partnership framework that is fair and equitable
		SA13: Government to develop and foster strategic sector partnerships
	SO4b: Governance framework for active citizenry formalized	**SA14:** DWS with DEA and CMAs to develop an engagement framework that enables more active participation of civil society at transboundary, national and catchment levels
		SA15: DWS, DEA and CMAs to support and drive functional platforms for the engagement of civil society nationally and within catchments

The strategy outlines a dual role for civil society, that of advocacy and watchdog, as well as communicator with government. The emphasis is on encouraging private sector partners to play stronger stewardship roles, and civil society to play stronger watchdog and advocacy roles, with responsibility for holding both government and the private sector to account. There may be some irony in that it is the state that needs to provide the support for this role, and as noted above, this requires a sophisticated understanding of democracy in state institutions with state agents being open to dealing with conflicts and adversarial perspectives, with capability to accommodate these as an integral part of governance. Here the DWS IWQM Strategy notes that "This is a critical role and DWS, together with the various government departments that partner the water sector, will continue to support the

active engagement of civil society through a variety of platforms such as the Water Sector Leadership Group, various working groups and catchment management forums (SA 15). This engagement with civil society will take place in line with a framework developed by DWS, DEA [now DFFE] and CMAs, through a consultative process with civil society (SA 14)" (DWS, 2017b, p. 52). It is also important that the capacity building framework for IWQM therefore includes a focus on democratic practice and democracy building as outlined in this report, so that state actors are able to take up their role in support of civil society activism, rather than avoiding or marginalising such practices.

Other issues in the DWS IWQM Strategy are relevant to advancing CBWQM practice, especially Strategic Issue 5, which provides support for proactive and integrated planning, seen to be essential to maintaining water security. It comments on the need for developing capacity for water quality planning in catchments that are highly developed and impacted on as a matter of urgency. These may therefore be good platforms for conceptualising and developing the role of CBWQM practices within a more proactively constituted planning system. Here it is noted that there is "need for **integrated plans that will address the specific water quality issues in those catchments**. Such plans can inform appropriate responses from a range of government, private sector and civil society actors" (DWS, 2017b, pg. 53). Again, it is important to note the emphasis in the IWQM policy on catchments as the unit of analysis and action. The Strategy explicitly states that "the **catchment is at the 'coal-face' for IWQM and integrated, coordinated planning ensures the effective use of resources (human and financial) in managing water quality"** (DWS, 2017b, pg. 53).

Strategic Issue 7 emphasises systems thinking, and the need for feedback loops for adaptive management, noting the importance of being able to learn from ongoing monitoring, which in itself will need to be systemically set up. This has implications for the kind of support that is provided for CBWQM practices, in other words if CBWQM is to have a more systemically constituted role within the adaptive management approach, then it would need systemically structured support that allows CBWQM practices to become more sustainable and which are constituted within a proactive approach to IWQM, rather than as a reactive, marginal and ad hoc type of activity. Here the Strategy notes that "**systems-based adaptive management** is an imperative for managing water quality, supported by **information and knowledge networks that provide the evidence base for decision-making** (SO7a)" (2017b, p. 59). The strategy notes that this process needs to be supported by appropriate '**learning systems'** at the catchment level, and that there is need for developing protocols for systems-based adaptive management, including **"how** monitoring, the assessment of new knowledge, and learning take place and inform decision making (SA 35)" (2017b, p. 59). It is within this space that CBWQM can be well positioned to contribute to meeting policy commitments, and can receive the relevant support for the expansion and scaling of the practice of CBWQM. From an institutional point of view (an important focus for aligning with the SDG 6.b.1 Indicator as discussed above), the Strategy notes that "localised and catchment-based institutions, at various scales, that are responsible for water resources management are able to respond more efficiently and effectively to changing circumstances. Some degree of self-organisation is needed to ensure that these institutions are supportive of the context" (2017b, p. 59). This allows for some space for co-defining the institutional configuration(s) of CBWQM, and how to report adequately on these in terms of institution building for IWQM, and for SDG 6.b.1 indicator reporting. As shown in our initial analysis (cf. also Appendix A), the institutional configuration of CBWQM initiatives differ, mainly according to the diverse partnership configurations that are established in support of CBWQM practice in diverse contexts. It will therefore be important to continue to develop insight into the institutional configuration of CBWQM projects and how these align with the institutional platforms for IWQM and SDG 6.b monitoring.

Strategic Issue 8 points to the importance of developing new funding and investment streams for IWQM in South Africa, of which CBWQM must be included as an important practice that also requires adequate resourcing. The Strategy proposes "development of a complete water quality management investment framework" (DWS, 2017b,

pg. 61) in order to understand the financial injections that are required. The Strategy also notes the need for a diversified approach to funding IWQM, arguing for an 'inter-departmental' approach. A list of priorities for funding are given in the Strategy, **but CBWQM is omitted from the list**. This would seem to require immediate attention from the DWS, as active citizen engagement is of primary importance to the development of settlement planning and policy, as outlined in the NDP.

Strategic Area 10 focusses in on monitoring and networks, noting that "Good water quality **monitoring enables effective enforcement and compliance"** (DWS, 2017b, pg. 67). The DWS IWQM Strategy also points to the importance of "timely sharing of data and information" which are essential for the "development of relevant and applicable WQM interventions" (pg. 67). The Strategy furthermore notes that "adaptive management is highly dependent on current, scientifically sourced and legally defensible data and information to support management changes over time" (pg. 67). This in turn requires adequate monitoring networks and monitoring services (e.g. online monitoring platforms) and management of the data once it is produced, including approaches that allow the data to be transformed into information and decision-making processes. In this regard, the strategy points to some of the problems associated with the current systems of WQM in the country, as follows:

> *South Africa has programmes in place to monitor water quality across the country, however, such monitoring is constrained by limited financial resources, cumbersome procurement processes, insufficient monitoring stations, inadequate numbers of suitably skilled staff, uneven availability of access to accredited laboratories for testing of samples, and the complexity of monitoring the number and variety of pollutants entering water resources, including new and emerging pollutants. There is thus a need to expand the coverage of both raw water and wastewater quality data monitoring to enable an integrated approach that will ensure optimal evaluation of water quality across the country, identifying what is required for a national monitoring network and what for catchment level management, and aligning the systems of different organs of state, such as DWS, DEA and CMAs (SA 45, 47) (DWS, 2017b, pg 67).*

CBWQM can play a potentially important role within this system, as indicated by the reference to recent developments in the CBWQM sector which have developed ICT-based innovations for monitoring practice. The Strategy says specifically, "huge strides have been made around citizen-based monitoring and science in the water sector. The smartphone enabled mini-SASS app developed in South Africa is an excellent example of what is possible. The development of citizen-based monitoring programmes can contribute significantly to data and information on water quality across the country, and DWS and the WRC have a leading role to play in this regard (SA 46)" (pg. 68).

Of significance too, is Strategic Action 47 (see Table 3 below) which outlines the role of DWS, in partnership with the WRC and the CMAs to "lead the development of a programme to create and support citizen-based monitoring programmes". This Strategic Action provides an important opening for the scaling of CBWQM practice in South Africa, which this review should inform.

Table 3: Strategic objectives and actions to strengthen monitoring networks and information management (Source: DWS, 2017b, p. 67)

STRATEGIC ISSUES	STRATEGIC OBJECTIVES	STRATEGIC ACTIONS
STRATEGIC ISSUE 10: Strengthen Monitoring and Information Management	**SO10a:** An integrated and functioning WQ monitoring network	**SA 45:** DWS/CMAs to strengthen national and catchment WQ monitoring networks through spatial expansion and identification of priority constituents for catchment-specific monitoring
		SA 46: DWS to support the network expansion with an initiative to ensure that accessible accredited laboratories are available to ensure efficient and effective analyses
	SO10b: Information systems that are current and accessible to support adaptive WQM	**SA 47:** DWS, with the WRC and CMAs, to lead the development of a programme to create and support citizen-based monitoring programmes
		SA 48: Government to ensure the harmonisation of data and information systems pertaining to WQ
		SA 49: Government to develop systems to enable data and information access by stakeholders/ public
	SO10c: Routine assessments inform adaptive WQM	**SA 50:** DWS/DEA/CMAs to develop protocols and systems to ensure M&E and new information inform adaptive management decisions for IWQM

Strategic issue 12 is also important for advancing CBWQM practice in ways that facilitate its contribution to national and international commitments. This strategic issue focusses on capacity building, with an emphasis on the **'urgent need'** for capacity building at the **'organisational level',** as is also shown by the DWS IRIS data. The strategy states that "**The building and maintaining of WQM capacity in DWS and its sector partners, including civil society, through education, training, research and communication is crucial in supporting the inclusive approach towards ensuring effective WQM"** (DWS, 2017b, pg. 69). Capacity building for local government, government officials responsible for WQM, as well as the private sector and civil society is emphasised. Here it is noted that ongoing research, innovation and development is needed to ensure that the most effective tools and approaches are being used for managing water quality across the country. It is also critical to ensure that this information and knowledge is conveyed to the relevant policy makers and implementers in a manner that supports the introduction of new tools, technologies and systems in an effective and sustainable manner (SA 54, 55). Thus capacity building on its own is not enough; there is need for an *applied and reflexive* approach to capacity building. Unfortunately the strategy focusses in on "awareness campaigns" for creating an informed citizenry, rather than **action learning programmes**. Current CBWQM practice can be reviewed to inform the design and development of a capacity building programme that builds on best practice via an action learning approach that is also applied and reflexive. In this way, the CBWQM sector can share experience and tools with government, while also further developing its own capacity for this important IWQM practice. Importantly, in the implementation of these strategic areas, the Strategy notes that capacity building was one of the most discussed areas of action during the consultative process and is seen to be a matter of utmost priority.

Thus one of the more immediate contributions that can be made by the CBWQM sector is to support the design and development of a high quality capacity building programme for civil society, government officials and business to upscale and improve the quality of IWQM in South Africa. Partnerships with the DSI and DHET and the university sector can be formed for such a capacity building programme, which can bring in alternative resources into the sector. This should be investigated as an area of high priority by the CBWQM sector in their further deliberations around scaling of CBWQM practice. This can also help with establishing regional an IWQM 'Community of Practice' which is seen by the IWQM Strategy document as being a "significant priority" in initiating and sustaining sector wide engagement. Table 4 below provides more detail on roles and responsibilities for the strategic actions related to capacity building.

Table 4: Strategic objectives and actions to build WQ and WQM capacity through education, training and communications (Source: 2017b, p. 69)

STRATEGIC ISSUES	STRATEGIC OBJECTIVES	STRATEGIC ACTIONS
STRATEGIC ISSUE 11: Build WQ and WQM Capacity through Education, Training and Communication	**SO11a:** Sustained capacity for Government /CMA/sector to effectively manage and support WQM through improved education and training	**SA 51:** DWS/WRC to develop and implement a capacity building programme for officials in DWS, CMA and other sector departments in systems-based, adaptive IWQM
		SA 52: DWS/CMAs to expand capacity-building initiatives to civil society and private sector
		SA 53: DWS to develop regulations to ensure the professionalization of key water services functions
		SA 54: DWS/private sector to providing bursaries/learnerships pertaining to WQM at tertiary institutions
	SO11b: WQM decisions are underpinned by best practice, research and innovation	**SA 55:** DWS, with the WRC, to investigate the options provided by recent innovative developments to improve water quality
		SA 56: WRC to lead the sector in innovation, research and development for IWQM
	SO11c: A well informed and actively engaged South Africa	**SA 57:** DWS to report annually on the state of WQ in the country
		SA 58: DWS/WRC to develop online tools for easy access to WQ and WQM related information
		SA 59: DWS/DEA/DAFF/DMR/CMAs to develop and maintain multi-sector stakeholder platforms for sharing information
		SA 60: DWS, with other Departments and sector institutions, to lead and roll-out awareness creation campaigns

The associated DWS IWQM Implementation Plan (DWS, 2017c) offers a practical way forward for implementing the strategy within a three-year cycle. It aligns more specifically with the NDP and the SDGs.

Building on the strategic areas outlined above in the Strategy, the following specific activities are prioritised in the Implementation Plan (DWS, 2017c) that are relevant to CBWQM contributions, and strengthening of CBWQM practice:

- For Strategic Issue 10: Identification of priority water quality constituencies across catchments; Assess monitoring gaps; Develop a national monitoring network development plan; assess laboratory requirements and gaps per catchment / province; Develop laboratory development strategies and support other information requirement assessments and systems to enable smooth access to data and information.

- For Strategic Issue 10, SA 47 which focusses directly on the need to create a programme that supports CBWQM programmes, the specific activities identified are:
    - **Identify types of data that can be provided by CBWQM practice**;
    - Develop a programme of support for key catchments, and
    - Provide **seed support** to ensure programmes are initiated and maintained in the short term, and strengthening of smooth access to data and information.

- For Strategic Issue 6, SA 32 focusing on capacity development, the Implementation Plan identifies the need for assessing capacity requirements in order to inform the development of a capacity building plan.

With the shift from IWQM Policy (2017a) to Strategy (2017b) to Implementation Plan (2017c), comes a narrowing of focus on the potential role of CBWQM, although a focus on this is maintained throughout. In the Implementation Plan (DWS, 2017c), the focus is on the types of data that CBWQM practices can provide, and on approaches that can facilitate sustaining the data flow from CBWQM practices. The social contract focus of collaborative governance disappears somewhat from the discourse, and thereby also the potential role of CBWQM in democracy building practices and in civic engagement in spatial planning and governance. The contribution of CBWQM practices to capacity building is also not articulated, and it is not clear if the capacity building needs of the CBWQM partners will be included in the training needs analysis which in turn will inform the capacity building plan. The CBWQM community can therefore engage with this policy space to a) make their practices and contributions more visible, and b) ensure that their interests and capacity building contributions and needs are taken into account. The role of CBWQM practice in the next iteration of the DWS IWQM implementation plan therefore needs to be carefully considered in order to be fully integrated for its potential contributions, and for potential strengthening and scaling processes. It is envisaged that this research-based review of CBWQM practice, and the associated scaling activities will take this into account as the programme unfolds further.

In relation to the above review of how CBWQM is included in the DWS IWQM policy, strategy and implementation plan (2017a, b, c), there is also a need to consider what is not well articulated in terms of CBWQM practice and intentions, especially when viewed within the wider notion of the contribution by CBWQM to democracy building and development. These gaps include, but are not limited to:

- The need for a stronger emphasis on CBWQM practices and tools, and what these can and cannot achieve within IWQM, especially the scope of available tools in relation to the types of WQM issues that require regular monitoring. This could help to differentiate the role of CBWQM within a wider range of WQM practices. In turn, this can help to more clearly articulate CBWQM's contributions to achieving national and international commitments in realistic and practical ways, and in ways that are do-able and not over-ambitious, yet which fully recognise the potential for expansion and scaling of CBWQM practice in South Africa as an integral component of IWQM. For this, there is need for more careful analysis of existing CBWQM practice, and evaluations of CBWQM practice and the scope and potential thereof as a particular type of IWQM practice (Madiba, in press).

- The IWQM policy and strategy recognises the need for water governance that is inclusive of other knowledge(s), understandings and methodologies other than scientific or academic knowledge or knowledge that is confined to institutions in water quality management so as to allow co-learning, co-creation, and co-adaptation for a sustainable approach. However, very little is said about the integration of other knowledge(s) or understandings in the policy, strategy and even less in the implementation plan. The main discourse around knowledge remains focused on science and institutional governance practice and

knowledge. This too affects participation potential and how participation in CBWQM is valued (Madiba, in press, cf also Vallabh, in press).

- There is also little differentiation in the notion of CBWQM in the IWQM policy, strategy and implementation plan, especially in a South African context from both the point of view of who is most affected by water quality issues, and who is most interested in being part of CBWQM initiatives under what conditions and in what contexts (e.g. there is largely an assumption that such initiatives are voluntary). Lack of differentiation of what is meant by 'community-based' in the context of WQM can lead to erroneous assumptions or limited success in mobilising communities. For example, gender related aspects need to be considered, as well as poverty related contextual considerations, along with the dire need for youth employment in South Africa, and potential career and learning pathways out of poverty. CBWQM can provide such pathways but this needs to be contextually situated and established in terms of how and where to focus initiatives in support of CBWQM. The aspect of who is affected by water quality issues and how can have a significant impact on how people participate in CBWQM initiatives, for example. Yet little is actually known about this dimension (Madiba, in press). Exploring this area is potentially important within the current policy framework, as it can potentially also respond to SDG 5 – how gender equality and inequality influence or are considered in the participation in water quality management (Mehta et al., 2014).

- Madiba (in press) argues that it is significant to consider diversity in CBWQM, as diversity can enhance public or community participation in IWQM. She argues specifically that diversity can create a platform for different forms of participation to emerge, which can also bring different lenses to the problem, and thus enrich the democracy building and co-engaged governance contribution of CBWQM. We also need to understand diverse interests in participation, for example, young people may not be that interested in attending meetings, preferring to be empowered through skills and competences that are linked to career pathways, decent jobs, entrepreneurship opportunities, etc. Such a policy analysis can facilitate a broader range of approaches to inclusion in the CBWQM and IWQM space

- Madiba (in press) argues further that an additional 'absence' in the IWQM strategy is adequate analysis of the ethical foundations that link human health (through good water quality) to human dignity (NDP Strategic Target 2), and how these can be linked to 'ubuntu', which is a 'fundamental constitutional and indigenous value' (Netshitomboni, 1998) demonstrating values at the heart of democratic sensibilities and democratic participation in water quality management. Madiba (in press) goes on to argue that this is an important element that enables one to understand access to good water quality as not only as the 'constitutional basic rights' but also understanding it as value for resuscitating, restoring, maintaining and sustaining human dignity. Giving attention to this dimension of CBWQM and IWQM can provide a perspective of social-understanding and value that goes beyond science-technical ontology of water quality management. And this value can complement and extend the systems-based adaptive management approach for water quality management that IWQMS proposes (ibid.).

The DWS National Water and Sanitation Master Plan

More or less at the same time as the emergence of the IWQM policy, between May and June 2017, a second DWS policy process was underway, in the form of the National Water and Sanitation Master Plan (NW & SMP) which appears to now be a driver of strategic planning and actions (Figure 19). Thus far, the NW & SMP does not show strong connections with, or alignments with the three documents, the 2017 IWQM Policy, Strategy and Implementation Plan (DWS 2017a, b, c). There also appears to be a contradiction in their approaches to policy, with the IWQM promoting a more participatory, adaptive approach to IWRM, while the NW&SMP appears to favour a more top-down, managerially directed approach to policy implementation. A search for 'citizen' in this

policy led to one mention of citizens paying for water services. There was no mention of citizen science, community participation, participation, or community (the only reference to community is to the international community, and community access to water services). This policy therefore does not appear to reflect the IWQM policy sentiments or intentions when viewed from a CBWQM perspective. One must therefore assume that this is implied, or potential.

There appears, however, to be some processes of alignment between the NW&SMP and the SDG monitoring processes emerging, as outlined in the slide presented by Mark Bannister, Chief Engineer, in his reporting on the alignment with the SDG processes, and how they were setting up structures and reporting mechanisms for SDG 6 reporting (Fig. 20).

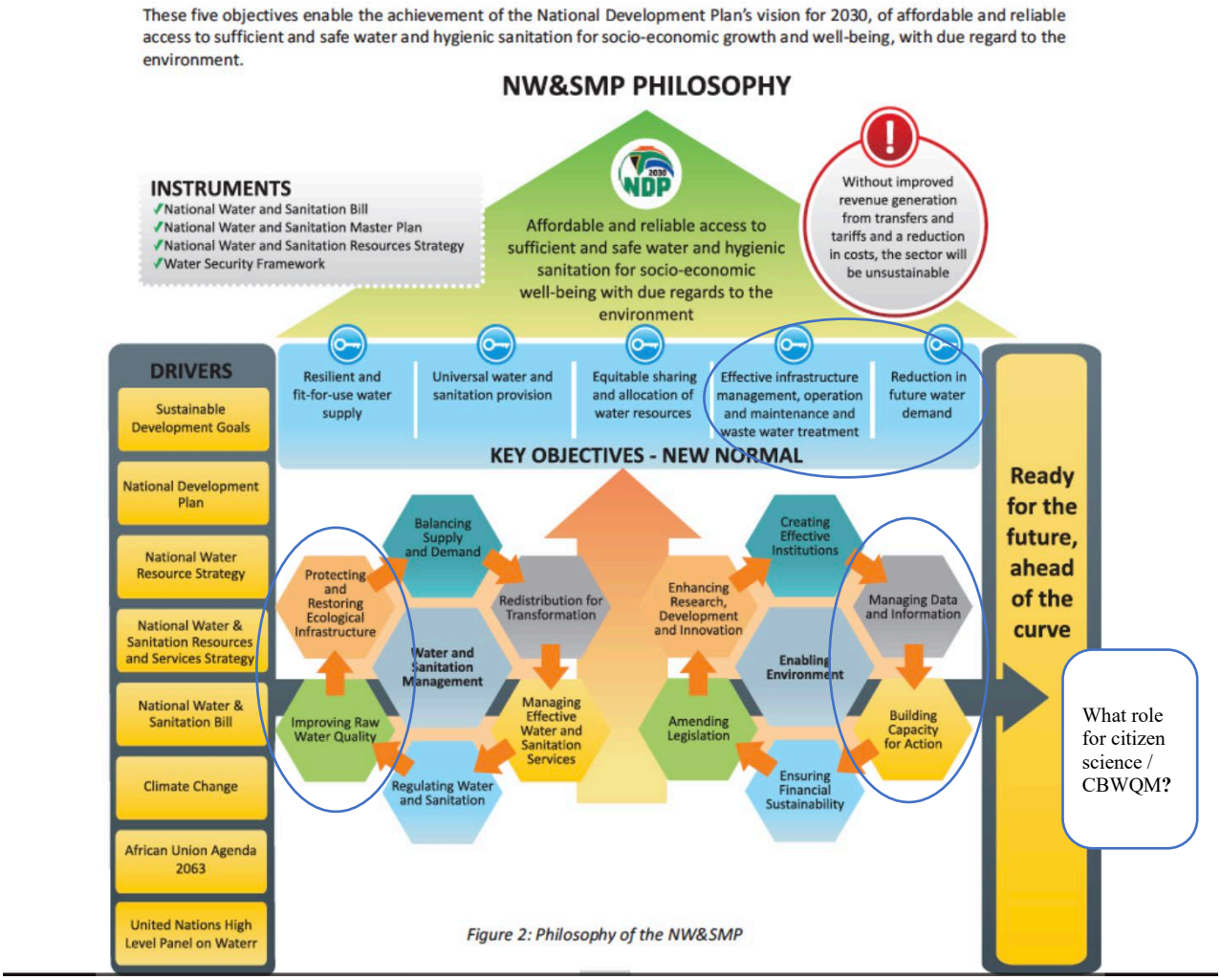


Figure 19: Diagram of the NW&SMP philosophy, with areas circled in blue indicating potential areas of alignment with CBWQM practice (however, these are not well articulated in policy)

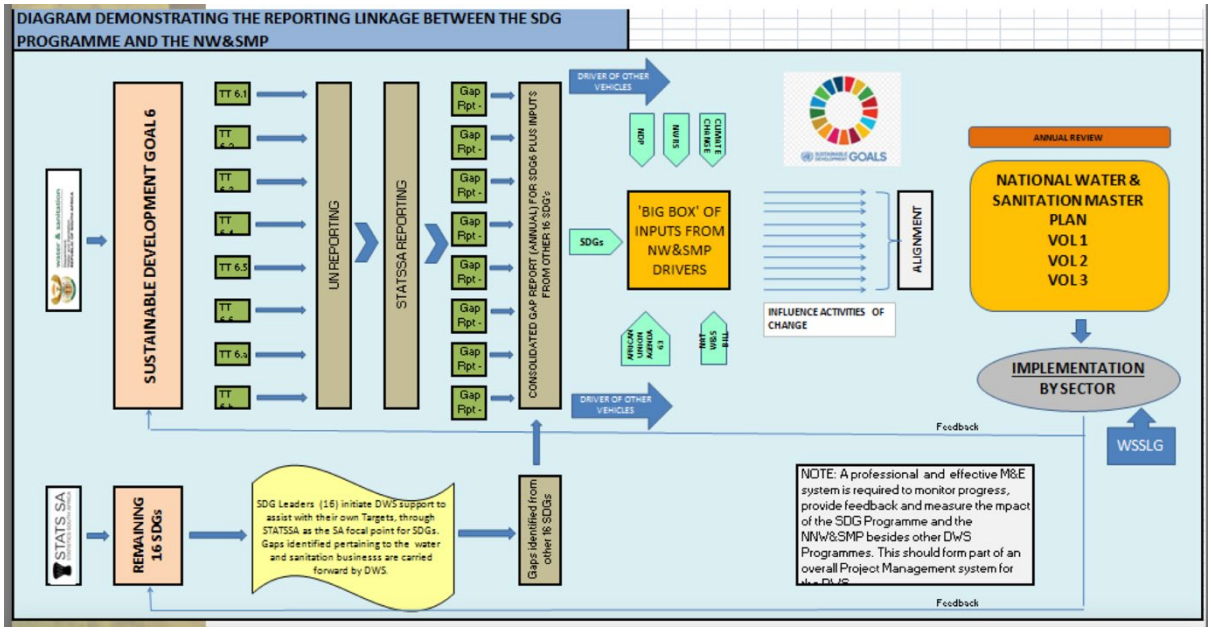


Figure 20: Slide presented by Mark Bannister, DWS, March 2019 showing alignment of reporting in the DWS with SDGs
Source: https://www.dws.gov.za/Projects/sdg/docs/presentations/2_WSSLG%20SDG%206%20Overview_Mark%20Bannister_Rev%203.pdf

As indicated above, the CBWQM community of practice would need to engage in a dialogue with the SDG 6 Target 6.b task team, regarding how CBWQM practices can be captured and included in national monitoring data and SDG reporting, and regarding operational procedures to support the NDP's intentions to strengthen and mainstream citizen engagement in governance and democracy building, especially since there was commitment in DWS to developing an additional indicator that would capture the quality and processes associated with citizen engagement and participation in water management for SDG 6b (ASSAf, 2019).

The NDP 2018 (DPME, 2018) concept note developed by the DPME to guide NDP planning that will help to strengthen integration, inter-sectoral collaboration, alignment with the SDGs and the current context, as well as a strong commitment to contributions from state, business and civil society, talks about revising the NW&SMP within the first iteration of the 2019-2024 NDP Five Year Implementation Plan. The NDP (2018) concept note, following the orientation to citizen engagement outlined above, recognises the need for a participatory approach and for including civil society in participatory democracy and governance. It goes further by re-stating its intention to create enabling mechanisms for civil society to be accountable for and own the NDP vision. Discussions in this regard indicate a strategic re-orientation of development planning in South Africa. In Commission 1 dealing with cross-cutting areas for the NDP Five Year Implementation Plan (DPME, October 2018), it was noted that this strategic shift will require government to engage differently with itself, and with non-governmental organisations and structures. What this means in practice is yet to be properly thought through, and this will present a challenge to the current system of governance. It is yet to be seen how this intention will be included and interpreted in the potential revision of the NW&SMP and alignments of this policy with the DWS IWQM policy of 2017 at implementation level, as well as the SDG 6 monitoring procedures. Most importantly, this offers a timely opportunity for CBWQM programmes to form part of the processes that are unfolding, and to make their contribution to civic engagement with policy, governance enhancement and democracy building more visible in the national landscape in order to also mobilise more sustainable forms of support for CBWQM practices.

3.3.3 Synthesis of key findings and production of mirror data to inform the action-oriented research process

As indicated in the policy inquiry above, **there are significant opportunities for CBWQM practice to contribute towards national policy intentions and commitments, and there are equally significant opportunities for strengthening CBWQM practice via policy support processes that are being articulated, but are yet to be fully implemented. The policy landscape therefore has adequate openings for the contradiction identified in this study to be resolved. This therefore presents a potentially important moment for CBWQM scaling research in South Africa, which provided the key opening for the rest of the action-oriented research reported on in this study.**

It is important to be pragmatic about the current policy context, and there are a few important lessons that need to be kept in mind as the CBWQM community engages further within the policy system:

- One of the important lessons to be learned about policy in South Africa, is that policy intent does not automatically translate into practice, and that significant policy contradictions exist, and there is inadequate social guidance on how to resolve this,

- Therefore, we need to give adequate attention to the translation processes in the policy-practice system, and

- Such translation processes need to focus on working WITH the public, which requires a transformative co-learning model, recognition of community agency, but also an equal state responsibility and agency for working with publics and communities [deliberative and engaged democracy] … this constitutes the wider social learning approach that were in focus in the scaling mechanisms and pathways outlined in this study (see also forthcoming chapters), as also reflected upon in the first phase of the questioning inquiry in this action-oriented research process outlined above.

How policy can be mobilised to support CBWQM scaling and practice, and how CBWQM practice can support policy objectives

As noted above, policy can be mobilised to support CBWQM scaling and practice given its contribution to active citizen engagement in monitoring of governance, environmental management (especially management of water resources which are identified as being scarce given the dryland status of South Africa), and quality of life concerns at local levels. It can also be mobilised to support CBWQM's potential role in creating an environment for social learning, education and public/community participation, democracy building and wider social transformation.

CBWQM can assist with policy implementation, especially around local monitoring of service delivery outcomes, and enhancing citizen engagement with policy and governance practices in South Africa, contributing to SDG 2.b.1 indicators achievement and their domestication, and other SDG targets, as well as NDP objectives. It can also assist with the need for development of spatial planning and engagement at local government levels, as required in the IDPs. Most importantly, in the current context it can assist with boosting capacity for monitoring of water quality given the significant failures in water quality monitoring and management reflected in the IRIS data above (discussed under SDG Target 6.3 above). Importantly, the local level focus of CBWQM practices which focus on water quality issues, helps to reveal that water issues are not uni-sectoral, uni-departmental nor uni-

disciplinary; instead that they are context-based and they foster inter-sectoral and multilateral engagements, as well as inter- and transdisciplinary engagements, promoting policy coherence (Biswa, 2004).

Politicising the CBWQM programme and aligning it with processes of governance

Aligning CBWQM programme with processes of governance: The ongoing Municipal Strategic Self-Assessment (MuSSA) process within the DWS (http://ws.dwa.gov.za/mussa/#!), see also the 2018 synthesis report which offers a province-by-province scorecard review, prepared by the Planning and Information Business Intelligence Team within the Department of Water and Sanitation (DWS, 2019) could be used by CBWQM practitioners as a mechanism for strengthening the case to the government for support. This is pivotal because if the CBWQM programme is presented as a business case, it might stand a chance to be taken seriously, especially looking at President Ramaphosa's convictions in the 2019 State of the Nation Address (President of South Africa, 2019) about inclusive economic growth, creation of jobs and improving the education system, and recent developments shaping the emergence of a District Development Model, and the crisis experienced in monitoring of water quality in most districts across South Africa. There are at least some related services in support of water quality monitoring that the CBWQM programme is capable of fulfilling through citizen science practice, if adequate capacity for scaling is developed and supported in partnership with local governments.

Aligning CBWQM programme with structures of governance: To make CBWQM scaling and practice real and relevant, there is a need to align them with the structure and functions of the South African government. Currently, it is the mechanism available to most of the public and it is also the main contact and reporting point for water quality monitoring as outlined in the policy inquiry above. This is necessary because exploring and aligning CBWQM scaling and practice to policies only is not enough for sustainability. Some policies are aspirations and others are priorities. Only the latter will be taken seriously by the government, and it is therefore also important to stay abreast of how government priorities are being set (e.g. via the current deliberations that are informing the Five-Year NDP Implementation Plan for 2019-2024, the NW&SMP and Five-Year Strategic Plans and Annual Performance Plans) which include debates on how to include civil society in governance structures and accountability platforms. This is the same reason why CBWQM practices should not only be framed as technical practice by environmentalists, academics and natural scientists, but must also be conceptualised as a significant and important process of democracy building and developmental practice for which the state and civil society need to have capabilities, that are adequately resourced and supported.

As shown above, the IWQM policy and its enfolding environment of the SDGs and NDP recognise the importance of CBWQM practices as making a contribution to national and international commitments. **However, there is inadequate definition of what this means in practice, and some areas for further research and development needs have been noted above.** These include, but are not limited to understanding better, and making more visible how CBWQM as a practice is well positioned to strengthen deliberative, participatory and more radical forms of democracy, and therefore also to assist the state with its functioning. However, this would require that the state recognise those involved in CBWQM practices as legitimate actors or publics who are co-engaged in deliberating and contributing to a more democratic society. This is especially crucial at district governance and service delivery levels, where more research is needed to establish *how* CBWQM can contribute to the types of monitoring that are required for reporting to inform improved water quality management actions at local government levels.

Towards scaling and maximising the potential of CBWQM practice in the policy landscape and system

To maximise the potential of **CBWQM as a developmental practice, that is able to more fully play out as a strong force for democracy-building in South Africa**, and for contributing to integrated water quality

management, it is necessary to align policy and policy institutions in ways that strongly support CBWQM scaling and practice. Based on the policy inquiry analysis conducted in the questioning phase of the action-oriented research above, we proposed the following approaches, to be used as mirror data for further deliberation with national stakeholders and CBWQM practitioners in the next stages of the action-oriented research.

- Develop multiple mechanisms and pathways for public participation in both policy development and implementation, especially from a monitoring point of view.
- Support transformed institutional cultures so that these see CBWQM as an important developmental practice that should be seen as *integral to* integrated water quality management and the national development trajectory. For this, there is need for a better understanding of the specific contributions of CBWQM to IWQM, and also potential for expanding their contributions.
- This in turn will require supporting CBWQM to become more fully and proactively an integral part of IWQM, and not be left to operate as a marginal, poorly resourced and supported reactionary, or risk mitigation practice (the current view as reflected in the experience of CBWQM practitioners as found in the first phase of practice-based questioning and inquiry).
- As noted above, CBWQM practice can contribute proactively to the urgent need for capacity building processes, and can in turn also benefit from this, at the same time contributing towards formation of an IWQM community of practice.
- It will also require research to develop systems of engaging with a deeper view of ethics as motive for CBWQM praxis, diversity, and multiple forms of knowledge, expertise and legitimation (i.e. there is not one way of doing CBWQM only – as is also shown in the first inquiry process above), and
- Establishing systems to facilitate and proactively support the abilities of publics to effectively and authentically contribute to, participate in and contest policy creation and implementation, including policy monitoring and reporting processes in a wider human settlements and ecological sustainable context.

As can be seen from the above, very useful perspectives emerged from the questioning phase of the action-oriented research. These were synthesised and carried forward into ongoing deliberations with the CBWQM practice community and national stakeholders involved in CBWQM via a second substantive round of engagement with national CBWQM stakeholders in a national workshop process.

CHAPTER 3: ANALYSING CBWQM WITH NATIONAL CBWQM STAKEHOLDERS

3.1 A co-engaged approach to analysing the situation

The first engagement with national stakeholders and subsequent deepening of inquiry into the central contradiction shaping the activity of scaling CBWQM praxis reported on above, was followed by a focus on the second learning action in the expansive learning cycle of Engeström (Figure 1). This involved **analysis** of the contradiction and the mirror data produced through the first action learning cycle ***with*** stakeholders in what Egeström and Sannino (2010) would typically term a 'Change Laboratory' which is a learning-centred workshop in which multi-actors analyse and deliberate the situation in order to work out what actions could potentially take their shared focus (object) of activity forward in a desirable direction; in the process expanding their learning and potentially also their transformative agency towards changing their shared activity.

As reported above, the initial engagement with the heterogenous multi-actor system of CBWQM activity, involving the review of questionnaire responses, interviews and case studies of CBWQM (Chapter 2) led to the identification of a system of interconnected scaling mechanisms and pathways (Figure 7), and the factors that enable or hinder these scaling pathways as well as possible responses that build systemic, organisational and individual capacity to scale CBWQM initiatives focusing on a range of dimensions of the shared activity.

In addition, the initial inquiry into and review of policy revealed a number of challenges and opportunities related to CBWQM, which were used as 'mirror data' in the workshop deliberations. These vary from narrow interpretations of SDG indicators and an apparent omission of citizen engagement in the National Water and Sanitation Master Plan, on the one hand, to a growing recognition of the importance of citizen participation in DWS IWQM policy, strategy and implementation planning, and possible critical areas or 'leverage points' to intervene with the activity of scaling CBWQM praxis, such as job creation for 'green jobs' and monitoring contributions to boost capacity at district level for monitoring of water quality using available (and potentially new) CBWQM tools, processes and networks (discussed in the previous two chapters).

In order to reflect back and reflect on emerging policy, practice and scaling pathway insights generated in the first Learning Action in this action-oriented research, key stakeholders in the water sector with emphasis on those who have an interest in CBWQM (across levels of practice), were invited to a two-day workshop. On 6 and 7 November 2019 over 50 participants (cf. Figure 21 and participation profile in 3.2 below) from a variety of sectors and levels of government (diverse activity systems) contributed in the workshop (Change Laboratory) to a deeper understanding of how to support and scale CBWQM, via a process of examining the questioning data and insights generated from the first Learning Action described earlier.

Figure 21: National stakeholder workshop participants gather to analyse initial findings of the CBWQM scaling research and contribute to modelling of solutions, November 2019

3.2 Multi-actor stakeholder profile and participation in CBWQM

In Learning Action 1 enquiries, the research team were able to build, and consult with a substantial database of people and organisations working in the field of, or supporting, CBWQM at different levels which constitute essentially three different 'heterogenous coalitions' (cf. Engeström & Sannino, 2021): policy and system development activity systems (e.g. DWS, WRC, DSI; National NGOs, universities engaged in policy system engagements, business); intermediary activity systems (national and provincial NGOs, universities, provincial level government, catchment level networked institutions such as UIEP, business partners, etc.); and CBWQM practice coalitions (locally engaged civil society organisations, NGOs, business partners, university partners, and local governments). In addition, all of the project team are actively involved in this field of work and are intermediary and 'boundary crossing' actors who interact with key at all of these levels of stakeholder coalitions on an almost daily basis.

This resulted in an invitation list for the workshop that was both diverse (in terms of the organisations represented) and strategic (in terms of the links into current CBWQM activity and scaling practices) – see Figure 22. The invitee list, based on synthesis of stakeholder data generated in the programme up to this point, confirmed that the configuration of CBWQM praxis in South Africa is **primarily a multi-levelled and multi-stakeholder activity, involving a diversity of stakeholders that operate and work at different levels of the system of water quality management and in various partnership relations in the three listed 'heterogenous coalitions).** Significant though, is the dominant role of NGOs and CBOs, as well as corporate / social innovation stakeholders, mostly working in partnership configurations with government (local, provincial and national, and academia), making these organisations and the level of actual CBWQM praxis the 'primary level' of coalition building for scaling activity.

Overall, this confirmed that the activity of scaling CBWQM praxis MUST be considered a multi-levelled, multi-stakeholder process involving cross pollination and boundary crossing between these 'levels' of heterogenous coalition (cf. Figure 3 for an overview and Figure 22 summarising invitee list and potential activity systems below and Box 2 confirming the heterogenous nature of the coalition partnerships in CBWQM) and their subjects, rules, mediating tools, partners, and ways of working (which may differ according to different stakeholder groups activity systems) although they are all contributing to a potentially shared object of activity: scaling of CBWQM praxis. **Each stakeholder group and the coalition they most align with, may have specific strengths to**

bring to the overall shared activity, and this may need to be differentiated and articulated to strengthen a scaling strategy in which resourcing is not simply reduced to financial resources.

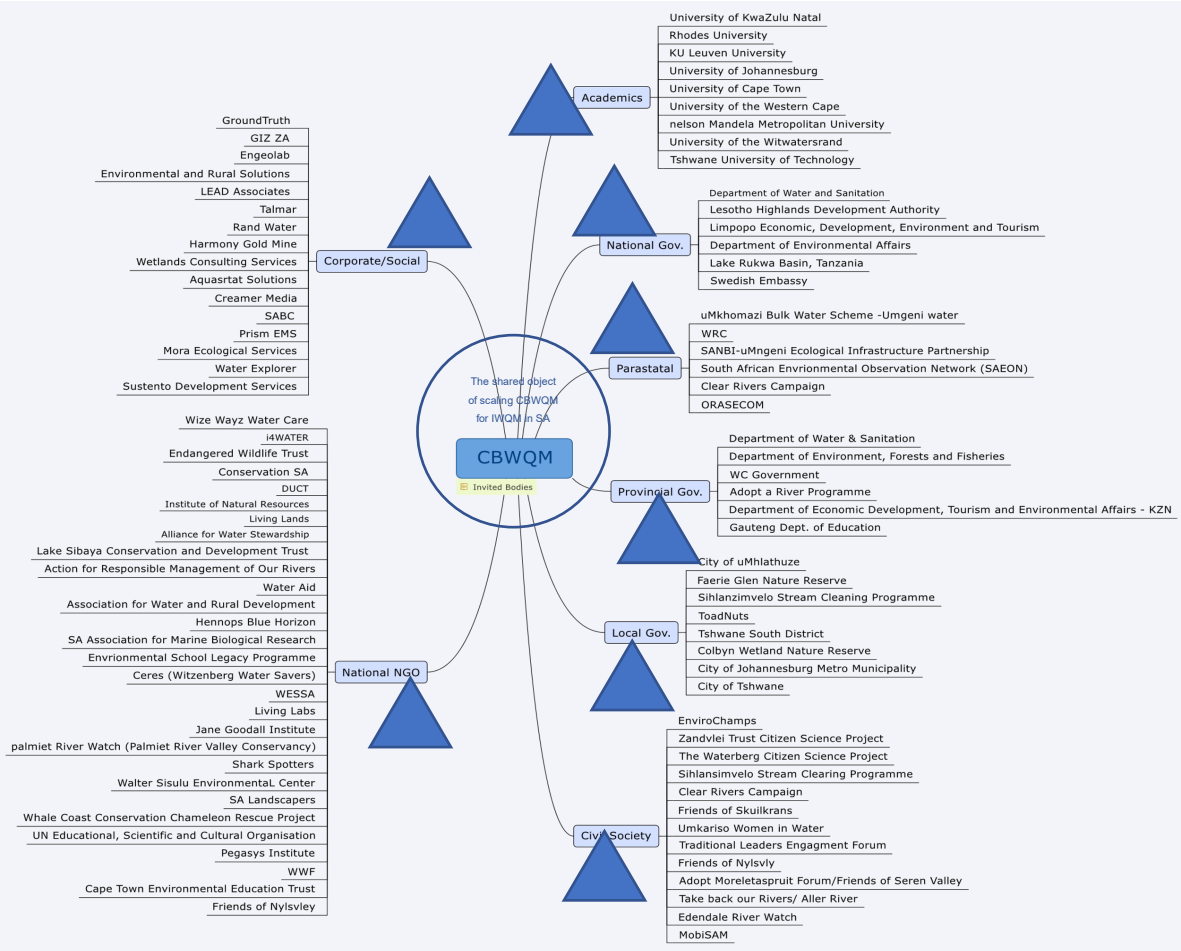


Figure 22: Invitee list indicating the scope of CBWQM stakeholders involved (all of whom were invited to the national workshop) confirming the heterogenous coalition of actors involved in the scaling of CBWQM activity as an emerging fourth generation activity theory research configuration (cf. Figure 3)

The wide range of participants who attended the workshop (cf. Figure 22) reflected an appropriate system of interacting coalescing activity systems constituting the CBWQM activity engagement for this phase of the research process. These included participants from national, provincial and local government, researchers as well as members from civil society partnerships. Civil society participants varied from community members working directly with water quality issues in their communities to senior managers representing national NGOs. In addition, a number of businesses that are developing tools, particularly internet-based tools, to support citizen-based initiatives, participated in the workshop and shared insights into this development. Although business and industry were not well represented, they were flagged as being a key focus group in the remaining activities of the project. This is especially significant in that a key purpose of the action-oriented research is to build sustainable funding streams for CBWQM activities.

The mindmap of participants (Figure 23 below) provides a number of important insights into the variety of institutions represented at the workshop, and in the collective activity of scaling CBWQM praxis. Participants from the diverse 'levels' of the heterogenous coalitions offered important insights into the scaling of CBWQM practice. For example, it was particularly encouraging to have the national Department of Water and Sanitation represented by both national and provincially-based staff. This allowed the workshop participants to gain an

insight into current developments including the launch of the National Water and Sanitation Master Plan and its implications for all levels of government. Two participants from the City of uMhlathuze, which has an active focus on water through the uMhlathuze Water Stewardship Partnership, provided useful perspectives on the challenges and opportunities of engaging with citizens on water issues. This perspective was broadened by the participation of experienced community water monitors working within the Mpophomeni Enviro Champs. An increasingly influential grouping in this field of work are a number of parastatals that are raising funding for and supporting innovative projects focused on unlocking finance for the protection and restoration of ecological infrastructure. These include SANBI and WRC who have leveraged funding from the Global Environmental Facility for an Ecological Infrastructure for Water Security (EI4WS) programme that has developed a social learning strategy which addresses a key component of the programme focusing on social learning and community capacity building for EI4WS at catchment scale (SANBI, 2016; Lotz-Sisitka et al., 2020). These projects have substantial synergies with the work of community and civil society groups seeking to initiate and sustain CBWQM, and bring a focus on heterogenous coalitions working together at catchment scale.

The local, national and international NGOs working in this field were well represented given the limited places available within the workshop. This group in particular often bridge the space between large government, business and international funders and local communities. As such, they play an important intermediary role that creates substantial benefit but also raises questions of how best to manage these relationships. All this work is being further supported by academic research which offers a critical perspective on this work, and which helps with tools development. Finally, a number of businesses that are focusing on developing new tools to support the generation and sharing of water quality monitoring information also participated in the workshop to share and discuss how these tools can be used. Figure 23 below provides a conceptual map of the participants of the workshops according to stakeholder groups and activity systems. Notable is the strong participation and involvement of NGOs in CBWQM praxis, but also the multi-actor nature of CBWQM praxis.

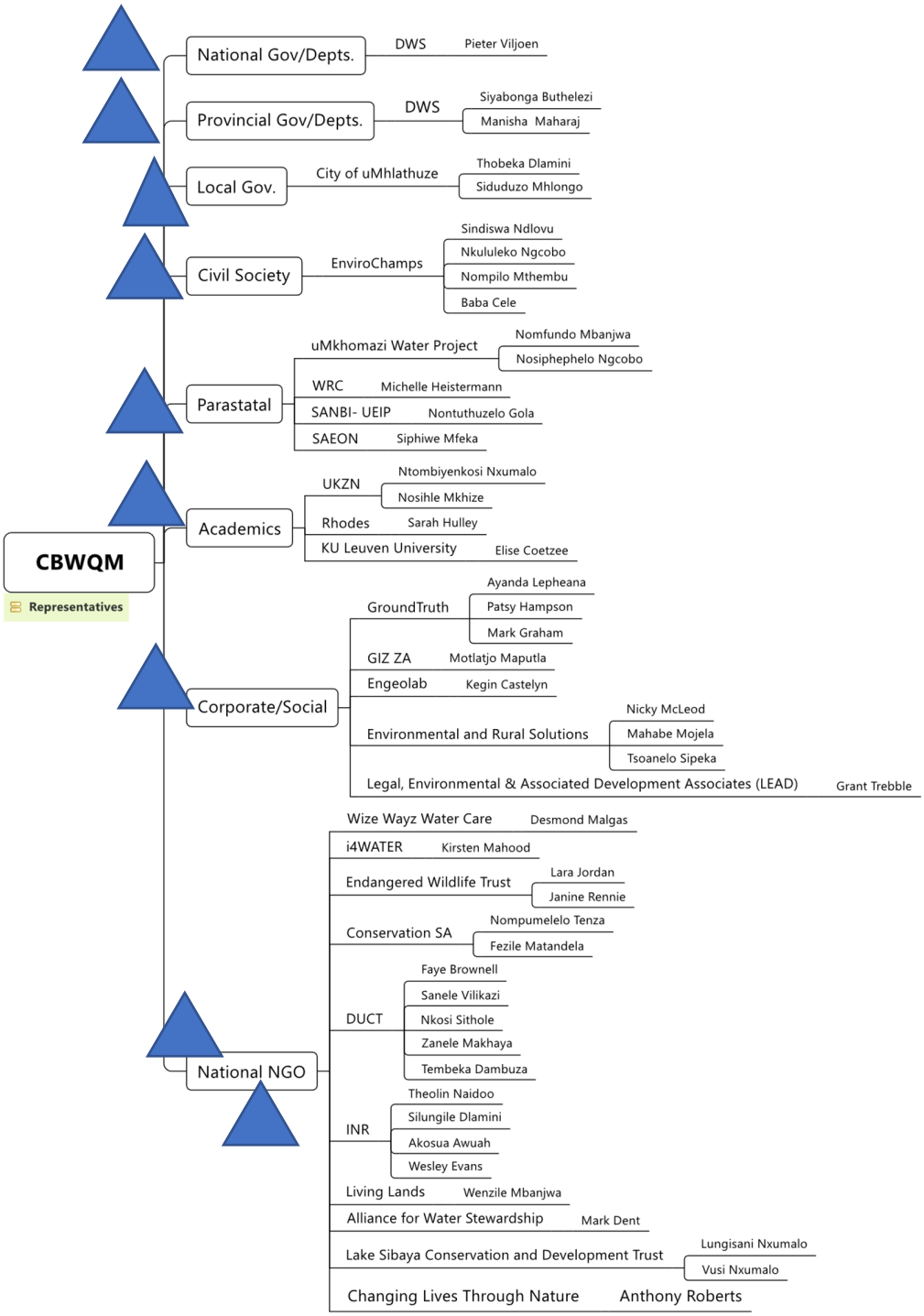


Figure 23: Workshop participants from different activity systems

3.3 Sharing of mirror data and findings of the research at this point

The findings from Learning Action 1 were shared with the workshop participants on the first day of the workshop. Particularly useful was the analytical framework that highlights a system of interconnected scaling mechanisms and pathways (Figure 7). This framework was used by workshop co-ordinators as a tool to generate engagement and reflexivity amongst participants, and for reflecting on the discussions emerging. To facilitate and mediate the discussion, the scaling conceptual framework tool was broken down into dialogical engagements around core issues raised in the Learning Action 1 phase of the research. Many of the insights and concerns expressed by

the participants affirmed the usefulness of the framework for considering scaling pathways for CBWQM, but also showed these scaling pathways to be embedded in, and integrated in and through praxis and the primary activity of CBWQM practice, in other words they gain meaning in and through the process of scaling CBWQM.

The workshop provided an important space for participants to reflect on and engage more deeply with the inquiry into policy and the policy contradiction, with a focus on what was most useful to support and profile CBWQM. Using these discussion questions "How can we bring policy and CBWQM practice closer together?" and "How can CBWQM help to close policy gaps?", the policy insights were presented to the group as mirror data, and were discussed during the first day of the workshop. As will become evident in the summary of the subsequent deliberations and further analysis of participants, all levels of policy and planning have gaps and opportunities that are relevant to the activity of scaling CBWQM.

Workshop participants confirmed that there are particular opportunities to engage with national reporting on Sustainable Development Goal 6 both in terms of national reporting and in terms of enhancing citizen participation in water and sanitation management as required by Target 6b. Their deliberations also confirmed that at the national level there are contradictions within existing and emerging policy and planning. This is particularly evident in the different discourse and approaches contained in the Integrated Water Quality Management documents and the more recent National Water and Sanitation Master Plan. Much discussion centred on how we engage with these global, national and local level goals, policies and legislation.

3.4 Analysis of scaling pathways further developed with activity system partners

Central to this entire project and to the discussion in the workshop was a focus on how we scale and sustain CBWQM initiatives, which was the common 'shared object' which all recognized as being characterized by complexity. As per the objectives of the project and the issues raised by participants in the initial questioning phase, three key areas were considered to be crucial, and were the focus of the workshop. These were: 1) alignment of and with policy; 2) the building of collaborative spaces, sometimes referred to as a community of practice, through a range of tools and processes; and the 3) securing of sustainable resourcing. It was recognized that new models and approaches were needed for all three foci. Important for area 3, resourcing was recognised to be far broader than funding and includes resources such as: capacity building processes; the building and maintenance of new technologies for collaboration; the linking to and support through institutional mandates; and the unlocking of economic value associated with ecological infrastructure, as well as social and ecological value for those participating in the CBWQM projects (e.g. clean water to drink; reduction of effluent in rivers, etc.).

At this stage of the action-oriented research into the activity of scaling of CBWQM, it was important to capture and reflect the scope and depth of the discussions and further analysis insights that emerged within the dialogue stimulated by these presentations / the mirror data. In order to structure the many inputs we clustered the points made using the system of interconnected scaling mechanisms and pathways developed in the questioning phase of the research (Figure 7, SPs = Scaling Pathways). The deliberations provided a progressive deepening of insights that developed over the four-year project via the action-oriented research approach.

SP1: Policy Support and Political Economy

In the presentation sharing insights and mirror data emerging from the review of policy in relation to CBWQM by Prof Lotz-Sisitka, a key point that emerged is the need to shift the discourse from "governing the people" to "governing WITH the people" as reflected in the NDP. In discussion with participants it was further clarified that this shift is evident in the declining emphasis on the 'developmental state' in government rhetoric and an

increasing emphasis on the notion of the 'social contract/ compact'. The former concept assumes a strong and capable state driving development while the latter emphasises the need for partnerships between government, business, labour and civil society. Participants indicated that this shift opens up opportunities for CBWQM to play a stronger role in the collaborative management of our water resources. It is also a key feature of the District Development Model that is now being piloted by government to strengthen integrated approaches to governance.

Linking to the global Sustainable Development Goals and particularly SDG 6, participants confirmed that there is an opportunity to contribute directly to both South Africa's and global reporting on SDG 6 (Targets 6.3 and 6.5, with emphasis on 6B particularly). The recent country report on the SDGs includes a 'domesticated indicator' (6.3.1D) which "provides information on the proportion of wastewater safely treated and lawfully discharged". Reporting against this indicator states that "in 2017 52% of wastewater was safely treated and lawfully discharged … with this 52% being limited only to wastewater treatment works". The report states further that "Lack of data is the principal challenge that affects effective reporting on the indicator. Data challenges exist because government departments and municipalities are not conducting the necessary monitoring or they do not have sufficient monitoring network density to enable adequate reporting … and that … municipalities are guilty of non-submission of water quality data to the Integrated Regulatory Information System (IRIS)" (StatsSA, 2019, p. 166). The report states further that "there is limited data on the volumes and quantities of effluent that are being discharged into the municipal wastewater treatment works (WWTWs) by the various economic activities (abattoirs, light industries, etc.)" (pg. 167). Additionally, for indicator 6.3.2D which "aims to measure whether the water quality in South Africa's dams, rivers and aquifers is complying with a set of water-quality objectives" the report states that "South Africa's reporting ability on this indicator has been reduced by the lack of data, limited monitoring because of lack of funding and resource mobilization, and to a certain degree the inability to coordinate monitoring across various sectors, government department sand public sector institutions". It also states that "Data on in-stream and in-aquifer water-quality monitoring across South Africa has been steadily declining since 2015. This is largely as a result of the financial constraints that have affected both the collection of water-quality samples as well as the analysis of the samples."

As discussed in the workshop, there are existing and potential citizen-based water monitoring initiatives all over the country, that, as identified at the start of the action-oriented research process are inadequately co-ordinated and under-utilised as a national resource for supporting IWQM in South Africa. The StatsSA report states clearly that "There is need to improve alignment between the various entities that undertake water-quality monitoring on data programmes, platforms and collection approaches" (pg. 167). This suggests that SA has not as yet mobilised any of the citizen-based water quality monitoring activity in support of improved governance and SDG implementation. There was agreement that there was enormous potential to contribute both nationally and internationally to the development of tools, processes and standards for CBWQM in relation to the SDG 6.3 indicators (especially 6.3.1D and 6.3.2D) on water quality, and SDG 6.b indicators on the operationalization of community participation monitoring. It was reported that Dr Chris Dickens (Head of Office of the Southern African office of IWMI (International Water Management Institute)) has asked Dr Mark Graham and Dr Jim Taylor (leaders in the field of CBWQM tools and scaling praxis, and part of the team undertaking the scaling research) to contribute to developing these processes already which offers a key opportunity for the activity of scaling of CBWQM praxis, not only in South Africa, but also internationally. It is also worth noting that the StatsSA have established a new online reporting portal for the SDGs and their indicators, which includes a 'goal tracker portal' (http://www.statssa.gov.za/?page_id=739&id=5).

As reflected in the policy inquiry above, also linked to the SDGs, is an anomaly within SDG 6.b which focuses on supporting and strengthening of the participation of local communities in improving water and sanitation

management. As discussed above in the policy review, the indicator requires that local administrative units both 'establish 'and have 'operational' policies and procedures for participation. Participants agreed that CBWQM provides tools, processes and a more co-ordinated national community of practice could contribute directly to SDG 6.b with emphasis on the focus on 'operationalising' CBWQM practice as a process of providing more realistic and robust reporting on Target 6b. Participants agreed that there was need to co-engage around the development of domestication of the indicators for this SDG reporting process in order to give more meaning to it, and that this should be done via praxis engagement.

Stakeholders in the workshop emphasised that within the broader national planning and policy framework there is a need for the CBWQM community to differentiate between different levels of government and within this different mandates and priorities in order to align activities more strategically and maximise engagements, in other words align all the different roles and responsibilities for CBWQM more strategically; effectively outlining expansive learning pathways for the different 'levels' of heterogenous coalition involved in CBWQM scaling praxis.

At the national level, it was said that there is a need to clarify the value that CBWQM can make in terms of monitoring and particularly the potential to align with the Data Acquisition Management (DAM) Strategy and the National Integrated Water Information System (NIWIS) and IRIS (as also indicated by the StatsSA and NDP 2019 reporting on the SDGs above). There is also a need to articulate the social benefits that CBWQM and the community of practice associated with it creates in terms of quality of life and economic opportunities including potential employment opportunities. Participants noted that a review of the War on Leaks programme provides some insights into how this could be done and thus this directorate within DWS would be a potential strategic partner.

At the provincial level of DWS the focus is largely about getting good monitoring data to inform decision making and tracking of service delivery. It was noted and confirmed by workshop participants that the current data is incomplete and there is potential for CBWQM to supplement the Department's monitoring activities. However, it was noted that this will require a good assessment of the capability of CBWQM tools and capacity in relation to the monitoring frameworks of government, and to identify a niche area for CBWQM, noting that CBWQM cannot compensate or replace state-based responsibilities, but it *can* contribute towards improved monitoring praxis overall.

At the local government level there is a need to align CBWQM more directly to water by-laws and service level agreements as well as commitments and aspirations expressed in the individual Integrated Development Plans and key performance areas. It also needs to be made more accessible and understandable for local communities so that they can make the links between government, business and civil society challenges and responsibilities. Here, it was proposed that the data at IDP level needs to be fed into District level reporting and capacity building as revealed in the IRIS data.

All of the above suggests that there are significant further opportunities for engaging with policy and governance structures at diverse levels for the scaling of CBWQM in ways that could better integrate with governance levels, processes and priorities and that all of this would require a co-ordinated effort on the side of CBWQM organisations, as well as agreement on core tools that could be consistently used for providing 'regular' datasets that could be integrated into national data sets on a regular and reliable basis.

It was noted by participants that there is a need for more co-ordinated activity across governance levels and that this should be considered within the **District Development Model** (DDM) currently being piloted and rolled out

by the Presidency, as well as the catchment level. The DDM model identifies the pattern of operating in silos as a challenge which has led to a lack of coherence in planning and implementation and has made monitoring and oversight of government's programme difficult. In response, the District Development Model aims to accelerate, align and integrate service delivery under a single development plan per district or metro. The intention is that this development plan should be developed jointly by national, provincial and local government as well as business, labour and community in each district (cf. also https://www.cogta.gov.za/ddm/index.php/about-us/). This will require the identification and engagement with the departments responsible for implementing the new model to position CBWQM within this model, and will require analysis of how CMA and other water management structures intersect with this model.

In addition to the national policy, there was also a suggestion that the CBWQM scaling project consider the implications of more specific legislation at the national and local level related specifically to catchments and water/ sewage management. Thus, for example, the legislation governing Catchment Management Agencies, Water Users Associations, Environmental Impact Assessments, etc. could be examined for gaps and opportunities with regard to CBWQM. Participants also mentioned the need to give adequate attention to the dual systems of governance in South Africa and the importance of understanding the mandate of Traditional Leaders and engaging with these structures, particularly in rural areas. However, workshop deliberations also indicated a perception or challenge that across the entire political spectrum, there was a lack of political will with regard to water quality issues. Participants indicated that this would require that we highlight the links between water quality and service delivery, community well-being, health risks, increased costs of treatment and potentially job opportunities in specific areas.

These deliberations led into the related area of political economy and the potential to secure the sustainable resourcing of CBWQM initiatives. **Participants were in agreement that this in turn requires that the value created by CBWQM be more clearly articulated across a range of areas**. During the workshop, it was repeatedly stressed that this was not only financial value but also the protection and creation of value related to infrastructure, the development of new innovations (see tools below), social networks, skills development and livelihood opportunities, and ecosystems protection including ensuring a safe and healthy environment. All of this points to a more robust framing of the object or purposes of scaling CBWQM activity. It was noted that there is ongoing work in the area of clarifying economic benefits which extend beyond monetary benefit only or instrumental value (e.g. the work on sustainable value creation that incorporates economic, social and environmental value). There were also recurrent links made to large national projects currently being implemented that focus on unlocking financing linked to ecological infrastructure and water security (the EI4WS project mentioned above). Particularly relevant potential partners in this regard are SANBI, the National Business Initiative, and the Water Research Commission. It was recommended that contacts within these projects need to be included in the next round of engagement with CBWQM scaling deliberations, which involves meeting with strategic entities and linking the CBWQM praxis to the EI4WS praxis more explicitly.

That there was significant concern that many of these large projects in the water sector (e.g. the EI4WS) were not making allowance for the time and beneficiation necessary to support local communities. This raised issues of 'equitable sharing' that included 'epistemic and cognitive justice' or how the knowledge and data of local communities was used and recognised. **It also raised issues of how funding was being allocated, with concerns that a number of current projects seemed to be built around a focus on community initiatives and yet there was little funding for the communities themselves or for the tools and platforms needed to support, profile and sustain this work.** Current studies into these issues need to be integrated into the scaling work, with the possibility of drawing up or at least advocating for 'good practice' guidelines for CBWQM funding

and management praxis – this could form a dedicated follow up study, and can also be considered as part of the policy brief series.

SP 2: Knowledge Commons and CBWQM Tools

Amongst the participants in the workshop were representatives from a number of organisations that are actively developing tools and processes for CBWQM (i.e. from the tool producing activity systems). Two slots were included in the programme to share and discuss these initiatives.

The first session explored Internet and cell phone-based platforms that supported the collection and reporting on water quality related issues. Geo-ODK is an open source platform that a number of community initiatives are using to collect data from activities such as house-to-house visits/ surveys, reporting on spilling sewage infrastructure and illegal dumping. This has enabled communities to move from paper-based records to direct input from cell phones.

Two locally produced digital platforms that combined cell phone applications with sophisticated data management systems were also shared. The Environmental Collaboration and Intelligence Network (ECIN) system enables the collection of data through customised dropdown menus and the collation of the resulting data into a range of customised reports depending on user requirements. The second system known as Managing Outputs and Time (MOAT) provides detailed and secure project management tools that are suited to large scale projects. The functionality within MOAT included biometrics (e.g. fingerprint scanning); geo-referencing (e.g. tracking of work areas); time stamping (e.g. start and end times of work), etc. This opens new opportunities for recording and reporting on CBWQM initiatives that address issues such as the provision of evidence for unlocking various financing mechanisms such as payments for ecosystem services in rural areas or the response times on sewage leaks. It was noted that this is a significant area for ongoing innovation necessary for the scaling of CBWQM praxis.

The miniSASS website[12] is well established and despite limited resourcing and support continues to provide one of the most visually powerful and useful websites for reporting on citizen-based water quality monitoring. Also focused on citizen science tools and processes is the Capacity 4 Catchments website[13] that is still in a beta development phase due to a shortage of funding for ongoing development. These two sites provide important services in terms of reporting, engaging, tracking change and sharing citizen science tools. It was noted that both are in need of concentrated support and capacity to develop the platforms further to maximise their potential as knowledge commons resources for CBWQM praxis.

The second slot was focused on enabling workshop participants to physically share tools that they are using in the field. Unfortunately, due to a thunderstorm, this activity had to be moved indoors. Despite this, the sharing and demonstrations generated many insights and subsequent discussions.

Key discussions that emerged from these two slots are summarised here. The first related to the digital platforms and focused on the diversity of systems that are being developed and used. The key challenge relates to the complexity of integrating data across these different platforms so that a more holistic and countrywide picture of water quality monitoring data can be shared and accessed. Although there are possibilities such as the CSIR developed C-More platform[14] that allows inputs from a range of applications, this is currently a very expensive option and would require national level funding and coordination. There is need for viable options to be

[12] www.minisass.org/en/

[13] https://capacityforcatchments.org/tools

[14] https://www.csir.co.za/platform-shared-awareness

established as part of this CBWQM scaling pathway project so that basic costings can be developed for potential funders.

Despite this challenge related to the diversity of platforms and tools, it was also recognised that there is significant complementarity between the tools being developed. This availability of a range of tools that can be combined in different ways for different contexts and purposes was seen as a positive outcome of creativity and innovation in many community-based initiatives. One of the needs expressed was to develop a common platform where these tools can be shared and commented on to support their use, refinement and redevelopment. The Capacity 4 Catchments was recognised as such a platform if additional funding can be secured to take if from a beta to fully functioning site and to support its ongoing hosting and management. Linked to this point was an important recognition that many citizen-based groups are taking the digital platforms, the water quality monitoring tools and the associated processes and 'making them their own'. This relates to enhanced levels of participation and ownership across a continuum of citizen science-based approaches, which occur along a continuum of scientists involving publics in gathering scientific data towards more substantive efforts of publics participating in science praxis in more substantive ways (Mueller, Tippins and Bryan, 2012; Dickenson et al., 2012).

Linked to the work that is going on around developing tools and the potential of this work to become more economically sustainable as demand for these products grow, was a discussion on how we ensure that that the technologies/ tools remain accessible within the CBWQM community of practice. There is an emerging concern that the tools/ relationship/ processes that have been built in a large community of practice (often volunteering or investing their own resources) could be appropriated by commercial/ specific groups for commercial gain. The question about whether we need to be considering copyrights/ codes of practice at this point was discussed but no definitive answer was reached.

Related to the above point was a suggestion that it is difficult to protect open source and collaboratively developed intellectual property and that it is more important that we remain at the cutting edge of this development. We need to bring our collective expertise into the discussion on unlocking finances and make sure that this community is recognised as playing a key role thus ensuring the community is able to generate funds and keep the innovation going with community/ citizen-based WQM groupings. Use of Creative Commons (CC) Property licensing agreements could be one way of resolving the challenges of intellectual property (IP) and the sharing of IP in the CBWQM community of practice (see Figure 24 below for an overview of what this might involve and mean in practice).

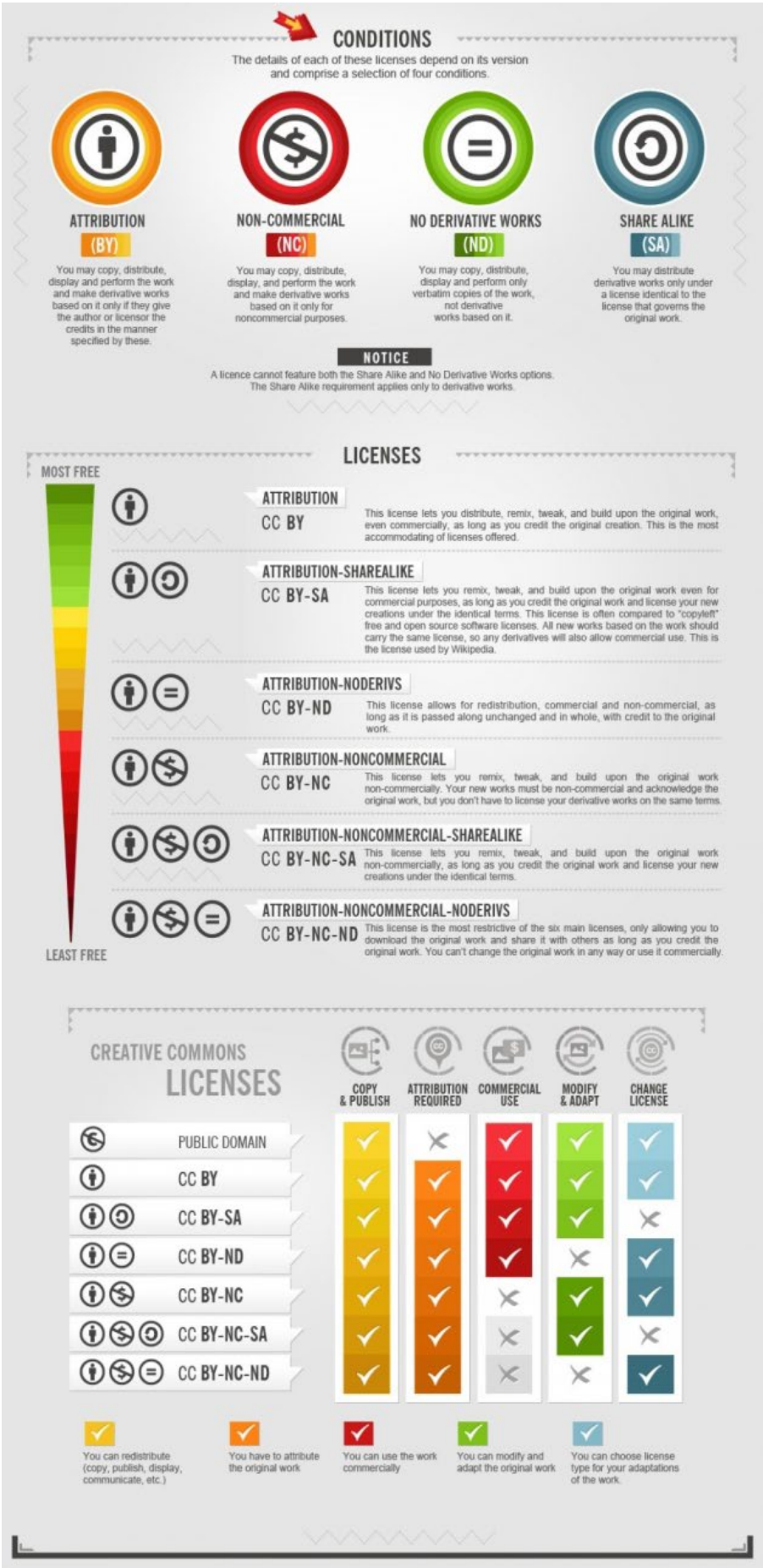


Figure 24: Creative Commons licenses (Source Foter, 2015)

Figure 24 shows that there are six different Creative Commons licenses: CC BY, CC BY-SA, CC BY-NC, CC BY-ND, CC BY-NC-SA, CC BY-NC-ND. The letter pairs indicate conditions for use. CC BY is the most open license. It allows the user to redistribute, to create derivatives, such as a translation, and even use the publication for commercial activities, provided that appropriate credit is given to the author (BY) and that the user indicates whether the publication has been changed. CC BY-SA is also an open license. The letters SA (share alike) indicate that the adjusted work should be shared under the same reuse rights, so with the same CC license. NC (non-commercial use) and ND (no derivative works) are conditions that make the CC licenses more restrictive and thus less open. (Source: Foter, 2015[15, 16, 17])

SP3: Capacity Development

Throughout the workshop deliberations it was emphasised that capacity development was one of the key value adding activities of CBWQM and that in many instances it played a key role in sustaining initiatives. However, it was also noted that there needs to be a stronger focus on the career pathing of people working in this field. This includes making sure that the training is of good quality, is recognised, is cumulative, and is tracked into CVs and shared so that people grow in the field and increase their opportunities for employment and livelihood creation. It was noted at this point in the process that various options linked to short and accredited courses will be explored by the project team going forward (see Chapter 5 and 6.4).

Building on these discussions a number of participants with knowledge of the Sector Education and Training Authorities (SETAs) highlighted the importance of engaging with the SETAs, and particularly the Energy and Water SETA (EWSETA) to research the demand for CBWQM related skills within the water value chain. Some initial work needs to be done to ascertain what existing occupations have been described such as 'Water Monitor', and what levels/ progression opportunities already exist that this project could link into. The Researching Education and Labour (REAL) centre at Wits University has a good reputation in this kind of study and it may be possible to set up a research initiative to inform this work.

There was also some discussion on who needs to be brought into projects and capacity development to ensure maximum benefit and sustainability. Of particular concern was that the people receiving training stay in the communities. This seemed to suggest that local community members be given preference rather than interns; Youth Environment School (YES) beneficiaries or Groen Sebenza participants from other areas may have more capacity but may leave the area. At the same time it was acknowledged that in some instances people with substantial capacity can be found in local communities and they may be able to take up leadership or support roles. This area seems to need further research as there were many assumptions and counter examples evident in the examples given by workshop participants.

For some time now the idea of a 'Citizen Science/ CBWQM Society or Association' in South Africa has been suggested as a way of supporting, formalising and accrediting capacity development and professionalism in this field. There are concerns about the capacity to establish and sustain such a society; one proposal suggested setting up a branch within an existing society or structure rather than a stand-alone society. There were also counter suggestions that such societies tend to become exclusive and may not serve the best interests in a community of practice that seeks to be inclusive across an extremely broad range of participants.

[15] https://creativecommons.org/licenses/by-sa/4.0/

[16] https://www.wur.nl/en/article/What-are-Creative-Commons-licenses.htm

[17] https://foter.com/blog/how-to-attribute-creative-commons-photos/

SP 4: Communication and Profiling

The importance of communicating and profiling what is happening in relation to CBWQM was raised many times during the workshop. There was a strong sense that unless we find ways of articulating the value of what we are doing better and communicating this in various ways to different audiences we would be unable to increase the impact of and support for this important work.

One suggestion is that we need to make the links much more directly to national priorities such as the links between water quality, employment, inequality and poverty. This was referred to at some points as the 'social dimension' and at others as the 'developmental dimension'. This point is supported by the findings in the policy review above. In this review, the recommendation was made to position CBWQM as a development activity with social, ecological, and economic beneficiation. Building on both the workshop and research findings **we have begun development of a series of policy briefs and dialogues that could inform and stimulate expansive learning trajectories with relevant stakeholders.**[18] Each of these briefs could inform one or more scaling trajectory in ways that include the importance of and contribution to deepening democracy and enabling community mobilisation. This in turn should support proactive and collaborative engagement with important issues rather than reactive and antagonistic protest. All these factors were seen to be important in building community well-being and yet CBWQM was often perceived to be a narrow interest lobby group focused on a niche environmental concern. This will require some careful work on articulating the value of this work and finding a way to represent it in ways (policy briefs/ graphics) that can be shared consistently to build recognition of the contribution made by CBWQM.

Linked to the above was a strong sense that citizens should not be perceived or perceive themselves as 'victims' in their relationship with government. Rather we need to highlight the notion of collaborative governance that extends to governance WITH communities and civil society. This sense of having something positive to offer that contributes to the success of our country was very evident in the workshop and we need to find ways of communicating this to a range of interest groups including different levels of government, business, labour and other sectors of our communities.

Much of the above was illustrated by reference to powerful videos (e.g. the Amanzi Ethu video made for the P4G programme) that communicates the need for change while simultaneously conveying a message of hope.

SP 5: Collaboration and Formation of Communities of Practice

In addition to supporting the development and sharing of tools and processes amongst the existing community of practice within the field of CBWQM already mentioned above there was regular reference to 'Who is not in the room?'. There was also a recognition, covered above under communication, that in order to widen and deepen collaboration, there is a need to identify and respond to the particular mandates and interests of potential partners in CBWQM.

Central to the notion of collaboration was a recognition that there are a number of large national initiatives that are exploring and opening up financial opportunities related to ecological infrastructure and water security (EI4WS). CBWQM has the potential to both contribute to and benefit from an engagement with these initiatives. At present there are many people who are involved in multiple projects who have the potential to build these collaborative bridges. It will be important to map out the various initiatives, identify strategic areas for collaboration and then formalise and strengthen these links.

[18] These were in the process of being developed at time of publication of this report, and were not yet available for distribution.

Another group that was mentioned on a number of occasions in the workshop was the Traditional Authorities. Some work has already been done with this group and it would be useful to get the materials and reports that were developed for and from this work. It was noted that there is need to draw on and consult with Tembeka Dambuza who is now working with DUCT, as she has been leading work in this area.

There was also a strong sense that schools could be an important partner in this work. The opportunity for schools to monitor local rivers and to share this information with other schools through the collaborative tools available provides many opportunities for learning. It also provides opportunities for recognising our connections across socio-economic-geographic divides. One suggestion was that we explore the possibilities of connecting to national initiatives such as Eco-Schools, Water Explorers and Fundisa for Change more directly. There are also possibilities to link this work into the regional Sustainability Starts with Teachers programme that is being run through the regional UNESCO office and Rhodes University, especially the science and education directorates at UNESCO ROSA. Here it was noted that care should be taken not to re-invent the wheel, but that careful work should go into assessing what is already happening, and what is already known about scaling this practice into the schooling system (e.g. SWAP and other school-based Water Quality Monitoring studies should be reviewed).

The potential to work with water stewardship was also mentioned and outstanding examples of collaborating with business to support CBWQM were also noted. As water becomes an increasing risk to business so new opportunities will emerge and the CBWQM community needs to find ways of articulating and capturing the value created by our work for business. This will help to build a stronger relationship between communities and business.

Finally, it was noted a number of times that in order to build better collaboration with government, it will be important to understand the different mandates, levels of responsibilities and key performance areas of specific levels of government. This understanding will inform a much more nuanced and reciprocal relationship between citizens and government officials with a shared interest in water quality issues. It will also help us to package and share the data being generated in ways that are relevant to various government departments, and contribute towards resolving the monitoring and water quality management crisis revealed in the IRIS data. This work would also enhance the contribution that CBWQM can make to supporting individuals working in often dysfunctional governance structures. It may also help communities to understand that in many instances, community actions are contributing to the issues we face (e.g. abuse of the sewer infrastructure) and how we can work together with government to address these issues.

SP 6: Data Use and Open Access Reporting

Many of the issues that are relevant to this scaling mechanism and scaling pathway have been covered under other headings. These include:

- The challenge and cost associated with sharing data across multiple tools and formats
- The need for sustainable platforms for data sharing
- The need to package CBWQM data in different forms for different audiences which in turn highlights the need for flexible and customisable reporting formats for the same data.
- The ethical issues associated with collecting and using data from communities.

SP 7: Monitoring, Evaluation and Research

Interestingly, Monitoring and Evaluation was only mentioned once explicitly in the workshop and yet was implied often in conversations on understanding, communicating and improving our work. It was also implied in challenges raised around the reliability of data produced by CBWQM. This suggests that it may be useful to

make more explicit the value of monitoring, evaluation and research for learning and improved practice in this field.

3.5 Operationalisation and expansion

Two areas that do not fit comfortably into the existing analytical framework for scaling mechanisms and pathways relate to operationalisation and scope. This points to the importance of analysing mirror data and the use of double stimulation tools *with stakeholders* during this phase of the action-oriented expansive learning and research cycle.

The point was made that the workshop and subsequent work on this project needs to consider carefully how the research findings will be operationalised. We need to think about where best to locate the findings, recommendations and resulting work. Is it in a particular government department, for example, within the Department of Water and Sanitation? And if so, does it relate to data and monitoring or social development as this will determine which directorate within the department that we need to work with – or both? Or do we need to locate and operationalise this work within the NGO/ CBO community or district level governance structures (e.g. the newly promoted District Development Model framework)? Or is there a need for a new type of intermediary that is able to mobilise funding from a range of emerging financing mechanisms and channel this funding to CBWQM? It was noted that the WRC is increasingly focusing on the operationalisation of research and that this project will need to make these links explicit. In the National Water and Sanitation Master Plan (Volume 2: Plan to Action) of 2018 (DWS, 2018), there is a proposal to "support the catalysing of a Hydrological Monitoring Centre for South Africa", under Cluster 6: Monitoring and Metering of the Investment themes. Citizen Science is located in this cluster of activities. In the Water RDI roadmap, (DWS, 2018, pg. Responsibility for the establishment of this Centre is shared between a range of national organisations (DWS, DEA, ARC, DAFF, WRC, CSIR, DST, SAWS, CSIR, StatsSA), and completion date of this is benchmarked at 2021. This would therefore be an important focal 'space' to investigate in future for the 'location' of CBWQM contribution co-ordination.

The second point raised has been a constant tension within the project and this relates to the scope of the project. Some participants questioned whether it was useful or even possible to separate water quality and quantity issues. Reference was made to tools that support citizen engagement with water quantity issues such as Flow Tracker (developed by AWARD) or complex spreadsheets used to track flow regimes in catchments such as uMhlathuze. Also related to scope was a question around whether we are only focusing on monitoring water quality or also supporting enhanced access to quality water sources by, for example, mapping and protecting natural springs. In both instances, it was felt that given the limited resources available for this project and the original funding proposal, these additional considerations fell outside of the existing project. However, this did not exclude their consideration in any subsequent funding proposals or collaborations that may be developed and they should thus be kept in mind as this work develops.

It is evident from all the above that a large number of topics were raised in the workshop and that the existing analytical framework of scaling mechanisms and pathways developed from the first consultative processes, provides a useful structure for advancing these topics, and for mapping out dimensions of scaling, as well as potential model solutions that are possible along the scaling pathways framework. These are consolidated at the end of the report in the form of recommendations, and were further advanced through pilot testing, and further research and via a third large scale CBWQM workshop or 'Change Lab' in Engeström's terms, as elaborated below.

3.6 Concluding perspectives on this phase of the action-oriented research process

Central to all of the analysis work undertaken *with* stakeholders in this phase of the action-oriented research, was a recurrent and overarching focus within the workshop on how to unlock sustainable funding/ resourcing that includes creating value across range of areas. This value creation is evident in the development of new tools and processes; the development of networks for collaboration both within and across communities but also between communities and different levels of government, and between communities and business. It was noted that this work needs to be further enhanced in the next phase of the action-oriented research project, within a clearer model for scaling praxis and resourcing.

In conclusion, the project team were encouraged by the attendance, levels of commitment and the immensely rich deliberations and discussions in the workshop. In particular, having three reference group members present throughout the workshop, as well as a number of senior government officials, was significant for linking the different 'levels' of heterogenous coalescing groups (CBWQM practitioners, intermediaries and policy and research actors). The workshop thus provided a good platform for the next phases of the action-oriented research initiative which engaged with how best to resource and sustain the wide-ranging citizen science initiatives that are proliferating across South Africa; in other words it would focus on modelling solutions that would then need to be tested and taken further along the expansive learning cycle. We turn now to a discussion on the modelling of solutions as these have emerged in the work following the second round of stakeholder-based engagement and analysis work following the initial stakeholder engagements and questioning phases of the action-oriented research.

CHAPTER 4: MODELLING SOLUTIONS – TOWARDS GUIDELINES FOR SCALING CBWQM AND A RESOURCING APPROACH

4.1 Development of methodology for scaling CBWQM initiatives in multiple contexts based on local and international research

In this phase of the action-oriented research, we drew on insights gained in the previous phase of the research and expanded these insights via a review on scaling praxis to help us develop a methodology for scaling CBWQM initiatives in multiple contexts in ways that were resonant with the key findings in the research project so far.

To move towards a practical approach to the scaling of CBWQM (i.e. a modelled solution for scaling of CBWQM activity), the following process was used:

1. Reflection on, and desktop review of the action learning steps above developed so far in the programme,
2. Mapping of preliminary scaling pathways based on this review via a two-day team workshop hosted in February (shortly before Covid-19 lockdown),
3. Literature review (national and international) of scaling as a concept and process, and generative research approaches suitable for an action-oriented scaling process for CBWQM in South Africa. Literature was carefully selected to provide useful vantage points on the processes and challenges of scaling CBWQM practice in South Africa and is drawn from diverse fields, mainly to shed light on aspects to consider in an iterative, action-oriented process of CBWQM scaling,
4. Interviews with 12 key informants to discuss updates and new developments in the field of CBWQM occurring that could inform the iterative action-oriented scaling process design,
5. Refinement of proposed scaling pathways and implications of engaging these generatively within a systemic transformation approach, and
6. Consolidation of the above into an iterative action-oriented scaling process design; or a modelled solution for the activity of scaling CBWQM practice to address the objectives of IWQM in South Africa.

The seven pathways (outlined in Figure 5 above) and further confirmed in the Learning Action 2 phase of the action-oriented research, reflect important areas of work that require individual and collective attention if the positive impacts of CBWQM are to be enhanced. This scaling will require partnerships across civil society, government and business. These partnerships need to be formed or strengthened in order to create shared benefits and expand these benefits. This in turn will require processes of learning and these processes of learning help to build capacity and impact.

A substantive literature review on scaling[19] was undertaken to further clarify the object of activity. This is not repeated here, but will be captured in a paper for publication. Importantly, and lacking thus far in our action-oriented research was a clarification of the concept of 'scaling' itself which, given the importance of the relationship between concepts and activity as outlined in in the orientation to this research above, required us to deepen understanding of the concept of scaling. Despite all of the useful contextual and policy insights and strong feedback on our concept of 'scaling pathways' we felt there was need to deepen understanding of scaling practice itself to provide a more differentiated approach to guide the activity of scaling CBWQM praxis. The

[19] This is available in Deliverable 7 of the internal process reporting on this project, that led to this report.

literature review noted that scaling is the proverbial 'Loch Ness' monster, mentioned a lot, cited often but seldom seen, with varied descriptions and very difficult to recognise.

In brief, four sets of scaling literature were consulted:

1) *Literature on the history and origins of scaling*, which helped us to probe where the concept of 'upscaling' comes from which revealed that the concept of scaling emerged at the nexus of Top Down and Bottom Up development (Unvin & Muller, 1994)
2) *Literature on a systems view of scaling*, which identified differentiated notions of scaling, e.g. horizontal, vertical, etc. Here the Brookings Study on scaling of quality education in education systems was found to be useful (Robinson & Winthrop, 2016) and offered good insight into how scaling within a systemic approach could be considered. Table 5 below summarises core ingredients of scaling according to Robinson and Winthrop (2016). Interestingly, the systemic approach required differentiated types of scaling, taking us beyond the notion of 'scaling up', which is the dominant, common sense notion of scaling. Based on this literature, we were able to identify core elements of scaling praxis for CBWQM.

Table 5: Fourteen core ingredients of scaling, adapted from Robinson and Winthorpe (2016) for CBWQM practice scaling

DESIGN: Committed leaders and actors who plan for scale from the outset. Ingredients necessary to do this are:	
1. Local needs and water quality concerns	Interventions should be designed in response to local demand and should ensure the participation of all who are concerned about the WQM issues
2. Cost effective practices for CBWQM	Cost effective approaches to CBWQM should be prioritised in the design for scaling
3. Flexible adaptation	Core elements of successful CBWQM should be identified and replicated across contexts while adapting the rest to local circumstances
4. Elevating CBWQM practitioners	Expertise and resources should be leveraged to adequately support and value the work of CBWQM practitioners
DELIVERY: Attention to the operational realities of implementing or delivering CBWQM practices and results at large scale is essential. This involves a combination of technical and political actions. Ingredients needed for this are:	
5. CBWQM alliances	All actors need to work together to achieve a common good – namely improved water quality within a social-ecological justice and sustainability framework
6. Learning champions and leaders	Scaling CBWQM is a political, social and technical exercise, champions within and outside of government and the field of practice are crucial.
7. Technological advances	Context appropriate technologies can accelerate CBWQM practices, reporting and results
8. Windows of opportunity	Effective approaches are more likely to take root and spread when they align with local, provincial and national priorities, and community priorities for well-being and healthy environments.

9. Better data and reporting	Data on water quality obtained and successfully shared with decision making structures and communities can play a central role in motivating informed action at the policy and practice levels.
FINANCE: How resources are allocated matters as much as absolute amounts. Ingredients for this are:	
10. Flexible financing	Financing should be flexible, including to build core operational capacity and effective communications and reporting
11. Long-term financing	Stable and predictable support, within the proviso above is essential
12. 'Middle phase' financing	Financing is required to bridge the critical stage between pilot and broad uptake
ENABLING ENVIRONMENT: As critical as the other three aspects outlined above are, scaling does not happen in a vacuum. Largely guided by governments from national to local, the environment in which programmes or policies operate plays a critical role in facilitating or impeding the scaling process. Ingredients needed for this are:	
13. Supportive policy environment	Government policy must include a commitment to IWQM and inclusion of community-based approaches to IWQM, while remaining open to a diversity of ideas and actors to contribute to this common aim.
14. A culture of Research and Development including Monitoring, Evaluation, Reporting and Learning (MERL)	Ensuring that more communities get involved in CBWQM and ensuring that their practice is adequately supported within a systemic approach requires a strong ethos of experimentation, collecting and reporting data on the practice, and using it for continuous improvement and reflexive engagement.

3) *Literature on scaling in multi-partner formations* (Mishra, Chandrasekaran & MacCormack, 2014). This literature was necessary because of the nature of CBWQM praxis as found in the South African contexts which was confirmed to be a multi-actor practice that draws on multi-partner formations (often in different configurations). This literature was very useful for development of the scaling model as it emphasised the importance of depth scaling as a means of working with a diversity of actors to create synergy along a practice value chain. It also emphasised differentiation in the scaling process, but argued for organisational management of scaling practice within a differentiation of skills and competences along a value chain of activity. This literature review further recommended scaling from low to medium or moderate levels first in multi-actor partnership programmes, and rather providing wider depth scaling support. This is an important insight for CBWQM scaling which currently is operating mainly in smaller and small to medium sized projects that lack sustainability in the longer term. From this literature we were able to identify the need to give attention to partnering depth and scope in multi-partner scaling initiatives. **Partnering scale** captures the *extent of resource interdependencies* between partners; **partnering scope** captures both the *breadth and depth of the interdependencies* between partners *across* the value chain (**partnering breadth**) and *within* the value chain (**partnering depth**).

At this point we noted that the insights from Mishra et al. (2014) relate to the different scaling pathways that have been identified in Figure 25 below, as they show up different dimensions of CBWQM practice that need to be scaled simultaneously, and point to parts of the value chain, but at this point, the 7 CBWQM scaling pathways are not yet adequately conceptualised *in relation to each other within the CBWQM value chain. We noted that this could potentially be an important starting point for the activity of scaling CBWQM processes.*

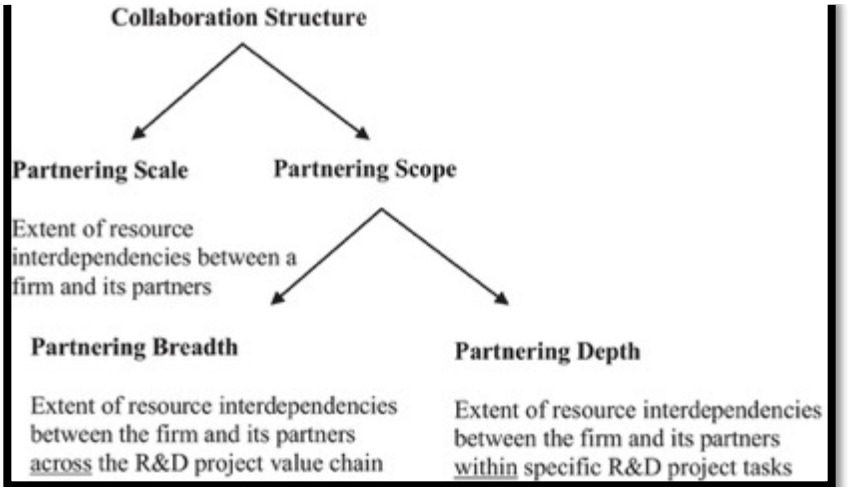


Figure 25: Partnering scope and scale in collaborative projects or programmes – a conceptual diagram (Mishra et al., 2014)

Some other insights from the Mishra et al. (2014) research are useful, although contextualisation in CBWQM practice may show up other results:

- As partnering scale increases from low to moderate levels, firms or organisations gain access to specialised expertise and capabilities of partners. This enables organisations to identify new perspectives and elicit alternative ideas from partners, and it encourages partners to exchange knowledge with each other on critical aspects of their shared activity, all of which can enhance partner scope and depth contributions.
- As partnering scale increases from low to moderate levels, knowledge structures developed as the size of the partner teams increase allowing partners to collectively monitor each other's efforts during the course of a programme or project or activity. This enhances efficiency as well as quality of practices.

The argument made by Mishra et al. (2014) is that partnering efforts have the best outcomes and results at **moderate partner scale level**. This is an important point for the CBWQM community to consider and co-define: What would partnering at moderate partner scale look like in a South African context? And how can existing practice be extended or enhanced for maximum benefit at moderate partner scale, may be an important deliberation for the action-oriented CBWQM scaling process.

The research of Mishra et al. (2014) while framed in a different context, offers a way of conceptualising scale as a multi-dimensional construct that can be operationalised with care and attention to partner scale, breadth and depth. This is in contrast to measuring scale as a uni-dimensional operationalisation process using the number of partners as main indicator and planning tool. This approach allows for

accounting for heterogeneity across projects in terms of resources allocated in partnering as well as relative magnitude and focus of partnering efforts. Depth and breadth of partnering scope provides a more granular account of how to consider partnering scale in multi-partner initiatives. Their study shows that instead of simply assuming that early partner involvement is always better, or that all partners should be involved in all aspects of the value chain, there is merit in considering carefully which partner skills are required for which aspects of the CBWQM value chain, and what kind of partner breadth will best support these aspects and how this can be aligned via shared knowledge and communications, etc. Their study also emphasises the importance of, and benefits of investing in development of partner breadth (communications, shared knowledge and IP) when moving a process from low to moderate partner scaling arrangements. This offers a more comprehensive approach to understanding multi-partner arrangements in CBWQM projects.

From a practice point of view, and of value to the scaling of CBWQM practice, is the insight that the negative effects of expanding partner scale can be mitigated by integration efforts associated with partnering depth. The recommendation by Mistra et al. (2014) is therefore to invest heavily in communication structures, sharing of IP across organisational boundaries, and mitigation of co-ordination burdens with increasing scale. They propose the idea of 'supply chain integrators' (Parker & Anderson, 2002) who are individuals that have significant knowledge of an area of practice as well as the technical knowledge of various tasks and functions and a deep understanding of the value chain dimensions. They propose that the use of 'integrators 'in improving communication and IP sharing across organisational boundaries has been shown to derive substantial benefits in the context of dyadic-partner relationships (Amaral et al., 2011). They propose that use of such 'integrators 'is an important 'starting point' for scaling of multi-partner projects in order to mitigate the co-ordination and other challenges that might arise along the value chain and the scaling process. In the language of cultural historical activity theory, such 'integrators 'would be **boundary crossing mediators** that help to facilitate co-learning and develop depth participation while engaging with the emerging challenges of the scaling process.

While the Mishra et al. (2014) study offers very useful vantage points for supporting the **process of scaling** from an organisational development and management point of view, and they recognise the importance of supporting work that can engage the dynamics of problem solving in multi-partner projects, their work offers too little insight into the work of the 'integrators' or 'mediators' or **how one comes to develop the depth participation processes in heterogenous multi-partner projects in ways that that can facilitate scaling from low to moderate levels in multi-partner initiatives – hence we turned to the work on 'scaling as a learning process' below.**

4) *Literature on scaling as a learning process* (Mickelsson et al. 2020); and Engeström's expansive learning work which focusses on ***object scaling*** *via learning together to change activity*. This brought in the importance of a shared motive and interest in scaling practice and being able to learn together how to develop and change an activity and how to learn together to resolve contradictions. As indicated above, the CBWQM practice in South Africa is characterised by a central contradiction in which policy intentions and CBWQM implementation praxis potential need to be brought closer together. Given the current crisis situation and the scope and scale of demand for improved WQM in South Africa, and the currently fragmented and inadequate levels of monitoring practice and capacity, this MUST be constituted as a co-learning process that helps to build South Africa's democracy and skills, especially amongst unemployed youth and local government institutions.

Useful insights that helped to inform the development of the modelled solution, included insight that the early emphasis in scaling praxis was primarily on 'scaling up' in terms of numbers/ geographic areas, and that this was an inadequate and limited notion of scaling. The review brought to the fore that we need more differentiated understandings of scaling – it is not only about numbers, it is also about focusing the scaling along value chains (i.e. **differentiated tasks** – scaling scope), and scaling the core support (i.e. **depth scaling**), and scaling at realistic levels so that programme leaders are not only spending time on co-ordinating and dealing with conflicts that result from scaling up too quickly without adequate tools and capacity being in place. It was also noted that in multi-partner scaling systems, it is better to scale from low to moderate levels at first, WHILE building depth of capability (i.e. with tools, shared IP, capacity building and co-learning); this allows for flexibility, agility and democratic praxis.

We found that the differentiated notion of scaling was important to work with in CBWQM praxis, as argued in the literature, the discourse of 'scaling-up' requires interrogation, especially its relationship to participation. We noted the crucial question asked by Unvin and Miller (1994) which has pertinence to the design of an action-oriented approach to scaling of CBWQM:

> *How can a development initiative move beyond the local level and make a larger impact while continuing to foster participation? Can a participatory, bottom-up program, or the organization managing it, scale up while avoiding the problems of cumbersome and overstaffed organizations, detached from their grassroots bases, becoming mere sub-contractors of the foreign aid system or of the state, unaccountable to the communities who they claim to represent?*

Important for the current status of CBWQM in South Africa as identified in Learning Actions 1 and 2, adopting an approach which, in addition to the above, embraces scaling as a learning process can enhance partner scaling **to move from low to moderate** scaling levels, while giving attention to the scope of scaling practice, with emphasis on both **breadth of scaling across the CBWQM value chain**, and **depth of scaling** in a *co-engaged process of scaling* in which *partners can learn to co-operate around their scaling object and aspirations*.

Scaling as a learning process enables

- Better accounting for the particular complexity of scaling activities,
- Flexibility,
- Contextual relevance, and
- Innovation to meet local demands, situations and needs.

As noted above, very little emphasis was given to evaluation in the field-based engagements on the scaling of CBWQM praxis, and viewing scaling as a learning process can also provide M&E data that can be framed within a MERL (Monitoring, Evaluation, Reporting and Learning) framework.

From this, we then developed a model for the activity of scaling CBWQM praxis showing the different types of scaling that can be 'brought together' within a process of expansive learning, where learning is seen as a process of scaling, or more specifically, 'object scaling' (see Figure 26 below). Here, **CBWQM is the object of activity**, and improved water quality, social and environmental justice and sustainability, are the outcomes of object scaling.

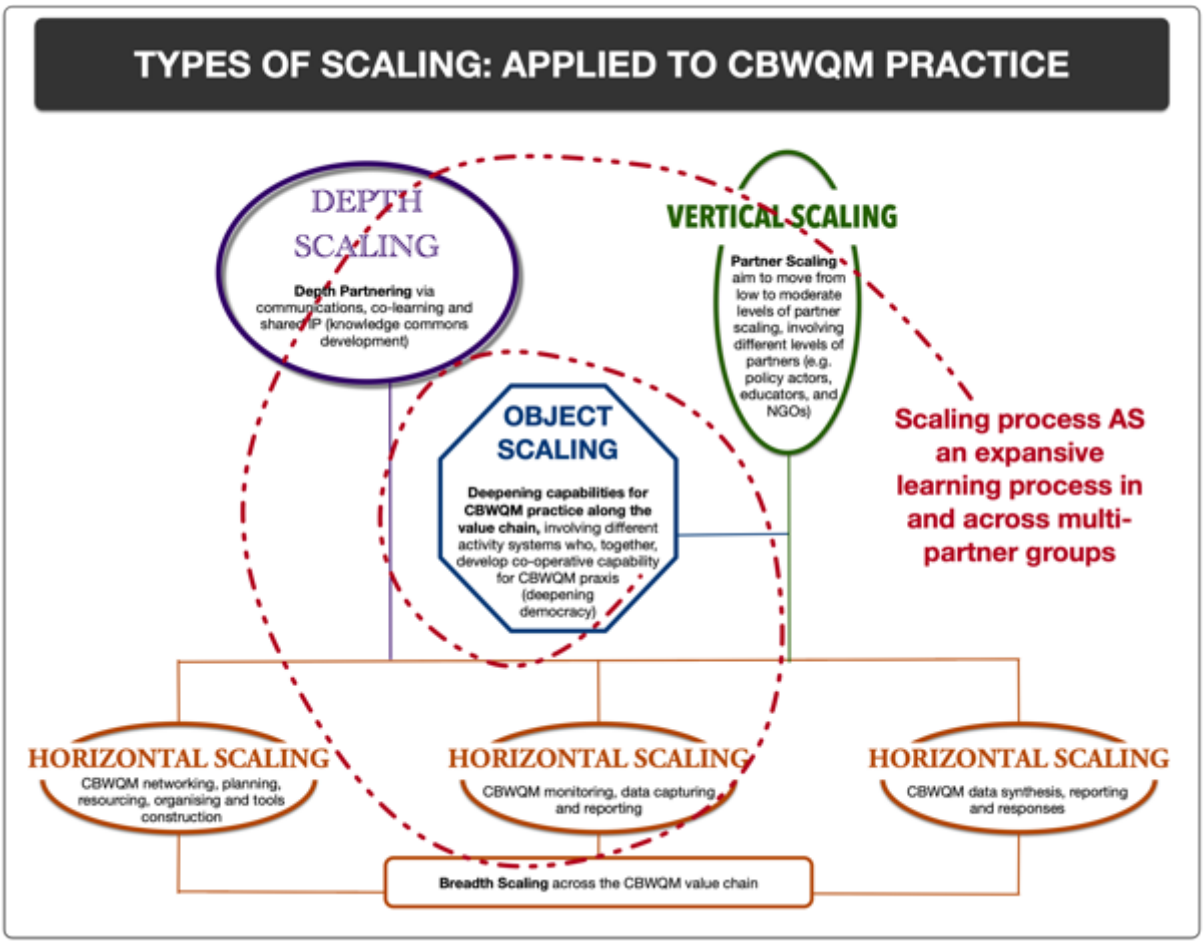


Figure 26: Modelled approach to scaling CBWQM practice. The model shows the different types of scaling that can be 'brought together' within a process of expansive learning where learning is seen as a process of scaling, or more specifically 'object' scaling, where CBWQM is the object of activity, and improved water quality, social and environmental justice and sustainability are the outcomes of the object scaling.

To summarise, CBWQM scaling praxis is essentially a multi-partner activity as identified in the initial scoping of CBWQM praxis in South Africa (see Figure 26). The multi-partner nature of CBWQM praxis differs in different contexts and projects and there is therefore need for giving attention to heterogeneity and boundary crossing learning in the scaling process, which we elaborate on below. We also noted the need to differentiate breadth scaling contributions along the CBWQM value chain, and to engage in vertical scaling expanding low level partner scaling to more moderate level partner scaling. Key to this process is depth scaling or shared knowledge and practice development, development of shared tools and communication processes (what we have named 'knowledge commons and capacity building scaling pathways' in Figure 7).

- **Depth scaling:** This is where gaining a deeper understanding of a practice or a field can help it to gain generativity or strength. For example, in CBWQM practice, one might have a superficial understanding of use of mobile technologies for supporting CBWQM. If one invested in depth scaling of our knowledge of mobile technologies and their affordances for CBWQM scaling, one can achieve depth scaling that can enhance the scaling of the wider activity over time. This may also involve development of shared tools for CBWQM and a knowledge commons platform, and capacity building activities.
- **Vertical scaling:** This involves partnership building – expanding from low level partner scaling to moderate levels of partner scaling – at least initially.

- **Horizontal scaling:** This involves breadth scaling along the CBWQM value chain, and differentiating of tasks, roles and responsibilities along the value chain. This can also be called 'functional scaling' where more and more complex forms of CBWQM activity are developed along the value chain.
- **Object scaling:** This is where the scaling processes above are brought together via a learning process that allows for development of shared understanding and capabilities for enhancing the object of activity (CBWQM practice) and for scaling the object of activity via the other forms of scaling. Object scaling needs to be done via an expansive learning process where learning IS a process of scaling.

In the modelling of the solution to scaling of CBWQM practice using this differentiated framework for scaling praxis, we also identified potential starting points. We noted that importantly for the CBWQM scaling research, is the insight that depth scaling (partnership building, communication, shared resources, capacity building, tools that can be shared across the learning network) is particularly important in supporting **breadth scaling**, i.e. movement from low to moderate levels of scaling and **scaling scope**, *i.e. better differentiation of contributions along the activity value chain.*

Investing in depth scaling means investing in 'shared IP, shared tools and materials, and capacity building' across smaller units of scaling, i.e. within a common good / knowledge commons approach and using tools and platforms that are shared, yet protected (as outlined in the CC licensing framework above).

In recent research on scaling as a learning process, Micklesson, Kronlid and Lotz-Sisitka (2018) saw scaling as a transactional learning process that contributes to the co-creation of environments and praxis. The work of southern African researchers (e.g. Mukute, Pesanayi, Kachilonda, Jalasi, Baloi, Lotz-Sisitka et al., 2017; and others) shows that scaling as a learning process involves a cultural historically situated expansive process of learning what is not yet there, often transgressing taken for granted norms and leading to the formation of new or transformed human activity. This is itself a scaling process as it produces new concepts and related activity at nexus points of social transformation. ***For this action-oriented CBWQM scaling process design, a focus on expansive learning as activity and concept transformation is crucial for the scaling of the citizen science system of interest, as we have argued across this report, and as this action-oriented research itself is showing.***

This accords with Engeström (pers comm.) who also suggests replacing, or at least closely linking the concept of scaling to **generativity** across interlinked multi-voiced activity systems (i.e. the multi-partners and their activity systems) as this avoids reification and instrumentalising of the concept of scaling as can occur when one is left with descriptions of types of scaling (examples given in the literature above, even if they are useful for getting perspective on where to start and what to do, they cannot 'stand in' for giving attention to the actual process of scaling and how it emerges via multi-actor co-learning engagements). Engeström's (1987, 2016) notion of expansive learning therefore offers a very useful and well researched process model for object scaling, where different activity systems, e.g. community organisations involved in CBWQM, NGOs involved in CBWQM, local government partners involved in CBWQM, traditional leaders involved in CBWQM, business partners involved in CBWQM – each constituting an activity system – meet and co-engage and learn how to develop, change and scale their shared object CBWQM practices. This can be done along each of the seven scaling pathways, or across them as outlined in Figure 27.

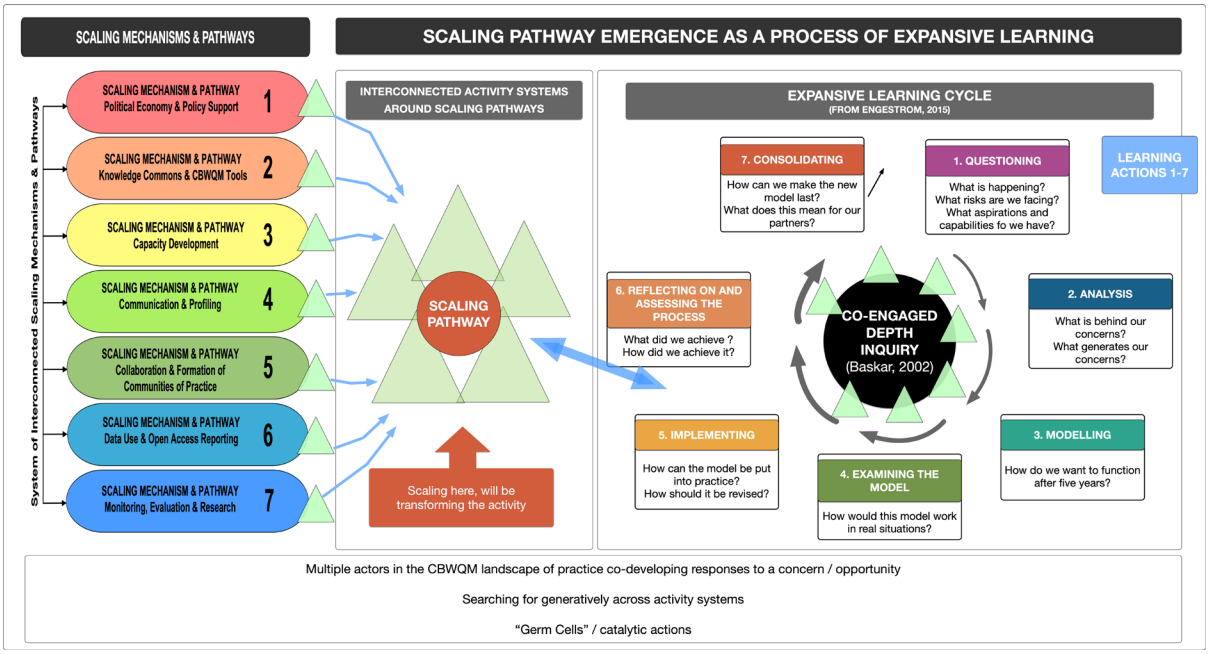


Figure 27: Model of object scaling involving CBWQM activity systems who move through expansive learning cycles together involving aspects of the CBWQM scaling pathways 1-7 as relevant to their shared object of CBWQM practice [green triangles indicate different partners / activity systems involved in CBWQM practice and scaling
NOTE: identifying activity systems relevant to the different CBWQM scaling pathways is discussed below]

Modelled solution in the form of a broad process outline

Based on our analysis so far, the national workshop outcomes, recent interviews we have conducted, and the insights gained from the international literature on scaling, we proposed the following conceptual and process framework for ongoing iterative action-oriented CBWQM scaling process:

1) The scoping reviews undertaken in Learning Action 1 showed that CBWQM practice in South Africa is a **multi-partner activity**; it operates in a range of smaller to medium scale communities of practice, that are not always well networked. The policy contribution potential and political economy opportunities for CBWQM are poorly mobilised, although there are some exciting new initiatives emerging that can be capitalised on as this process unfolds. There is need for **vertical scaling or partner scaling** that can mobilise a stronger funding structure, political and political economy support for CBWQM practice, addressing structural and resource-based scaling at least to some extent. The focus in the short to medium term would be on **expanding partner scaling from low to moderate levels** so as to avoid the pitfalls of high level scaling without adequate time and attention to depth and breadth scaling practices.

2) There are excellent tools and starting points available for scaling CBWQM practices, if more attention can be given to **depth scaling** via structures and approaches that can better develop and sharing CBWQM tools and IP (i.e. a knowledge commons) with capacity building tools and programmes via open-access approaches. The innovative work using mobile technology stands out as an area for further scaling, development and sharing, along with the work already conducted on CBWQM tools and capacity building, and more needs to be done to make these more accessible to a wider range of people and organisations. There is scope for a national course on CBWQM practice that could provide a substantive mediating process and tool for boundary crossing learning and co-engaged scaling praxis work. There are emerging capacity building initiatives (e.g. at Rhodes University, including the use of

online tools and formats) that can be linked into for this dimension of the scaling process. The literature as pointed to above, has confirmed that giving immediate and substantial attention to **depth scaling** is a crucial focus for supporting the move from successful low to moderate partner scaling.

3) CBWQM practice is currently taking place amongst a number of different organsations, some of which are aware of each other's work and others who are not. There also appears to be inadequate differentiation of the CBWQM value chain across the sector, and it would be important to clarify the roles, responsibilities and tasks that are required in the different phases of the CBWQM activity value chain. This needs to be done to make the **horizontal or breadth scaling** possibilities easier, more attuned, and to avoid unnecessary duplications and co-ordination challenges. This will then also assist with ensuring that the depth scaling can better support the breadth scaling processes, which in turn will better support the vertical scaling movement and shared objectives for the common good.

4) All this needs to be held together by a **learning-centred process of object scaling** where different subjects, groups and activity systems who have contributions to make to the overall project of system building scaling for CBWQM (identified along and across the seven CBWQM scaling mechanisms and pathways in Figure 5) can meet in variously well planned expansive learning cycles where they can deliberate the possibilities and especially engage with ways of navigating challenges that are constraining the scaling of their praxis. These may need to be differentiated around particular dimensions of the object (e.g. building the knowledge commons and developing tools or designing a good capacity building programme as outlined in Figure 5) but there should also be a process where all 'sub-groups' also come together and share and develop knowledge of the overall object scaling work. Here there is need to give attention to scaling resources (i.e. resources to bring groups together in these learning-centred object scaling pathways development processes) and to bring different sub-groups together into a larger CBWQM scaling network. This is necessary to ensure that the heterogeneity of the CBWQM praxis is respected, that ownership and participation is ensured.

5) For the latter, namely the co-engaged 'scaling as learning' approach, the expansive learning cycle involving learning actions (conceptualised in a broad sense – e.g. any one learning action can take the form of more than one actual learning sessions) is a useful **process model that can support object scaling** in ways that can support the other forms of scaling discussed in this deliverable. To initiate this, it is important to identify the already known challenges and suggestions from the scoping and analysis work outlined in Learning Actions 1 and 2 above, and to offer this as 'mirror data' linked to the seven scaling pathways identified (Figure 5) and to confirm the specific subjects and organisations associated with the activity systems that are critical to furthering the partner scaling (vertical), depth scaling, breadth scaling (horizontal along the CBWQM value chain), and object scaling (co-learning) identified as being important for the scaling of CBWQM practice in this deliverable.

6) This approach is likely to support **a more comprehensive approach to scaling**, as recommended in the literature, and also result in the combination of structural scaling (i.e. quantitative scaling), programme scaling (enriching and extending scope and depth of offerings), political scaling (i.e. empowerment and policy influence and impacts), and resource-based scaling (i.e. diversifying and securing a stronger base of resources) recommended in the literature by Unwin and Muller (1994); and the Robinson and Winthorpe (2016) who argue that scaling from the margins must ultimately give attention to 1) **idea adoption and spread** (knowledge and practice uptake and 'diffusion') across the system, and 2) **delivery innovation** where actors within the system develop new approaches to accommodate the new idea or practice. As discussed above, Unwin and Muller (1994) note that **delivery innovation involves more than adoption of the idea, it requires systemic support for the new idea, within the system itself**, and they go on to recommend giving attention to design, delivery, financing and enabling environment in scaling practice, and identify 14 useful 'ingredients' that can facilitate scaling practice. These are all useful insights that can be deliberated with scaling partners in the CBWQM environment as they plan and consider how to approach scaling of their practices further.

To further model solutions, a resourcing strategy was developed into a 'Report and Respond' instrument, in co-operation with partners. This instrument is further detailed in Section 4.2 below.

4.2. A resourcing strategy based on business and funding models and possibilities identified through strategic meetings and consultation

A second process of modelling solutions responded to the central concern of stakeholders around more sustainable approaches to resourcing CBWQM praxis in South Africa. We therefore undertook research and analysis to identify interests of potential contributors to CBWQM praxis along the value chain, in order to develop a differentiated resourcing strategy within the wider differentiated, yet systemic scaling model solutions framework outlined above. The resourcing strategy document was developed as a '**report and respond ' instrument** (see Appendix B) which offered useful feedback in the form of mirror data in the ongoing action-based research process / expansive learning process. Responses to the report and respond instrument are captured in the next chapter – see also Appendix B). Here we summarise the research-informed mirror data that was used to construct the report and respond instrument to guide further deliberation on solution construction around resourcing.

Note: This review gave rise to **Report and Respond questions**, which were significant for eliciting engaged inputs and for elaborating the solution modelling process, hence we include them as they arose in the review in boxed text below. This is to assist in following the *way in which* the process of modelling solutions was set up to be co-constructive.

4.2.1 Perspectives on the current funding environment in South Africa

Water quality management is a government-wide responsibility, to be implemented under leadership of DWS, with provincial governments, municipalities, the private sector and civil society playing a role. Central to the ability of these sector partners to play their roles is access to the resources, including funding, for the management and stewardship of water and the catchments through which it flows.

Government

From a government perspective the National Water and Sanitation Master Plan (2019) anticipates that over the next ten years there will be a funding gap of R 333 billion between funding required (R 898 billion) and the funding available (R 565 billion) within the water and sanitation sector. As part of this deficit, it is acknowledged that the funding requirements for good water governance across government institutions is estimated at R14 billion per annum. The budget of DWS provides R3.3 billion for core governance functions in the sector. This deficit impacts on leadership, planning, coordination and control of water quality.

It is likely that these funding deficits will increase as both national and local government struggle to set and collect water related tariffs. Raw water tariffs are managed by DWS and should include the Water Resource Management Charge however revenue collection is falling. Despite billing R16 billion per annum only about R14 billion is collected. This had resulted in a cumulative debt of R10,5 billion by 2017 with municipalities accounting for 50% of this debt. The municipalities are responsible for the provision of water and sanitation services and the management of stormwater; however, here too revenue collection is falling due to leaks (non-billable water) and non-payment by users. Over 30% of users who should be paying municipalities for water do not do so for a variety of reasons including unaffordability, protest around poor service delivery, and a lack of enforcement. This contributes to an accumulated municipal consumer debt (including electricity, water, sanitation, waste removal, rates, etc.) which stood at R143.6 billion in 2017 (National Treasury figures).

One outcome of these funding gaps is the inability of government to maintain water quality. This in turn results in increasing costs for water purification, heightened environmental risks and associated social and economic hardship. Further exacerbating the water quality challenges is a forecast of 17% water deficit between supply and demand by 2030. As the NW&SWP notes:

> *"Deteriorating water quality has the potential to significantly limit the economic growth potential of the country. The deterioration of water quality in rivers, streams, dams, wetlands, estuaries and aquifers impacts on the economy, on human health, and on the healthy functioning of aquatic ecosystems. Deteriorating water quality reduces the amount of water available for use as more water must be retained to maintain the dilution capacity in our river systems. It increases the costs of doing business as many enterprises are forced to treat water before using it in their industrial processes." (NWSMP, Vol 2, 7-1)*

Although the National Water Act of 1998 makes provision for the Water Resource Management Charge within water levies, this charge has been poorly utilised. Key challenges include the collection of the charge, the inability to ring-fence the collected levies for water management, uncertainties about how the levies can be used, and distrust between the various institutions collecting, distributing and using the levies. In the absence of funding, through the Water Resource Management Charge, other funding mechanisms such as the Working for Water programme have been used to fund public investments in catchment management.

Report and Respond Question: What other government mechanisms, departments and programmes are investing in water quality management? What is the scope and scale of this investment?

At the local level concerns about investing municipal funds on private land has hampered the funding of water quality management including catchment management. Where partnerships have been formed with local community groups and non-government organisations (non-profit companies) the government often funds project costs and salaries of Expanded Public Works Programme employees but does not sufficiently cover the core costs of implementing organisations. The high risk and low return of working with government is leading to many civil society organisations either needing to 'blend 'public and private funding or turn down government funding contracts.

Business

The private sector contributes funding through normal taxes and water charges in addition to which some businesses have contributed through corporate social investment (CSI) practices. In many instances this has been through *ad hoc* projects usually funded on an annual or three-year funding cycle. More recently, some businesses have started using more programmatic, structured, and sustained approaches such as 'water stewardship' programmes that move beyond CSI and into core strategic investment in water quality. The WiseWaterWayz initiative is a case in point (see Appendix A). Further research into the corporate social investment system and how it can be leveraged in this manner is required for a more comprehensive vantage point on this source of funding (see also the more general perspective on this from the Trilogue reporting below).

Another case that can be investigated further as a potentially more sustainable source of funding for CBWQM, especially in mine-affected communities, are the funds that are meant to be used in the mining industry for more systemically developed approaches to water quality management. Mine owners are responsible for monitoring water resources in accordance with their water resource monitoring plans that are submitted together with water use licence applications. Mines are also required to make financial provision for rehabilitation management of negative environmental impacts, one of which is pollution of water courses and rivers. Here, it is notable that the

mine owner must annually assess its environmental liability and increase the financial provision to the satisfaction of the Minister of Mineral Resources and Energy. The financial provision can be in the form of (a) a contribution to a trust fund, (b) a financial guarantee from a bank or financial institution, or (c) a deposit into an account specified by the Minister of Mineral Resources and Energy. Closure certificates are not meant to be issued unless the Chief Inspector and the Minister have confirmed in writing that the provisions pertaining to health and safety and management of potential pollution to water resources have been addressed. The NWA also requires the person who owns, controls, occupies, or uses land on which an activity was performed that has caused pollution of a water resource to remedy the effects of the pollution and the effects of any disturbance to the bed and banks of a watercourse. The MPRA states that the mine owner remains responsible for any environmental liability, pollution or ecological degradation only until the issuance of the closure certificate. However, even after the issuance of the closure certificate, the Minister of Mineral Resources and Energy may retain any portion of the financial provision discussed above for latent and or residual environmental impact which may become known in the future. Communities and both juristic and natural persons can defer to common law remedies such as delictual claims to get redress and compensation for pecuniary and non-patrimonial damages arising from mining activities downstream. While these regulations are in place to manage water quality in the mining industry, there are weaknesses associated with the legislation itself (e.g. the longer term responsibility of the mining sector for water quality management), and there is strong evidence that they are not well implemented and compliance is weak (due also to the generally low fines for major transgressions). Hence resources to support improved compliance in this sector can potentially provide resources for participatory governance and citizen engagement in monitoring of water quality; especially where these may be leveraged from official sources of funding that emerge from the mine's responsibilities for water quality monitoring and management; and that help to improve compliance monitoring. This could be an important and interesting case to consider more holistically as a mechanism for leveraging funding for co-operative governance (civil society working with the compliance management system) to hold the mining sector more accountable for water quality transgressions. The Centre for Environmental Rights might be a good partner for CBWQM organisations to work with in conceptualising this possibility as they have a good understanding of the legislative environment, as well as the penalty structures and the compliance related issues; see their documentation on this. It is interesting to note that there is no official online database of penalties / fines and committed compliance transgressions related to water use and pollution in the mining sector in South Africa. The Centre for Environmental Rights is a non-profit company and law clinic that works on the protection of environmental rights, and they have compiled a list of these penalties.[20]

A similar strategy can also be developed for holding other business sectors who are responsible for water pollution more accountable. The principle here would be to mobilise funding that arises from transgressions (fining) or improved compliance accountability strategies internally and voluntarily produced within the business sector for supporting CBWQM practices that could facilitate and support the business community to a) contribute to improved water quality management through better stewardship practices, and b) at the same time strengthen citizen-based partnerships for collaborative governance and monitoring. While such relationships are often conceptualised antagonistically, there is no logical reason as to why they should remain antagonistic, especially if the shared object between business, government and communities is to better manage the scarce water resources that South Africans have access to. Expansive learning and collaborative governance practices need to be put in place to enable and facilitate such partnership building; this could ultimately provide one of the more sustainable forms of funding for CBWQM in the longer term, and a greater appreciation for the contribution that can be made by unemployed communities, young people needing to develop skills and work practice experience

[20] The list can be found at https://cer.org.za/wp-content/uploads/2013/02/Schedules-to-When-Mines-Break-Environmental-Laws-Offences-and-Penalties-Jan-2013.pdf

and viable livelihoods. In other words, CBWQM could become an integral part of business operations if conceptualised within a stewardship orientation, and if complemented by supportive and accountable compliance practices. In fact, CBWQM practices could be an important mediator in this important relationship offering a more sustainable and proactively productive contribution than currently constituted CBWQM practices which arise mainly in response to water quality crisis situations. This research on how to maximise private sector responsibilities for water quality monitoring and potentially leveraging of funding for CBWQM could also be considered within the wider EI4WS programme of SANBI and GEF.

Report and Respond Question: What other examples are there of existing business initiatives that are investing in CBWQM water quality management? What is the scope and scale of this investment? What other opportunities (e.g. the example of the legislative compliance requirements in the mining sector) may there be for leveraging stronger CBWQM partnerships within a more sustainable co-operative governance framework? Who can partner to open up these possibilities (e.g. CER noted above)?

International donors

International donors have played a significant role funding large catchment level initiatives often linked to climate adaptation. Some examples include USAID support for the work done by AWARD in the Olifants/ Limpopo catchment; the GEF6 funding supporting the Ecological Infrastructure for Water Security project; C40 Finance Facility supporting the Transformative Rivers Management Programme in eThekwini and The Nature Conservancy support for the establishment of the Greater Cape Town Water fund. In most instances these projects are implemented through partnerships that involve a range of government, civil society and business institutions.

Report and Respond Question: Which other international donors are active/ potentially active in South African water quality management that may include more explicit support for CBWQM ? What other examples do we have and what can we learn from these for how these initiatives can be set up to more explicitly support CBWQM practices?

Civil Society

Civil society groups ranging from small groups of individuals to large national NGOs have played an active role in catchment and water management. This has varied from protecting local water courses to international engagements focused on the management of shared water courses. In many instances, local level work is self-funded and reliant on volunteer commitment and capacity. Where resources cannot be mobilised within the community, a wide range of funding and resourcing options have been pursued. These include government support (often through EPWP type programmes); business support (often through CSI projects); and international donor funding that is often facilitated through local NGOs or state institutions.

Civil society organisations broadly in South Africa receive the bulk of their funding from South African Corporates (see Figures 28 and 29 below). In real terms (adjusted for inflation) CSI expenditure has remained at a constant level with the amount in 2020 being R10.7 billion and accounting for 27% of NPO income. Income from South African trusts/ foundations and South African private individuals accounted for a further 30% of NPO income. A further 10% of income is self-generated. While many of these figures have remained relatively consistent over the past 5-6 years, funding from the South African Government to NPOs has declined significantly from over 16% to 7%. Foreign government funders' contribution to NPOs has shown an even larger decline from 15% in 2014 to 3% in 2020 (Trilogue, 2020).

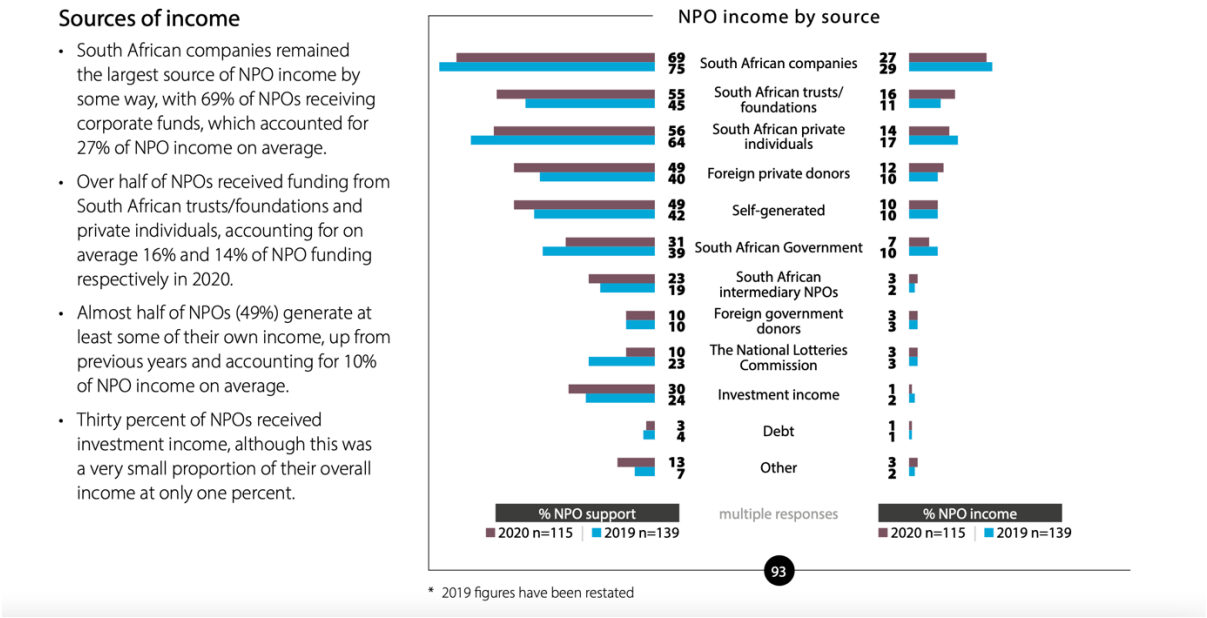


Figure 28: Sources of NPO funding from Trilogue Business in Society Handbook (2020)

SA companies funding to civil society groups

Most of the corporate funding is driven by Broad Based Black Economic Empowerment (BBBEE) policies and intentions as per the national priority for transformation of all sectors of society and to address historical inequalities. This is reflected in the fact that in 2013 prior to the introduction of BBBEE codes of good practice, only 13% of companies used a percentage of net profit after tax (NPAT) to determine their CSI budget. The BBBEE scorecard has a target of socio-economic development spend of 1% of NPAT. By 2014 34% of companies used NPAT to calculate CSI spend and in 2020, 49% of the companies sampled used NPAT. By comparison in 2003, 55% of companies used their discretion and board approvals to allocate CSI spend. This number has dropped to 19% in 2020. The implications of these shifts is that while corporate funding is vital for NPOs and civil society organisations it is vital that the work of civil society organisations align with BBBEE requirements or other 'licence to operate 'requirements as they emerge.

Reflecting BBBEE requirements (and possibly National Skills Levy requirements) the majority of the funding from South African corporates goes to education (50%), and social and community development (15%) while environment receives 4% (Trilogue, 2020). Among the companies surveyed by Trialogue (2020) and allocating CSI spend to environment, the average spend was relatively evenly allocated across three types of interventions: wildlife conservation (21%), awareness programmes (20%) and water conservation and wetlands management (19%) (cf. Figure 29 below). What is significant to note is that the spend on water conservation and wetland management had increased significantly from 11% in 2019. This was likely to have been, in part, a delayed response to the impact and profile of the drought that affected Cape Town in 2018 and the low water levels and poor water quality in the Vaal system that continue to the present, and the impact of COVID-19 which raised issues around water access in many communities. The 2020 Trialogue publication notes that water is likely to become a key area of focus for future CSI attention, and an article by the NBI in this publication, notes the importance of Public-Private-Partnerships (PPPs) and draws attention to the job creation potential in the water sector in area of improved water management, monitoring and recycling amongst others.

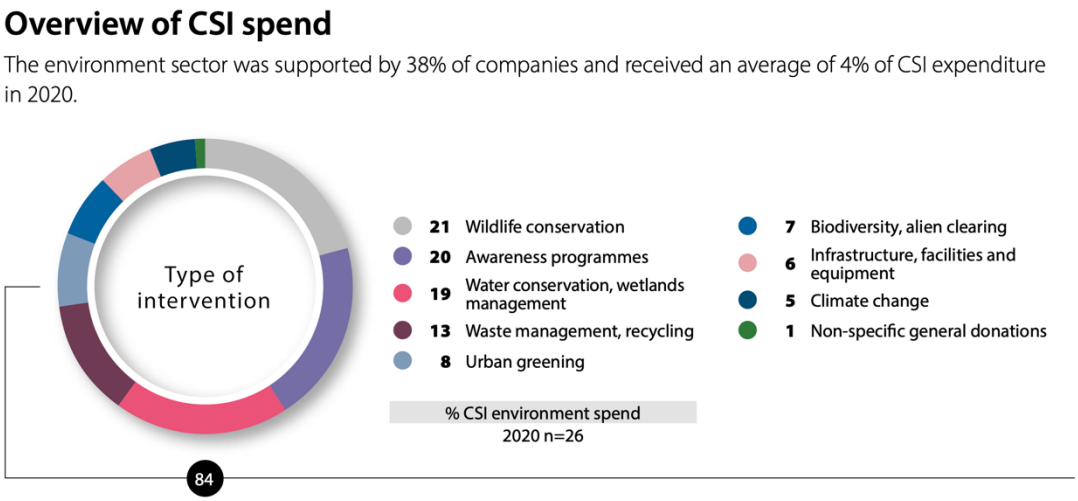


Figure 29: Overview of CSI spend (Source: Trilogue Business in Society Handbook, 2020, pg. 122)

'Licence to operate' obligations including BBBEE requirements are obviously key considerations in the allocation of corporate funding. What is less clear is the impact of the increasing importance of what is often summarised as ESG or Environment, Society, and Governance issues. The 2020 Trialogue report notes that "In line with the increasing importance of ESG issues, respondents reported an increase in resources for ESG-related functions" (2020). The report goes on to note that most companies (85%) suggested that resources set aside for environmental issues are likely to increase. In addition, 68% of the companies suggested that resources set aside for social issues were rising although only 16% expected social investments to rise above inflation in the next two years.

There is emerging narrative that business can derive value from and create value for a wider set of stakeholders, i.e. beyond shareholders. This narrative suggests that value can be created across a range of capitals (financial, infrastructural, intellectual, social, human and natural) and that integrated thinking and reporting should take all of these areas into consideration in relation to business operations and impacts. It is interesting to note that only 54% of the companies surveyed by Trialogue in 2020 measured the business value of their CSI. Despite this lack of measurement 43% of the respondents felt that improved brand perception/ reputation was the main business benefit of CSI and 39% felt that CSI improved community relationships. This despite the fact that these two areas rated as the lowest ranking reasons for supporting CSI.

When considering the reasons cited for allocating support to CSI and emerging ESG obligations, it is apparent that business is still largely mitigating risk and aspiring to enhancing reputation through CSI spend. In seeking to secure funding from the main funder of citizen initiatives and NPO activities in South Africa it will be important to keep these considerations in mind. Largely the funding will need to be sourced as BBBEE spend and other 'licence to operate 'obligations. However, there is an argument to be made that if other areas of value can be articulated, some funding may be allocated to these areas. In addition to risk reduction and reputation enhancement it may be possible to argue for broader strategic value creation initially for shareholders and over the longer term for broader stakeholders (this is explored in more detail below)

One other dimension of corporate funding bears a quick consideration and this is what costs corporates are prepared to support and what they will not support. A 2012 Trialogue report noted that while 98% of corporates interviewed by Trialogue will fund project specific costs, only 58% will fund operating costs and over 70% stated

clearly that they would not fund operating costs. Although it is not possible for NPOs and other civil society organisations to maintain and strengthen their organisations without operating or core costs, it is usually possible to build capacity/ growth costs, capital costs and operating costs into these projects. This is in contrast to an increasing number of government project funding models that explicitly exclude core costs of the organisation.

SA private individuals funding of civil society groups

South African private individuals are the third largest contributors to NPO income after South African corporates and South African trusts/ foundations (which may be established by companies or individuals/ families). Little data exists on the contributions that individuals make to NPOs and civil society actions. One of the more comprehensive studies on individual giving trends in South Africa was conducted in 2005 by the Centre for Civil Society at the University of KwaZulu-Natal. This large national study found that 93% of the randomly selected respondents gave time, money or goods to an organisation or individual in the month before being interviewed. Over half of respondents (54%) gave money to charities or other causes, a third (31%) gave food or goods to charities or other causes, while slightly less than a fifth (17%) volunteered time for a charity or cause, in the month prior to being interviewed. At the time it was estimated that individuals contributed almost R1 billion per month for a charity or cause. The vast majority of this support was focused on religious giving (80% of the interviewees gave to religious institutions), while 29% supported the poor and 3% gave to environmental issues.

In addition, 17% of the respondents in the 2005 study volunteered time in the month of being interviewed and gave on average 11 hours per month. There is a relatively high correlation between wealth and giving, with poorer respondents volunteering more time and those with money, giving more money. What is interesting is that while those giving money were relatively evenly spread across the race groups, blacks were almost twice as likely to volunteer time as whites. The causes supported through volunteer work were very similar to those supported through financial donations with 60% of respondents volunteering for religious institutions, 30% volunteering to support the poor and 4% volunteering to address environmental issues. Recent research on citizen science is showing that most of the CBWQM work and citizen science is voluntary and follows similar profiles, but that there is a need to strengthen income generation from these activities especially for young people who are also in need of viable learning pathways into jobs (Madiba, in press).

There is the category of foundation funding which is also a strong source of funding for civil society initiatives and NPOs. Most of the opportunities for funding are carried on this website[21].

Government funding of civil society groups

The two main distribution channels set up by government to support the non-profit sector are the National Lotteries Board (NLB) and the National Development Agency (NDA). Both these agencies have been plagued by mismanagement, slow disbursement of funds and inconsistencies in the adjudication of applications. With the weaknesses of these two institutions, many NPOs have sought to work with government departments directly. In this relationship NPOs have become service delivery agents on government's behalf implementing projects that government has outsourced. In this relationship, NPOs are able to secure relatively large amounts of money often closely aligned with the service delivery components of their missions. This funding does not however contribute to the broader policy and governance level change that many NGOs also seek to bring about. In addition, the government funding tenders are more commercial arrangements where government seeks to minimise the project management costs and eliminate any core funding support. Instead non-profit organisations need to build surpluses into fees or other components of the budget in order to ensure that the projects do not actually undermine the sustainability of the organisation. This requires a strong commercial sense and high-level

[21] https://www.fundsforngos.org/

negotiations to ensure that the non-profit organisations do not ultimately subsidise government's service delivery. Despite all these challenges, government remains a very large funder of environment related projects, usually linked to youth development and job creation. This funding can potentially be better leveraged for capacity building outcomes for CBWQM in ways that also support viable learning pathways into jobs.

Foreign donor support for civil society groups

Funding through foreign government donors has also declined significantly in the past five years. The 2014 Trialogue report shows that almost 15% of NPO income was derived from this source. It also showed that a very small group of NPOs (about 6% of the respondent NPOs) was securing this funding. The 2020 report shows that this source of funding now only accounts for 3% of NPO income and is spread across only 10% of the responding NPOs. These trends reflect the increasing requirements for international donors to coordinate their activities and make them more transparent which has resulted in grantmaking becoming increasingly rigorous and competitive. This is exacerbated by higher levels of accountability and evidence of effectiveness and impact demanded by donor organisations. At the same time, there is growing pressure on governments and donors to reduce the transaction costs of implementing aid programmes. This has led to funding being allocated through competitive tender and grant distribution processes while at the same time requiring reduced administrative costs. This in turn has resulted in larger grants being made to NGOs that are able to show a competitive advantage in the programmes that they deliver and the project management expertise/ delivery of staff and systems. In addition, large multi-lateral climate funds and other sources of funding are being channeled through 'national implementing entities 'that are able to show high levels of institutional capacity, often funded by government, and risk reduction, often based on government guarantees. This results in reduced funding trickling down through these intermediaries to civil society organisations and NPOs. Another trend in international development funding is that it is being routed into research funding, and therefore implemented via universities and funding institutions in service of developmental innovations (see more on this below).

Some insights into funding available for WQM and particularly for CBWQM

- Government is struggling to fulfil its responsibility to manage water quality on both the national and local level
- Business is still focused on narrow interests when it comes to water quality and has only recently started to expand its role in water stewardship
- Civil society is in some instances undermining government's ability to fund water quality management (e.g. through non-payment of water rates) but is also active in water quality management. One of the challenges for citizen-based water quality management is accessing funds to support this work
- There are a range of funding possibilities; however, their possibilities and limitations need to be acknowledged
- Creating value for funders (whether government, business, individuals, international donors) will require an identification of needs and benefits required by various potential funders; and tracking shifts in the landscape of development financing. This value creation will be required in order to unlock funding sources.
- The potential for partnerships will rely to some extent on the ability to identify shared value and thus opportunities for shared value creation. This may require mediation and engagement over time to also build this shared understanding of value. Hence capacity building programmes that support depth scaling work are critically important to bring together different actors in working together in a collaborative, co-governance approach/es.

Report and Respond Question: Are there other examples or dimensions of funding of civil society organisations that we should take into account for CBWQM resourcing? What other examples do we have and what can we learn from these for how these initiatives can be set up to more explicitly support CBWQM practices?

4.2.2 Ontological (reality-based) argument for CBWQM practice and funding

One of the dimensions of arguing for stronger funding resources that are also more sustainable is to articulate the reality-based need for supporting and scaling CBWQM practice in South Africa. As argued in the environmental and water sciences, there is a desperate need to improve water quality in South Africa, and also to better manage water resources. The policy analysis deliverable (section 2.3) indicated that we have progressive policies for this in place, but that these are poorly implemented, and are at times contradictory. There are also increasing economic arguments being made for managing our water resources better; these are linked to the need for adequate water for economic and social development. There is no doubt about the argument for investing in CBWQM, especially if water quality management is to be shared across society in an integrated, collaborative approach to governance and social change 'governance with the people' as is expressed in the National Development Plan as intention for building a participatory democracy and transformed society. Thus, there are also political arguments to be made for supporting and scaling CBWQM practice.

Water, and the catchments through which it flows, provide a wide range of services to both human and non-human communities. These services can be categorised as provisioning services (e.g. drinking water); regulating services (e.g. the purification of water); cultural services (e.g. cultural traditions such as baptism) and supporting services (e.g. the water cycle or the maintenance of river systems). These services in turn create value that the government have a role in regulating and protecting; that businesses use as an input into processes that generate profit; and that communities may protect and benefit from for their livelihoods or quality of life. How these different sectors perceive, fulfil and fund their water related activities have significant implications for both the sustainability of the different sectors and for the sustainability of the provision of and access to water and the multiple services it provides.

Investing in ecological infrastructure is a cost-effective development strategy that can deliver multiple benefits, including water security, food security, disaster risk reduction, climate change adaptation, job creation, rural development. Despite the services provided by water and thus the value created by better water management, unlocking investment in water quality has proven difficult and inadequate in South Africa.

For mobilising resources with any partner group – government, international development organisations, local funders, businesses, private individuals or more – we need a clear and consistent argument. We refined this via this resourcing strategy and its report and respond instrument.

Report and Respond: We invite respondents to help us to clarify this argument …
For water resources to be able to continuously sustain a healthy society and economic development, the quality of our water needs to be maintained within predetermined parameters. Most of the country's water resources are negatively impacted by a combination of wastewater discharges and run-off from land-based activities. We need to involve citizens in water quality management, to facilitate collaborative management of our water and build a participatory democracy. This can create jobs and learning pathways that develop skills and values for integrated water resources management. All actors need to be involved.

4.2.3 Key points from the policy review that point to resourcing strategy orientation

The Constitution guarantees everyone's right to access sufficient water and places an obligation on the state to achieve the progressive realisation of this right. National government has legislative and executive authority over freshwater resources while municipalities must administer water and sanitation services limited to potable water supply, domestic wastewater, and sewage disposal systems. The National Water Act (NWA) (Act No.36 of 1998) provides the legislative framework for South Africa's water resource management and places sustainability and equity as central principles. The national government, acting through the Minister of Water and Sanitation, must thus ensure the protection, use, development, conservation, management and control of water resources for the benefit of all. This mandate is supported through the establishment of decentralised institutions such as the Water Users Associations and the Catchment Management Agencies. At the local government level, the Water Services Act places a duty on municipalities designated as Water Service Authorities to ensure the efficient, affordable, economical and sustainable access to water services. A number of recent studies have extended this mandate by reference to the constitutional requirements that where a particular action (e.g. catchment management) is incidental to the delivery of municipal services (e.g. affordable and sustainable access to potable water) then municipalities can (under particular circumstances) take on these actions.

As discussed already in more detail in the policy review, guiding the implementation of water related legislation are a number of strategies and policies. The National Water Resource Strategy states that "water management operates within a social, economic and ecological environment, and for effective and integrated management of water resources, top-down consultation should be replaced by citizens' participation, which will be facilitated through community forums and civil society organisation structures to achieve the required balance in the decision-making process within a developmental water management agenda". Similarly the Integrated Water Quality Management Policy calls for integrated approaches to water quality management across sectors, including the private sector and civil society. These calls for partnerships are echoed in the National Development Plan which sets out a "new development approach that seeks to involve communities, youth, workers, the unemployed and business in partnership with a capable state". As we reported in our analysis in Deliverable 4, the National Development Plan indicates a commitment to governing with the people, and for mobilising participation in collaborative governance. However, we noted that this is yet to be adequately actioned in society by national, provincial and local governments, due mainly to narrow understandings of participation in governance, and also due to weak governance regimes that have in many cases been suffering from corruption and other stressors that have reduced national capacity for building a strong participatory democracy. Deliverable 4 also noted that the Department of Public Monitoring and Evaluation has a structure to facilitate community-based monitoring, but this is yet to be actualised in the water management sector. Therefore there are many governance instruments that are in place, including the participatory impetus in the National Water Act of 1998 (RSA, 1998) itself, and the IWQM policy that set the stage for resourcing and support of CBWQM activities as a legitimate and important policy implementation process. This potential, however, needs to be mobilised into practical resourcing approaches.

The policy review also pointed to opportunities for improving CBWQM contributions that could help to provide more substantive data for reporting on SDG 6.2b, which requires government to report on community participation in water resources management. The review identified this to be a weak area in the reporting practices, as the current reporting only focusses on capturing policies that indicate that there *should* be community participation, not *if there is* community participation in water management.

Despite the explicit recognition of the need for more partnership-based approaches to the management of water resources the cost of these partnerships are unevenly spread, and are inadequately funded from the national

policy implementation space *as* legitimate contributions to policy implementation and success.

Report and Respond Question: Are there any other significant policy leverage points that we should be giving attention to for the funding of CBWQM practices in South Africa?

4.2.3 Key points from the contextual and workshop reviews, and scaling research that point to resourcing strategy orientation and approaches

As indicated above (see Chapter 2, Appendix A), the case studies that we analysed in some depth, were selected for their diversity. They covered a range of different types of CBWQM projects, differentiated by the diversity of governance, leadership and partnership interactions and alliances which are all possible starting points for enabling CBWQM projects and programmes, and are therefore important for the scaling pathways and also for the expansion of CBWQM projects and resourcing configurations in the context of WQM policy, including, but not limited to the following types of partnership configurations:

- NATIONAL NGO AND SOCIAL MOVEMENT ALLIANCE
- CIVIL SOCIETY LED MULTI-STAKEHOLDER PARTNERSHIP
- NATIONAL GOVERNANCE
- CORPORATE SOCIAL INVESTMENT LED PARTNERSHIPS
- ACADEMIC INSTITUTION AND NGO ALLIANCE LED CIVIL SOCIETY PARTNERSHIP
- LOCAL GOVERNMENT LEADERSHIP FOR MULTI-STAKEHOLDER ENGAGEMENT
- NATIONAL NGO – GOVERNMENT DIALOGUE (mainly provincial)

This configuration of partners is also typical of the scope of organisations and groups that are involved in the advancement of CBWQM practice. Our scaling research to date shows that most often CBWQM projects are initiated by one or more of these groups in partnership; hence partnership structures are characteristic of this practice. This is a positive dimension of the practice that can also be more strategically used for leveraging resources for the practice; although it can also present as a somewhat 'fragmented 'field as different groups tend to form different coalitions depending on who is able to carry different responsibilities in the CBWQM value chain of activities.

In our work in conceptualising scaling mechanism and Pathway 1 focusing on Political Economy and Policy Engagement we considered political economy as used also by Ager (2006) in the context of environmental risk and vulnerability (a condition created by poor water quality management): "… it is widely noted that vulnerability to environmental change does not exist in isolation from the wider political economy of resource use. Vulnerability is driven by inadvertent or deliberate human action that reinforces self-interest and the distribution of power in addition to interacting with physical and ecological systems" (p. 270).

We noted that a recurrent theme in the case studies is the difficulty of creating sustainable economies for citizen-based water quality management. One dimension of this challenge links to whether citizen engagement is a requirement of policy (see above). Munnik et al. (2011) have referred these as 'invited spaces' where citizens have a mandate to participate in water management decisions. A second dimension related to those spaces where citizens create and shape their own possibilities for involvement in water management. These are sometimes referred to as 'invented spaces '(Munnik et al., 2011). A third dimension is related to the underlying political economy of development and contradictions that exist between a neoliberal and developmental state

framework where it would either be in the interest of the state to fully support CBWQM in order to improve the well-being of people and protect the country's water resources for development, or to ignore these benefits as profits accrue to the few via either exploitation or corruption (Wilson et al., 2016). The high level of social protests in South Africa around service delivery efficacy would appear to indicate the latter rather than the former.

Where participation is a policy requirement, there tends to be greater opportunities for resourcing these processes although some of the processes may be superficial and may actually suppress citizen activity, especially in cases where the data may be revealing inadequate compliance or compliance management. We noted that where civil society create spaces for engagement, there is a tendency for these processes of engagement to rely substantially on volunteer commitment. In addition, where multiple sectors of society recognise common areas of interest (such as access to quality water resources), the possibilities exist for multiple resourcing options and thus the potential for securing less restrictive and more sustainable political economies.

Important for this part of the study, is that we noted that this polycentric approach to the political economy of CBWQM requires a capacity and commitment to work with multiple resourcing options and to manage the underlying systemic structures and the power relations they shape between participating institutions. It also requires distributed forms of management and leadership, and distributed capacity and roles and responsibilities. It is this line of argument that we also followed through on in our research on scaling approaches captured in Deliverable 7 where we recommended that the CBWQM value chain be unpacked and differentiated to support depth scaling (e.g. course design, capacity development and intellectual property sharing and management across a range of projects) and that the policy engagement work and the monitoring practice work also be separated out; and that partners work 'in tandem 'and via an association or learning network where each can maximise particular strengths instead of all trying to do the same thing. We also recommended horizontal scaling in smaller associated clusters in partnership type activities such as the CBWQM activity, rather than huge programmes as these tend to produce much conflict management and many management challenges, and a lot of capacity is then spent on that rather than the actual monitoring and reporting work. This means that the resourcing strategy for a multi-partner activity such as CBWQM should be carefully considered and differentiated but at the same time, should service and support all dimensions of the communities of practice within a landscape of practice approach that can be connected via a learning network or association type structure. Figure 30 summarises the types of scaling needed along the CBWQM value chain.

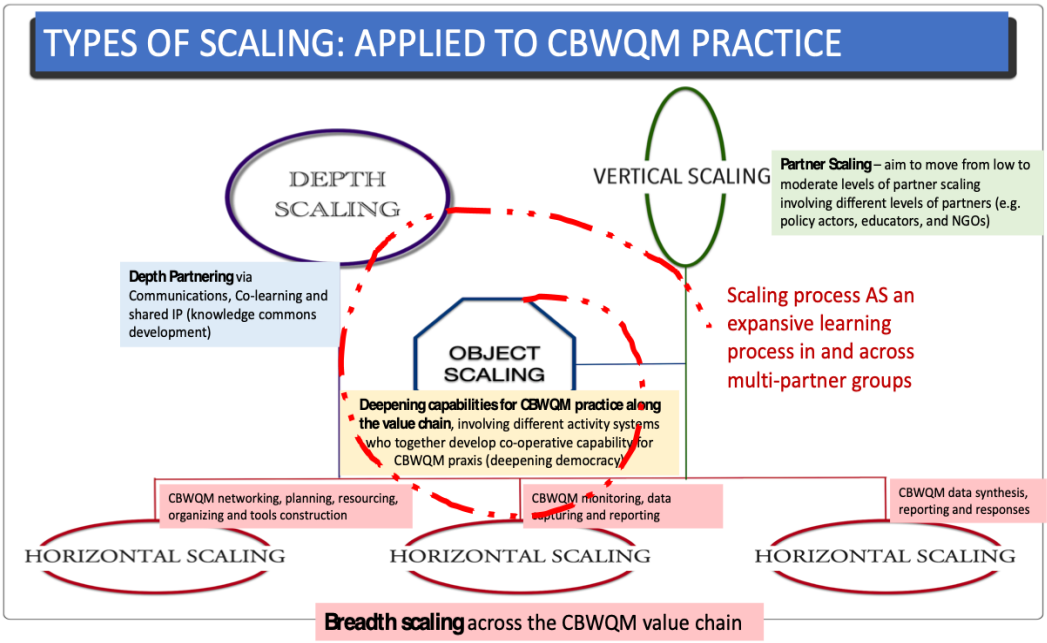


Figure 30: Types of scaling that need to be resourced along the CBWQM value chain.

There is need to give attention to resourcing of scaling from the following perspectives, as also recommended in Deliverable 3:

- Livelihood support and social enterprise development. The approach of using volunteerism alone in communities where unemployment is already high is not sustainable in our view. We believe that creating a model where volunteerism is kept at a leadership level, combined with payment for services rendered, is sustainable.
- There is need for sufficient resources to initiate and sustain the project for as long as possible. A model is necessary that involves part funding, part income generation.

This requires, among other aspects:

- Skilled and available implementation staff, who are based locally, with local networks.
- Capacity building of participant group is critical in all aspects related to the provision of environmental services, enterprise development, administration and record-keeping, as well as with respect to maintaining the groups / enterprises themselves.
- The proposed mixed financing model is complex (i.e. local government funds, local and international business, social enterprises/income-generation from environmental activities) and requires pooling of resources, time and equally working towards a common shared vision, and this requires credible and skilled facilitation and management.

There are enabling and constraining factors that influence resourcing for scaling within a multi-partner dynamic system:

- Policy references to consultation and collaboration between government and civil society enables spaces for engagement and potential funding.
- Legislative requirements related to corporate social responsibility and transformation in South Africa as well as reputational issues create opportunities for collaboration between business and local communities.

- The common interests between large international and national civil society organisations and local community-based organisations enable the flow of funding from large and complex funding mechanisms to local projects.

Constraining factors:

- Policy commitments to consultation and engagement may be misinterpreted or subverted due to political concerns related to service delivery and broader governance failure, or due to underlying contradictions in the policy framework governing water quality and development in the country
- Corporate commitment to citizen-based initiatives tends to be limited to shared benefit although it is often portrayed as 'social investment' in local communities. This funding is often insecure and tends to work on three-year funding cycles.

We therefore recommend a more structured model for resourcing the scaling of CBWQM practice that can accommodate and extend a networked, partnership approach to scaling and funding of CBWQM, with stronger government involvement within a differentiated scaling system.

Report and Respond Question: Are there any other aspects that should be considered in the multi-partner context of CBWQM as this currently characterises the way in which CBWQM is being resourced in South Africa?

4.2.4 Towards a multi-stakeholder and multi-pronged partnership

Approach: How value can be created for all stakeholders

Case studies that show how value can be created for different partners through investing in CBWQM practice

In this section, we consider what value is created for whom and why when it comes to investing in CBWQM. We draw on a couple of case studies to illustrate this, and then further annotate Figure 2 as a model for resourcing the scaling of CBWQM practice. We proposed this as the foundation of a scaling resource strategy for CBWQM practice, and that this should be deliberated with partners in the consultative process informing this final report on this study.

The case study that follows shows that various types of value were created for different partners:

- The company acquired new partners who could help it respond to the pollution problem it had caused;
- The company was also able to broaden its social investments to include environmental dimensions thus broadening its corporate social practices in ways that are more aligned with international best practice;
- The community acquired financial resources and a partnership infrastructure to expand community conservation and local water resources management;
- An opportunity has been created to support young people to develop new skills and capabilities and new networks;
- Local NGO groups are supported to provide co-ordination and communication and capacity building support which aligns with their social justice and environmental mandates;
- The public have been exposed to wider forms of environmental education and social cohesion building practices, and also have more opportunities to participate in democratic decision making in the interests of their own livelihoods and well-being, as well as the environment in which they live.

Case Study

The Baynespruit Conservancy

In August 2019, a major spill of oil and caustic soda into the Baynespruit River caused significant damage to the downstream health of the Msunduzi and uMngeni rivers. For the responsible party, Willowton Oil, it was a wake-up call that an accident on their piece of land could have impact 80km downstream. In conversation with some of the management, they admitted it was the first time they had really stepped out and noticed the stream outside their property boundary. As part of the longer-term remediation, and risk mitigation strategy, Willowton agreed to sponsor the initiation of a local conservancy to focus on river health and other broader catchment concerns. The Conservancy is in its infancy, with Willowton volunteering to chair the committee, and lead the local stakeholders over the first two years. Subsequent to this, Illovo Sugar, and Belgotex Carpets have both agreed to serve on the committee too. Msunduzi Municipality, Umgeni Water, a local farmers association, the ward councillors, schools, and NGOs are also involved. The primary focus of the Conservancy is to improve the ecological infrastructure of the catchment. Each member needs to decide what contribution they can make, on priority projects, and help source funding.

The primary interest for investment for the three private sector stakeholders is community upliftment, education, and job creation. They all have existing programmes that target these issues, but they don't have an 'environmental' impact. All three are committed to find ways to adjust their programmes, or add new facets to ensure that social, economic, *and* environmental impact is included. Investment will start slowly, but will likely increase as results are realised. Willowton has pledged funds to support a team of young Enviro-Champs to work in the catchment for a pilot period. These Enviro Champs will be doing practical work along the rivers, and using citizen science tools to gather information on the state of the river. Belgotex is pursuing a partnership with DUCT for SMME development. The aim is to set up a long-term partnership that will see benefit in the area surrounding their factory, and also in the areas where their staff live.

The Baynespruit Conservancy has also piqued the interest of the local water board, Umgeni Water. They are a committed member of the Conservancy, and are very interested in citizen science, and SMME development. They have committed funds in the current year to support Enviro Champs in the same pilot programme as Willowton, and are in discussion about the rollout of similar initiatives in many different areas where they operate. For Umgeni Water, it is important from a community relationship perspective, CSI spend, river/water quality data, and reporting of environmental issues across the catchment.

The Msunduzi Municipality has long recognised the Baynespruit as a priority area for intervention. They are in full support of the Conservancy. Through their contract with DUCT they have agreed to an increased work focus in this area, in support of the Conservancy. A river walk to gather baseline information, community education, and additional staff monitoring and reporting service delivery issues are additional components agreed to.

Combined efforts like this Conservancy allow for many different stakeholders to invest in ways that make sense in their value chain, aligned to their own priorities, but still contributing to the overall environmental impact. Community-based water quality management can include many different aspects, at reasonable cost, and fulfils social, economic, and environmental goals, thus 'ticking the box' for a wide range of institutions.

Case Study

Amanzi Ethu Nobuntu Programme

The COVID-19 Economic Stimulus programme initiated by the South African Government in 2020 in response to the viral pandemic, has a focus on job creation for unemployed youth. DUCT was approached by the Department of Science and Innovation (DSI) to employ 300 youth for three months in an environmental, citizen science-based programme. DUCT has subsequently brought more than 10 partners in the uMngeni Catchment together to implement a range of projects on the ground. Each partner is already operating, and this is merely an expansion of existing work. Each partner has a slightly different focus, and different goals. But all have agreed to the utilisation of citizen science tools at key monitoring points on the rivers/streams in their project location. In addition, what makes this programme truly unique, is that each partner is bringing their own additional 20% of co-funding to cover elements not in the DSI budget. This blended finance model brings in funding from the public and private sector, into one funding pot, and then distributes it to ensure the entire programme is successful. The R5 million funding from DSI, is supplemented by an extra R1 million from these other sources. Examples of private sector investors are: Willowton Oil, AECI, Bidvest, and Adreach. Public sector sponsors include: Msunduzi Municipality, SANBI, Msinsi, Umgeni Water, eThekwini/DBSA.

Everyone's interest, almost without exception, is that environmental improvements can be realised, whilst creating employment at community level. Investors gain a direct link to these communities, making a positive impact, and getting to know the faces of those who understand the challenges, and want to be a part of the solution.

The very exciting element of utilising citizen science tools, is that data is being collected at many different locations, and stored centrally. This is done via a simple mobile application, developed on open source software called Geo-ODK. All data is geo-referenced, with photos, and collated into a project dashboard that is accessible to partners, management, and clients. In future, there will also be a public portal.

The simple approach of helping communities to understand their local environment, gather and report data, and be a part of the solutions to problems they have identified, is powerful.

This case study also shows similar types of value creation through this co-operative approach to funding and supporting CBWQM. Not only are jobs created, and the natural environment improved, but the authorities are provided with information that helps them better plan their services delivery, and natural resources management programmes. Government and business partners are able to achieve their mandates, and also to form stronger partners with the communities they are serving.

We unpack potential value that can be created for different stakeholders if they fund and resource CBWQM praxis.

Why would business fund CBWQM?

As also outlined above and in our other reporting, it is becoming increasingly clear that South Africa faces a multi-dimensional water crisis. A looming water deficit, significant deterioration in water quality, major governance challenges and a substantial public funding gap in the water and sanitation sector will have major impacts on social and economic development. This in turn will impact on business. At the very least, water

quality issues will impact on the health and productivity of labour, on the cost of water, and on the availability of water for business and agriculture.

In this context, water stewardship is increasingly being taken up by business as a proactive approach to managing and securing water. Water stewardship is defined as the use of water (by the private sector generally) that is socially equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder-inclusive process that involves site- and catchment-based actions (AWS, 2014). Businesses work on internal efficiencies as well as working beyond their 'factory fences' through collaboration with other stakeholders, to reduce the risk that water may have on their profitability and long-term viability. For a meaningful and wider adoption of water stewardship, companies need to clarify how water stewardship creates value both for shareholders and broader stakeholders.

A brief consideration of sustainable value creation suggests that there are two key dimensions that interact to create value for a company and impacted stakeholders over the long term (Hart & Milstein, 2003; Laszlo, 2008; Senge, 2008). The first is a spatial dimension and extends along a continuum from internal to the organisation to a broader inclusion of internal and external stakeholders. The second is a time dimension and extends along a continuum from the present to the future. These two dimensions form a matrix with four areas in which value is created. The first is cost and risk reduction; the second reputation and legitimacy; the third is innovation and repositioning; and the fourth is the development of new growth paths. Figure 31 provides an overview of a potential framework for sustainable value creation.

Each of these quadrants have particular strategic value, drivers, and line functions within the business. Water stewardship can create value in each of these quadrants. By way of example: 1) Water is required for many of the manufacturing processes. By protecting water quality and access there are opportunities to reduce water costs and the risk associated with water shortages. 2) The social impacts of poor water quality combined with the visibility of many industrial and agricultural water use activities creates both risks and opportunities in terms of the social licence to operate. 3) Innovation in terms of managing water can reposition businesses from being a major water users/ polluters to being partners in water management. 4) An engagement with external stakeholders creates opportunities to identify new growth paths or trajectories for companies that address shared concerns.

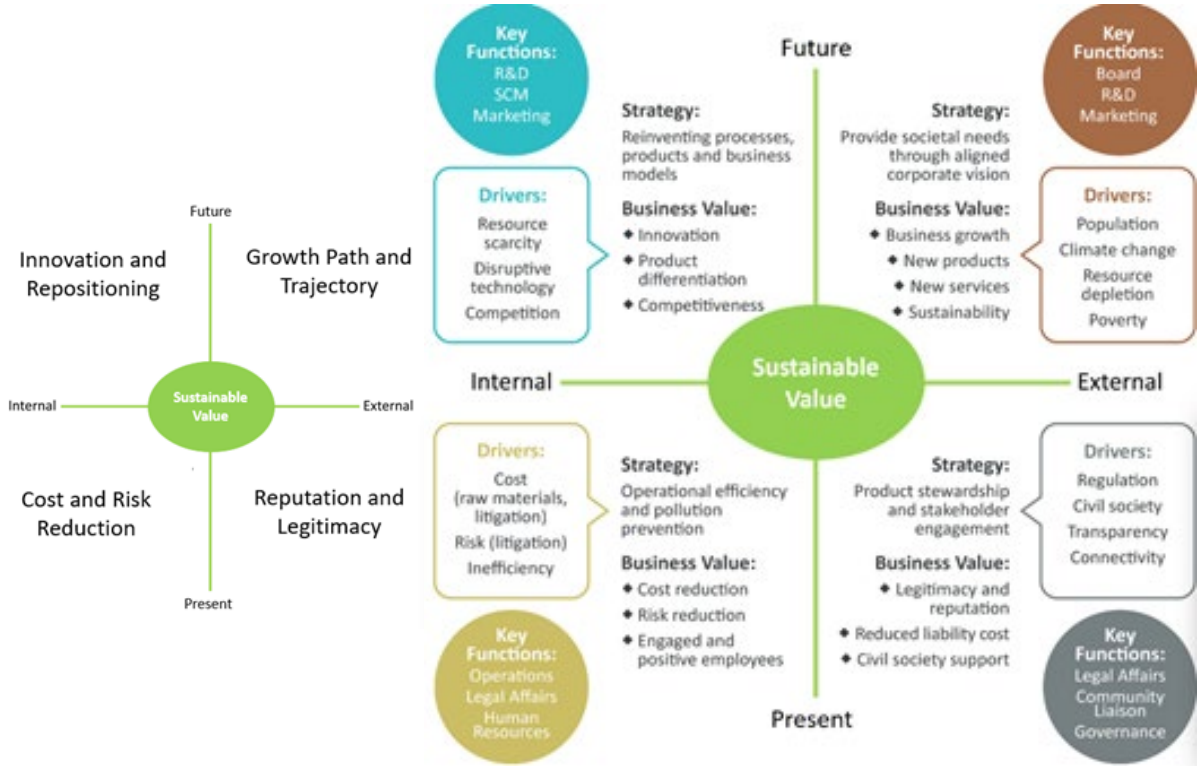


Figure 31: Framework for Sustainable Value Creation (Source: Ward, 2020)

By investing in water stewardship and particularly by partnering with civil society and government to manage water quality issues within communities, opportunities exist to reduce risk, to enhance reputations, to innovate and potentially to identify new business models and opportunities.

Why would international funders and development banks fund CBWQM?

It is difficult to get a comprehensive picture of international funding in South Africa as development assistance is highly fragmented and the country has yet to establish a system for collecting accurate data; thus it is also difficult to see how they have invested in activities such as CBWQM, and thus what value might be created for them. It is useful, however, to consider this funding landscape more carefully to see how it is being positioned, and thus what kind of value is potentially created for international funders through supporting practices such as the scaling of CBWQM.

What is evident is an ongoing shift where overseas aid was previously available directly to non-profits it is increasingly being funneled through government departments and 'national implementing entities' (see also research section below). This is in line with many overseas donors developing and using 'Country Strategy Papers' that take into account governments' broad policy objectives. These strategy papers are often developed with a requirement that there be significant 'local stakeholder engagement' although in reality this is often limited to engagement with large national (predominantly government) departments and institutions. At best these engagements result in close alignment between the funding interests of the international funders and the medium-term strategic and economic plans of South Africa. This alignment needs to be held through: the initial conversion of funding commitments into overall framework agreements between donor countries and institutions and SA; the translation of conceptual proposals to specific sectors based programme (e.g. water and sanitation) / project agreements; and actual programme / project implementation.

Broadly, overseas development funders refer to the National Development Plan – which is also being aligned with the Sustainable Development Goals – as the basis for programming in South Africa. The European Union for example has focused aid on employment creation, education, and the building of a capable and developmental state. Increasingly, however, overseas development finance (including concessional loans) and aid (grant funding) is being aligned to the Paris Climate Agreement with a view to supporting both mitigation and adaptation/ climate resilience, and the Sustainable Development Goals. Ostensibly, this shift is intended to align development aid with the recipient country's plans to develop in an "equitable, sustainable and economically efficient manner". In addition to funding for mitigation and decarbonisation pathways, there is also a focus on adaptation projects that support national and sub-national policies and strategies for climate resilience.

One of the challenges for this emerging approach is that in many instances, including South Africa, the Nationally Determined Contributions, and associated long-terms plans, are inadequate for achieving their fair share of decarbonisation and sufficiently building resilience. This has resulted in the development of tools such as the Resilience Rating System[22] by organisations such as the World Bank to support more focused investment in climate adaptation. In common with many of the large international funders, this system seeks to support countries to manage climate risks at every phase of policy planning, programme design and implementation. Water security through climate informed management plans is one of the priority areas in this emerging funding focus. It is evident in many of the 'nature-based solutions'[23] projects being developed, in the focus on 'ecological infrastructure for water security' and in emerging programmatic areas such as 'People, Nature and Climate' being developed by the Climate Investment Funds. These emerging programme areas will be important opportunities for CBWQM practitioners to explore in greater detail.

It is also necessary to consider how SDG related funding can be mobilised via international organisations in support of CBWQM practices. One example from GIZ illustrates possible ways of interfacing with international development organisations on key aspects of SDG implementation. Here the emphasis and interest appears to be mainly on research-policy relationships especially evidence-based policy making, and increasingly universities and research institutions are being brought into development assistance partnerships (see more below) as the emphasis of development assistance tends towards supporting innovation for futures oriented programmes and projects, and as the world considers the implications of the youth dividend in Africa for future markets and relations (Africa is set to be home to half of the world's children by 2050).

[22]https://www.worldbank.org/en/news/feature/2021/01/25/what-you-need-to-know-about-the-climate-change-resilience-rating-system

[23] https://www.afdb.org/en/news-and-events/are-nature-based-solutions-key-africas-climate-response-33090

Case study

Funding for SDG policy implementation

Since June 2020, the **South African SDG Policy Support Initiative** (SDGI) has been jointly organised by the **Policy Analysis and Research Services Unit of The Presidency**, the **SDG Hub** at the Albert-Luthuli-Institute for Responsible Governance at the **University of Pretoria** and **GIZ** on behalf of the German Government, namely the **German Federal Ministry for Economic Cooperation and Development** (BMZ).

The SDGI aims to bridge the **gap between research and policy-making/policy coordination/policy implementation**. The objective is to make effective use of the capacities already available at South African Universities to contribute towards achieving the SDGs as prioritised in the NDP. Of course, in the current context, special attention will be given to the challenges of **COVID-19**. All partners have agreed to continue implementing the SDGI and to give it a long-term perspective.

NOTE: At the time of writing this report (2021), GIZ was undertaking an **appraisal mission** to develop this concept. It is shared here as an example of the type of funding interests of international development organisations.

The above is just one example of ODA related funding for water and sanitation, and related SDG programmes. Of interest is the findings from a study by Khanji (2021) that considers donor interest in water and sanitation sub-sectors. The graphic (Figure 2 from Khanji, 2021) shows that while less than ODA in education and health, there has been an increase in ODA focussing on water and sanitation, "nearly doubling between 1995 and 2014 (increasing from $6.8 billion to 12.9 billion annually (constant 2014 prices)" (Khanji, 2021).

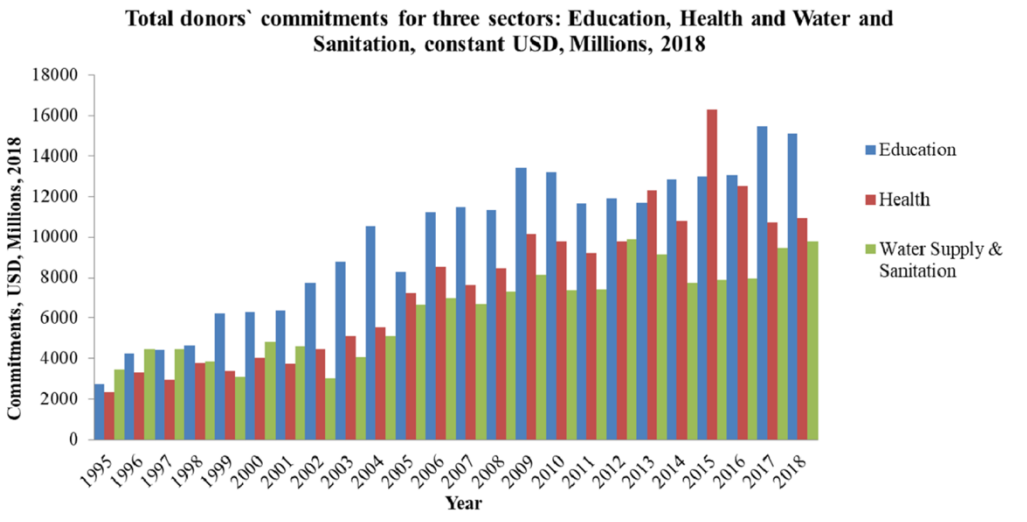


Fig. 2 Volume of Donors' Disbursements and Commitments for Health, Education and Water & Sanitation, Source of Data: OECD-DAC official website

Source: Khanji (2021)

There are a number of partnerships opening up between international development organisations and research organisations within this shifting trajectory (see research section below – the above is only one example). See implications of these new developments for CBWQM practice below. The COVID-19 pandemic has drawn

attention to water-related stressors in South Africa and there are various opportunities to develop proposals with these emerging defining features of international funding calls held in mind. This is particularly because international development organisations are focussed on the international agreements guided by the SDGs, and agreements such as the Paris Agreement on Climate Change. COVID-19 responsiveness and humanitarian support is also emerging in all international funding programmes as a focus.

There is a strong case to be made for CBWQM policy and practice advancement within an evidence-based policy framework for SDG advancement and climate resilience, as well as health risk reduction in current COVID-19 pandemic contexts, especially if this can also be linked to job creation, and young people's future competences and learning pathways development to adapt to, and use new technologies. The sector should consider the options here, and the necessary partnerships to enable approaching this sector for resourcing support.

Why would government fund CBWQM?

There are a number of reasons why government would consider funding CBWQM. These include:

To fulfil policy obligations

Deliverable 4 of this WRC project explored the potential for realising national and international policy commitments through CBWQM for the Department of Water and Sanitation's Integrated Water Quality Management Policy and Strategy. This strategy envisions an inclusive, integrated approach to water quality management, which, if supported with citizen science tools will become a reality in South Africa. Our deliverable explored various anomalies in efforts to implement this policy and concluded that citizen science tools, along with appropriate human capacity development, are key enabling processes.

To meet SDG target reporting commitments

As a signatory to the Sustainable Development Goals (SDGs), South Africa has an obligation to report annually on progress towards these goals. The South African report for 2019 reported that due to capacity constraints, and a lack of laboratories, the country was unable to report against SDG 6.3.2-proportion of water bodies with good ambient water quality. There is considerable potential for CBWQM to assist government in being able to report on SDGs such as this. For example, the Stream Assessment Scoring System (miniSASS; www.minisass.org), a popular and easy-to-use citizen science tool used to monitor the health of rivers, can be used to collect large volumes of water quality data from across the country that could potentially be utilised by the government to report on South Africa's progress towards SDG 6.3.2.

Job creation – e.g. Groen Sebenza Project and the EPWP

National government has very high annual targets for job creation. Citizen science is a powerful support process for job creation schemes, equipping people with a valuable set of skills to enhance their employability. A number of job creation programmes that have a strong focus on citizen science currently exist. A widely known and successful example of such a programme is the Groen Sebenza Project. This initiative was launched in 2013, is spearheaded by the South African National Biodiversity Institute (SANBI) and funded by the Development Bank of Southern Africa (DBSA). The primary aim of the project is to promote skills development and equip unemployed graduates and matriculants with the necessary skills and experience to work in the biodiversity sector.

Another example of such a programme is the Expanded Public Works Programme (EPWP), a key initiative of the government which "contributes to Government Policy Priorities in terms of decent work and sustainable

livelihoods, education, health; rural development; food security and land reform and fight against crime and corruption" (EPWP, 2018). This programme focuses on "person days" as one of its key outputs. There is very little data collected on the work undertaken, or the impact made. And very often the work never moves beyond menial tasks. It would be more meaningful if the EPWP *Working for* programme participants are introduced to citizen science processes to support the work they do rather than simply instructing them to undertake simplistic labouring tasks like removing alien invasives, and picking up solid waste. Citizen science enhances the work experience and supports people to understand why the work is being done, how to do it most effectively as well as enabling measurement of the outcomes of the work they do.

To assist local government in meeting its mandates

The provision of water and sanitation services is usually an obligation of local government. Although this is the case, many local government entities are not adequately capacitated to fulfil this function optimally. A citizen science programme can, however, using appropriate citizen science tools, support local government to meet its obligations. An example of where citizen science tools have been successfully used to support local government in meetings its mandate around service delivery is the Mpophomeni Enviro-Champs (see Appendix B). A group of dedicated individuals, passionate about the environment and helping their community were selected from within the Mpophomeni Township and trained in using a variety of citizen science tools. The Enviro-Champs have successfully used these tools to identify hotspots for fly-dumping, sewage-blockages and water leaks which has assisted the Department of Water and Sanitation () and local government in identifying problem areas, prioritising areas to assist in the repair of water leaks (thus saving large volumes of water and improving service delivery within the township) and undertaking ongoing monitoring of these problem areas (Taylor & Taylor, 2016). DUCT has undertaken a similar role in various townships around Pietermaritzburg (Taylor & Cenerizio, 2018).

Democratisation of Science and connecting government to the public

Local government faces many challenges in South Africa at present. One particular issue is the disconnect between services offered, or not provided, and local residents. By working with citizen science tools, with linkages to local councillors or traditional leaders, a greater connection can be achieved. Where this occurs, it bodes well for enhanced service delivery in the long term.

National Development Plan (NDP)

Citizen science participation also helps establish priorities for development and monitoring/feedback on development processes. Such processes also mean that any public participation processes can be informed by citizen science principles rather than emotional or popularist perspectives that are not well informed. As indicated in the policy review, it can also help government give real meaning to its intention of governing *with* the people.

Why would the civil society sector seek funding and/or use funding for CBWQM?

Social justice and democratisation of science

South Africa is reputed to have one of the largest gaps between rich and poor of any nation in the world. In this regard, equity issues, especially with regard to access to water, are a big concern in the water sector. Large-scale agriculture is able to co-opt water for its use whereas local communities have to rely on water tankers, if they are lucky. By using citizen science tools, such as the velocity plank, which can be used for measuring the volume of water, it is possible to find out exactly how much water is being used and by whom. Citizen science can address such issues and the use of the tools in appropriate contexts can support the development of agency amongst communities.

Case study

Shiyabazali Informal Settlement

Shiyabazali is an informal settlement close to the town of Howick. Although the people in the settlement have no access to piped water or sanitation, a major sanitation effluent pipeline passes through their settlement and pours into the uMngeni River. The outflow of this pipeline is used for washing clothes, recreation and at times, as a convenient stream for removing waste! A long-term citizen science project commenced in 2012 involving local community members. This project was supported by DUCT and monitors the sewage outflow from the Howick Wastewater Treatment Works (WWTW). The outflow is monitored three times a day, every day of the week at 8am, 12noon and 5pm. The quality of the outflow is normally very poor and seldom meets South African outflow standards. When the quality reaches very bad proportions, the community members notify the authorities who then sometimes take action to solve the water purification issues and improve the outflow quality.

This community-based citizen science project provides good evidence of the status of the outflow and how it seriously impinges on the community and compromises the downstream reservoirs which supply fresh water to Durban. Interestingly, when the local community first began monitoring the water outflow, the management of the nearby sewage works took notice of the community involvement and the water outflow quality improved (Taylor, Msomi & Taylor, 2013). Following massive further developments in Howick, however, and much greater volumes of effluent arriving at the WWTW, the quality has simply declined. Fortunately for the residents of Howick, and the people in the settlement of Shiyabazali, a large scale WWTW is currently being constructed at Mpophomeni which will reduce the amount of effluent that the Howick WWTW has to deal with.

Local community well-being

Almost 50% of human disease in Africa is waterborne. When local communities use polluted water resources, gastrointestinal complications and illness are a common outcome and a poverty/pollution trap ensues. Where illness is common, parents are unable to work, children are unable to attend school and a cycle of poverty continues. CBWQM can allow for water quality issues to be detected and thus mitigation measures can be taken. This is of particular importance as water pollution is not always visible. For example, the water in the Mthinzima Stream near Mpophomeni Township *looks* relatively clean and children therefore think it is safe to play in this water. However, water quality monitoring by citizen scientists has revealed that this stream has very high *E. coli* concentrations and poses a health risk to those who ingest it. Conversely, water may look polluted, such as that in the Umkomaas which is very turbid and looks brown, and yet still be safe for recreational use. CBWQM is therefore an important tool for detecting water issues and warning community members about these. Additionally, citizen science tools are an important education tool and can support engaged community education processes that can address such issues and build understanding about water sources, water security and how disease spreads (Mandikonza, Musindo & Taylor, 2011).

Education for Sustainable Development (ESD)

ESD is considered an important part of South African society. ESD connects people with the reality around them and supports them to understand issues relating to water, energy and food. When supported with citizen science tools, ESD processes can prove helpful in developing and deepening the learning. Such learning processes help overcome myths and conspiracy theories with growing understanding of elementary scientific knowledge developing amongst learners. These forms of learning can overcome concerns and fears that people may have about water and health.

Economic benefits of recreation

Water-dependent recreational activities are an important income-generator for many South Africans. This may include activities where people are likely to come into direct contact with the water, such as the Midmar Mile swimming event and the Dusi Canoe Marathon, or activities where people are unlikely to come into direct contact with the water, but the water creates part of the setting for the activity, such as picnic sites or ecotourism options where people go boating, etc. In both situations, water quality is vital to the success of activities. For example, the Midmar Mile or Dusi Canoe Marathon cannot take place if the water quality poses a health risk to people which, in turn, results in a loss of revenue as the events may have to be postponed or even cancelled. Additionally, where people have concerns about water quality they may be hesitant to participate in an event. CBWQM may allow for concerns surrounding water quality to be either confirmed or assuaged, thus protecting not only people's health but also those dependent upon these recreational activities for a living. Additionally, CBWQM can assist in identifying the drivers of poor quality and thus allow for these to be addressed. Recreational activities that rely indirectly on water quality are likely to be negatively influenced by changes in the aesthetic quality of the water. For example, it is unlikely people are going to want to go on a boat tour in murky water or picnic next to a river that smells of sewage. Here CBWQM could play an important role in identifying the problem, its source and the risk it poses.

Research funding – why would research funding be allocated to CBWQM?

A key dimension of advancing IWQM practice is giving more attention to CBWQM practice – as outlined in previous deliverables. A key dimension of advancing this relationship is research. This involves different kinds of research as we have seen over time. Research is needed to develop citizen science tools for CBWQM. Research is needed to understand the social learning dynamics of citizen science practice and the use of citizen science tools. Research is needed to understand the policy environment of citizen science practice and the role of CBWQM in policy implementation. Additionally, research is needed to position CBWQM in the context of the wider system of Integrated Water Quality Monitoring. Research is also needed to conceptualise and establish viable learning pathways for CBWQM participants, and the implications of CBWQM for identity formation, community well-being and social and environmental health. Research is also needed to consider the power and potential of CBWQM generated data for monitoring and evaluation, and how to manage such data as open access data in the interest of the common good. At a broader level, there is need for research that supports CBWQM practices as a contribution to participatory democracy and collaborative water governance. And research is needed on social and environmental justice and the achievements of CBWQM in enabling such contributions to society and sustainable development. As can be seen from the extensive dimensions of this WRC project, there is also clearly research needed into the scaling of CBWQM and its wider relationship to ecological infrastructure for water security, and for social justice, inclusivity and participation in the water sector and its objectives in South Africa. Research can be done on CBWQM and its contribution to sustainable cities and communities and to the simple yet neglected aspects of human dignity that are linked to a healthy environment and clean water in the South African Constitution. Research could also explore the ways that CBWQM can support local government to fulfil its service delivery mandate, which is a major concern for so many communities in South Africa.

As can be seen from the above, CBWQM is an important space for collaborative research in South Africa, not for instrumentalist or extractivist purposes, but for the purpose of supporting and enabling expansive learning amongst all actors and participants in the CBWQM value chain and social-ecological relational system. It has important social and environmental foundations that can advance not only the practice, but a re-orientation of approaches and values informing research praxis in South Africa.

One of the key trends in the research environment at present, in South Africa, but also more widely in the international research community that is concerned with more sustainable, socially just futures, is to re-orient historically inherited positivist research approaches that were limited in their knowledge construction frameworks by empiricism, technicism, and abyssal thinking (exclusionary ways of working, thinking and producing knowledge). Exciting new research is emerging that focusses on knowledge co-creation with communities and social innovations for social and environmental change. CBWQM is one such process. There is also a shift towards transdisciplinary research – this implies that research should impact on the world and cannot just be confined to disciplines in universities. Rather it should include partners outside of universities and traditional research institutions to produce a new kind of knowledge that is oriented towards solution building and sharing of benefits of many different kinds of knowledge in the interests of the common good. CBWQM offers an interesting and enlivening environment for young researchers in South Africa to understand practically these dimensions of research and its re-orientation.

The Department of Science and Innovation and the National Research Foundation, along with major international research funders such as the Global Challenges Research Fund, and the Belmont Forum, as well as research foundations are all supporting the above-mentioned approaches to research; in other words, research needs to be restructured from a positivist, technical approach to a more socially engaged approach that takes community issues and questions to heart. This interest is also associated with the Sustainable Development Goals and their implementation nationally and internationally (as shown above).

There is therefore an interesting and productive landscape for research opening up with these important new developments in the research landscape in which CBWQM partners are a critical contributor in many different ways. With more applied and engaged models for research, research can also be a process of social learning and engaged development praxis while also helping us to understand the world better (which is the main purpose of research).

There is a strong possibility therefore that CBWQM partners who link up with researchers with the above-mentioned interests, intentionality and sensibilities can leverage substantive resources for advancing CBWQM practice in different ways. This is particularly important in the light of the shift in international development funding assistance moving towards universities and research institutions under a re-orientation of international funding as also pointed to above. In this process, research institutions themselves need to re-imagine their roles in society and develop the skills and competences to be more integrated into the types of partnership structures that are typical of CBWQM practices.

4.2.5 Summary recommendations for a resourcing strategy

Summarised below, this could mean the following for a resourcing strategy in terms of resourcing partners to approach:

- **Depth scaling:** This is where gaining a deeper understanding of a practice or a field can help it to gain generativity or strength. *From the analysis above, the most suitable partners for this type of scaling would be educational and research institutions, as well as CSI project funding for specific innovations. Activities along the value chain to develop via these partnerships would be capacity building, knowledge commons tools and management of IP, as well as learning to use new technologies, share data more effectively, and share knowledge resources across the wider CBWQM communities of practice.*
- **Vertical scaling:** This involves partnership building and policy implementation impact. We recommend that this should ideally emerge from low level partner scaling to moderate levels of partner scaling – at least initially. *Key partners here for resourcing would be government (local government) as well as*

national government initiatives that are locally implemented such as EPWP programmes, Adopt a River programmes, etc. International development partnerships to strengthen the role of CBWQM uptake and support at policy level, especially for monitoring of policy and development of participatory democracy praxis could also be leveraged here.

- **Horizontal scaling:** This involves breadth scaling along the CBWQM value chain, and differentiating of tasks, roles and responsibilities along the value chain. This can also be called 'functional scaling' where more, or more complex forms of, CBWQM activity are developed along the value chain. *As can be seen in the diagram above, the networking communication, capacity building, tools development and some aspects of innovation associated with reporting are also forms of depth scaling and could involve the same partners as noted above for depth scaling. The actual implementation of CBWQM and regular monitoring of the practice would be best supported by the same partners as mentioned above under vertical scaling.*

This shows a differentiated approach to resourcing CBWQM practice is needed. This needs to be a co-ordinated approach as there will be little value in designing innovative tools if they cannot be used widely in support of IWQM, etc. There is little value in engaging at policy level if there is no practice occurring and so on.

Thus, we recommend the following for potential partners to get involved in resourcing of CBWQM projects and programmes:

- **Government:** should support and fund the roll-out of CBWQM programmes within a job creation framework (e.g. Groen Sebenza)
- **Business:** should support local communities of practice to establish themselves and learn how to contribute to local IWQM via CBWQM practice; and they should allocate resources to capacity building, and innovation of tools, communication and network formation activities.
- **International funders:** should support governments to integrate principles and practices of CBWQM into policy systems and funding structures; and should support innovations in the whole system of CBWQM praxis. Piloting a scaled-up system of CBWQM by giving attention to all the elements along the value chain and all dimensions of scaling practice may also be a good focus for international funders as a key intervention around SDG implementation.
- **Education and research institutions:** should particularly get involved in supporting innovation along the CBWQM value chain through engaged research, tools development and social learning support, including the design and management of capacity building programmes across the sector; and can also support learning network formation in partnership with civil society / NGOs and government partners.
- **Civil society/NGOs (e.g. WWF):** should continue to be the primary actors in the CBWQM system, at the forefront of monitoring and reporting practices and the actors who help to define the needs of the sector as these emerge from their experiences in practice. They should continue to attract funding for implementation but aim to continue to work synergistically with the range of partners along the value chain.

As can be seen from this section, this Learning Action in the action-oriented research process focused on modelling of solutions. The next Learning Action in the process involves testing the solution models, which is described in more detail below.

CHAPTER 5:
TESTING THE SOLUTION MODELS AND RESOURCING STRATEGY

5.1 Establishing an Amanzi Ethu Learning Network

As indicated above, this was an action-oriented research project. Following the development of the model solutions in the form of a) guidelines or guiding approaches to scaling of CBWQM practice and b) a resourcing approach, the research team then sought to test these out.

As identified above in the modelling of solutions, the co-engaged expansive learning process of object scaling is crucial for supporting the co-design and development of other forms of scaling in the CBWQM community of practice. The engagements with stakeholders from the heterogenous activity system coalitions in Learning Actions 1, 2 and 3 indicate that the CBWQM community of practice is highly conscious of its praxis and the need for scaling design and development support, hence also this proposal and project being undertaken by members of this community of practice with support from the WRC. To bring synergy to the diversity of efforts, in our meeting in February 2020, we discussed the possibility of using the concept of **'Amanzi Ethu'** meaning **'Our Water'** to launch a national process of expansive learning and scaling in the CBWQM community to test the models and approaches that had been put forward by the action-oriented research so far. This would require social innovation tools, including concept and practice brand development or communication tools which could then also contribute to the **depth scaling** work that we had identified as being central to advancing scaling partners and scaling praxis overall. Subsequently, the Amanzi Ethu Nobuntu project logo was developed by DUCT and participating actors in the pilot scaling project outlined below.

We noted that it may also be helpful to formalise the **Amanzi Ethu** as a **national learning network of CBWQM practitioners**, who could associate under various other associations, e.g. the Environmental Education Association of South Africa, or the South African Water Caucus or both (and other relevant emerging institutions such as the EIWS catchment programmes). A national **Amanzi Ethu Learning Network** would be an important social innovation tool for strengthening vertical and horizontal forms of scaling, and provide a mechanism for strengthening breadth and depth scaling too, and a course activated expansive learning process could strengthen object scaling within this network. It could also provide a mechanism for sharing CBWQM tools and resources and shared IP. Examples of other initiatives that have used a combination of tools such as 1) learning network formation, 2) which is activated via an open access course, and 3) shared open access learning and practice resources and 4) communication tools that support the practice network are the WRC supported Amanzi for Food programme, and the UNESCO Sustainability Starts with Teachers programme. New innovations here are used in designing courses that interface directly with shared resources (i.e. web-based, open access courses that provide access to the community of practice as well as shared IP).

While it is important to identify the 'shared tools' and process structures for interaction (e.g. Amanzi Ethu Learning Network), it is also very important to concretely identify the relevant actors and **activity systems** that are already working together on scaling of CBWQM praxis, and others who may be helpful to expand from the low to moderate partner level scaling framework recommended in the modelled solutions above. The shared database that has been developed in this project is a key resource for this, and ongoing database development is an important tool for advancing the scaling process and should be included in the Monitoring and Evaluation framework (Learning Action 5).

Table 6 below, generated through the consultative workshop, provides an initial framework for concretely identifying relevant activity systems related to the resourcing of CBWQM, and leverage points for scaling practices via the expansive learning process and proposed learning network approach outlined above. From this table, it is clear that corporates, NGOs, civil society organisations, local, provincial and national government, academic institutions and parastatals are all important activity systems to engage in the Amanzi Ethu CBWQM scaling pathway relevant to resourcing. However, the details of the actual stakeholders and activity systems need to be co-defined and identified *in situ* at the levels of scaling that are already emerging.

This list of 'critical stakeholders' identified by CBWQM participants and activists indicate that there is need, in each setting, and around each scaling pathway or concern to carefully identify and map the relevant activity systems. Here the concept of **breadth** scaling and the points made by Mishra et al. (2014) on careful engagement with partners along the CBWQM value chain could help to decide which activity systems are most critical for advancing which particular aspects of CBWQM scaling. Care should be taken not to simply make 'lists of stakeholders' 'to involve, but rather to cluster them into activity systems that share an object of activity, similar rules guiding their practices, similar tools and approaches, etc.

Here, we indicate briefly how one might cluster 'stakeholder lists' into activity systems that may be more or less engaged in different components or parts of the CBWQM value chain in order to engage them in expansive learning processes. Note that this process would need to be refined *in situ, and via contextual ethnographic and historical understanding.* This is simply an indicative example of how one might re-consider a 'stakeholder list' given the understandings developed above on breadth / horizontal scaling.

Typical stakeholder list:

- Mining companies
- Tribal offices
- Schools
- Municipalities
- Water User Associations (WUAs)
- Farmers organisations (emerging, subsistence and/or commercial)
- Department of Water and Sanitation () & local water and sanitation forums
- Community members/Community-based organisations (CBOs), e.g. Vaal Environmental Justice Alliance (VEJA); SAQMC; Botle ba Tlhaho; FSE; SAVE the Vaal, etc.
- Working for Water
- Working for Wetlands
- Private nature reserves / Associated Private Nature Reserves (APNRs)
- Law enforcement
- Learning exchange programmes
- Department of Science and Technology (Innovation) (DST)
- Strategic Water Partners Network (SWPN)
- High-level decision-makers who manage organisational budget allocations
- Existing and operational Catchment Management Agencies (CMAs)
- DFFE Natural Resource Management (NRM) – because they hold much EPWP work
- Expanded Public Works Programmes (EPWP)
- South African Water Caucus
- Various activist groups
- Department of Cooperative Governance and Traditional Affairs (COGTA)
- CSIR developed C-More platform

- Capacity 4 Catchments

The stakeholder list has been re-framed according to the CBWQM value chain (diversified activity, roles and responsibilities of actors) and captured at a high level in the form of major types of activity systems involved in CBWQM scaling practice. The model presented in Figure 32 shows that there is a need to move beyond stakeholder-based activity systems (as outlined above) to clusters of stakeholders who share a key role or task in the CBWQM value chain in the expansive learning design for scaling CBWQM. This offers a different configuration of the third generation activity system for CBWQM scaling; potentially re-configuring the action-oriented research design to a fourth generation CHAT research process (to be discussed during the evaluation of the process under Learning Action 5).

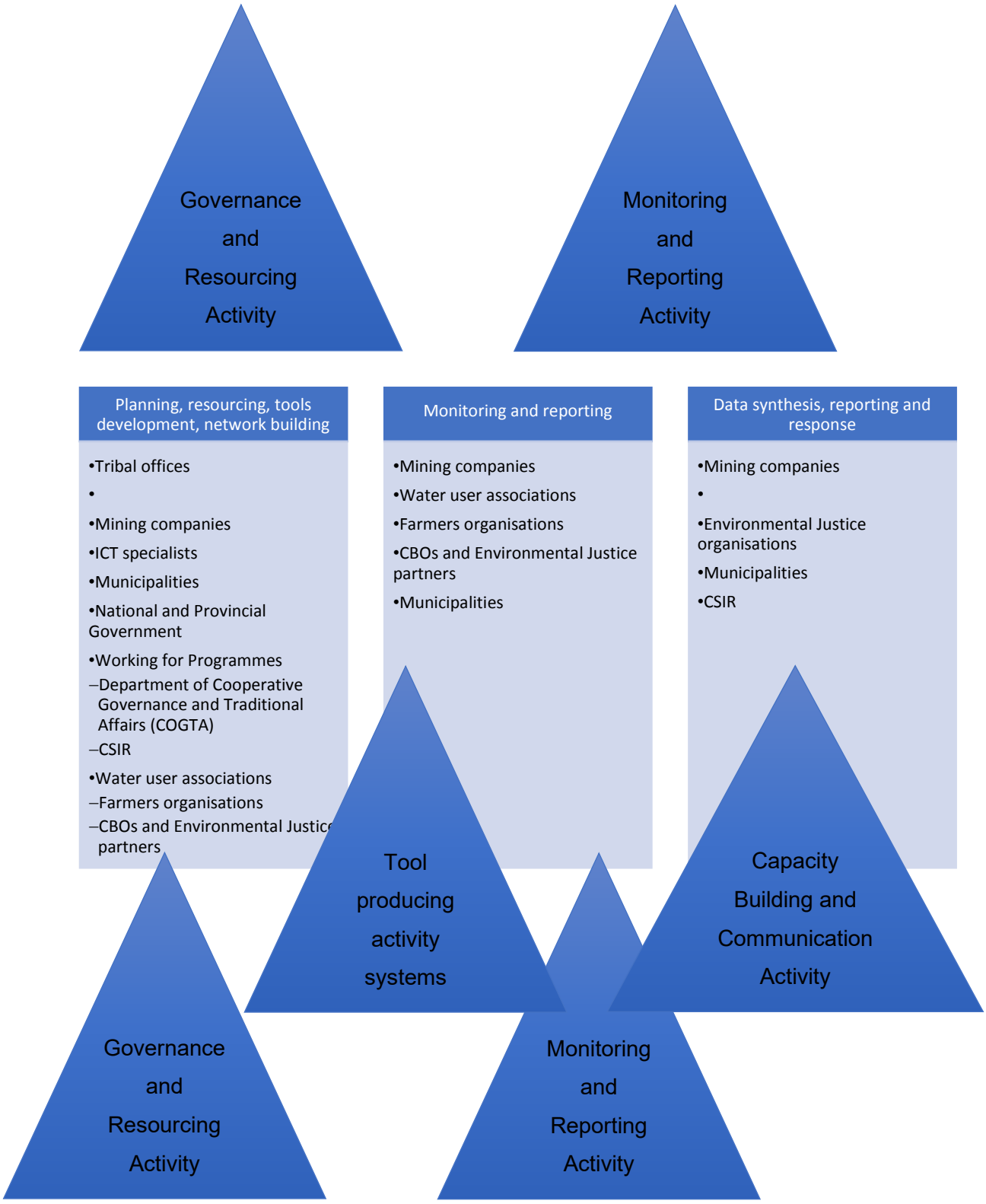


Figure 32: Model showing there is a need to move beyond stakeholder-based activity systems (as outlined above) to clusters of stakeholders who share a key role or task in the CBWQM value chain (i.e. coalitions of stakeholders) in the expansive learning design for scaling CBWQM

A key outcome of the project workshop, was the collaborative articulation of three areas pertinent to the CBWQM landscape, comprising information and data management; policy; and resourcing, which provides the necessary means for horizontal, vertical and depth scaling. The three tables below (Table 6, 7 and 8) summarise focus group discussions in each of the three areas. The group feedback provided a range of insights, priorities and concerns from diverse stakeholders. As can be seen, the feedback resonates strongly with insights reported above, and with the current articulation of 7 scaling pathways in Figure 7. For example, Table 6 (information & data management) foregrounds the need for data alignment and access, as well as thinking through data collection and management processes across diverse resource bases; Table 7 (policy) speaks to the need to align citizen science activities to existing state mandates, and to further integrate citizen science methodologies into the implementation strategies being enacted through various state organisations; Table 8 (Resourcing) highlights a number of the scaling pathways already identified, including scaling open data systems, capacity development mechanisms, media and communication systems, development and sharing of monitoring tools, standardisation of data systems, and others. This confirms that at the very least, the expansive learning process for object scaling recommended above should involve the following types of activity systems:

- Policy and governance activity systems
- Resourcing activity systems
- Tool producing activity systems
- Capacity building and communications activity systems
- Monitoring and reporting activity systems

This starts to provide definition to the solution modelling above in Learning Action 3, and shows that even for the first part of the CBWQM value chain (policy, planning and resourcing), there needs to be an engaged expansive learning process to support scaling. Tables 6, 7 and 8 all focus mainly on the first part of the CBWQM value chain. Further work is therefore needed to think through other parts of the CBWQM value chain in order to identify activity systems.

For each of the areas that were identified as emerging contradictions, the scaling questions used in the Sustainable Lifestyles and Education Framework were used by workshop participants to clarify scaling pathways. For each of these priority dimensions of scaling, four broad questions were considered. Firstly ‘What needs to be scaled in order to enhance CBWQM?’; secondly ‘Why does this aspect of CBWQM need to be scaled?’; thirdly ‘How do we best go about scaling this dimension of CBWQM? ’and finally ‘Who needs to be involved in order to ensure the success of scaling this dimension of CBWQM?’ It must be noted that the ‘what ’and ‘why ’questions in particular often involved an interactive process of clarification and prioritisation.

In addition, an initial take on possible ‘activity systems’ or stakeholder groups was proposed based on the identification of who needed to be involved. It must be noted that the tables represent a summary of the discussions and further detail was added in the subsequent reflection on the process and products by the workshop participants. The tables do however represent the ‘germ ’of a more complex expansive research design to support scaling. In the next section we describe firstly what the tables offer and secondly what needs to be deepened to support scaling. This provided the practical and field-based engagement starting points for role definition in differentiated model for scaling CBWQM praxis.

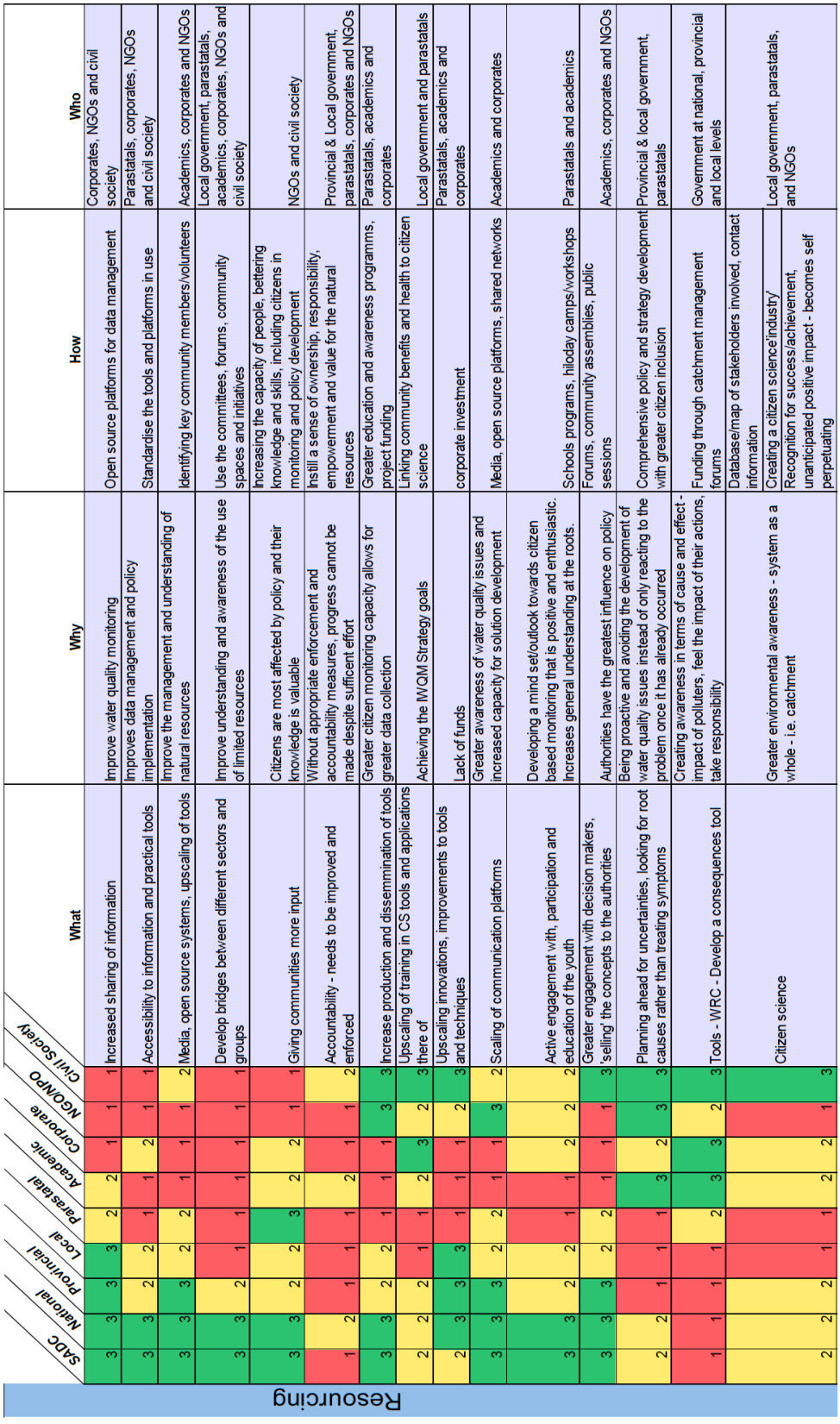
Table 6: Initial role definition and plans for Information and Data Management activity systems contributions in the scaling model

	SADC	National	Provincial	Local	Parastatal	Academic	Corporate	NGO/NPO	Civil Society	What	Why	How	Who
Information & data management	3	3	3	2	1	1	1	2	3	Centralising the available data in a database accessible to both public and private. Open access platforms	Data is divided across individual organisations and not shared across an open access network.	Ensure that communities are not restricted from information , but that it is spread through an all-inclusive communication network. The DWS project called DAM (Data Acquisition Management) must be incorporated and data must remain current and relevant.	Civil society (citizen scientists), corporates, academics, local government and parastatals
	3	3	3	3	2	1	1	1	2	Mobile apps are only accessible to those with smart phones. This requires other digital means to be available for others to engage. Internet acesss is essential.	Access to data/internet is key for all mobile applications and participation in digital platforms of data recording and management.	Free wifi provided at central loctions. Connection sites to the internet availabl at public centres like libraries, schools. Citizen scientists to be provided with specific log ins, and assigned online progiles.	Local government, parastatals,academics, corporates and NGOs
	3	3	3	1	1	3	1	2	2	Network connectivity for access to open source data management platforms is poor in remote areas that also require water quality monitoring.	Access to data/internet is key for all mobile applications and participation in digital platforms.	Develop a system or strategy that can be put to network providers to encourage cooperation. Apps developed for monitoring, need to work offline.	Local government, parastatals and corporates - Mobile network providers &App developers
	3	3	2	2	1	1	1	1	2	Data standardisation to ensure all involved are 'speaking the same language'; to ensure quality is consistent.	Reduce inconsistancies and unreliability of data	Implementing standardised tools and monitoring practices. Greater sharing of information and data across sectors. Look at ways to connect the broader community and increase knowledge.	Parastatals, academics, corporates and NGOs
	3	3	3	2	1	1	1	1	2	Increase communication across scientific sectors	Reduce inconsistancy and missinterpretation	Through the use of open source platforms.	Parastatals, academics, corporates and NGOs
	3	3	3	2	2	1	1	1	3	Image management - there is a need communicate to the community in which work is being done, the reasons for it and what it is. Creating an open and inviting atmosphere that encourages participation and cooperation.	Increase citizen/community engagement, willingness and cooperation	Creating a transparent process where communities feel they benefit from the work	Parastatals, corporates and NGOs
	3	1	1	1	2	2	2	1	3	Engagement with the youth	Need to create an atmosphere/trend of participation by starting with the youth	Visual Representation/ stimulation e.g. Posters in public spaces like libraries, results feedback	Government, parastatals and NGO's
										Incentives	The need to maintane interest, to create long term engagment and partnership	Targeting the right audience e.g. Visual displays and removing the language barrier.	Government, parastatals and NGO's
											Marketing	Awards & Recognition	
												Using Social Media as a platform for information dissemination (e.g. Hash tag citizen science activities, Facebook group or page, learning sessions, live feeds in public spaces)	
												Taking advantage of major events i.e. drought or large scale pollution incidents like Willowton	
												Marketing budget (Showcasing tools)	
												Getting human resources (someone responsible for co-ordination especially for online activities)	
												Encourage schools to share their citizen science stories	
												Promotional Drives	
	3	3	2	2	1	2	1	1	3				

	SADC	National	Provincial	Local	Parastatal	Academic	Corporate	NGO/NPO	Civil Society	What	Why	How	Who
Policy												Develop a centralised method or sector for citizen science financing, funding and tools.	
										Understanding how to use policy in connection with citizen science to mobilize government into action	In order for projects to become a part of the bigger picture of water quality monitoring (WQM).	Standardise monitoring tools used across the different sectors (government, corporate, academic, citizen).	Collaborations between invested parties over policy review and implementation
											To embed citizen science into the culture of environmental/water quality work.	Policy review - a closer alignment between policy and practice	Professionals, academics and government
											Strengthen the implementation of policy goals by using citizen based methods.	Providing platforms for collaboration and communuication	Citizen scientists, professionals, researchers and government
	1	2	3	3	2	1	1	1	2		To standardise citizen science tools across the sectors (transboundary, national, regional, local).	Public participation forums and focus groups	Professionals, academics, parastatals and government
	3	2	2	2	1	3	3	3	3	SANBI engagement with the water and sanitation policy provides opportunities for strenghtening citizen science work;	To improve uptake of the science and tools by citizens, professionals and municipalities.	Through the EIA & wateruse license process - make citizen science monoting part of the approval requirements	Professionals, parastatals and government
	1	1	1	2	2	3	3	2	3	Reviewing of the Integrated Water Quality Management Strategy and opportunity for revisal of policy;	Allows for innovation and evolution of policies and strategies	Public forums - including local communities creates greater opportunity to build alignment between local work and national policy;	Government at national, provincial and local levels
	1	1	2	2	2	3	3	3	3	National Water Resourse Strategy v3 - there is opportunity for scaling citizen based monitoring within this framework	Monitoring of Resource Quality Objectives (RQOs), and at a finer spatial scale within catchments allow for the fullfilment of goals	Monitoring of RQOs and at a local and finer scale as well as alignment with WULAs and license requirements	Government at national, provincial and local levels
	3	3	3	1	1	2	2	2	3	Aligning the policy and practice work by Heila lotz-Sisitka with the work by Michelle Hiestermann & John Dini on Ecological Infrastructure for Water Security (EI4WS) & DWS policy + the Sustainable Development Goals	Creates the opportunity for the upscaling of citizen science from strategic goal to implementation on the ground	Involve multiple sectors to enable national legislation to become part of the citizen science movement	Government at national, provincial and local levels
	2	3	3	2	1	2	3	3	3	Ingtegrate the SANBI working groups on sustainable development goals to this work on citizen science based monitoring	Different policies are applicable to different contexts, important to review and consider all relevant policies and strategies	Develop contextually based solutions	Local government and parastatals
	1	1	1	1	2	3	3	3	3	Align monitoring practices with RQOs	Create a platform for collaboration and partnership	Incorporate citizen science into education carriculim	Government at national, provincial and local levels
	1	1	1	1	1	2	2	3	3	Align monitoring practices with Catchment Management Strategies (CMS)	To improve alignment between policy and practice	Including CS in new and established monitoring systems	Government, parastatals, academics and professionals
	1	1	1	1	2	3	3	3	3	Align monitoring practices with provincial and national policies, create the capacity to look beyond WQM. Ensure there's space for reviewing policy and practice.		Integrated and fully accessible data management network	Government and parastatals
	1	1	1	1	2	3	3	2	2	Implementing of water services by-laws allows for more local level work by citizens	Achieving the outlined policy goals	Data gathering and management includes citizen science sources	Government at national, provincial and local levels

Table 7: Initial role definition and plans for Policy activity systems contributions in the scaling model

Table 8: Role definition and initial plans for Resourcing activity systems contributions in the scaling model



Resourcing												What	Why	How	Who
SADC	National	Provincial	Local	Parastatal	Academic	Corporate	NGO/NPO	Civil Society							
3	3	3	3	2	2	1	1	1				Increased sharing of information	Improve water quality monitoring	Open source platforms for data management	Corporates, NGOs and civil society
3	3	2	2	1	1	2	1	1				Accessibility to information and practical tools	Improves data management and policy implementation	Standardise the tools and platforms in use	Parastatals, corporates, NGOs and civil society
3	3	3	2	2	1	1	1	2				Media, open source systems, upscaling of tools	Improve the management and understanding of natural resources	Identifying key community members/volunteers	Academics, corporates and NGOs
3	3	2	1	1	1	1	1	1				Develop bridges between different sectors and groups	Improve understanding and awareness of the use of limited resources	Use the committees, forums, community spaces and initiatives	Local government, parastatals, academics, corporates, NGOs and civil society
3	3	2	2	3	2	2	1	1				Giving communities more input	Citizens are most affected by policy and their knowledge is valuable	Increasing the capacity of people, bettering knowledge and skills, including citizens in monitoring and policy development	NGOs and civil society
1	2	1	1	1	2	1	1	2				Accountability - needs to be improved and enforced	Without appropriate enforcement and accountability measures, progress cannot be made despite sufficent effort	Instill a sense of ownership, responsibility, empowerment and value for the natural resources	Provincial & Local government, parastatals, corporates and NGOs
3	3	2	2	1	1	1	3	3				Increase production and dissemmination of tools	Greater citizen monitoring capacity allows for greater data collection	Greater education and awareness programms, project funding	Parastatals, academics and corporates
2	2	2	1	1	2	3	2	3				Upscaling of training in CS tools and applications there of	Achieving the IWQM Strategy goals	Linking community benefits and health to citizen science	Local government and parastatals
2	3	3	3	1	1	1	2	3				Upscaling innovations, improvements to tools and techniques	Lack of funds	corporate investment	Parastatals, academics and corporates
3	3	3	2	2	1	1	3	2				Scaling of communication platforms	Greater awareness of water quality issues and increased capacity for solution development	Media, open source platforms, shared networks	Academics and corporates
3	3	2	2	1	1	2	2	2				Active engagement with, participation and education of the youth	Developing a mind set/outlook towards citizen based monitoring that is positive and enthusiastic. Increases general understanding at the roots.	Schools programs, hiloday camps/workshops	Parastatals and academics
3	3	3	2	2	1	1	1	3				Greater engagement with decision makers, 'selling' the concepts to the authorities	Authorities have the greatest influence on policy	Forums, community assemblies, public sessions	Academics, corporates and NGOs
2	2	1	1	1	3	2	3	3				Planning ahead for uncertainties, looking for root causes rather than treating symptoms	Being proactive and avoiding the development of water quality issues instead of only reacting to the problem once it has already occurred	Comprehensive policy and strategy development with greater citizen inclusion	Provincial & local government, parastatals
1	1	1	1	2	3	3	2	3				Tools - WRC - Develop a consequences tool	Creating awareness in terms of cause and effect - impact of polluters, feel the impact of their actions, take responsibility	Funding through catchment management forums	Government at national, provincial and local levels
2	2	2	1	1	2	2	1	3				Citizen science	Greater environmental awareness - system as a whole - i.e. catchment	Database/map of stakeholders involved, contact information Creating a citizen science'industry' Recognition for success/achievement, unanticipated positive impact - becomes self perpetuating	Local government, parastatals, and NGOs

The review of CBWQM (through the work informing the proposal to WRC as well as the first five deliverables of the project) along with the substantial experience that the participants brought to the workshop provided the basis of the questions and 'needs' that informed the deliberation reflected in the tables.

The tables also indicate that more in-depth analytical work is needed to refine and deepen understanding of various aspects of CBWQM in order to develop a more robust and just system of scaling. For example, absent in Table 6, is an articulation of distributive justice with regard to co-produced knowledge – this might include foregrounding open data and open publishing norms for knowledge produced collaboratively through citizen science methodologies, etc. (as evidenced in Vallabh's PhD study). Similarly, Table 7 excludes the need for strengthening systems of radical democracy which positions citizen scientists as civil partners, rather than as mechanisms to compensate for a partially dysfunctional or poorly aligned policy system. Table 8 excludes the need to articulate alternative economic models through which to enact citizen science within a South African context; for example Brownell (pers. comm.) described the ongoing struggle to fund citizen-based monitoring activities within capitalist funding models, and explained that building strong systems of social capital have provided a higher degree of project resilience during times of crisis, and Madiba highlights the need to rethink the 'volunteer 'aspect of such monitoring work and the need for a more critical engagement with issues of distributive justice in a context of high unemployment rates (Madiba, in press).

Coherent scaling efforts, then, would need to draw on the rich experiences and situated knowledges of a range of practice-based researchers, as well as more in-depth analytical processes of investigating systemic functioning.

5.2 Pilot testing the modelled solution in Amanzi Ethu Nobuntu Programme

5.2.1 Orientation and objectives of the Amanzi Ethu Nobuntu Programme as a case of scaling CBWQM praxis using the modelled solutions

To further interrogate and begin to test the model, we used the Amanzi Ethu Nobuntu Programme implemented by the Duzi-uMngeni Conservation Trust (DUCT) and the uMngeni Ecological Infrastructure Partnership (UEIP) partners, which was established under the complex conditions of COVID-19 as an intervention to support livelihoods. South Africa, like many countries, has been impacted heavily by the COVID-19 pandemic. Critical issues that have surfaced during this time, are issues associated with water quality and availability, as well as issues associated with job creation and social cohesion and social organisation of civic organisations. As indicated by the scaling study of Robinson and Winthorpe (2014), scaling does not take place in a vacuum, and there is always need to be monitoring the wider context or environment in which scaling processes are being considered and / or conceptualised. As has been shown in the COVID-19 period, the CBWQM system of activities offer an opportunity for much needed job creation in South Africa, especially if there is better alignment and valuing of these practices within the National Development Plan objectives and the need for community participation in the SDGs and in the DPME's objectives for integrating citizen-based monitoring in support of stronger models of democracy and governance in South Africa (cf. above). This presents as a potentially important 'generative moment' that CBWQM practitioners can make use of if they are in a good position to do so. Giving attention to the action-oriented approach to scaling as outlined in this document, which supports a reflexive adaptive approach overall, can support CBWQM organisations to be more able to respond to and make use of generative moments in the scaling process. These, as can be seen from the COVID-19 pandemic, are not always easy to identify in advance, but it is nonetheless important to be prepared to make use of such unknown opportunities. This indicates that any scaling processes such as those deliberated on in this study need to constantly be engaged with 'contextual profiling' especially to identify upcoming or potential generative moments

and then to make use of organising structures (multi-partner structures) to maximise these potentially generative moments in an essentially open-ended scaling process. It is important, however, not only to focus on these generative moments in isolation, as this could lead towards innovation isolation, and fail to engage the wider system of scaling within a longer term sustainability orientation as has been deliberated on above.

The *Amanzi Ethu Nobuntu* Programme is part of the solution to water quality management challenges, and the challenges of loss of livelihoods and jobs during the COVID-19 pandemic (and the high levels of unemployment in South Africa already visible before the pandemic). The focus is to empower local citizens to be champions of the environment (Enviro-Champs) in their local community. Through a green livelihoods programme, people living adjacent to rivers are given the responsibility to adopt-a-stretch – cleaning, maintaining, greening, restoring, and undertaking citizen science monitoring on that section of the river. DUCT, under the umbrella of the UEIP, spearheaded the *Amanzi Ethu Nobuntu* Programme (the video linked in Figure 33 provides an overview of this partnership). In the first round of this testing process, investment was secured from the Presidential Employment Stimulus package via the Department of Science and Innovation (DSI); more partners also became engaged. Many members of the UEIP were contacted, and local level projects were identified to join the programme. This work is about stimulating the economy, in COVID-19 times, while restoring our river catchments. The project took a developmental, as well as multi-actor and democracy building approach to scaling of CBWQM involving government, private, and civil society partners, as all have much to offer. They also have value to gain from being involved in civil-society partnerships: linking local projects across a catchment, working towards a common vision, sharing data, and all benefiting from the environmental, social and governance impact.

Figure 33: Amanzi Ethu Nobuntu Programme Video: https://www.youtube.com/watch?v=qj-rkCJxziU

The UEIP's geographical area of focus is the uMngeni River catchment. As such, the focus of the work described in the Amanzi Ethu project is also the uMngeni catchment. This catchment, although occupying less than 5% of the surface area of the KwaZulu-Natal province, constitutes a large part of the Southern Drakensberg Strategic Water Source Area and supplies water to 42% of the province's population including the major cities of Durban and Pietermaritzburg.

Economic development and the growing population in the catchment led to demand for water services rapidly exceeding the system's ability to supply. The uMngeni River catchment consists of four major in-line dams as well as other dams associated with inter-basin transfers to facilitate water supply to the cities of Pietermaritzburg and Durban and surrounding towns. These interventions of investing in engineered or built infrastructure have not been sufficient to adequately address the issue of water security in this catchment, and more investments are planned to address the growing demand. While built infrastructure remains essential for providing water to large populations, there is a growing understanding of the role of ecological infrastructure (EI) to supplement and enhance, and in some cases substitute for, built infrastructure. Landscape management throughout the catchment is essential for improving water security to this area.

The uMngeni Catchment includes a large portion of a Strategic Water Source Area (see Figure 34 for a contextual map of the catchment) – areas identified as being a priority for the Department of Environment, Forestry and Fisheries, and the Department of Water and Sanitation who have included SWSAs in their National Water Resources Strategy (NWRS) as "strategic national assets that are vital for water security". The NWRS goes on to identify the investment in SWSAs as a key strategic action (Action 5.4.2). Support for this initiative therefore represents an investment in institutional, environmental and human capital in identified priority areas.

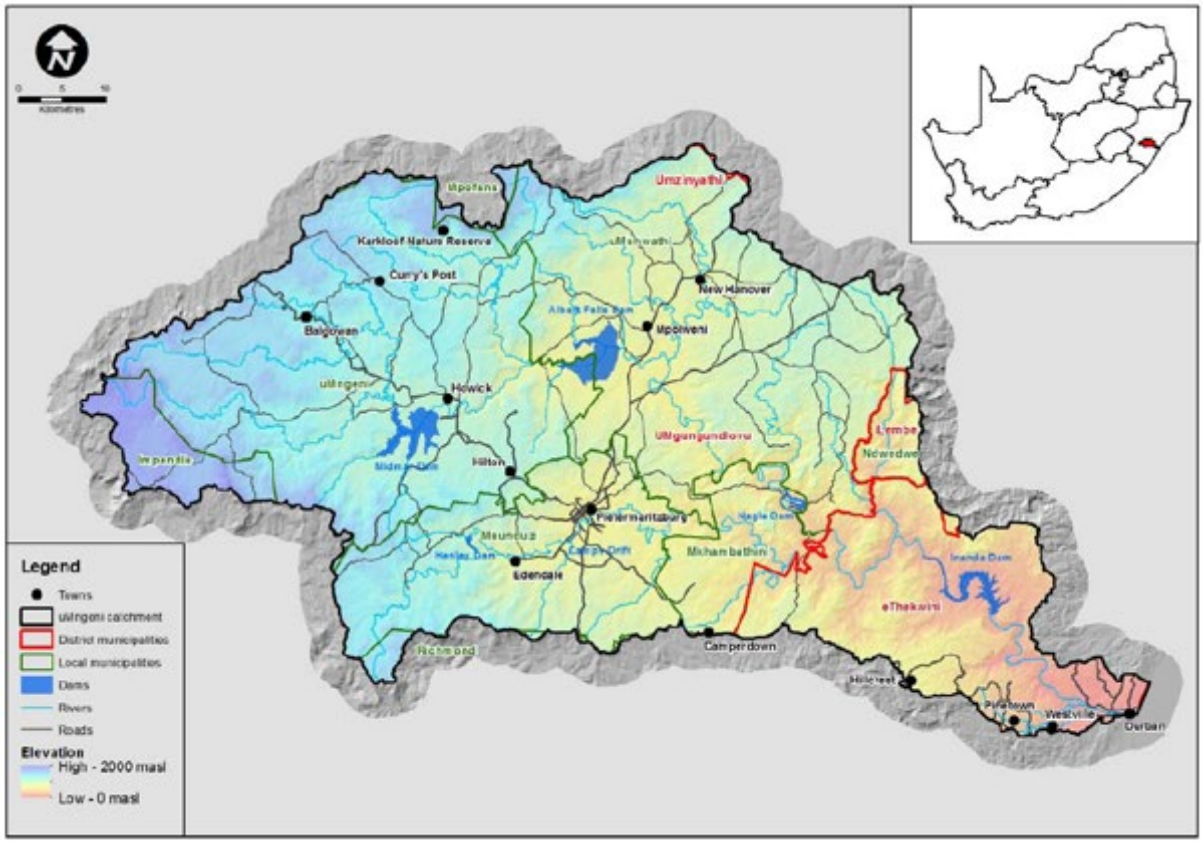


Figure 34: Contextual map of the uMngeni River catchment (Source: Pringle et al., 2016)

The fact sheet (Figure 35) and presentation slides (Figure 36) below show the scope of the funding mobilised for this project, as well as the multi-partner structure of the programme. While short in duration, the project set out to test some of the dimensions of the scaling modelled solutions, especially the foundations of the approach which is centred on a development, social justice approach to scaling CBWQM, while also giving attention to **depth scaling** aspects (tools and capacity development), and **a blended funding model**, which is one of the approaches recommended in the resourcing strategy.

The beneficiaries of this work consisted of 1) those people benefiting directly from the funding through employment and capacity development, and, 2) given that the project is of a catalytic nature, those who could benefit indirectly through the stimulation of the green economy in the catchment through the entity's role in strategic mobilisation of funding for ongoing projects. The project sought to directly benefit 500 community members through creating an employment opportunity together with training / capacity building, with 300 job opportunities created for youth in the first pilot[24].

Implementing partners could benefit through the capacity building activities, and access to additional funding for their local projects. The intention was that this would ultimately result in opportunities for improved income for recipients through improved pay for increased skill levels.

Since this was conceptualised as a catalytic project, it was expected that the vast majority of beneficiaries would in fact benefit indirectly through the entity's role in mobilising additional investment into ecological infrastructure activities in the catchment. This included individuals employed in implementation projects, as well as SMME's contracted to undertake related work in the catchment.

DUCT worked consistently in building partnerships with various private and government entities to co-fund, and integrate projects to maximise effectiveness, and sustainability. Historically, DUCT managed projects separately, and objectives were not well aligned. This has been changing over the past two years, with a newly revived strategic approach within a blended financing model. To do this, DUCT is working very closely with uMngeni Ecological Infrastructure Partnership (UEIP) to build a co-ordinated approach in the catchment. Together with other partners (Wilowton, Belgotex, Fairfield Dairy, Sappi, AECI, EnviroReport, GroundTruth, Adreach, WESSA, Wildlands, Liberty NPO, SANBI, WRC, eThekwini, uMgungundlovu, Msunduzi, Umgeni Water, Msinsi), a strong alliance is being built so that the maximum impact from all funding sources is realised. The key is a move away from individual, small projects, to a catchment-wide programmatic approach that is not reliant on one source, and therefore operate in a stop-start manner.

[24] The pilot has been extended to a second phase in 2021 with ZAR 25million being allocated via the PES / DSI to the Amanzi Ethu Nobuntu partnership, based on a funding proposal submitted out of this research and the Phase 1 Amanzi Ethu Nobuntu pilot (see Appendix C). This has created a further 500 job opportunities for youth to be engaged in CBWQM and other related environmental monitoring activities.

Existing partnerships

Table 9: Details of existing partnerships

Partner	Scope	Duration of existing contract	Value of partnership funding
Msunduzi Municipality	Enviro Champ monitoring, alien clearing of riparian zones. Programme will be fully aligned with NRM programme, providing a depth of support in municipal services delivery, monitoring of environmental incidents, and community education.	In existence for two years. Due for renewal in 2021	Approximately R1.5 million per year.
Willowton Oil	Establishment of a conservancy with Umgeni Water, Msunduzi and industry partners in Pietermaritzburg. Holistic action plan for an adopt-a-river approach in a very polluted catchment. A rehabilitation plan and community Enviro Champs are a part of the scope		R250 000 (Conservancy Action Plan) R45 000 (Enviro Champs)
Global Challenge Account	Development of a mobile app for in-field biomonitoring and reporting by Enviro Champs	2019-2021	$100 000
P4G	Development of a business plan for public-private partnership model for natural resources (ecological infrastructure) services	2019-2021	$100 000
eThekwini Municipality	Catchment restoration for the Palmiet. A combination of alien plant clearing, community Enviro Champs, bio monitoring, and rehabilitation planning. Partnership with GroundTruth Consulting.	2019-2022	R5 million

Pipeline partnerships

Table 10: Details of partnerships in the pipeline

Partner	Scope	Duration of existing contract	Value of partnership funding
Sappi	New partnership in the Karkloof catchment. Aim is to work together to ensure clearing both on Sappi private land, and the seeding areas downstream.	Agreement in principle (see letter attached)	Not available at the time of reporting
Belgotex Carpeting	Small business development for contractors	Agreement in principle	Not available at the time of reporting
Umgeni Water	Community-based wetland rehabilitation with Enviro Champs in Mpophomeni	To begin July 2021	Not available at the time of reporting

Amanzi Ethu Nobuntu

Overview

The Department of Science and Innovation (DSI) approached DUCT to implement a youth employment programme as part of the Presidential Employment Stimulus programme. This is a programme that aims to boost income streams impacted by the COVID-19 pandemic. The DSI were specifically interested in how community youth could be employed in the green economy, utilising citizen science tools.

DUCT decided to approach the uMngeni Ecological Infrastructure Partnership (UEIP) members to be a part of making this a success. As a result, projects throughout the catchment joined in, and a network of amazing interventions – all slightly different – are being implemented. Each partner was requested to supplement the DSI funding by an additional 20%, to cover costs, thus making this a test case for a blended finance funding model.

In so many ways, this very short project is a show case for what partnership really can look like; what the benefits of an umbrella programme can be to smaller projects; how to gather and share data that can help all partners work smarter; and above all, if working together can make a bigger impact on our catchment.

FAST FACTS

Location: uMngeni Catchment
Duration: February – April 2021
Client: Department of Science and Innovation (DSI)
Budget: R5.2 million from DSI; R1.3 million co-funding
Partners:
Umgeni Water, Msunduzi Municipality, Ethekwini Municipality, uMgungundlovu Municipality, SANBI, Msinsi, Adopt-a-River, uMngeni Conservancy, Green Corridors, AECI, Triple-P, Willowton Oil, Wessa, Adreach, Sibaya Conservation Trust, Blue Deal, Fairfield Dairy, GroundTruth

SCOPE

1. Employ 300 youth
2. Provide training, and capacity building to youth on environmental issues, and citizen science tools
3. Build a connection between the youth and their environment
4. Understand the state of the rivers of the uMngeni Catchment by gathering data on river health utilising citizen science tools such as mini-SASS, velocity plank, clarity tube, ecoli strips, and photographs.
5. Monitor and report environmental and service delivery issues via a mobile application (water leaks, sewer surcharges, spills, dumping)
6. Improve the state of the rivers of the uMngeni Catchment by removing litter, preventing soil erosion, removing invasive alien plants, educating communities, clearing illegal dump sites, repairing pathways, and trails, preventing poaching, rehabilitating land.
7. Gather stories of change of the youth and partners involved.
8. Test a multi-partner, blended finance model
9. Encourage a community-of-practice to form with the partners

Figure 35: Amanzi Ethu fact sheet

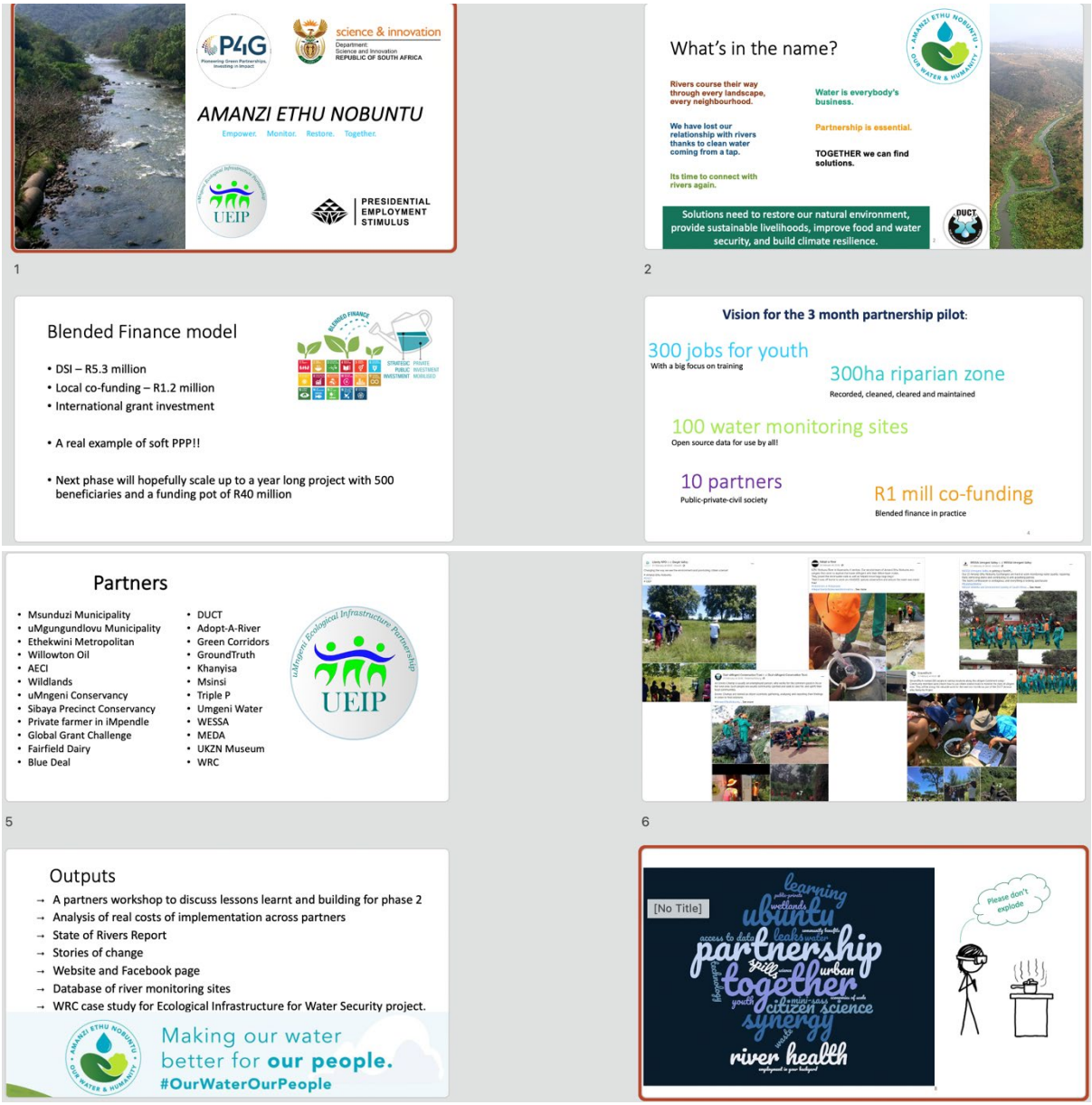


Figure 36: Amanzi Ethu presentation slides

In the reporting on the project after the three month period, Brownell (2021) noted that,

> This initial three-month partnership has showcased the possibilities for real government, private, and civil society partnership. All these partners have much to offer, and value to gain from being involved. Linking local projects across a catchment, working towards a common vision, sharing data, and all benefiting from the environmental, social and governance impacts, are just some of these gains. Amanzi Ethu Nobuntu is a real example of blended finance in the ecological infrastructure space, and has the potential to grow across the catchment, and then to other catchments in the country. Many lessons are being learnt, models written up, and the business case for PPPs in water management is truly being proven.
>
> Recognising the value of community members in the management of water resources is key. This model of labour-intensive job creation can be rolled out in any community, and provides a cost-effective mechanism to improve both natural resources management and basic services delivery …"

The project was designed for scale, as noted by (Brownell, 2021) with the Amanzi Ethu Nobuntu programme being designed with the intent that it can be scaled to every catchment in the country (see Appendix C). With the number of Catchment Management Agencies (CMAs) being reduced to 9, the area that needs to be covered by one agency is very large. Local governance, funding, and co-ordination to implement the catchment management strategies of these CMAs and will be essential. This programme is taking the next step in the uMngeni catchment to be able to test the most effective mechanisms to do this. Once a basic model is working, it can then be tailored for all catchments. Although the project was initially only oriented to support job opportunities for 500 people, the potential for this to create thousands of NEW jobs is clear (see Appendix C).

Other important elements related to the scaling research model framework is the emphasis on some of the dynamics of depth scaling, as Brownell (2021) states,

> From our short Phase 1 Presidential Employment Stimulus (PES) project, it was clear that beyond the opportunities at community level, there is a need for young graduates to be involved as "extension officers", collecting data, building relationships between projects, report writing, data cleansing and interpretation, etc. This is amazing work experience, and provides a solid field work and office work foundation for graduates to then move further in their careers. We would propose a strong alignment with a programme such as the PES funded programme managed by the Water Research Commission (WRC) to be a power partner in Amanzi ethu Nobuntu, sourcing and placing young graduates into the programme for 6-month internships.
>
> A further lesson from our current work, is that there is a vital need to link older and younger generations to pass on wisdom, and maturity. Youth of today often lack the drive and perseverance required to develop their skills and careers. This results in poor work ethics, and low performance, which worsens self confidence. It is important to find key, respected elders in communities to lead groups of young Enviro Champs to find solutions for their own neighbourhoods. The Amanzi Ethu Nobuntu programme seeks to find the long time champions of community work, and provide opportunities for these people to mentor the Enviro Champs.

Making this an ideal action-oriented pilot for testing some of the elements of the modelled solutions for scaling CBWQM praxis in South Africa, is the programme's commitment to innovation. As explained by Brownell (2021), "the Amanzi Ethu Nobuntu programme is testing many new elements all at the same time. Much of this has been studied, and recommended, but very few projects have been implemented at this scale. There is so much potential to expand, and innovate, and find new solutions to our water crisis. And we have to find ways for all partners to be involved in the best possible way".

The Amanzi Ethu Nobuntu Phase 1 programme also gave attention to tools development, and beta tested a mobile application for CBWQM monitoring. As reported by DUCT (2021) in the final Amanzi Ethu Phase 1 report,

> "In December 2019, DUCT partnered with Khanyisa Projects and received funding from Grand Challenge Africa to develop a river health monitoring App. The aim of this App was to develop a bio monitoring and enviro monitoring tool which would be piloted with 15 Enviro Champs along one river catchment within the eThekwini municipal area. The Amanzi Ethu Nobuntu programme provided an awesome opportunity to beta test the app with the 300 Enviro Champs instead of the original 15 planned. This resulted in robust testing, and further improvements in the app, which are unlikely to have happened so quickly without this opportunity.
> As a result of the beta testing enabled by this programme, partners have met and committed to consolidation of several divergent app development initiatives, under this one technical solution. The

App is poised for a considerably wider use in future, and attainment of this goal has been accelerated by the fact that the app was so widely beta tested on this programme, as well as the fact that so many partners were able to witness its capabilities.

The Enviro Champs were trained to use all aspects of the Enviro App with the App proving to be a valuable operational tool providing:

- Live interaction with the Enviro Champs on the ground
- Automated and current reports
- A simplified timesheet
- Alien plant polygons
- Capturing of photographs and GPS co-ordinates
- An NGO platform which could upload additional information / stories / pictures."

Table 11 and Figure 37 below indicates the affordances of the App, as well the types of data that were captured on the App by the Amanzi Ethu Enviro Champs, and gives some indication of the data as produced via the back-end of the App.

Table 11: Data captured on the Field Survey App developed and beta tested in Phase 1 Amanzi Ethu (Source: DUCT, 2021)

App Form Name	Description	Frequency
Enviro champ Registration	Take on registration form	At Start-up
Bio monitoring forms:	Water quality testing	
• Mini SASS		Monthly
• E. coli		Monthly
• Clarity Tube		Weekly
• Velocity Plank		Weekly
Enviro monitoring forms:	Environmental data	
• Alien Clearing		As found
• Household Visit		As performed
• Leaks		As found
• Solid Waste		As found
Timesheet		Daily

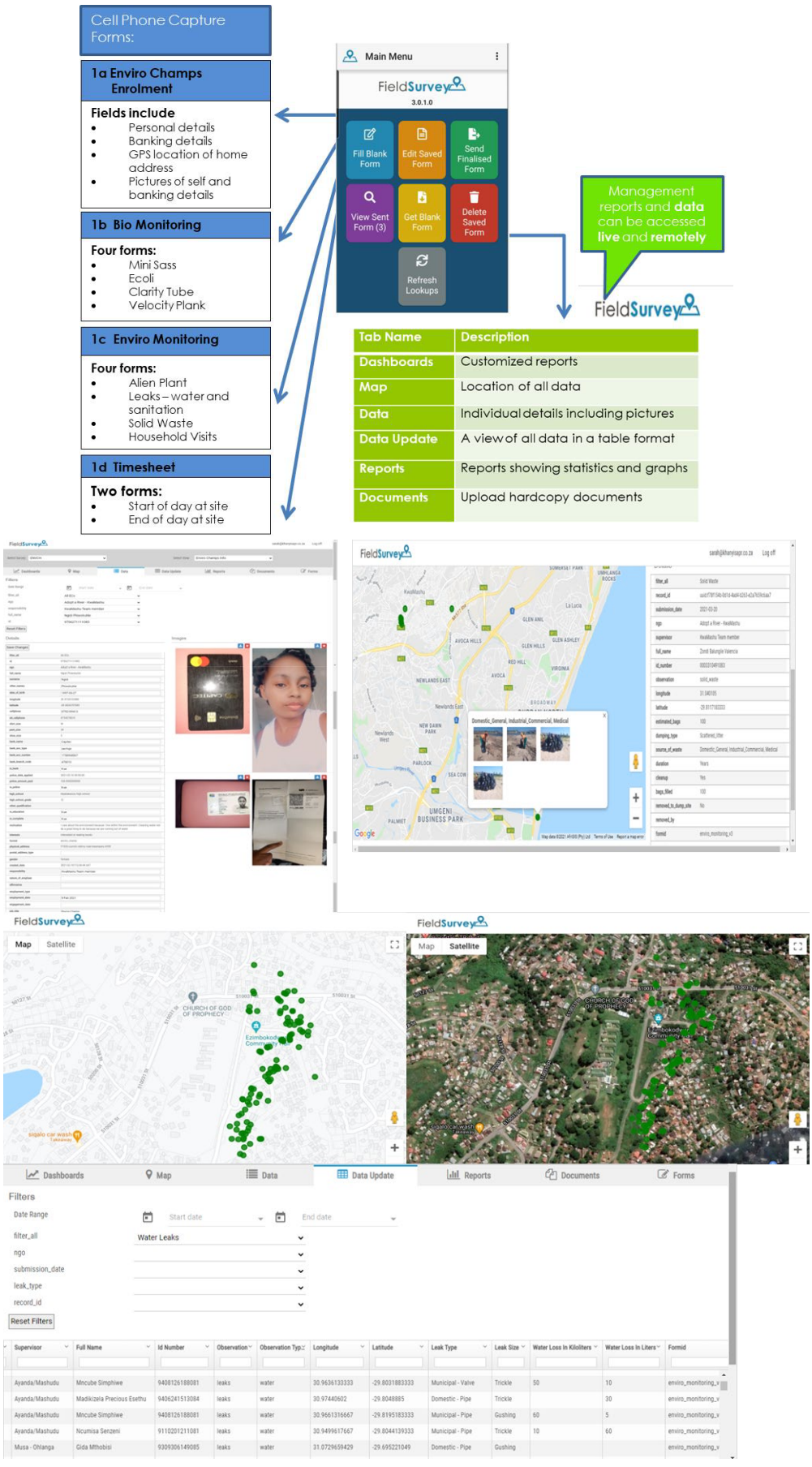


Figure 37: Examples of data captured using the Enviro App (Source: DUCT, 2021)

Use of the application was quite successful in that DUCT (2021) reports that, in the PES Phase 1, which employed 325 young people over a period of 90 days, a total of 1190 home visits were recorded over the three months across different communities in the catchment; a total of 25 species of alien plant were identified and cleared from the sites, with data being collected on the types and numbers of the alien plant species identified, as well as data on the clearing methods, herbicides and biomass treatment. A total of 198 municipal sanitation leaks were identified, with over 50% of these classified as 'gushing'. All leaks were reported to authorities for remediation, but follow up on leaks was not recorded during this phase. DUCT have since been developing a system to report and monitor faults. Solid waste in the rivers was also addressed with a total of 1275 sites with an estimated 93520 bags of litter collected from concentrated and/or scattered litter sites. The app also allowed for reporting on site-based distribution of scattered and concentrated waste, with a total of 848 concentrated and 987 scattered sites identified in the catchment. Of these a shocking 96 were concentrated medical waste, 90 industrial / commercial, 95 construction waste, and 567 domestic waste, showing that waste management is a severe problem affecting river health.

Part of the skills learned and exercised by the Enviro Champs, related to sampling and measurement of parameters relevant to river health. Amongst the tests conducted were: "Mini Sass" (Macro invertebrate stream scoring system to indicate river health); Velocity plank measures (flow); and Clarity tube tests (turbidity of water), and miniSASS data offered the following findings, see Figure 38 below.

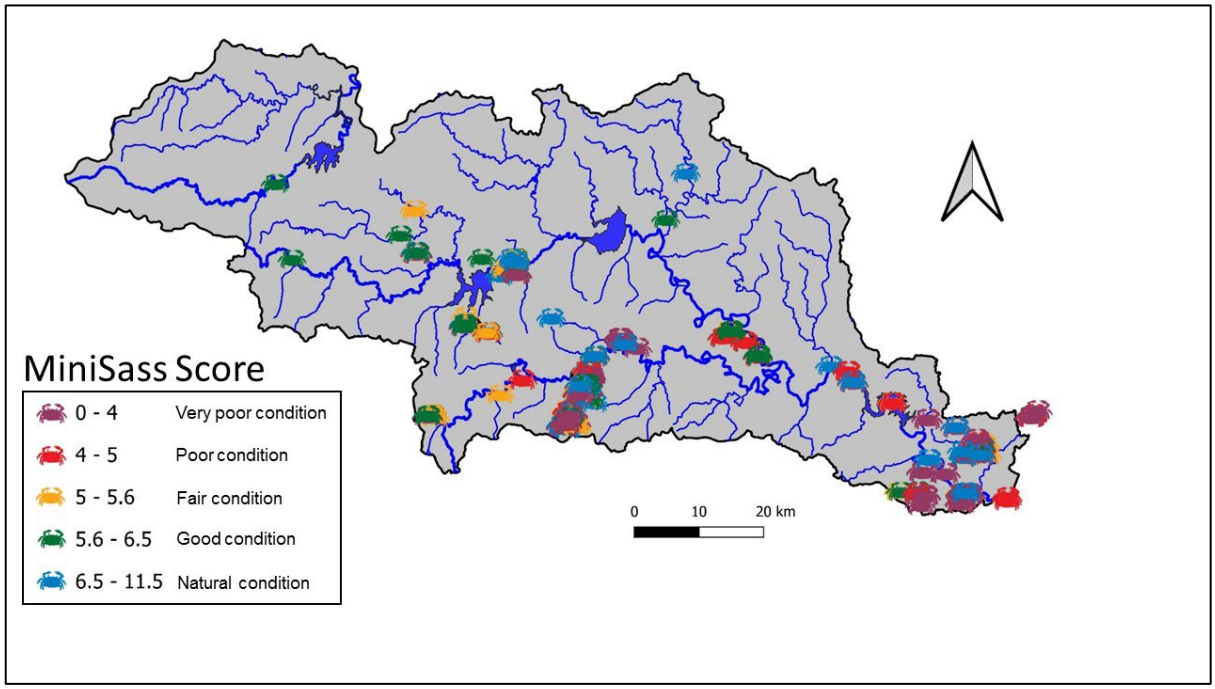


Figure 38. MiniSASS data scores identified by EnviroChamps in the Amanzi Ethu Phase 1 PES pilot.

Overall, this pilot process shows that it is possible to scale CBWQM with the blended finance approach and with state support for youth employment, if coupled with good training. While this pilot shows good success in terms of monitoring, and capacity building, it also importantly shows outcomes in terms of social change (see Box 8 below, which carries some of the stories of Change from the DUCT (2021) report on the pilot.

BOX 8: Stories of Change (Source: DUCT, 2021)

'Our water is an enabler of life'

Zamani Gwala, a project manager or Enviro Champ supervisor from Triple P Amanzimtoti which is formally known as i4Water. They are part of the programme as one of the implementing agents of one of the projects they run which is Wise Waters ways care. Zamani mentioned that he has been involved in a lot of projects that involve saving water and keeping rivers clean as water is an important source and an enabler of life. He further explained that he had a passion for the environment and nature and that is what drives him to continue the work he does with the Enviro Champs. Zamani explained that Triple P Enviro Champs have been working tirelessly for some time before this programme that even community members know and support the work they are doing. The Amanzi Ethu Nobuntu project came as a good opportunity for the Enviro champs to offer them support (incentive) and tools to work with when doing this amazing work of keeping our rivers clean.

Zamani views the project as a supporting structure for the Enviro Champs especially during these challenging times. He thinks the timing was exceptional because it supported their beneficiaries who had challenges of funding and offering incentive for the Enviro Champs. It means the work continuing during these hard times and more progress being visible.

For Triple P, the main benefit of this project was mainly on incentive because there were trainings, workshops, and interactions prior this ongoing Amanzi Ethu Nobuntu. Enviro champs made use of what they already know as some of them are qualified individuals from different environmental fields. The Amanzi Ethu Nobuntu programme added to what they know.

Zamani spoke about the way before Amanzi Ethu Nobuntu programme the Enviro Champs were viewed as beneficiaries working without an incentive. Without the incentive and tools there were limitations on times spent working on the streams. But with Amanzi Ethu Nobuntu project it came with a force that requires them to be on the field five days a week which changed the progress, and it is now quite high. The incentive and having tools encouraged them to be more active than before and more interested in the results they are getting.

After the project, it'd be sad to lose the incentive as it supported the Enviro Champs and increased productivity amongst the team. But after the project has ended, they will continue to work as they had been working before. It'd be nice to see the government continuing to support such initiatives in the future.

Story captured by: Noluthando Ndabezitha
Employed as part of the WRC Water Graduate Employment Programme, placed with host organisations Duzi-uMngeni Conservation Trust, and GroundTruth
Date: 31 March 2021
Project location: Amanzimtoti
Implementer: TripleP

"Water Doesn't Offend Anyone"

Sindiswa Ndlovu, is currently an Enviro Champ at the Wildlife Environmental Society of South Africa (WESSA), an organisation based in the upper catchment area of the uMngeni Catchment.

Sindiswa emphasises the importance of water preservation which she believes is central to not only our survival as human-beings but is also the essence of our livelihoods as a society. She believes it is the duty of every one of us to ensure that we tirelessly work for the environment, just as the environment tirelessly provides and works for us, that is what Amanzi Ethu Nobuntu means to her. "Water doesn't offend anyone" – something that she said which greatly echoes the message of what the Amanzi Ethu Nobuntu project stands for, by keeping that in mind, it is easy for us to remember to ensure that we do not unnecessarily offend the ecological ecosystems in and around water resources, by polluting them or using them as dumping sites.

Sindiswa cites her greatest benefit as being more knowledgeable after being an Enviro Champ. She is now more environmentally aware and has used her new-found knowledge to educate and empower others in her community, especially using Citizen Science Tools. Her knowledge of Citizen Science Tools has empowered her immensely, making her realise that you do not have to be a qualified professional in order to be able to assess the condition and quality of the water resources in your community; this has also made her more interested about the environment that surrounds her.

Prior to her being an Enviro Champ, Sindiswa lived in an informal settlement and was someone who only used the river for washing her laundry and as a source of dumping because they had no weekly collection of domestic rubbish. She has since moved away from her previous ways and has been able to encourage majority of her community members to do the same. Sindiswa now collects rainwater in drums, for washing, cleaning as well as gardening.

Sindiswa loves working with children and pledges to commit herself, in gathering young children within her community (Kid's Club), to teach them about environmental health and the importance of preserving our water resources.

Story captured by: Sindiswa Mthalane
Employed as part of the WRC Water Graduate Employment Programme, placed with host organisations Duzi-uMngeni Conservation Trust, and GroundTruth
Date: 19 March 2021
Project location: uMngeni Valley Nature Reserve
Implementer: The Wildlife Environmental Society of South Africa (WESSA)

Additionally, the programme also had good outcomes in terms of testing the **blended finance model**, as reported by DUCT (2021)

> "The broad success of the Amanzi Ethu Nobuntu programme represents a public display of both good governance as well as the leverage afforded by projects co-funded by government and private enterprise. Co-Funding raised was from an extremely broad platform, with supporters putting in their money for their own favoured cause or site, but allowing it to be pooled for the benefit of all partners

across multiple sites. In addition, the private funding was used to leverage the money contributed by government, by funding aspects which would not fit with DSI's mandate, but which have been of significant value to the programme (examples: marketing, professional project management, purchase of cell phone data). This serves to support faith in government initiatives, in that it provides a tangible example of people benefitting from the leverage enabled by government, and contributed to by civil society."

5.3 The Amanzi Ethu Nobuntu Indaba – Next round of engaging with national stakeholders to 'test' the modelled solutions

To reflect on and further test the model of scaling CBWQM praxis presented above in Learning Action 3 of this action-oriented research, the model was deliberated in the Amanzi Ethu Nobuntu Indaba on 20 April 2021 (see Figure 35), where a report back on the piloting process was also presented along with the scaling research framework.

There were strong indicators from the workshop that the model being presented offers a useful approach for planning the scaling of an initiative like the Amanzi Ethu Nobuntu programme within a wider systemic framework. In addition to a participatory process in which participants were requested to contribute suggestions on the different scaling dimensions as outlined in the scaling model, we also requested stakeholders attending this Indaba to contribute to the Resourcing Strategy Report and Respond questions, thus also testing the Resourcing Strategy for its validity.

The scaling research framework – as outlined in the previous chapter – was presented to the Indaba participants for further development and deliberation.

Figure 39: Participants at the Amanzi Ethu Nobuntu Indaba

A number of suggestions were made by participants at the Amanzi Ethu Nobuntu Indaba on approaches to activate and realise the scaling approach. This was done by drawing the scaling framework on the board, and then inviting participants to add their suggestions on scaling processes and approaches linked to the different types of scaling of CBWQM praxis (Figure 40 below). To ensure active participation from all present, each participant was given a number of coloured cards and a felt marker pen. They were then invited to discuss options with their neighbours and make suggestions on the coloured paper. This 'data' was then placed on a large white-board template which was facilitated by Michelle Hiestermann from the WRC. The material was then clustered according to the various scaling opportunities for citizen science and these are tabulated below as Depth, Horizontal and Vertical Scaling.

Figure 40: Soliciting contributions from the Indaba participants to inform the proposed model of scaling CBWQM praxis in South Africa

BOX 9: **INDABA CONTRIBUTIONS ON TYPES OF ACTIONS AND ITEMS TO TAKE ACCOUNT OF IN THE SCALING OF CBWQM**

Depth scaling

Recognition of the importance of capacity building as depth scaling, with emphasis on youth capacity building. The following points were highlighted as important:

- Training is absolutely key
- Youth employment and training is critical
- Depth scaling is probably the best way of scaling – especially for and through community-based projects
- Empowering youth and creating a sense of ownership is important
- Giving a voice to the youth in communities, youth being able to negotiate political agreements – and having a safe space to articulate their views

Suggestions for content and focus of capacity building work:

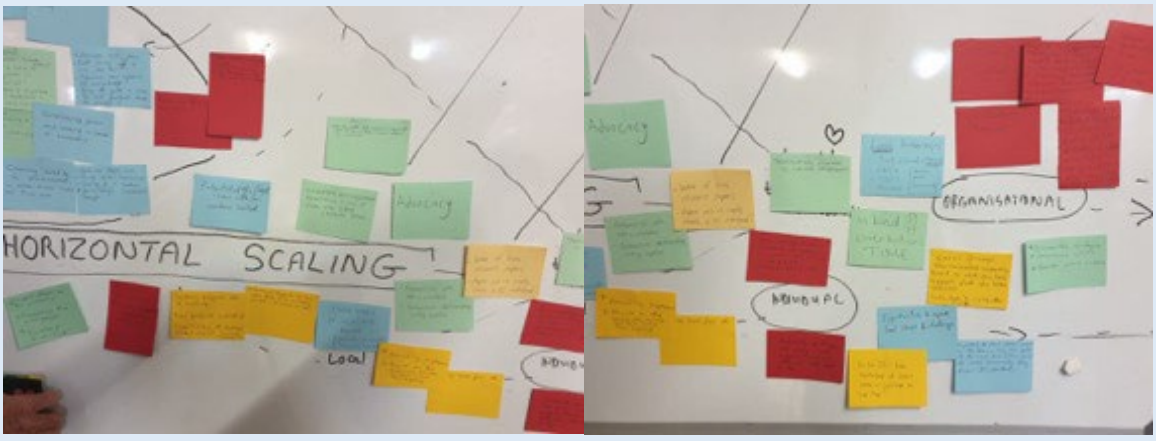
- "Each one teach one" is a useful principle for change
- Private sector involvement is important for scaling up numbers
- The Enviro Champs movement is important for inter-generational transfer
- Capacity building for Enviro Champs in other areas (such as first aid) is important
- The Catchments-to-Coasts vision, in its entirety, offers an holistic orientation
- Social media and Adopt-A-River can be used as a case for better engagement
- Door to door awareness, involvement of local community enable progress and training of employees
- Exchange workshops are very important, going forward, for all players

- Rehabilitation and restoration, post clearing, is essential for alien species removal
- Illegal dumping in our water resources and the lack of adequate waste collection processes are an issue. Furthermore, there aren't enough bin containers for waste and solid material
- Swimming lessons are important for field worker safety
- Snake Awareness training is important
- Waste Classification and the separation of waste at source is important
- The use of technology, such as the Mobile App, can be very helpful
- Learning from previous teams and learning new information (this highlights the training and skills development)
- Skills Training to use Technology, First Aid and knowledge on water quality is important
- It is important to encourage participants and enable them to develop a sense of pride and purpose, or agency. Training must be linked to sustainable career growth for the youth.
- Skills Development (Technical, Social and Environmental) is critical

Tools for developing and sharing for depth scaling

- The field survey app needs to be improved. It can help give youth a voice as can different platforms for awareness such as radio.
- Use social media more to spread environmental news
- More exchange needed, proper training – not one-day training. Field survey app is a great tool but not user friendly enough due to it being under developed.
- Mobilise the amazing skills within the partners
- Funding (important to have a good track record of good financial management to attract funding).
- Knowledge exchange is key to improve standard of understanding the subject.
- Custodian of science system should be developed. This entails working together to connect science with people (Postgraduates and non-graduates).
- Radio to reach can be very helpful (as used in the KwaMashu community as opposed to only door-to-door surveys)
- Enviro-Champs teams are a mixture of doing, learning and teaching.
- Important to have funding for travel – for seeing new areas and get-togethers and networking
- Important for each Enviro Champ to have an exercise book to write down data and report on their work
- A supportive and enabling M&E framework is crucial

Horizontal scaling



Benefits of horizontal scaling:

- The sense of pride and ownership of the work done on areas cleaned by teams.
- Stipend offered by the partnership.
- Supporting the unemployed.
- Excellent initiative Partnerships with NPO + volunteers
- Partnerships: Collaborative working together
- Existing projects able to scale up.
- New projects initiated.
- Potential of the project even with few numbers involved.
- Continual support on the work that has already started (incentive or not).
- Excellent initiative Partnerships with NPO + volunteers
- Partnerships: Collaborative working together
- Value of more applied research reports and papers
- Increased environmental monitoring + the use of real time data capture tools
- Importance of scaling down (spatially, to intensify localised interventions).

Suggestions for improving horizontal scaling by developing:

- Community dialogue
- Community visits
- A greater area covered. It is important to have local people in the team. They can speak to the Ward Councilors and local community; they also know the context.
- Enviro-Champs offer environmental leadership. This builds on local initiatives and can inspire group.
- Local partnerships, Individuals (passionate strengths), CBOs, NGOs, Business (Know your community)
- In kind contributions (such as time)
- The stakeholders need to think of visual presentation. We need to show off the work carried out for each person so that we can create data for the whole catchment
- Agriculture should be part of the environmental conversation
- Partnerships, working together: we need more stakeholders to join for a bigger group
- All partners big and small are needed
- The value of partnerships with other NGOs and funders was stressed
- Communication and community involvement is key
- The Programme should provide opportunities for local youth. Programmes (government funded or not) need to stop providing jobs but rather provide opportunities and a voice for local youth
- Small initiatives can lead to big partnerships. Strategic partnerships are the future
- The involvement of youth is a good way of investing in managing our water resources. The way things are done can be transferred to the younger generation

Issues and challenges affecting horizontal scaling:

- Delayed funding and implementation on the ground
- Councilor liaison to work in an area.
- Time (limited)
- Projects need to be of longer duration. Three months is too short!
- Internally sourced co-funding is crucial
- Translating volunteering to career opportunity
- Environmental activists (citizens disrupting the process, not believing in it)

Vertical scaling

- Human-centred design approach of DSI: multilevel perspective – niche, regime, landscape is important
- The involvement of local people to enter into the political space is important
- Advocacy is necessary at times
- Politics at a municipal level plays a huge role in inhibiting the development of townships and youth
- Poor service delivery has a direct negative impact on the rivers
- Recognising that processes of a Makhosi and community participation are core to successful implementation
- Projects must involve and partner with local municipalities
- The political space and the mediation of that space is crucial
- The buy-in of politicians will lead to the success or failure of the vertical scaling.

Investment related comments **(needs to be interpreted according to the scaling framework and resource strategy):**

- Tax incentives/rebates for service delivery by private/community/individuals could help a lot
- Community/social investments from the private sector are needed.
- Mechanisms to market the Enviro-Champs concept must be developed so that initiatives get media coverage and therefore attract further CSI funding due to advertising
- Co-funding from government, private industries collaborating together including NPO and volunteers is a good way of working
- Blended finance (at least having multi-partners contributing)
- Blended financing and blended resources i.t.o skills and abilities – each organisation to apply for funding for one ability, i.e. skills development and training and not to have to manage all components. COLLABORATION!
- Projects should align to the SDGs
- These large investor funding programmes enable a return on of social improvement and ecological infrastructure
- This work should be linked to social grants for sustainability
- Public private partnerships can be very helpful
- There is a need to challenge the municipality. It has been noticed that their role has been minimal and it would be good if they chip in and help resolve some of these issues on the streams.
- Better service delivery is key. The collection of waste is crucial
- Need multistakeholder approach to funding not only one source
- Develop relationships with local organisations. Work with existing organisations as catalysts in sourcing and implementing funding for environmental management initiatives
- A strong mixture of co-partners from government, local business, NGOs, local government, SANBI, forestry, farming, industry has enormous potential
- The catchment umbrella of the uMngeni Ecological Infrastructure Partnership (UEIP) helped with the funders being more confident to offer support
- Alien Invasive Clearing requires ongoing follow-up, i.e. replanting where clearing has happened

Challenges

- Short-term contracts, lack of education, community engagement and digital divide
- Financing for project management funding for organisations is often lacking.
- Environmental advocacy fatigue

- Transport of the collected litter to the landfill site
- Lack of understanding by government and funders of the economic benefits of Ecological Infrastructure (EI)
- Solid waste removal
- Administrative volume of handling financial matters, timesheets, reporting issues
- TIME! It takes time to do things right and to do things the right way
- Delay of start – Formalisation of contracts (UIF-COIDA, pay slips) always takes longer than anticipated.
- Partners, including councillors and community members lose hope and commitment.
- The Field Survey App needs technical improvements and must be made more user friendly
- Safety in Water. All participants engaging in catchment rehabilitation need to learn to swim.
- The lack of working tools
- Littering and solid waste dumping
- Lack of employment opportunities
- Gaps in skills
- Planning competence and action competence are often lacking.
- Time for training especially for start-up groups is often inadequate
- Forums give time for talk, but time for implementation may be lacking
- Many years of working plus partnerships may be evident with little implementation
- Lack of critical skills (swimming are first aid) are a threat to health and well-being.
- Transportation of bags of waste is a challenge
- Community resistance to sustainability practices
- Monitoring water quality in coastal estuaries is difficult

As can be seen from the above, the scaling framework was well received by participants as a potential approach to mobilising and scaling CBWQM activity. Participants also had good suggestions on how to further concretise the differentiated concepts of scaling. For example, they had practical suggestions related to the content and focus of the depth scaling work, both in terms of what should be included in capacity building programmes (e.g. swimming lessons for Enviro-Champs and exchange visits) and in terms of the tools that need to be developed, improved and shared (e.g. the Field Survey App). With regard to informing horizontal scaling, participants articulated the benefits as well as ways of improving horizontal scaling and outlined the challenges experienced in the horizontal scaling space.

Suggestions related to vertical scaling re-affirmed the findings of the action-oriented research that there was need to involve all levels of government, as well as traditional leadership.

Challenges relating to scaling overall were articulated. The feedback confirmed the range of challenges identified earlier in the action-oriented scaling interactions with stakeholders in Learning Actions 1, 2 and 3. These relate to technical issues such as delays in contracts and tools in use, as well as social issues such as community resistance. Practical issues such as time for the work, and resourcing issues such as those associated with tools for the practice, as well as reliable, longer term and sustainable streams of funding.

These dynamics are important to understand and report in any scaling initiative. Overall, however, the engagement with the proposed model confirmed the usefulness of a differentiated approach to scaling, and confirmed the importance of depth scaling, as well as horizontal and vertical types of scaling practice. Multiple, complementary funding partnerships were shown to be useful time and time again.

5.4 Testing the resourcing strategy with the Report and Respond approach

For Deliverable 9 of this project, and as reported on in the previous chapter, a Report and Respond instrument (cf. Appendix B) was developed to gather feedback on the questions we were asking about resourcing CBWQM in South Africa. The detailed feedback to the report and respond questions helped synthesise the resourcing strategy, and the whole research process, from Learning Actions 1-7 along the expansive learning cycle used to guide this action-oriented research into the activity of scaling CBWQM praxis in South Africa.

To enable greater feedback on the nine Report and Respond questions these were also tabled at the Amanzi Ethu Nobuntu workshop that was held at uMngeni Valley on 20 April 2021. The research questions were posed to groups of workshop participants who were then able to share their perspectives with the support of a facilitator. The insights gleaned through this process were also fed into this final synthesis report.

Some of the responses to the resourcing strategy are shared in Appendix B, and are summarised here. This demonstrates the value of this kind of tool in an action-oriented research process, especially given current conditions of limited travel and interaction amongst stakeholders. Stakeholders raised the following points that are relevant to a resourcing strategy for scaling CBWQM:

- Resourcing does not involve 'money' only but includes willingness, motivation, organisation, partnerships and the social dynamics of resourcing, and these should be factored in to a resourcing strategy.
- The range of stakeholders involved in resourcing and supporting the scaling of CBWQM should involve actors such as the DBSA and SADC, as well as local authorities and organisations such as tribal authorities and agricultural unions, as well as Water Boards.
- The resourcing strategy should also include those who are struggling with, and are contributing to water quality problems such as the wastewater treatment plants and mines, and those that are responsible for their compliance.
- The resourcing strategy should also differentiate between who is 'obligated' and who is accountable, and indicate the mechanisms that can strengthen accountability of those obligated, and indicate how CBWQM can assist with feeding into the compliance and accountability structures (i.e. it should not be their job to do the work of those who are obligated, but they can facilitate and support towards greater accountability).
- There should also be differentiation between volunteerism and job creation, and further consideration of how and where job creation is needed, and where volunteerism can be mobilised. More sustainable approaches to job creation for those most in need of jobs was recommended, and encouragement of volunteerism also recommended. Both are important in the South African context.
- Some of the difficulties in allocating resources to community organisations were also related to the complexities of the boundaries of the MFMA and SCM legislation. Here there is also a challenge related to the time frames of three years, which creates longer term sustainability challenges.
- There were strong recommendations to integrate CBWQM into existing programmes, rather than setting up new programmes, as this would be less costly and reduce administration, given that programme mechanisms are already in place.
- It was also noted that international organisations are shifting towards 'technical support' to local governments, rather than direct funding.
- For working with municipalities, improved efficiencies are essential.

- Developing viable resourcing strategies should include a mix of activities that involve all, and that seek to find ways of drawing on strengths and contributions of diverse actors while seeking to strengthen equitable partnership arrangements. Detailed suggestions (see Dent, Appendix B) and methods (e.g. use of Participatory Agent Based Social Simulation Modelling) were made to:
    - Derive holistic and trusted methods of estimating monetary value for the individual portions of CBWQM work, carried out by citizens;
    - Derive methods of monitoring the activities of citizens engaged in CBWQM ;
    - Derive methods of rewarding citizens engaged in CBWQM ; and
    - Derive methods of achieving all the above with the lowest possible transaction costs so that most project funding is paid to the citizens engaged in CBWQM, at grassroots level
- Tools and approaches for SDG 17 on partnership building could be mobilised to strengthen collaborative approaches to partnership development.

Stakeholders noted that,

> "Overall, the picture presented above shows that CBWQM in South Africa is an important social-ecological innovation, and could be further developed with a resourcing approach and strategy that gives careful attention to the needs for resourcing across the different dimensions of the CBWQM value chain. Importantly, is the insight that not all of the resourcing is financial, much of the resourcing lies in more invisible dimensions such as relationship building, values such as commitments to open source, knowledge commons approaches and accessible, inclusive approaches. However, these approaches also need financial investments that are more sustainable if the practice is to be scaled in meaningful ways. Thus, care should be taken to develop resourcing proposals and partnerships that maintain the integrity and values of the practice itself. It is essentially a values-based social-ecological innovation proposition" (Dent, Appendix B)

Towards a resourcing strategy

In summary, based on the extensive work on the resourcing strategy development, and the multi-actor dynamic of CBWQM, as well as the different dimensions of the scaling strategy outlined above, the following key pointers are offered towards a resourcing strategy:

- Resourcing needs should be differentiated along the different dimensions of the CBWQM value chain.
- Funders who are suited to different dimensions of the value chain should be engaged
    - State funders should be approached for job creation opportunities – e.g. the Presidential Employment Stimulus Programme / DSI / DWA);
    - Corporate social investment and research funders should be approached for partnership-based innovations in tools and capacity development (depth scaling) and network building interactions, etc.
- At catchment level, a Public-Private-Partnership model is recommended that mobilises 'blended funding model' that integrates with local and provincial governance and associated funding structures, with national state and CSI/research funding offering foundational funding to leverage local funding to support expansive learning and activity support as well as value adding to the CBWQM process at local levels.
- International donor funding can be sought in partnership with state funding to advance the scaling of CBWQM overall, and to catalyse the above resourcing system at national scale and across multiple catchments.
- Care should be taken to recognize that not all resourcing in the system of CBWQM is monetary, and this should be accounted for in a resourcing strategy and approach (e.g. voluntary time and services are not 'value free').

5.5 Other inputs from groups informing the action-oriented research process on the activity of scaling CBWQM in ways that can address the central contradiction

In addition to the above insights generated in the testing of the model solutions for Learning Action in the action-oriented research process, other useful inputs emerged from the Amanzi Ethu Indaba on:

Policy Leverage Points and Multi-Partner engagements

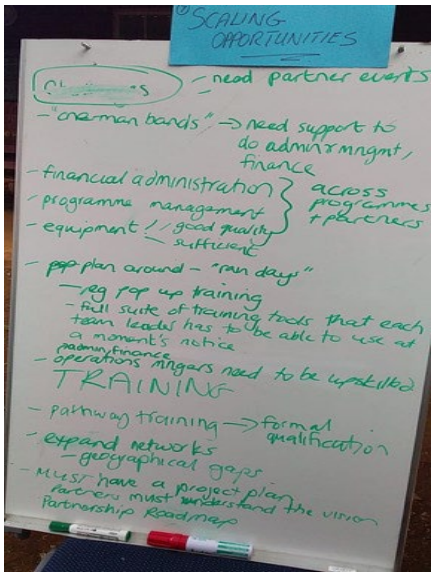
Responding to the question: Are there any significant policy leverage points that we should be giving attention to for the funding of CBWQM practices in South Africa?, participants indicated,

- Polluter pays principle
- Extended producer responsibility
- Circular economy policies and Just Transitions
- CMA Implementation Plans
- State of the Rivers reporting (where it occurs)
- National Water Act and associated legislation
- Water Services Act
- National Water Resources Strategy
- IWQM Policy and Strategy
- South African Constitution

In relation to the multi-partner nature of CBWQM praxis, it was noted that policy must be linked with development planning and approvals processes, and that there should be policy related rewards – in the form of capacity building or educational aspects for example that could advance learning pathways and career development. There is also need to develop a better understanding of the *type of work* that is involved, in other words it is not just a 'technical job' but a form of social employment or social-ecological employment that has wider value to society and the environment, beyond individual employment benefits. This should be appreciated by all concerned, and such a concept of work for the common good can be promoted via CBWQM. Ultimately, the disconnect between policy and work on the ground needs to be bridged.

Scaling Opportunities

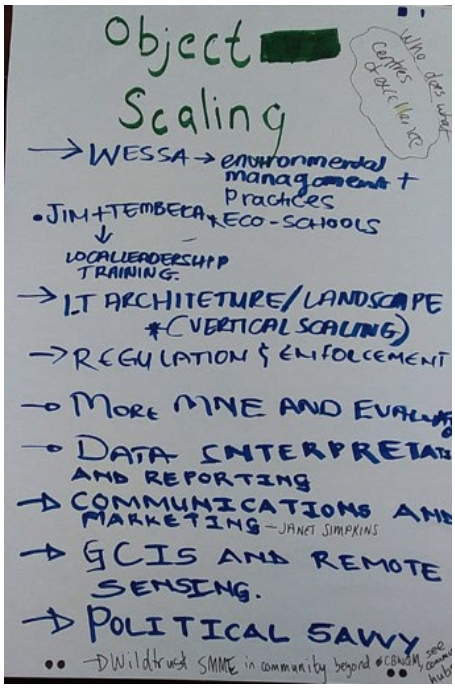
Insights here included the need to create partner events, and give more attention to the support needed for CBWQM groups in areas of administration, finance, and management. Financial management and programme management were particularly areas where depth scaling activities could better support the CBWQM community of practice, and should also be considered as part of the capacity building process. With regard to capacity building, it was noted that a full suite of training tools should be developed that each team leader could access and use at a moment's notice in the field (the proposal for 'pop up training' captures this interest). It was noted that operational managers need to be upskilled. The importance of enabling pathway training that could lead to a formal qualification was emphasised again. Equipment was another item noted that should receive attention, particularly good quality and sufficient equipment for WQM practice. Proposals were also made for expanding networks and addressing geographical gaps.

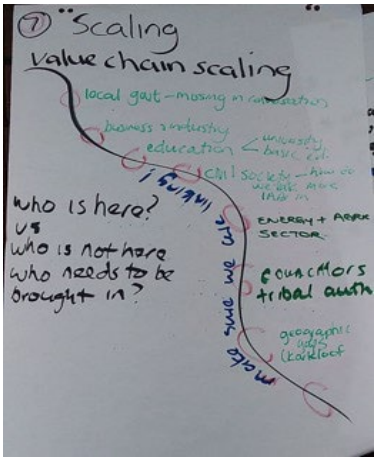


It was noted that a partnership plan was an important tool that could help partners understand the vision, and that a partnership roadmap could be developed amongst the partners to facilitate scaling of CBWQM praxis.

Object scaling

A discussion on object scaling focused in on who does what in expanding the shared object of scaling CBWQM praxis. Here it was noted that different groups could contribute differently to the scaling of the object. For example, WESSA had capacity for strengthening environmental management practices and could reach the schools through the Eco-Schools programme. Jim Taylor and Tembeka Dambuza (DUCT) had experience in working with traditional leaders, and could therefore help to engage traditional leaders in the scaling processes. IT Architectures, on the other hand, had expertise in dealing with regulations and enforcement, and could facilitate vertical scaling with policy structures, while other stakeholders could facilitate communications and marketing work. Others could offer GIS support and remote sensing, monitoring and evaluation and data interpretation and reporting activities. As indicated in the scaling model, this would facilitate scaling practices along the CBWQM value chain and offered the start of a strategic identification of relevant stakeholders who could best contribute to the different types of activities that needed support along the CBWQM value chain. All these would ultimately be necessary for object scaling and achieving the desired ends or outcomes of the activity of scaling CBWQM praxis.





The CBWQM value chain scaling

Participants also engaged in discussions on CBWQM value chain scaling. The value chain was identified as involving local government, business and industry, education (universities and basic education), civil society, the energy, water and agriculture sectors as well as human settlements, councilors and traditional authorities (i.e. governance structures), and the full scope of geographical areas in a particular catchment. The point was made that there was a need to ensure that all these partners along the CBWQM value chain were linked and working together. This raised the important question as to who is there, and who is NOT there, and who needed to be brought in to ensure a 'joined up scaling praxis'.

Other suggestions included:

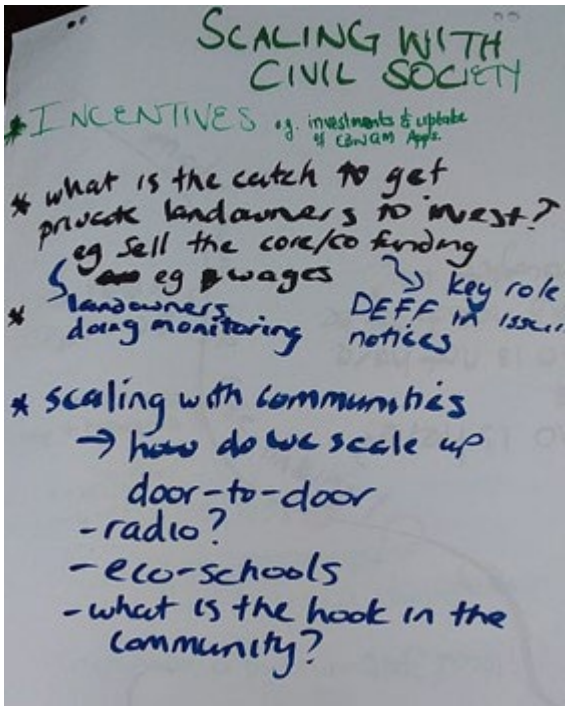
1. Capacity building for both people involved and community affected.
2. Visibility to attract funding is important. To achieve this, the groups felt the programme needs to be packaged in clearly defined work packages or approaches (outlined below). The programme needs to be formalised through defining the goal, vision, objectives and outcomes.

   – define all necessary tools and technology to achieve the main objectives of the programme.

– human resource requirements, for example, management with different levels and structures)
– training and support (systems and content)
– reporting, monitoring and evaluation
– financial management
– collaboration with partners and networking
– lessons/reflective learning.

3. Quantify the value or benefits of the services
4. Lead champions in each institutions/ institutionalise the programme
5. Communication with all stakeholders
6. Build evidence based for policy formulation
7. Development of appropriate water resource management institutions
8. Make it simple!!!
9. Activities must be sufficiently financed
10. Identify network of expertise around the project site, for example, laboratory for testing water
11. Involve all levels of government
12. Involve local businesses to access funding (Corporate Social Investment)
13. Develop initiative(s) with the communities/ community engagement (solution driven/community driven)
14. Grow youth learning and career paths
15. Integrate CBWQM in the basic education curriculum
16. Public-private partnership

Scaling with civil society



Given the important central role of civil society in CBWQM, further discussion ensued as to how to scale with civil society, and what needed to be done to ensure sustained participation of civil society in CBWQM scaling praxis. Here, it was noted that incentives were important to engage communities and civil society in CBWQM praxis – this was not always monetary and could take different forms. A discussion also ensued on how to get private landowners involved, and suggestions were made for involving landowners in monitoring practice. Scaling *with* communities was also discussed, in terms of practical strategies such as door-to-door approaches, and use of radio, Eco-Schools, etc. Again, it was noted that attention should be given to the interests of communities and what would engage them in the scaling of CBWQM praxis.

From the above, it is clear that there has been much engagement in the conceptual model solution that was put forward for the activity of scaling CBWQM praxis amongst stakeholders involved in the praxis. This confirmed the usefulness of the model for developing more strategic approaches to scaling CBWQM praxis. Combined with the feedback on the draft resourcing strategy that is emerging from the responses to the 'Report and Respond' process, a consolidated approach for scaling of CBWQM in South Africa has emerged. This will be taken further into ongoing and related research and field-based practice spaces.

CHAPTER 6: SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

This final chapter of the action-oriented research into the scaling of CBWQM praxis in South Africa, consolidates the key findings and recommendations of the programme (section 6.1). Via this, it offers further guidance for strategy and action planning for scaling of CBWQM praxis, and shows how this research can be used for a resourcing strategy in support of resource mobilisation for scaling CBWQM. Additionally, the chapter also points to recommendations for further research that can potentially advance scaling of CBWQM beyond, and arising out of this study (section 6.2). In effect therefore, section 6.1 makes recommendations that can immediately advance the scaling of CBWQM practice, and recommendations that can further advance insight into this practice (section 6.2), thus furthering the in-depth, theoretically informed and engaged expansive learning / action-oriented research approach developed via this study.

As can be seen from the report, the key findings and recommendations of this study have been generated through an iterative and grounded action-oriented approach to scaling of CBWQM practice in which stakeholders in the CBWQM practice system have been consulted via a number of in-depth engagements across the action-oriented research process. Figure 41 offers a summative view of the design of the action-oriented approach to CBWQM scaling adopted in this research and includes a summative view of dynamics for systemic change that have emerged from the process.

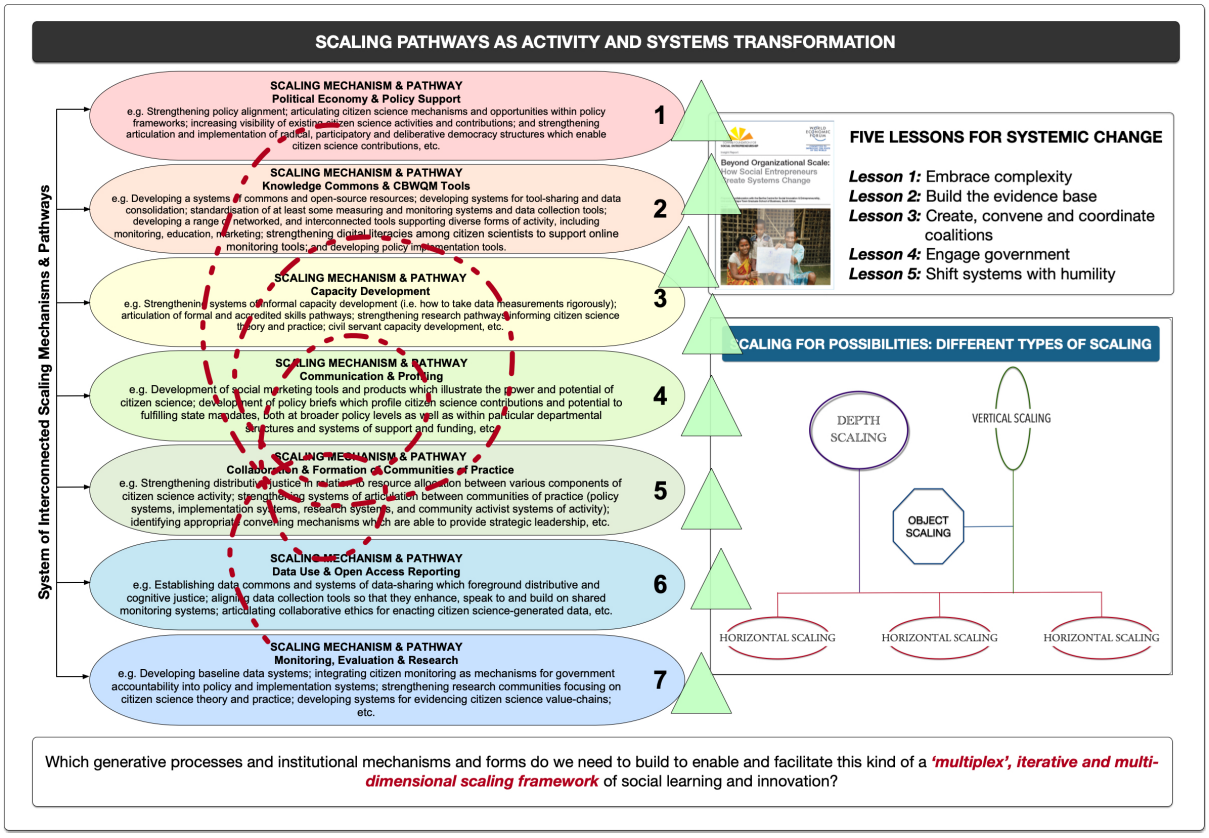


Figure 41: Summative view of the design of the iterative action-oriented approach to CBWQM scaling that appears to be most useful and relevant for the scaling of CBWQM in South Africa

6.1 Main Findings and Overall Recommendations:

.1.1 Main finding and overarching key recommendations

Main Finding 1 (over-arching finding): CBWQM practice is hampered by an IWQM policy-practice contradiction that must and can potentially be reconciled with a multi-actor scaling approach along scaling pathways, with a coordinating mechanism supported in the shorter to medium term

This research has revealed that CBWQM practice in South Africa, and its potential contribution to substantive monitoring of water quality in support of greater efficacy of IWQM in South Africa, is essentially hampered by an IWQM policy-practice contradiction. This contradiction arises in the 2017 Integrated Water Quality Management (IWQM) Policy (DWS, 2017a), Strategy (DWS, 2017b) and Implementation Plan (DWS, 2017c) which describe an integrated, inclusive and adaptive approach to IWQM. Despite this policy commitment to include citizens in IWQM via CBWQM approaches, CBWQM practice is poorly supported, and is largely fragmented into small communities of practice that lack sustainable resourcing and support. This contradiction is further exacerbated by a contradiction between the IWQM policy, strategy and implementation plan (DWS 2017a, b, c) and the National Water and Sanitation Master Plan (NWSMP) (DWS, 2018) issued by the same government department which in essence, fails to take account of citizen engagement in water quality management in South Africa.

The study has uncovered a serious policy-practice contradiction that exists between (non) execution of CBWQM imperatives within existing IWQM policy implementation practices, while, at the same time, there is a dire need for community involvement in a multi-actor and inclusive approach to IWQM. Furthermore, there is contradiction on this front between water management policies in the government department responsible for water quality management in South Africa, a situation which exacerbates the main policy-practice contradiction identified in IWQM policy.

NOTE: While the focus in this study has mainly been on the IWQM policy (as per the brief and ToR), CBWQM should also be considered as an important enabler of the NWSMP and the National Water Resource Strategy (NWRS2) (as articulated by Munnik et al., (2011) and Wilson et al. (2016) in earlier WRC research projects. Thus CBWQM should not just be limited to the IWQM policy context, but should be seen more broadly in relation to South Africa's water policy system overall. As argued in the policy chapter in this study, CBWQM is also integral to SDG 6, and to the intentions of the National Development Plan (NPC, 2011).

As pointed out in this research, this policy-practice contradiction can be resolved through the scaling of CBWQM with adequate support, and if implemented via an expansive learning approach that supports engagement and a diversity of contributions along the CBWQM value chain.

Importantly, in Strategic Issues 4, 10, and 11 of the IWQM Strategy (DWS, 2017b), the Department of Water Affairs [now DWS], with the Department of Environmental Affairs [now DFFE], Catchment Management Agencies (CMAs) and the Water Research Commission (WRC) are tasked to:

1. Develop an engagement framework that enables more active participation of civil society at transboundary, national and catchment level
2. **Develop co-governance mechanisms and systems which lead to the development of a programme to create and support citizen-based water quality monitoring programmes**
3. Expand capacity building initiatives to civil society and the private sector, and

4. Develop online tools for easy access to water quality and water quality management information, and to lead and roll out awareness creation campaigns.

The recommendations emerging from this scaling research provide guidelines on how to

- Develop and support an engagement framework that enables more active participation of civil society at transboundary, national and catchment level;
- Develop a networked programme that can create and support CBWQM activity;
- Expand capacity building initiatives to civil society and the private sector; and
- Inform further development of CBWQM tools that can contribute to easy access to IWQM information.

The research is therefore relevant to the IWQM policy mandates of the DWS, DFFE, CMAs and the Water Research Commission.

RECOMMENDATION 1: **Organise a policy dialogue** (with follow through actions) **to carefully consider this research and its outcomes in relation to the IWQM policy mandate for strengthening CBWQM practice and citizen engagement**

- The DWS, DFFE, CMAs, DPME and the WRC should consider the recommendations of this research project in order to address their mandate(s) to advance CBWQM practice in South Africa in support of improved IWQM, and the NWSMP and other water policy such as the NWRS2, noting that the NWRS3 is in development.
- To this end, the WRC is well placed to, and should ideally, convene a policy dialogue with these stakeholders to engage with the findings and recommendations of this research.
- The research team should also consolidate the key findings into a series of policy briefs and dialogues for consideration in such a policy dialogue event, and for integration into emerging water policy and strategy such as the emerging NWRS3.

As can be seen across this report, CBWQM is a multi-stakeholder led activity, and the research and scaling approaches investigated all point to **a multi-stakeholder approach** that should be engaged **along the CBWQM value chain** and **involve different types of activity systems and stakeholders that can best contribute in particular ways to scaling of CBWQM practice** (see Figure 42 that follows). This will require **a learning network, association or similar co-ordinating structure to facilitate this co-engagement within and across activity systems**.

The ***Amanzi Ethu*** learning network that was established during this research, and that also led the research on behalf of and with inputs of all stakeholders, is well placed to carry this work forward, but should expand its reach beyond the current KwaZulu-Natal focused implementation platform. This will require additional support for the *Amanzi Ethu* activities in support of scaling CBWQM practice.

NOTE: To this end, a proposal was developed and submitted by the research team working on this research report. The proposal for national scaling of the Amanzi Ethu programme was discussed with the DSI and the PES, and was submitted to the Presidential Employment Stimulus (PES) Programme and the Department of Water and Sanitation (see Appendix C) out of this research and the Amanzi Ethu Phase 1 pilot (see Appendix C). This was submitted to the PES in late 2021, and a Phase 2 has since been funded to the value of R25M, but only for a short period of six months. **Thus, longer term sustainability is still needing attention.** The

Department of Science and Innovation have allocated funding for a national dialogue, and it is recommended that this dialogue be aligned with the WRC research outputs and aligned with recommendation 1 above.

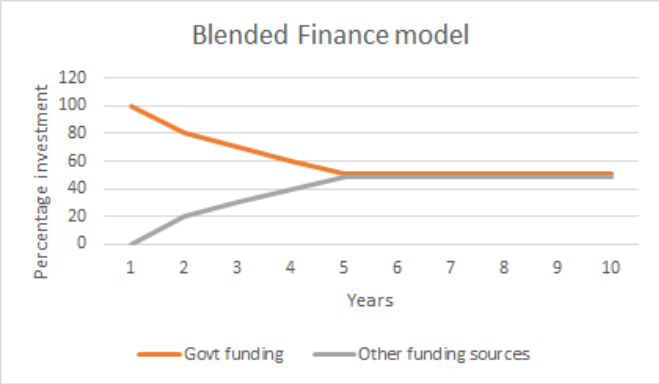
Figure 42: The need to move beyond stakeholder-based activity systems (as outlined above) to clusters of stakeholders who share a key role or task in the CBWQM value chain in the expansive learning design for scaling CBWQM; with an organizing entity or learning network that can facilitate a blended financing approach to CBWQM resourcing

Figure 43 below, expands this model into an organizational / operational conceptual framework that proposes development of nodes with an ***Amanzi Ethu learning network and NPO holding entity*** that can support the development of a blended finance model for CBWQM in all nodes, while also drawing on state funding for national level scaling and employment creation. The conceptual framework also demonstrates the following important dynamics of making such a model work:

1) Conceptualising ***work as 'work for the common good' with a strong capacity building / learning approach that involves 'learning for the future'***. The learning programme should include CBWQM training (use of tools and practices) but also capacity building for life skills and enterprise development skills. Further research is needed to embed such a learning programme in the national system of skills development. This model should include ICT-based innovations including mobile learning and

application tools development so that learning can be delivered in a blended model of online and offline / mobile learning. In the proposal sent to the PES, we noted that 'Work for the Common Good' within this model can be extended into other areas relevant to water quality management in South Africa, notably Work for the River Commons, Work for the Biodiversity Commons, etc. Given the challenges of water for food (outlined in the Amanzi for Food research report, Lotz-Sisitka et al., 2021) at community and household levels, such a programme can also be extended to Work for the Food Commons (see Appendix C). Innovations around water quality monitoring of household water can also be developed.

2) A ***blended finance model*** that will work for CBWQM praxis. In the proposal to the PES (see Appendix C), we have proposed a Community-Public-Private-Partnership (CPPP) approach with a goal of 50-50 funding from the outset, with 50% funding from government and 50% funding from other sources.



Government investment is to be focussed on contributing to core government mandates in terms of the management and protection of our natural resources, as well as basic services delivery. However, it comes with performance incentives attached, that require investment from other sources, most notably the private sector. This needs to happen in a phased approach, with the government providing the set up and planning costs to shift an existing partnership in a catchment into the blended finance model.

Our proposal (see Appendix C) is that in year two, the requirement will be for there to be 20% other sources of co-funding – this includes co-funding in non-monetary forms as a recognition of the huge investment that communities/NGOs and other groups that are implementing on-the-ground. Each year, the balance of investment should shift so that within 5 years there is a 50-50 relationship. This is a tight time frame, but is viewed as possible if the programme is set up with the right support systems at a national level, and that catchments are only brought on board when they are ready to mobilise (also see further recommendations for resourcing strategy below).

Figure 43: A conceptual model for CBWQM operational implementation at scale that takes recommendations of depth scaling, breadth and horizontal scaling, as well as vertical scaling into account. It also seeks to take financial sustainability and governance WITH the people into account, as recommended across this report (see Appendix C).

RECOMMENDATION 2: **Adopt and support a multi-stakeholder approach to CBWQM scaling, but support an interim structure to support initial mobilisation of the scaling strategy (e.g. Amanzi Ethu learning network, and Amanzi Ethu NPO holding entity)**

The scaling pathway recommendations below reflect the work that needs to be done via a differentiated expansive learning and resourcing approach conceptualised along, as well as between different scaling pathways outlined in Figure 7, involving different activity systems within such a structure or network.

6.1.2 Scaling Pathway: Political Economy and Policy Support

Main finding 2: There is need for policy advancement and implementation of CBWQM at organisational level in ways that also create jobs and learning pathways for youth

As reported across this study, there have been some large scale government supported CBWQM projects, especially the 'Adopt-a-River' programme that was supported by the DWA and the CSIR. These were aimed at supporting IWQM policy and practice, and enabling community participation in river quality monitoring. However, this initiative has not been systematically sustained.

As reported on above, there are also progressive policy frameworks that support IWQM and CBWQM as an associated practice, from the Constitution, through to the NDP to local government level policies, and the most recently adopted SDG framework. However, as reported on across our reports in this project, there remains a big gap between policy intentions in this area and policy implementation.

As reported in Chapter 2, there is a need to more strategically align CBWQM practice with the intentions of the Constitution, the NDP, NWA, the IWQM policy framework and the role and responsibility of the DPME who have a framework in place for supporting community-based monitoring programmes and contributions, but which is inadequately mobilised and utilised. This scaling research has pointed out clearly how CBWQM as a practice in South African society can be scaled in the interests of policy implementation in the context of the IWQM, as well as wider policy priorities such as the NDP and the SDGs, and at local government levels the IDPs and priorities for enhancing service delivery.

The Amanzi Ethu case study has shown the CBWQM is a viable Green Jobs / Groen Sebenza / Work for the Common Good option and can create much needed jobs and, at the same time, facilitate improved monitoring and management of South Africa's water resources while also building capacity. Combining this job creation approach with a skills development programme and learning pathways for youth can also facilitate viable options for unemployed youth, and contribute to much needed youth development in the country. This should be considered seriously by government within a longer-term framework (i.e. not simply short term options for jobs because it takes considerable effort to set up the infrastructure and mechanisms for the practice, and it should therefore be sustained). Hence in the Concept proposal submitted, we include a strong focus on 'Work for the Common Good and Learn for the Future', with innovations proposed for the learning programme associated with the work programme (see Appendix C).

The key action that is needed is to unlock a substantive commitment from government for enabling and supporting CBWQM and integrating it more sustainably into national, provincial and local government action plans and partnership structures, practices and budgets in service of national, provincial and local policy implementation imperatives for improving water quality management and monitoring in South Africa. The COVID-19 pandemic and the need for clean water for health reasons is but one reason for this imperative. Longer term and a more sustainable supply of clean water for all is another strong reason. Maintaining the ecological infrastructure necessary for health, well-being and sustainability of South Africa's society and economy is the over-arching reason and responsibility of government, according to the South African Constitution.

RECOMMENDATION 3: **Undertake a strong drive to meaningfully integrate CBWQM practice into government budgets at all levels for longer term sustainability, especially to support local CBWQM practices in all of South Africa's communities where water quality requires monitoring and regular reporting data for IWQM. As shown in the IRIS data, this appears to be a national priority given the problems being experienced with IWQM across the country in almost all municipalities. Consider this seriously as a Groen Sebenza / Working for EI4WS, conceptualized as 'Work for the Common Good and Learn for the Future' (see Appendix C) option in South Africa to create jobs and capacity building opportunities for youth.**

6.3 Scaling Pathway: Support Knowledge Commons to CBWQM Tools Development and Use

Main finding 3: There are a number of CBWQM tools that have been developed and that can be used for CBWQM praxis. There is need for more substantive research on the scope of impact of these tools, as well as need for ongoing research and innovation in CBWQM tools, especially use of ICTs to enhance CBWQM praxis.

Research into, and the development of, citizen science tools for CBWQM is ongoing and over recent years we have witnessed many exciting advancements in this field. For example, in 2020 the C40s Cities Finance Facility (CFF) funded the development of a toolkit for the transformative riverine management of eThekwini's rivers. A key component of this toolkit is a set of socio-ecological tools that have citizen science as their key underpinning. Another key example of research and the development of tools for CBWQM was the WRC-funded project for the development of 10 citizen science tools which researched the potential for citizen science to effect meaningful change in water resource management (Graham & Taylor, 2018). The core focus of the project was to find and develop appropriate "citizen science tools, interventions and social processes so as to better respond to the challenges around water resources…" (Graham & Taylor 2018). The following tools were developed by the project:

- Aquatic biomonitoring tools
- Riparian health audit
- Water clarity tube
- Transparent velocity head rod (Velocity plank)
- Wetland assessment tool
- Estuary tool
- Spring tool
- Weather monitoring tools
- School lesson plans
- Enviro Picture Building game to investigate catchment issues

This work has been published, ensuring the insights gained and tools developed through this research can be widely shared. Many of these tools are used as part of CBWQM programmes across South Africa and are contributing to the improved management of our water resources. Interest in the work undertaken as part of this project gave rise to the scaling idea and prompted this current project.

Key to developing useful and user-friendly citizen science tools is information sharing and knowledge exchange. A number of events have been held over recent years to bring together those interested in citizen science and facilitate the exchange of information so that all can learn and contribute towards innovation and the advancement of citizen science. One such event was the second **A**frican **FRE**shwater work**SH**op (AFRESH2), held in 2020 and funded by AfriAlliance, where participants from six countries – Italy, Lesotho, Madagascar, Mauritius, South Africa, and Tanzania – came together to exchange ideas on, and experiences with, the use of citizen science in water quality monitoring. This workshop also introduced citizen science tools for water quality monitoring and provided participants with practical experience using these. Additionally, this workshop facilitated discussion around the scaling of citizen science tools and applying these in context-specific situations.

Given the dire condition of water quality in South Africa, as indicated in the IRIS database (shared in Chapter 2 above), we also felt it was necessary to assess the **current capability of CBWQM tools to contribute to achieving SDG Targets 6.3 and 6.b, in other words to assess their capability to assist government,**

especially local governments with their water quality monitoring mandates. This, as shown across the report, can be done with citizen support and partnership.

As noted in Chapter 2, in particular, there is a crisis around South Africa's wastewater treatment works (WTWWs), which are in a dire state with approximately 56% of the country's treatment plants in a poor or critical condition and 75% of the municipality-run WWTWs achieving less than 50% compliance to minimum effluent standards in 2020 (Kretzmann et al., 2021). This is of major concern as discharging non-compliant effluent into aquatic ecosystems will contaminate water resources, posing risks to maintaining sustainable ecological infrastructure for water security, the aquatic ecosystem and human health. Although it is evidently crucial that effluent be monitored to ensure compliance with discharge standards, our research revealed that many municipalities lack the capacity to undertake this monitoring – as is also shown in the IRIS data – and there is therefore great potential for CBWQM tools to be deployed to support municipalities and national monitoring of compliance with General Limit Values (GLVs) and Special Limit Values (SLVs) for wastewater discharges into water resources as stipulated in the NWA, Government Gazette No. 20526 of 1999.

During the WRC project "Development of Citizen Science Water Resource Monitoring Tools and Communities of Practice for South Africa, Africa and the World" (Report no. K2/2350), a suite of CBWQM tools were developed. As part of this project these tools were reviewed to assess their current capability for contributing meaningfully to the four types of monitoring undertaken for WWTWs, namely **1) microbiological, 2) chemical, 3) physical, and 4) operational**, which are the categories that are used by municipalities to monitor water quality, as indicated in the IRIS database. This review revealed the following key findings:

- CBWQM tools generally are not suitable for the monitoring of more complex aspects of water quality, namely microbiological and chemical determinants. Therefore, building relationships between CBWQM groups and relevant laboratories with capacity for this kind of water quality testing is needed.
- A clear link between microbiological, chemical and physical water quality exists, i.e. where issues are noted with the physical quality of the water, issues with the microbiological and chemical quality may also exist (Power & Nagey, 1999; Mann et al., 2007). Therefore, while the CBQWM tools assessed may not be able to provide direct measures of microbiological and chemical water quality, they can provide measures of certain physical water quality parameters and thus allow for conclusions relating to microbiological and chemical water quality to be drawn.
- **Of the suite of CBWQM tools assessed, the miniSASS tool, clarity tube and the Transparent Velocity Head Rod (TVHR) showed the greatest potential for use in monitoring the performance of WWTWs.**
- The **miniSASS tool** allows for the health of aquatic ecosystems to be measured. Assessing the aquatic ecosystem health upstream and downstream of where effluent discharges into a river can allow for the impacts of that effluent on the health of the aquatic ecosystem to be assessed.
- Although WWTWs do not have discharge limits for clarity or turbidity, they do have limits for Total Suspended Solids (TSS). Using data collected at the Howick WWTW, GroundTruth conducted various analyses and identified relationships between water clarity and turbidity, and between turbidity and Total Suspended Solids, ultimately developing a mathematical formula that can be used to convert a clarity tube reading to a measure of TSSs. **The clarity**

tube can therefore be used as a tool to assess whether WWTW effluent is complaint with TSS limits as defined by a WWTW's GLVS or SLVs.

- The **TVHR** is a simple tool that can be used to measure the velocity and discharge of a stream or river. **The TVHR has the potential to answer the following questions: How much sewage is entering a river? What is the dilution potential of the receiving environment? How severe is the contribution or problem?**

As reported in Chapter 6, the Amanzi Ethu Phase 1 programme also beta tested a mobile app for CBWQM praxis which showed good outcomes in terms of monitoring data that can be collated and interpreted for reporting. It was noted that further improvements to the App could include aspects such as follow up on water leak reporting. The App can also include tools for social dimensions, as most of the data is environmental-technical in nature. These improvements are being considered in the Phase 2 programme. Additionally it has been identified that further training and support is needed for collating and interpreting the data in a timely manner so that it can be used to best effect.

RECOMMENDATION 4: **Improve and expand use of existing CBWQM tools to advance water quality monitoring practices in local government settings, especially WWTW monitoring for SDG Target 6.3 and 6.b.**
Specifically:

- CBWQM tools have potential to show not only how WWTWs are performing, but also their impact on the environments into which they discharge. These tools are, however, not currently being used to their full potential. The current WWTW crisis in South Africa can act as a leverage point for the activity of scaling of praxis.
- Great potential exists for mobilising CBWQM groups and utilising CBWQM tools to monitor WWTW effluent. Encouraging citizen participation in monitoring effluent empowers communities to take ownership of water and sanitation management, and holds municipalities accountable thus creating meaningful involvement by communities and assisting government in achieving Target 6.3 of SDG 6, which is to "by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally" and Target 6.b which is to "support and strengthen the participation of local communities in improving water and sanitation management".
- The specific potential of the CBWQM tools should be discussed in the policy dialogue under Recommendation 1.

RECOMMENDATION 5: **Expand citizen science tools development (including ICT-based innovations) as well as support systems for their use, in ways that also include capacity development**

Ongoing investment is needed in both the development, trialling and testing of new citizen science tools for water quality monitoring, as well as investment into the uptake and use of the citizen science tools. This latter need is closely linked to capacity building needs (see below). It is also necessary to invest time and resources in open data platforms, tools and resources that can be widely shared and easily produced in sites across the country. The miniSASS is a good example of a citizen science tool that was easily produced (low cost) and shared; it is a good example of how citizen science tools that are accessible can easily support scaling of a CBWQM practice. The website platform that was developed within the earlier research needs to be expanded and set up within a more sustainable hosting and management platform as a key dimension of supporting uptake and use of the tools. This requires resources – monetary, but also institutional and skills-based resources. More sustainable partnerships with a network of research institutions who are engaging in water quality monitoring and

management socio-technical innovations are also needed in support of social and technical innovation for CBWQM praxis. There is also substantive potential in sharing tools and CBWQM results using ICTs which is an emerging tendency in CS tools development; substantive support for such development and hosting processes is required.

6.4 Scaling Pathway – Capacity building

Main finding 4: There are a number of capacity building programmes emerging or on offer that can strengthen basic skills in CBWQM. These are, however, not well conceptualised as meaningful green skills learning pathways within the national system of skills development or accreditation. Thus, both synthesis research, as well as research and development of such learning pathways for youth are necessary, especially in the context of youth unemployment and new forms of work.

Over the last few years a number of programmes that focus on capacity building of citizen scientists in relation to water quality monitoring have been implemented throughout South Africa. A key example is the Mpophomeni Enviro-Champs, with the concept of 'Enviro-Champs' as young leaders in the field of CBWQM catching on and providing a model of capacity building across the country.

Throughout South Africa, and indeed in many countries across the world, CBWQM projects and programmes are successfully being implemented. For example, the Western Cape Change Project is being implemented by the Franschhoek Conservation Trust in collaboration with the Valley Schools Committee. Through this project a number of schools, both primary and high schools, are working together with the Conservation Trust to conduct water quality monitoring in an important water supply catchment. Another example of a project currently underway is the Lake Rukwa Change Project. This project involves a partnership between Lake Rukwa Basin Water Board and a number of secondary schools and centres to provide training to learners on the application of citizen science tools, including the velocity plank, clarity tube, and TARISSfupi (Tanzania River Scoring System). As part of this project, a number of biomonitoring protocols have been set up at stations in inflowing rivers around Lake Rukwa.

Opportunities currently opening up with regard to capacity building for CBWQM include the Amanzi Ethu Nobuntu Programme (see case study above) and the Adopt-a-River Capacity Building programme. As indicated in the Amanzi Ethu case study, 300+ young people and community members were supported to learn CBWQM practice as well as other skills. The Adopt-a-River programme is being funded by the DWS and will focus on providing training to approximately 25 personnel from nine provinces in South Africa. The objective of this programme is to provide training for the capacity building of citizen scientists in the context of the Adopt-a-River (AaR) programme, and to build sustainable and meaningful implementation, and assessment of citizen science. The course will specifically focus on empowering and upskilling personnel/specialists to:

1. Use citizen science tools
2. Accurately upload assessment results
3. Analyse, interpret and report citizen science assessment results
4. Implement and maintain a volunteer-centred programme
5. Source and obtain citizen science guides and material to enable river/stream monitoring in the field
6. Promote partnerships and volunteer actions that will facilitate the fulfilment of the Departmental mission of provision of sustainable water resources
7. Approach funders and compile a business case
8. Implement a change project
9. Evaluate and reflect on what was learnt during the change project

The opportunities currently opening up for capacity building for CBWQM pave the way for future capacity programmes and assist in identifying potential partnerships and funders.

Rhodes University with funding from the Tsitsa project (DFFE Environmental Programmes Branch) are also running a Training of Trainers capacity building course for environmental monitors and this programme is expanding with funding from the EWSETA. The citizen science tools and approaches need to be more explicitly integrated into these training and capacity building initiatives. There is also potential for the catchments website developed by the citizen science community to become an online course that can be offered data-free for use on cell phones – this model has been developed and is being tested by Rhodes University in the WRC funded Amanzi for Food programme. Additionally, WRC and Rhodes University are also launching an ecological infrastructure for a water security participatory course based on the Rhodes University / SADC / WESSA Change Project model and the lessons learned from the Amanzi for Food courses and the AWARD / Rhodes University Changing Practice courses for the water sector in which CBWQM is a key activity. These courses are applied, changing practice courses and therefore build local communities of practice and can support depth scaling as recommended in this report.

RECOMMENDATION 6: **Identify existing and emerging courses and course development systems that can strengthen capacity building for CBWQM in partnership with local governments and multi-actor groups. Work with training institutions, the WRC EI4WS programme, the SETA system, as well as the Groen Sebenza / Working for institutional framework to develop and support an intensive capacity building process or course over a period of 3-5 years for depth scaling, use of CBWQM tools, and development of the CBWQM community of practice at national level. Include more communities, rivers, and local governments than are currently involved. Key to this is to develop accreditation and institutional frameworks for meaningful learning pathways for young people.**

As indicated in Recommendation 2, this study also recommends the formation of a strong learning network for CBWQM communities of practice to facilitate collaborative depth scaling activities such as shared intellectual property and tools development, as well as shared national training programmes that can strengthen a range of diverse communities of practice implementing CBWQM praxis. These are all opportunities for partnership building with the private sector, universities and research institutes, and government capacity building institutional structures such as the EWSETA who have resources for capacity building. Research is needed to better couple the capacity building with both the short and longer terms of CBWQM and IWQM praxis, and to connect the capacity building to meaningful green skills learning pathways for youth, especially to explore meaningful accreditation frameworks for such training. In the PES Phase 2 proposal (Appendix C) we have proposed a 'Work for the Common Good and Learn for the Future' learning programme as a site of innovation which requires further research and development praxis.

6.5 Scaling Pathway: CBWQM implementation practice: Monitoring and reporting practice (reporting at different levels) AND communications and profiling

Main finding 5: Monitoring and reporting in CBWQM praxis is showing interesting advances, especially from the point of view of using ICTs. This needs to be expanded and more systemically supported with a sustainability orientation. There is especially need to strengthen the link between monitoring, reporting, and use of monitoring data via communications and capacity building.

The scaling research has revealed a number of important dimensions of CBWQM monitoring and reporting practice. As indicated above, the monitoring and reporting practice is also a point of innovation in the CBWQM community, especially when adequate investments are made in tools development, uptake and use, and building local communities of practice that can work together on monitoring and reporting practices. Here, there have been a number of innovations in the South African CBWQM community that have drawn not only national but international attention – particularly the innovations that have led to the ability to gather data with citizen science tools and collate this data through shared platforms such as miniSASS, Matuba and Google Earth mapping. This has motivated CBWQM participants and significantly enhanced their impact on water quality monitoring. These approaches also make CBWQM practice more visible to decision makers and the wider community. These are important innovations as they are progressively using ICTs in ways that are accessible to local communities at grassroots level. They also fulfil the important dimension of CBWQM practice, which is to ensure that the data that is generated by community monitoring practices are available for decision-making in short time spans, and that the data can be collated and synthesised in formats that are easy to interpret and use for immediate decision-making. This is important because CBWQM practices are often needed when water pollution levels are high, and when there is need for immediate action. The heatmap image (Figures 44 and 45 below) shows the use of this kind of monitoring and reporting technology for rapid reporting that can enhance rapid decision making and response capabilities.

Figure 44: Heatmap illustrating the use of citizen science approaches to monitoring which fascinates rapid response. This mapping process allows the identification of "Hot Spots" of high incidents of surcharging manholes.

Figure 45: CBWQM monitoring results represented via creative and innovative use of ICTs, Google Earth and the Internet Left: WWWC monitoring team members, Zandile and Ntombifuthi, conducting miniSASS at one of their monitoring sites. Right: WWWC monitoring team's miniSASS results uploaded on the miniSASS website.

ECOMMENDATION 7: **One of the main findings of the CBWQM scaling research to date is that CBWQM approaches need to be strengthened, supported via capacity building, but also via more sustained resources to maintain and further develop these reporting platforms. This is an interesting area of innovation that could tap into funding sources that are interested in supporting communities to make use of ICTs for monitoring.**

There is potential to join into a wider community of practice that seeks to innovate with ICTS for community-based monitoring and citizen sciences for the SDGs. Such work can be funded by government funding (DSI) as well as international development funding and/or research funding sources. The research and development work required here should be integrated with capacity building and with research and activities that secure intellectual property partnerships within a common property licensing system, and that allow for expansion of depth scaling work (see Appendix C for proposals in this regard).

RECOMMENDATION 8: **The work on tools development, capacity building, data reporting and uptake of data, should also focus on strengthening communities of practice to scale CBWQM from smaller to medium scale activity, as recommended in the scaling models put forward in this study. It should also involve capacity building for integrating the data into local government, and other compliance monitoring systems and structures so that the monitoring data is supported into management action. Producing data for the sake of it is not helpful, therefore there must be a strong intervention to support the uptake and use of the data within compliance monitoring systems, and management action. In this context, communication of the results and outcomes of the CBWQM practice will be crucial for raising awareness of the importance of the work being done and the way in which the data generated can facilitate improved governance. In other words, the communication approach should be aligned with the reporting of results and mobilising of further agency for change, and not be an exercise that is disembedded. The role of different partners, and achievements along the way will also be important to share across different communities of practice and into the capacity building programme.**

6.6 Scaling Pathway: CBWQM Data and data sharing

Main finding 6: There are interesting innovations emerging with regards to use of open data monitoring tools. These need to be further supported into wider use.

For the past four years, DUCT has been utilising an open source mobile application Open Data Kit (ODK) (a part of the Data Software for Social Good community), for the gathering of information on service delivery failures and environmental issues at community level. In 2019, $100 000 from Bill and Melinda Gates Foundation (via the African Academy of Sciences) was secured to develop and test this app further, integrate it with municipal systems, and broaden to include many more appropriate parameters, including citizen science data around river health. The app allows community members (Enviro Champs, volunteers, concerned citizens) to report issues, and record results (including photos), and these are sent to a database. The data is cleaned, and processed to produce relevant reports for different stakeholders. It will in future be publicly available, and as reported above in the previous chapter, the App was beta tested during the Amanzi Ethu PES Phase 1 pilot with good results.

What is key about the current development, is that the app is providing a tool for community members to understand and engage with environmental concerns, and status in their backyards, and provides a communication link with responsible authorities, project staff, researchers, etc. The aim is for the municipality to integrate the reporting system into their customer services feedback loop, so that app users get a response from the municipality when issues are attended to. The app testing phase began in January 2021, and will continue through 2021. If successful, phase 2 funding will be sought, seeking up to $1 000 000 to be able to implement in

many wards, across several municipalities. The DUCT (2021) report shows via the beta testing, that tools like this allow community-based water management practitioners to build a spatial picture of their catchment issues, and to more effectively communicate with stakeholders and decision-makers on how to better manage ecological infrastructure at a very local level.

RECOMMENDATION 9: **As indicated above, the area of data and data management and ownership within a commons property system is an important area of development and innovation in the CBWQM environment, and is also attracting funding. This component of CBWQM can also provide significant advantage and interest in resource mobilisation. Care will have to be taken, however, to maintain the foundations of shared intellectual property and open access / open source data in order to avoid commodification of this practice.**

6.7 Scaling Pathway: Monitoring, Evaluation and Learning

Main finding: While good and innovative CBWQM praxis is emerging, as outlined above in the report, approaches to MEL need to be developed that align with the types of scaling along the value chain, and that capture the contributions of diverse activity systems and actors.

As indicated above, a key recommendation of this research is to develop a scaling approach that is diversified in type of scaling along the value chain, and that different activity systems with different roles and responsibilities be engaged in the different facets of the scaling process. We propose that this framework be used for monitoring and evaluating of CBWQM practices, along with actual data reporting compliance and improvement of water quality management. The tools below offer some starting points for developing indicators for scaling praxis. This would need to be done via the Amanzi Ethu learning network (or similar co-ordinating structure) and be developed with the participating organisations so that the monitoring and evaluation of practice becomes central to the learning orientation. As indicated above, scaling can be seen as an expansive learning process which is elaborated and extended over time. Hence, we see M&E as part of a learning process. However, time should be given to reflective analysis of the scaling processes and outcomes.

The key outcome of the evaluation work should be to focus on deepening capabilities for CBWQM practice along the value chain of 1) CBWQM networking, planning, resourcing, organising and tool construction; 2) CBWQM monitoring, data capturing and reporting, and 3) CBWQM data synthesis, reporting and responses. However, we have also argued that this should be underpinned by a commitment to deepening democracy in South Africa and, as indicated in the IWQM policy, to ensuring inclusion in IWQM praxis in South Africa. Therefore the M&E framework should not be simply technically inscribed, but should focus on how scaling of CBWQM practice deepens democracy, creates learning opportunities, jobs and pathways for those currently excluded and marginalised, and how it strengthens and deepens socially just IWQM governance in ways that are accountable to citizens and society, and in ways that support improvement of water quality in South Africa, and protect ecological infrastructure for water security for current and future generations. Within the Amanzi Ethu learning network, co-developed indicators can be developed to inform and support vertical scaling, depth scaling, as well

as horizontal scaling practice, and the recommendations along the scaling pathways outlined above. Figure 46 below illustrates an architecture for framing M&E for CBWQM practice.

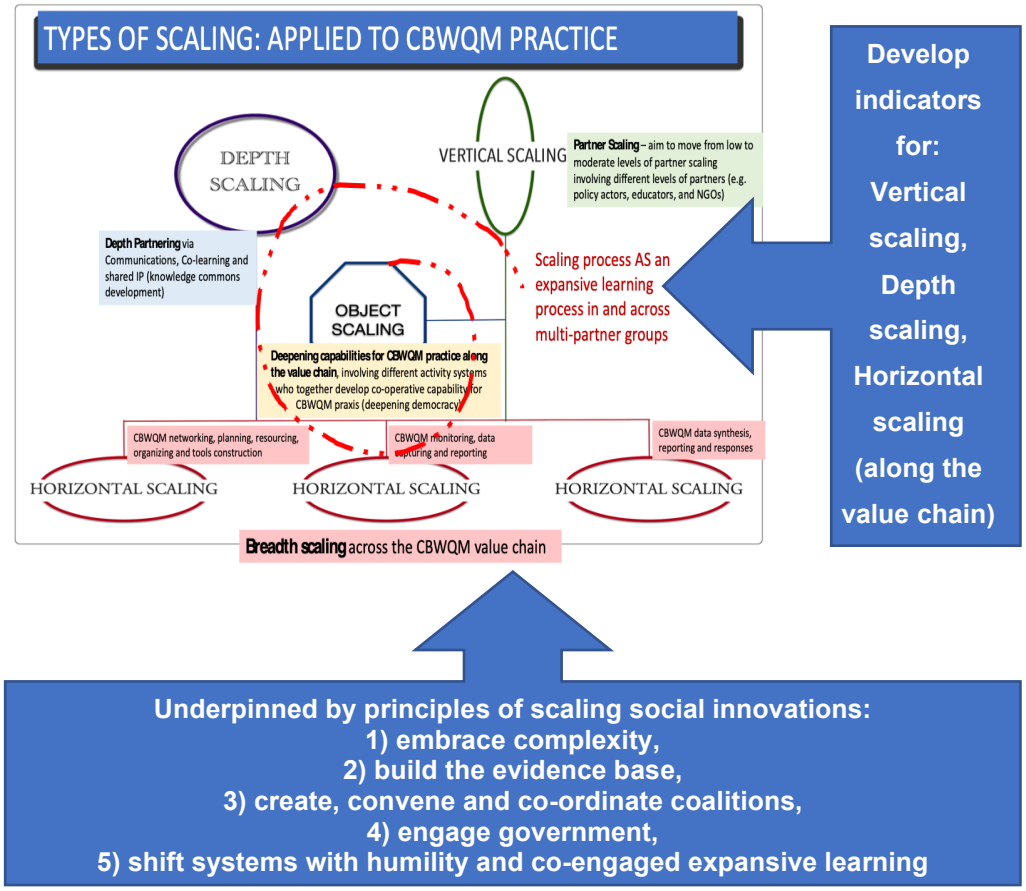


Figure 46: Architecture for framing a monitoring and evaluation approach for scaling of CBWQM practice

The M&E framework can also be informed by **principles of scaling social innovations** developed by the Bertha Institute of Social Innovation at UCT (UCT / WEF, 2017) and adapted for this study as outlined below (see Figure 47 below). These are:

Figure 47: Lessons shaping principles of scaling social innovations (UCT/WEF, 2017)

Principle 1: Embrace complexity – in the case of this CBWQM research project and scaling praxis recommendations, we have recommended an approach to scaling which takes account of

a) the complexity of CBWQM practice as currently characterised by the policy-practice contradiction;
b) the complexity of the current crisis of water quality monitoring in South Africa;
c) the complexity of diverse levels of government engagement needed, as well as orientations to more participatory, radical and democracy building collaboration practices; and
d) types of scaling (depth, breadth, horizontal, vertical) needed to strengthen CBWQM praxis along the CBWQM value chain.

Principle 2: Build the evidence base – in the case of this CBWQM **action-oriented** research and CBWQM scaling praxis, we have offered:

a) an expanding database and a tool that scoped dynamics of CBWQM practices (2.2.);
b) case studies that analysed existing scaling potential and pathways (cf. Appendix A and 2.2.1);
c) tools for policy analysis and engagement (2.3.1 & 2.3.2);

d) tools for engaging partners in articulating and co-designing scaling dynamics (Chapter 3); and
e) tools for launching and supporting scaling practices of various kinds (Chapter 4).

This provides the evidence base (baseline) at this point of this practice in South Africa. The same tools and approaches can continue to be used for building the evidence base of a) the practice of CBWQM and results that emerge from the practice, and b) the scaling of this practice in a multi-actor and multi-levelled system of activity.

Principle 3: Create, convene and co-ordinate coalitions – This research report has confirmed that CBWQM practice is essentially a multi-actor practice that involves a variety of coalitions that join forces in support of improving water quality monitoring and management in South Africa. The report has also pointed to the current unsustainability and struggles of these coalitions, especially to obtain adequately sustainable resources for supporting scaling of this much needed practice. It has further recommended that new coalitions need to be formed especially to advance the scaling of CBWQM practice along the value chain. The report has further recommended a co-ordinating learning network / association or similar structure that can help to convene and support especially depth scaling (capacity building and sharing of intellectual property) that can resource and support partnership building and coalition building.

Principle 4: Engage government – This research report has indicated that government are involved in CBWQM practice, most often as partners in coalitions. Different levels of government are involved, local, provincial and national, again in various configurations and coalitions. Most recently government has been involved from a job creation vantage point via the Amanzi Ethu Presidents stimulus intervention following the massive job losses of the COVID-19 period. This research has also indicated that government could do much more to involve CBWQM, especially to support critical water quality monitoring activities associated with the national crisis of WWTWs, and to strengthen approaches for Ecological Infrastructure for Water Security management initiatives. Overall, however, there is need for a more strategic, longer term and sustainable approach from government to support CBWQM as pointed to in the IWQM policy, as well as better policy coherence across the policy system.

Principle 5: Shift systems with humility and a transformative, expansive learning co-learning orientation – This research report has emphasised the importance of approaching scaling of CBWQM in South Africa as a co-learning process in which all actors involved, and those who join up with, or in support of the practice are willing to co-learn how to expand and strengthen this practice in South Africa in the interests of improved water quality, social justice and the common good.

RECOMMENDATION 10: **Design a Monitoring and Evaluation Framework for CBWQM that aligns with the differentiated scaling approach model, underpinned by principles of scaling social innovation. This should be done collaboratively at sector level, and involve CBWQM stakeholders so that it can also become a MERL tool (monitoring, evaluation, reporting and learning).**

6.9 Key recommendations for a CBWQM resourcing strategy for scaling CBWQM practice

Main finding: CBWQM is a multi-actor practice, and involves a range of different stakeholders all of whom can contribute to the resourcing of CBWQM, albeit in different ways and with different contributions that together can make up a blended financing model for CBWQM praxis. Such a model needs to be explicitly articulated and further developed with due attention being given to sustainability of funding, as most efforts so far lack a longer term sustainability orientation. For sustainability to become possible, CBWQM should be regularly and systematically budgeted into state funding programmes for water management, and should be linked to progressive development of PPPs, or CPPPs, as discussed in this report.

In summarising the research to inform a resourcing strategy for CBWQM presented above, we note the following:

- There is already a substantive history of resourcing for CBWQM practice in South Africa. This history is located in the nature of the practice, which is a multi-partnership practice, involving a diversity of stakeholders and types of partnership.
- There is need for a stronger and potentially more strategic approach to resourcing of CBWQM within a framework that can facilitate scaling of CBWQM practice in ways that will not break down the culture of the practice, or transform its social-ecological and democratically constituted nature; in other words care should be taken not to commodify it within a values system that will be counter-productive in the longer term. At the centre of a resourcing strategy should be the values that inform the practice, as well as the history of the practice as it has emerged in South Africa. Its innovative and social-ecological justice foundations also need to be retained as well as its commitments to inclusion, capacity building and job creation for those most marginalised.
- There is significant potential to strengthen all these dimensions of the practice as has been shown up across the scaling research, with more investment in the practice from a range of partners, all of whom can generate value from being associated with and from contributing to the development of CBWQM practice in South Africa – as has been shown by the case studies included in this study, as well as earlier case studies (see Appendix A), and in the workshop data where stakeholders were consulted on the significance of CBWQM practice and how to scale it.
- In this report, we propose a scaling approach that would consider different types of scaling for different purposes in the CBWQM landscape of practice. These are also potentially aligned with the resourcing opportunities identified to inform the resourcing strategy, and could strategically be used to draw in new and existing partners who can support key dimensions of the practice, and see that their contribution is part of a larger whole; in other words the smaller contributions from diverse partners can be made more visible within a larger and expanding system of activity that can benefit all.
- For this to happen, the diversity of practices that can attract resourcing will need to made more visible along the value chain, and resourcing partners approached to support different parts of the CBWQM value chain and scaling praxis.
- Figures 48 and 49 that follow illustrate the potential approach that can be used to resource CBWQM practice within a scaling framework as developed via this research.
- Overall, we recommend a **blended finance model** as far as this is possible to implement, with leveraged funding from government, which is complemented by funding from the private sector over time, and in which contributions in kind from communities are also costed, making a

community-private-public-partnership model (see also Appendix C in which we have developed a concept note for funding with these principles in mind).

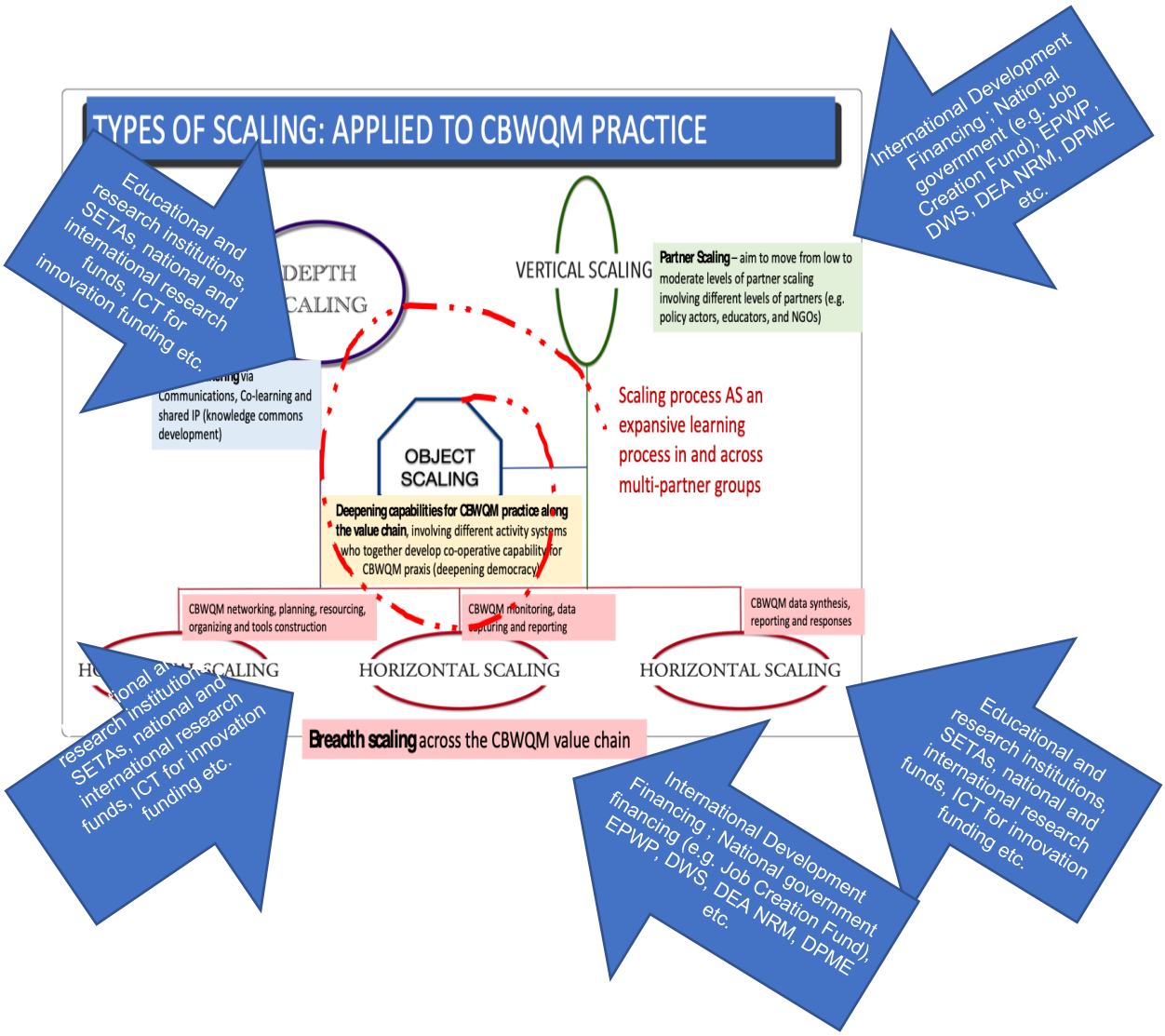


Figure 48: Potential approaches to scaling CBWQM within this research framework

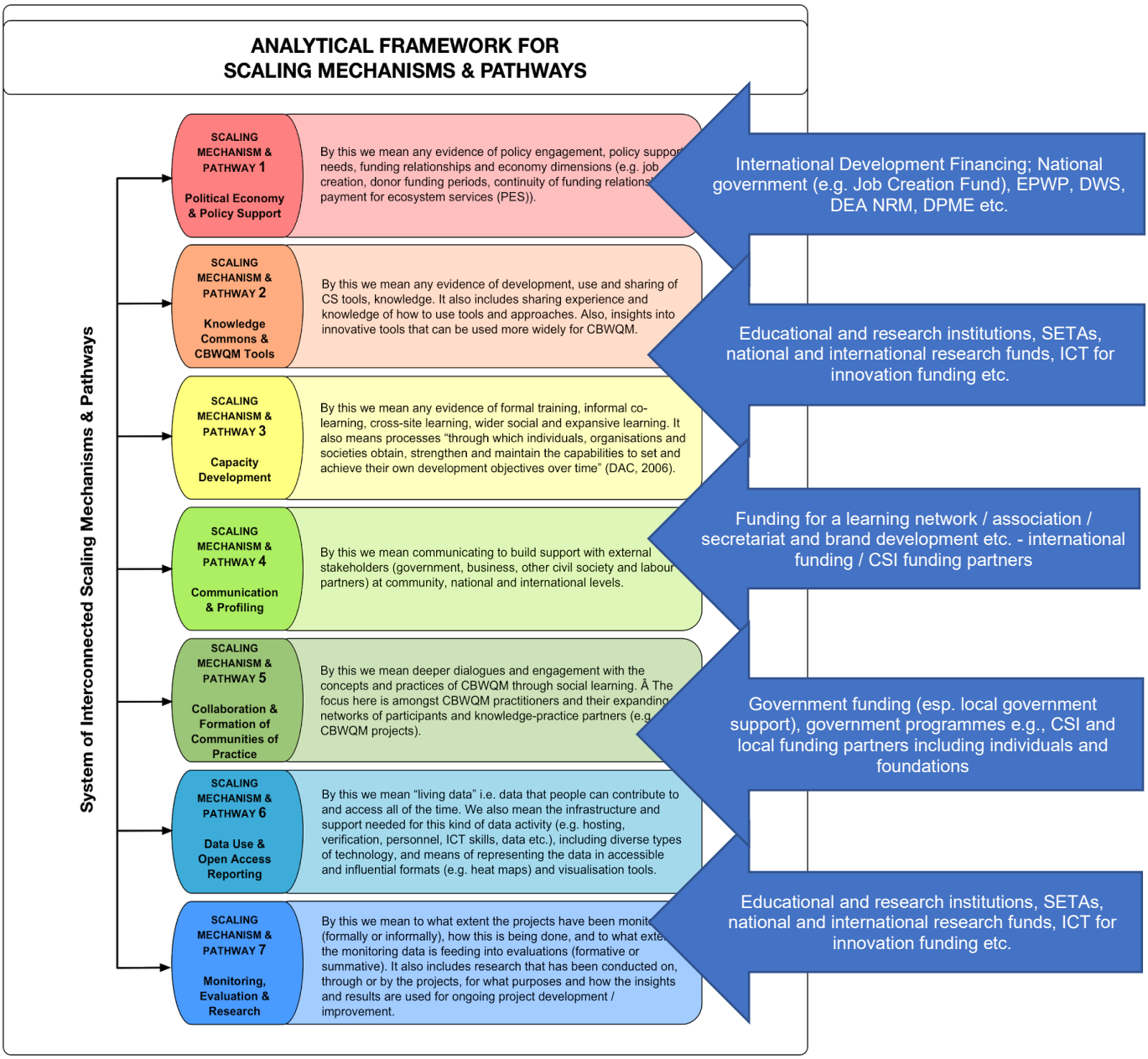


Figure 49: Types of scaling that need to be reproduced along the CBWQM value chain and the diversity of partner type for a diversity of scaling

Summarised below, this could mean the following for a resourcing strategy in terms of resourcing partners to approach:

- **Depth scaling:** This is where gaining a deeper understanding of a practice or a field can help it to gain generativity or strength. *From the analysis above, the most suitable partners for this type of scaling would be educational and research institutions, as well as CSI project funding for specific innovations. Activities along the value chain to develop via these partnerships would be capacity building, knowledge commons tools and management of IP, as well as learning to use new technologies, share data more effectively, and share knowledge resources across the wider CBWQM communities of practice.*
- **Vertical scaling:** This involves partnership building and policy implementation impact. We recommended in Deliverable 7 that this should ideally emerge from low level partner scaling to

moderate levels of partner scaling – at least initially. *Key partners here for resourcing would be government (local government) as well as national government initiatives that are locally implemented such as EPWP programmes, Adopt a River programmes, etc. International development partnerships to strengthen the role of CBWQM uptake and support at policy level, especially for monitoring of policy and development of participatory democracy praxis could also be leveraged here.*

- **Horizontal scaling:** This involves breadth scaling along the CBWQM value chain, and differentiating of tasks, roles and responsibilities along the value chain. This can also be called 'functional scaling' where more or more complex forms of CBWQM activity are developed along the value chain. *As can be seen in the diagram above, the networking communication, capacity building, tools development and some aspects of innovation associated with reporting are also forms of depth scaling and could involve the same partners as noted above for depth scaling. The actual implementation of CBWQM and regular monitoring of the practice would be best supported by the same partners as mentioned above under vertical scaling.*

RECOMMENDATION 11: **A differentiated approach to resourcing CBWQM practice is needed, but this needs to be a co-ordinated approach at the same time as there will be little value in designing innovative tools if they cannot be used widely in support of IWQM, etc. There is little value in engaging at policy level if there is no practice occurring and so on.**

Thus we recommend the following for potential partners to get involved in resourcing of CBWQM projects and programmes:

Government: should support and fund the roll out of CBWQM programmes within a job creation framework (e.g. Groen Sebenza)
Business: should support local communities of practice to establish themselves and learn how to contribute to local IWQM via CBWQM practice; and they should allocate resources to capacity building, and innovation of tools, communication and network formation activities.
International funders: should support governments to integrate principles and practices of CBWQM into policy systems and funding structures; and should support innovations in the whole system of CBWQM praxis. Piloting a scaled up system of CBWQM by giving attention to all of the elements along the value chain, and all dimensions of scaling practice may also be a good focus for international funders as a key intervention around SDG implementation.
Education and research institutions: should particularly get involved in supporting innovation along the CBWQM value chain through engaged research, tools development and social learning support, including the design and management of capacity building programmes across the sector; can also support learning network formation in partnership with civil society / NGOs and government partners.
Civil society/NGOs (e.g. WWF): Should continue to be the primary actors in the CBWQM system, at the forefront of monitoring and reporting practices and the actors who help to define the needs of the sector as these emerge from their experiences in practice. They should continue to attract funding for implementation but aim to continue to work synergistically with the range of partners along the value chain.

6.10 Recommendations for further research

6.10.1 Advance an action-oriented approach to CBWQM scaling research and practice

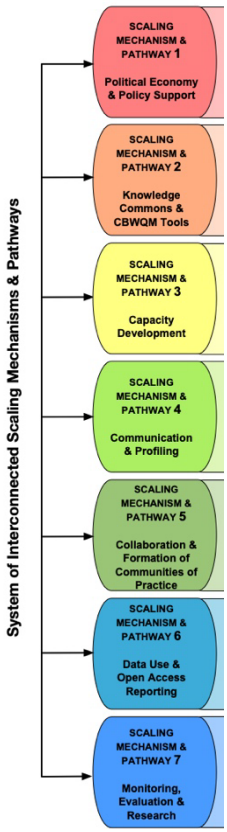
As noted above, and across this report, an action-oriented approach to researching the scaling of CBWQM is a productive approach that not only deepens understanding of the praxis at a national level, but also helps to

advance the praxis. This requires a *learning-centred research orientation,* in this project conceptualized as expansive learning in the tradition of fourth generation cultural historical activity theory research which involves multi-actors and heterogenous coalitions of actors from different activity systems who agree to work together to resolve key contradictions that affect their shared interest in the main activity, being CBWQM, in ways that contribute to social justice, democracy building and ecological sustainability while also creating work and learning opportunities for South African youth. We recommend that such a learning-centred orientation to expanding research in CBWQM, undertaken *with* activity system actors along the value chain continue in order to expand the concretization of CBWQM as policy concept via expansion of the CBWQM activity in all of its facets.

6.10.2 Undertake research into the dimensions of scaling CBWQM practice

Undertake research to advance **depth scaling** (shared capacity building, tools and IP), **breadth and horizontal scaling** (expanded nodes of CBWQM praxis in different sites), and **vertical scaling** (integration into policy such as the NWRSIII and to address policy contradictions identified in the IWQM policy and between the IWQM and NWSMP policy, seeking alignment with the NDP and SDG intentions and reporting structures with integrity and commitment to democratic governance. All of these need to be considered in relation to each other, and in relation to **scaling of CBWQM as a shared object of activity that advances water quality management, social justice and sustainable development in South Africa**.

6.10.3 Undertake research to advance scaling along the scaling mechanisms and pathways for CBWQM



In the context of the two recommendations above, we also recommend ongoing research along the key scaling pathways identified in this research (cf. Figure 7), with emphasis on:

- **Scaling Pathway 1**: Political Economy and Policy Support – here research is needed to advance sustainable forms of investment from both state and private sector partners into more sustainable forms of employment creation for CBWQM practice in South Africa, especially for youth. The blended finance model has shown promise in this research and should be further investigated as CBWQM is a multi-actor practice involving a range of different actors with different interests. Creation of social employment models within this approach also needs further research (see also Appendix C). As indicated above, the contributions here need to be understood in relation to advancing IWQM and associated forms of water policy, and resolving the policy practice contradictions outlined in this report.

- **Scaling Pathway 2**: Knowledge Commons and CBQWM tools – here research is needed to advance shared IP platforms and approaches to tools and resources developed within a wide national CBWQM learning network to advance depth scaling and access to tools across a range of catchments and spaces. Advancing innovations in ICT use is a promising approach to building the knowledge commons with quite some progress already underway that requires more sustainable support and innovation partnerships.

- **Scaling Pathway 3:** Capacity Development – here research is needed to design and develop a meaningful 'Learn for the Future' programme that can support and complement CBWQM practice in ways that also offer potential green skills learning pathways for youth. Accreditation research is especially needed that is aligned with the intention of the practice as well as the SETA and National Qualifications Framework, and employment opportunities and career pathways for young people in the post-schooling system.

- **Scaling Pathway 4:** Communication and profiling – here research is particularly needed to advance the relationship between data production and reporting (from the monitoring practice) and data uptake and use in communities, amongst local, provincial and national government actors, in municipalities, and amongst various stakeholders (note the data that shows medical waste, construction waste, industrial waste as well as domestic waste concentrations in rivers that were monitored, as well as data related to the failure of wastewater treatment plant monitoring). Connecting these processes to public accountability and public communication forums (e.g. public media), and local democratic fora will also be important for translation of data into practice. The status and value of CBWQM as practice with social, economic, as well as ecological value also needs to be expanded via communications.
- **Scaling Pathway 5:** Collaboration and formation of communities of practice – here further research is needed into the scope and scale of 'communities of practice that work' and their configuration, as well as ways of connecting and linking communities of practice involved in CBWQM through a learning network and shared tools, capacity building opportunities, resourcing approaches, etc. There is also need to have a better understanding of the diversity of CBWQM communities of practice and what motivates their formation and their sustainability. The role of diverse actors within these communities of practice also needs to be better understood from a longer-term sustainability perspective.
- **Scaling Pathway 6:** Data access and use, and open source reporting. As noted above under communications, access to – and use of – CBWQM data is crucial, as is the timing of the transfer of data into reporting and uptake into management practices, or practices that improve river health, and the health and well-being of people and biodiversity. This is oftentimes a specialized translation process, and the use of graphic-based applications that produce visual perspectives on issues (e.g. heatmaps, or miniSASS imaging) helps with data access and use. There is need to support open source reporting in real time, and platforms that enable this. Further research into the feasibility and accessibility of such platforms is needed, as is the political economy of the data and its management as an open source tool for democracy building.
- **Scaling Pathway 7:** Monitoring, evaluation and learning. As shown in this report there is need to more carefully consider how the monitoring practice facilitates evaluation and learning, and thus also transformed practices, especially at local government levels and in local community-based contexts. There is also need to integrate these monitoring and evaluation practices and outcomes into other monitoring instruments (e.g. in Integrated Development Planning M&E processes, or in IRIS monitoring and evaluation tools, or in DPME tools for monitoring the advancement of democracy, or SDG 6 monitoring and evaluation tools). Further research on *how best to do this,* is needed.

6.10.3 Undertake research that locates CBWQM in the national system of innovation and development

As was shown in the Amanzi Ethu PES Phase 1 pilot, CBWQM is a practice that holds much promise in terms of its potential for contributing to transformative innovation policy and practice, and to development practice and objectives, as well as the building of South Africa's democracy. It is a practice that models and demands the need for governance *with* the people. It can also contribute to the development of notions of work that expand beyond the current EPWP model, as well as the limitations of the human capital development model. It can contribute to articulating social employment models in South Africa, and the concept of 'Work for the Common Good'. This must, however, be coupled with a viable learning programme that builds real-life skills, and supports enterprise competences, as well as technical environmental management competencies, social engagement competence and values that address sustainability concerns. To this end, we developed a Concept Note, submitted to the Presidential Stimulus Programme via the DSI as one of the final outcomes of this research project (Appendix C) and the Amanzi Ethu pilot particularly.

This concept proposal situates this work within the DSI's interest in advancing Transformation Innovation Policy, which is articulated as a new generation of innovation policy – of which the Living Catchments is a South African case study in the DSI/NRF TIPC. We propose here that CBWQM could be a strong contributor to such innovation policy development in South Africa as it clearly addresses 'Frame 3' type innovation policy outlined in the diagram below (Source: TIPC website: https://www.tipconsortium.net)

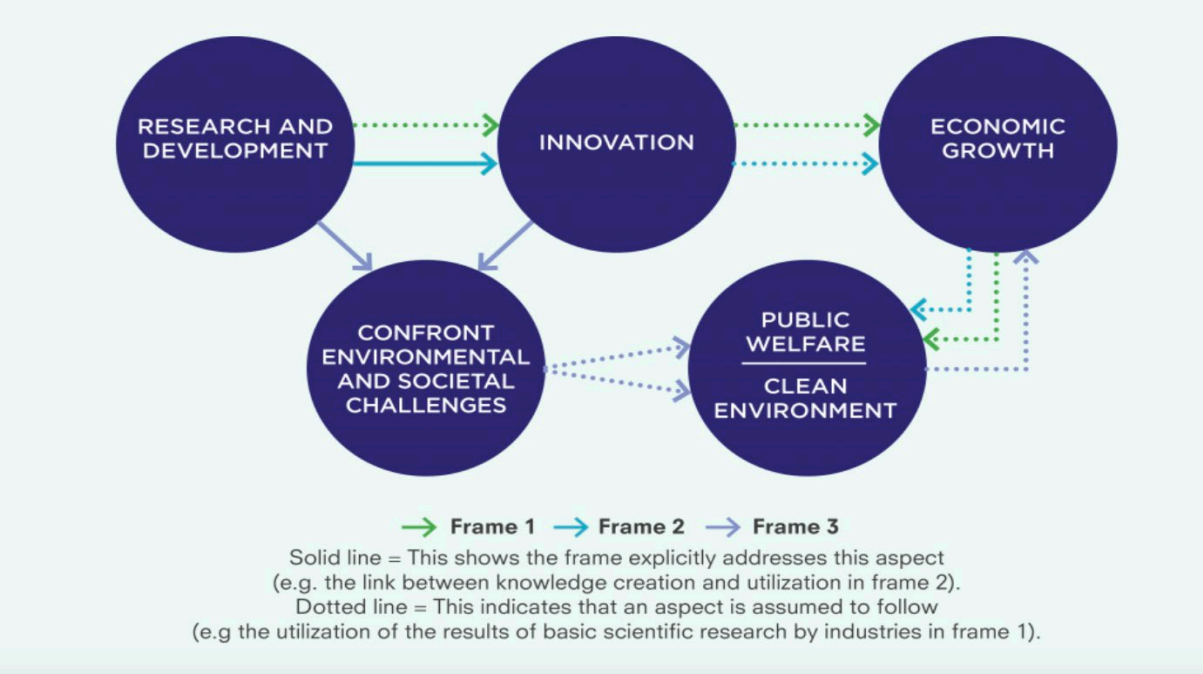


Figure 50: TIPC diagram showing three generations or 'frames' for innovation policy, with Frame 3 being most aligned with CBWQM praxis. In the Concept proposal, we have therefore framed future action-oriented research on CBWQM within this innovation system policy framework as follows (Box 9)

BOX 9: EXTRACT FROM THE CONCEPT PROPOSAL – APPENDIX C

TRANSFORMATION INNOVATIONS APPROACH

The concept of 'social employment' and 'work for the common good' in South Africa requires imagination and transformative innovations, if the challenges above and outlined in Appendix B are to be addressed. South Africa has already an extensive social employment programme which is most well known as the EPWP programme, which is primarily state driven and mobilised to create employment opportunities. In this proposal, we put forward an alternative that can extend and complement the EPWP / DEFF EP programmes, via the development of a Community-Public-Private Partnership (CPPP) model that will be anchored in South Africa's Living Catchment Communities. This model will mobilise green economy and civic action mechanisms that reach beyond the market only. It will develop the transformative innovation practice of work for the common good by mobilising state, community, education sector, and private sector partners in a drive to create decent work for the common good, while creating future's focussed learning pathways for young people.

The proposal addresses inter-alia, the Economic Reconstruction and Recovery Plan of the Presidency put forward in October 2020, the objectives of the NDP to govern with the people, the National Environmental Management Act of South Africa (and associated biodiversity, waste management, etc. policy); South Africa's commitment to the Sustainable Development Goals, the National Climate Response White Paper, and the Integrated Water Quality Management policy of South Africa. All of these policies emphasise citizen engagement. While these policies exist with good intentions, there is a clear need for transformation innovation approaches to realise their objectives.

This proposal is firmly positioned within the transformational change objectives of the Transformative Innovation Policy Consortium (TIPC) framework – led by DSI – which emphasises that giving attention to social and environmental welfare are transformative foundations of reducing inequality and expanding productivity, catalysing new forms of economic well-being and work in the process. Transformative innovation requires government, science, industry and civil society partnerships, and focussed on grand challenges that extend to multiple scales exceeding geographical, sectoral,

technological and disciplinary boundaries. Such approaches are both systemic and experimental. The project will focus on 4 interrelated transformation innovations (see Appendix B for further detail on the Innovations):

- INNOVATION 1: A community-public-private partnership (CPPP) model for creating and supporting work for the common good
- INNOVATION 2: Creating, unlocking and defining work for the common good for 10 000 young people
- INNOVATION 3: #datafree, mobile, accredited 'Learn for the Future' programme
- INNOVATION 4: Citizen science and civic action tools development – ICT innovations (including innovations for payment for value created) and Knowledge Commons development

These innovations are articulated in more detail in Appendix C and may be the focus of future CBWQM praxis development as the programmes and projects move forward, but here we in general, recommend research to support this orientation to scaling CBWQM *as a process of transformative innovation in South Africa.*

6.10.4 Consolidate the outcomes of this research via a series of policy dialogues

In alignment with recommendations on policy engagement, there is need to develop a set of policy briefs out of this research that capture the main insights gained from the research that can inform integrated water quality management policy and practice in South Africa, as well as other water policies (e.g. NWSMP and NWRSII and III implementation and development), the SDGs and their monitoring and reporting, as well as development – including skills development – and innovation policy in South Africa. To this end we propose the following as potential focus areas for such policy briefs

- The status of CBWQM in South Africa's democracy – a Review
- Engaging the CBWQM policy-practice contradiction in South Africa's water quality management policy
- Scaling CBWQM practice in South Africa – depth, horizontal and vertical scaling approaches
- Work for the Common Good and Learn for the Future – Amanzi Ethu Nobuntu in practice
- Towards a CBWQM Knowledge commons: Tools, shared resources, IP and Capacity Building
- Resourcing strategies and blended finance approaches to CBWQM
- CBWQM as a transformative innovation practice for the Common Good

And finally, we recommend that these policy briefs be developed into published papers, and that the policy briefs be developed to inform targeted policy engagements in the national policy system, as well as at local community levels, and in multi-partner networks such as the EI4WS programme networks (amongst others).

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APPENDIX A:
CASE STUDIES AND INITIAL ANALYSIS OF SCALING PATHWAYS

CASE 1: South African Water Caucus (SAWC) Change Projects – Vaal and Olifants

Rationale for choosing the case

The Environmental Monitoring Group (EMG) has a long track record of supporting community-based monitoring of environmental concerns in ways that shape and inform environmental justice activism in South Africa. The EMG has capacity to work across system levels engaging grassroots activism and national policy critique and debate at the same time, and in interactive relations. They are also working closely with and in support of the South African Water Caucus (SAWC) (a social movement with a long history of engaged environmental justice activism in the water sector) to strengthen water justice activism and practice in South Africa. In the past few years, the EMG have been leading a policy-practice civic engagement programme, with initial support from the WRC, for expanding water justice activism and community-based monitoring of the National Environmental Water Resources Strategy II in South Africa (Wilson et al., 2016). Building on earlier EMG activist research and praxis, and via partnership between the WRC, Rhodes University's Environmental Learning Research Centre (RU ELRC), the Association for Water and Rural Development (AWARD) and other social and environmental justice organisations, the EMG established a social learning programme that supports changing practices and empowerment for community-based organisations, local alliances (most often affiliates of the South African Water Caucus) and community groups who are dealing with water-related injustices and water system degradation, including pollution, acid mine drainage, erasure of water rights, access and traditional water knowledges and practices, amongst others. The EMG work has, via two iterations, developed a strongly reflexive social learning course that builds capacity amongst civic activist groups to strengthen their local knowledge networks, activism and learning praxis (Burt et al., 2018). It also supports expansion of local water justice practices. This 'Changing Practice Course' is accredited by Rhodes University's Environmental Learning Research Centre.

Data sources

Main documents and literature reviewed:

- Wilson, J., Munnik, V., Burt, J., Pereira, T. Ngcozela, T. Mokoena, S. Lusithi, T. Lotz-Sisitka. H. (2016). Citizen Monitoring of the NWRS 2. WRC Report no K5/2313/10. Water Research Commission, Pretoria.

- Burt, J., Pereira, T., Lusithi, T. & Horgan, S., Ndlhovu, D. Wilson, J. & Munnik, V. (September 2018). *Changing Practice: Olifants Catchment Report.* Environmental Monitoring Group, Association for Water and Rural Development and Rhodes University, with Susan Boledi, Collen Jolobe, Lorraine Kakaza, Elvis Komane, Tokelo Mahlakwane, Nthabiseng Mahlangu, Eustine Matsepane, Christina Mothupi, Bernerd Ngomane, Thelma Nkosi, Kedibone Ntobeng, Provia Sekome, Tshepo Sibiya, Elton Thobejane and Mmathapelo Thobejane.

Three Change Projects of 2018 EMG course participants:

- Collen Jolobe, Lorraine Kakaza and Susan Moraba. 2018. *Being a voice for the Brugspruit Wetland: Social and Environmental Justice in Action.* A publication of Social and Environmental Justice in Action.

- Mmathapeto Thobejane, Tokelo Mahlakoane and Eustine Matsepane. 2018. *The danger of living next to a mine operation. Sekhukhune Environmental Justice Network.* A publication of the Sekhukhune Environmental Justice Network
- Tshepo Sibiya, Kedibone Ntobeng and Christina Kanyhile Mothupi. 2018. *A Mountain of Disposable Nappies. Itumeleng Youth Project.* A publication of the Itumeleng Youth Project.

Interview and interactive engagement processes

- Rhodes University's ELRC has been a partner in this programme and Heila Sisitka has supported the research and design of the social learning course over three iterations, and has therefore been interacting closely with the programme and its evolution over the past five to six years. She has attended project meetings and has also been involved in moderating and reviewing the change projects of some of the course participants.

Case analysis

SP 1: Political Economy and Policy Support

This project was initially established to support civil society organisations operating within the wider South African Water Caucus social movement, to strengthen civil society monitoring of the National Water Resources Strategy II through a focus on three issues in three case study sites. The project undertook policy system research to assess civil society's involvement in key water policy documents within the context of legal requirements and democratic discourse (Wilson et al., 2016). The review focused on the role of the South African Water Caucus, a social movement that embodies public interest values. The review also included an analysis of government's legal obligations to civil society in the water sector. Significant to this case study is the work done to articulate the policy *requirements* of government to involve civil society:

> *"Local government is regarded as the sphere of government closest to the people; the municipalities are at the coalface of deepening democracy and accelerating services delivery (Handbook for Municipal Councilors, 2006). For example, municipalities are required to develop Integrated Development Plans (IDPs) in accordance with Chapter 5 of the Municipality Systems Act of 2000. One of the core objectives of the IDP is to be a tool for democratic local government by ensuring that community participation is institutionalised, and citizens can play an important role in identifying their own development priorities."* (Wilson et al. 2016, p. 68)

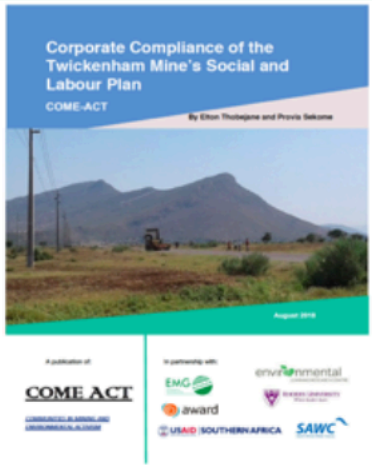
The report also identifies misunderstandings of this responsibility in the governance system:

> *"However in practice, Sangweni, Chair of the Public Service Commission (PSC), concluded: "The PSC's research … suggests … that the understanding of consultation of most departments reflect a misalignment with what was intended… departments 'understanding of consultation includes information sharing, discussions and conferences… whereas… the public should be consulted about the level and quality of the public services they receive…" (Wilson et al. 2017, p. 68)*

The different case studies focusing on water quality (i.e. not all cases were focused on water quality as the EMG work also includes cases of water rights and water access) in the 2016 and 2018 Changing Practice groups, highlighted the following aspects of CBWQM and policy:

- In the case of the Vaal (2016), the case study highlighted that spiritual water users were excluded from water access, use and governance. They were found to be either absent or under-represented in water user associations, yet their everyday practices are impacted upon by poor water quality.
- In the case of the Olifants (2018), the case studies highlighted the need for scientific support for testing of toxins in water, especially in highly polluted areas (mine and wastewater treatment pollution). The cases also

highlighted the need to find approaches to engage municipalities, and to engage them co-constructively, and to resolve problems such as the 'blame game 'where all stakeholders were caught in a trap of blaming each other (e.g. for the problem of disposable nappies in rivers). These cases also showed that engaging with local policy instruments such as the IDP of municipalities, and the Social and Labour Plans of mining companies could provide avenues for enhancing accountability for compliance. In all cases, civic activists were marginalised, and most often had huge difficulties to engage authorities or more powerful actors in 'hearing 'their case, or in 'listening 'to their data and evidence. Coalition building at local level was found to be crucial for enabling the CBWQM work to be heard and noticed, as was empowerment of groups at local level.

Cover page of booklet	Title and Authors	Description
	**Being a voice for the Brugspruit Wetland,** by Collen Jolobe, Susan Moraba and Lorraine Kakaza, Organisation: Action Voices, Location: Emalahleni.	"The main problem and reason we've become activists in our communities, is the pollution of the wetlands/streams that are located right next to our villages: the Klein Olifants stream, Brugspruit stream and wetland. The pollution has got worse over time, not only are community members still dumping their waste, there is now also the pollution from the KG Mall and from the nearby mine".
	**Corporate compliance of the Twickenham Mine's Social and Labour Plan**, by Elton Thobejane and Provia Sekome, Organisation: Come-Act, Location: Burgersfort	"Our Change Project is about working towards changing unethical corporate practice in terms of Social and Labour Plans, including monitoring, and enhancing compliance enforcement by coming up with recommendations for improved SLPs, systems and legislative provisions for a people-centered social beneficiation system".

Example of case study booklets produced by Changing Practice course participants (Burt et al., 2016)

SP 2: Knowledge Commons and CBWQM Tools

Important strategies to develop the knowledge commons involved integrating into the course strategies to access and draw on local knowledge resources, both people as well as other kinds of knowledge resources such as water testing tools, etc. One of the issues experienced in the 2018 course was that some of the groups of participants were working on responding to issues of severe water pollution in the Olifants basin, and required support for toxicity testing. A group of university students joined the programme to assist with this aspect of the

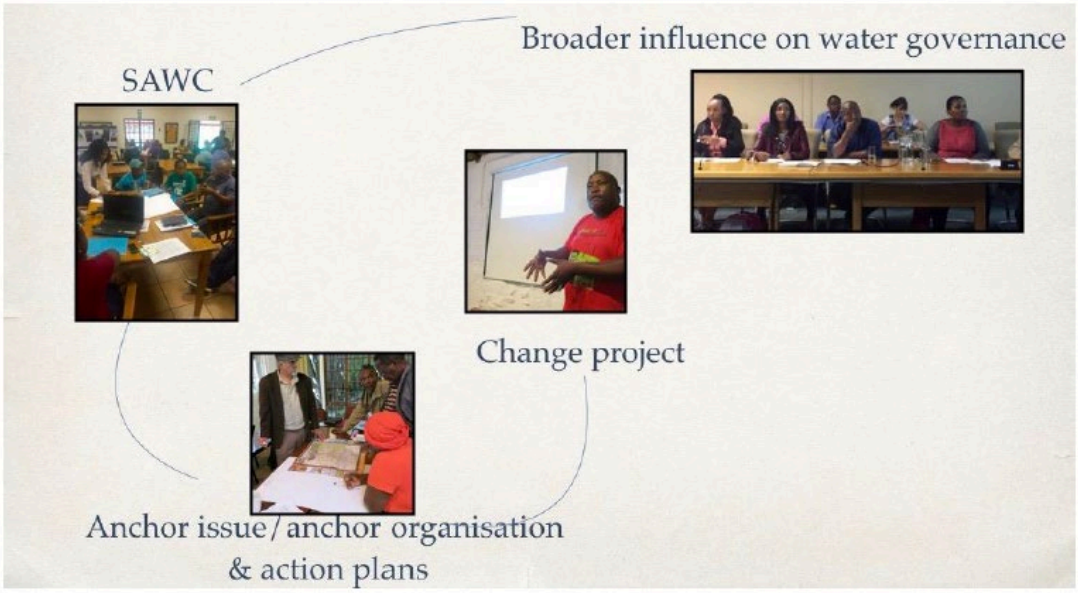
programme but unfortunately dropped out. Thus, community members were unable to obtain accurate scientific information on the toxins in the water. This shows the need for collaboration across types of institutions who have different types of expertise and resources for water quality testing and monitoring. Not all the relevant tests and tools are available via the low-cost water quality testing routes.

SP 3: Capacity Development

The project also undertook to pilot, test and improve an approach that empowers community-based and other civil society organisations to participate in local water governance, using forms of knowledge and analysis that are appropriate to their context and experience, through monitoring and engaging on key issues from the NWRS2 (DWA, 2013). This involved developing and testing social learning approaches to capacity building in this context, and strengthening of CBOs and networks within the water sector through peer support and social learning.

The social learning model for the course activated learning network is based on a reflexive and situated learning approach that supports ongoing action research and praxis development over a period of time. It brings different types of knowledges into dialogue – academic, scientific, community, activist, indigenous and local knowledges amongst others. The emphasis is on reflection and critical reflexivity, as well as action and change. The starting point for this is the ethical perspective, emphasising the value-based approaches of cognitive justice and dialogue as a starting point in the knowledge work of SAWC.

Significant here was that the capacity development programme (i.e. the course activated social learning process which involved participants working through four assignments and on a collective change project that developed their own strategy and action plans) was situated within a wider process of social learning linking them together with other actors and government via dialogues, and within a wider social movement structure (the SAWC) where the issues that were being raised by individual participants or smaller groups could be amplified into wider networks and systems. The EMG (a mediating NGO with a national profile) was well placed to help support this interconnected system of networking and capacity building.



How individual change projects became a catalyst at different scales (Wilson et al., 2016, p. 102)

SP 4: Communication and Profiling

The 2016 project developed guidelines to strengthen citizen-monitoring in the water sector, and presented them to for comment. Participants' change projects were developed into booklets that have been used on the ground within the organisations, and also shared more widely. The same strategy was used for the 2018 course participants, whose change projects were also developed into booklets (see figure above). All are being shared on the EMG website, and some of the booklets are also being shared on the AWARD website and via SAWC meetings and dialogues. The social movement Africa Rising attended the final stakeholder workshop of the 2018 group and is interested in forming a partnership to develop the Changing Practice programme more widely for environmental justice activists in Africa. This shows that the final project stakeholder meeting held in 2018 involving critical actors in the sector that can strengthen citizen activism and monitoring can have an impact, and can generate interest and support for the citizen action projects.

SP 5: Collaboration and Communities of Practice

Ten water activists from four civil society organisations (in the 2016 programme) and seventeen water activists from seven civil society organisations (in the 2018) programme completed a Changing Practice course accredited by Rhodes University that is based on a social learning approach developed in the WRC research project, Change Oriented Learning and Water Management Practices (K5/207/1), which in turn was based on WRC research on mediation of water knowledge, and earlier research on models of change oriented learning and professional development developed via Rhodes University's ELRC and associated network partners since 1992 with the Gold Fields and SADC Certificate Courses. The course supported the development of local knowledge networks, as well as collaborative course assignments that were oriented towards changed practices of small collectives, who in turn were working towards changed practice and environmental and social justice within the SAWC framework. The course activated learning network and social movement development process was designed to support and strengthen civil society organisations and networks, as well as relationships between government and society. This happened through structured interventions within SAWC and member organisations, a series of research team meetings, and dialogue processes that were initiated with government structures. At a grassroots level, people's experiences were shared through three Catchment Management Forums (Sabie, Sand, Rietspruit in the Upper Vaal), three dialogues with them on NRWS2 implementation and other interactions and dialogues.

The South African Water Caucus is a national **social movement structure** which has achieved local, national, international influence since its formation in 2001. It uses a decentralised resourcing and leadership model, and has a wide membership. It uses a range of activities including street mobilisation and protests, to change practices in organisations, policy participation, research and media use. It is a potentially important structure for strengthening CBWQM in South Africa. The definition of social movement is important here:

"Social movements operate in the civil society space, but are often taken to be different from civil society. Chatterjee (2010), for example, makes a sharp distinction between civil society which engages in the public interest, dominated by a well-resourced elite, and social movements (which he calls "political society") which make demands on government as a collective, not based on individual rights" (cited in Wilson et al., 2016).

SP 6: Data Use and Open Access Reporting

The case study participants found in some cases that there was a lack of willingness to support environmental justice activism as local authorities did not want to see or hear about data that could harm their reputations or show up a lack of compliance or delivery of services. In some cases, activists were actively intimidated, and democratic participation in civic water monitoring and action was actively discouraged, through strategies that reduce public participation, or do not make support available for this.

SP 7: Monitoring, Evaluation and Research

The processes in this initiative were intensively researched using action research approaches, public sociology, critical theory, critical realist analysis, and change oriented learning monitoring and reflections. The research found that civil society does and should play an important role in the water sector through deepening participatory democracy and monitoring public interest aspects of water policy. The research found that this leads to more effective implementation of some of the core principles of water and environmental resources management, including ecological integrity, protection of rivers and wetlands, recognition of indigenous knowledge and cultural practices, gender equality, social justice and the right to water. The 2018 process has also been intensively researched, with an emphasis on the qualities and processes of the learning. Here, issues such as cognitive justice, deep empathetic listening, care, and collective agency have emerged as being significant to citizen engagement and water activism (as explored in the PhD of Jane Burt). Important insights for monitoring and evaluation of not only changes but also deep transformation are emerging from this initiative.

The research also included a strong focus on power, and power relations and how they are structured, as well as consciousness of a 'politics of knowledge' and how this structures and influences praxis, both excluding and including. It is from this basis that a focus on cognitive justice also emerged in the project, and became a focus for ongoing research.

Synthesis of key dimensions relevant for 2019 scaling workshop

- This case study emphasises the important role that civil society plays in water governance and monitoring. It argues for both *protecting* and *supporting* this role. It also argues for ensuring that budgets are available at national, catchment and municipal levels to give proper effect to public participation and civil society engagement in water policy, implementation and monitoring in a long-term and meaningful way, and in a way that respects the democratic principles of the Constitution and legislation. Additionally, it recommends publicly condemning practices that close down local democratic spaces through, for example, intimidation and patronage, and prosecution of those responsible.

- The study also offers a best practice example of how course-activated learning can strengthen social learning and capabilities for activism, action learning and CBWQM amongst civil society organisations and how this can contribute to multi-levelled capacity building and engagement, as well as social movement strengthening (Wilson et al., 2016). Important here is the careful thought, action research and ongoing reflexivity that has informed the course design including around democratic and social justice principles such as cognitive justice (Burt et al., 2016).

CASE 2: Mpophomeni Enviro Champs – KZN

Rationale for choosing the case

The township of Mpophomeni has a legacy of apartheid planning and poor infrastructure. It is situated in the uMngeni catchment that supplies water to major town and cities including Howick, Pietermaritzburg, Pinetown and Durban. Due to the poor services, including sanitation and waste management, residents of Mpophomeni have had to struggle with spilling sewage manholes and solid waste issues for many years. It was estimated in 2014 that while Mpophomeni constituted 3% of Midmar's catchment, it contributed 51% of the E.coli and 15% of the phosphorus load in Midmar. This nutrient loading, along with agricultural runoff in the catchment and nutrients being introduced through the Mooi River inter-basin transfer scheme, is raising concern about the water quality in one of the country's most important dams. The combination of internal quality of life issues for the community and external impacts on an important water source stimulated the formation and support of a number of community initiatives including the Enviro Champs. The work of the Enviro Champs has become well known both nationally and internationally and has featured in a number of studies, in TV programmes and conferences. In addition, the Enviro Champs have supported community groups in other parts of the country to establish and enhance community-based water quality management initiatives.

Typical issues that Enviro Champs have to deal with, and views of the natural areas surrounding Mpophomeni

Data sources

Main documents and literature reviewed:

- Dent, M. and Taylor, L. (2017). *Strategic developments that will support and strengthen the participation of local communities in improving water and sanitation management in South Africa.* Unpublished paper.
- Kolbe, A. (2014). *Citizen Science and Water Quality in the uMngeni Catchment Area, KwaZulu-Natal, South Africa*. Master's thesis, Queen's University, Canada.
- Ward, M. (2016). *Review of the Enviro Champs Project in Mpophomeni*. Hilton: GroundTruth.

- Jonsson, A. and Klasander, K. (2014). *Mpophomeni Enviro Champs: A qualitative study about an Environmental Champions project's attempt to manage water issues in a South African township. An evaluation study.* University of Jonkoping, Sweden.

Interview and interactive engagement processes:

- In 2016 Mike Ward undertook an evaluation of the Mpophomeni Enviro Champs. This involved a series of interviews with organisations working with the Enviro Champs (GroundTruth, DUCT, WESSA); with key Enviro Champs (Ayanda Lipheyane and Thandanani Luvuno); with many of the other Enviro Champs; with local politicians; and with the local plumber. In addition, a number of field visits were conducted and an international meeting on citizen science that profiled the work of the Enviro Champs was attended. This resulted in an evaluation report the findings of which were shared and worked with in Ceres and Stellenbosch with similar citizen-based water quality management groups. This work has informed other evaluations, has been taken up in national strategic planning (see TIPS) and included in the Presidential Jobs Summit Framework Agreement. More recently (2018), Morakane Madiba has engaged with the Enviro Champs as part of a PhD study that is developing deeper insights into the work of this group and their influence on CBWQM nationally.

Case analysis

SP 1: Political Economy and Policy Support

The combination of poor infrastructure and the proximity to a key water source supported the mobilisation of funding from the Umgungundlovu District Municipality (UMDM) for the Mpophomeni Sanitation Education Programme in 2011. This project was supported by the Dusi-uMngeni Conservation Trust (DUCT) and was able to secure additional funding through the WWF-SA Nedbank Green Trust and the Expanded Public Works Programme. In 2016 the programme provided work for over 20 Enviro Champs and was recognised nationally as a leader in its field. Despite the strategic location of Mpophomeni, the support from local government and national NGOs, and the impact of the initiative, funding for this citizen-based water quality management has been an ongoing struggle. At the time of writing this review (2018), the Enviro Champs are operating without any external funding. This reveals a significant challenge in the political economy of this kind of work.

A key strength of the Enviro Champs has been their ability to engage politicians in a non-violent way. This has enabled an ongoing working relationship with eThekwini and uMgungundlovu District Municipalities; uMngeni Local Municipality and Ward councillors. A commitment to building networks resulted in the Enviro Champs being invited to present at 'war rooms' (local ANC planning forums) and at political events in the local Wards. Despite these links, a dysfunctional uMngeni Municipality was unable to respond to requests for service delivery. Through connections to external NGOs, the Enviro Champs were able to profile their work and ultimately get support from the District municipality and some recognition from the national Department of Water and Sanitation. This support however has not translated into a sustainable political economy for the Enviro Champs nor a concerted effort to address remaining service delivery challenges including sewage infrastructure and solid waste management.

SP 2: Knowledge Commons and CBWQM Tools

The generation of information to support and empower community groups is an important part of bringing environmental challenges to the fore and helping to gain the recognition and influence required to bring about change. The Enviro Champs have used a range of tools to work more effectively with the generation and use of information. These include the use of cellular phones, the development and use of data gathering sheets and the transfer of this data onto electronic spreadsheets. A wide variety of citizen science tools including miniSASS, and the representation of data on platforms such as Google Earth and various presentations including banners, poster, PowerPoint, Internet, etc., are also used.

Very significantly, the Enviro Champs were supported to take the information that they were generating and upload it into Internet-based representations that allowed public access to the challenges and successes of their work. Some of the platforms used include: Matuba, miniSASS and Google Maps. The image below shows the use of 'heat maps' to portray the intensity and duration of sewage manhole spillages in the local community. This data was collected by the Enviro Champs. In addition to making the data accessible for a very wide range of role players locally and nationally, the use of the Internet in innovative ways has raised the profile of the project and thus increased its ability to influence decision-making at many different levels.

The mapping process allows the identification of "Hot Spots" of high incidents of surcharging manholes.

In addition to Internet sharing the Enviro Champs have been extremely active in working with emerging CBWQM initiatives in South Africa. This interaction was enabled through the connections with local and national NGOs that drew on the Enviro Champs to support similar initiatives in Ceres, Pongola, the Palmiet river, Stellenbosch and elsewhere (the heat map above shows their influence into the Western Cape).

SP 3: Capacity Development

The Enviro Champs engaged in a very wide variety of capacity building initiatives. This includes building both their own capacity and the capacity of various stakeholders within and beyond Mpophomeni. In addition to raising awareness of the issues, the Enviro Champs have developed an approach to capacity development that emphasises mutual engagement to build shared capacity to identify, understand and respond to local issues. This co-engagement has been evident in a wide range of capacity development initiatives including formal and non-formal education and training programmes; drama developed through the Mpophomeni Youth Productions; Enviro Clubs that worked with schools; and door-to-door visits.

It is interesting to note that some of the capacity development initiatives drew on and were supported by external initiatives such as Eco-Schools, the Water Explorers, and accredited training institutions such as WESSA. Other initiatives were driven internally by the Enviro Champs such as the local river walks and clean-ups, the Enviro Clubs and the engagement with the community through Door to Door interactions. The interplay between external and internal capacity building processes was both complex and learningful and is perhaps best captured in a quote that was included in the GroundTruth evaluation of the Enviro Champs:

> *'While trial and error is a great educator in itself, there exists knowledge in the outside world which people can adapt to their needs and thereby accelerate their own endogenous process of learning…*

Learning is a creative process that cannot be accomplished by a mechanical transfer of external knowledge. The latter has to be adapted by critical reflection and creative application in order to be internalised." (Rahman, 1993)

SP 4: Communication and Profiling

The communication and profiling work related to the Enviro Champs took place at multiple levels and was closely linked to the network within which the Enviro Champs operated. In some instances, the communication and profiling was closely aligned with capacity development initiatives such as the door-to-door visits, the drama productions or the engagement with schools. These communication exercises raised the profile of the Enviro Champs and the work that they were doing. In some instances, simple 'marketing' tools such as the use of brightly coloured T-shirts or making a point of meeting at a visible place near the main entrance to Mpophomeni were important for raising the profile of the Enviro Champs and the work that they were doing.

The links to national NGOs, such as WESSA and WWF-SA, meant that the Enviro Champs were involved in international events and national publicity processes. An example of this was the WWF-SA River Walk that involved national celebrities and was screened on national television. People who have been involved with the Enviro Champs continue to share their work into many local, national and regional planning processes such as the Presidential Jobs Summit and the Science, Technology and Innovation road map. This profiling motivates participants and enhances the impact of their work. However, it is not enough to either build capacity of the participants or guarantee political support for the change that is needed in Mpophomeni.

SP 5: Collaboration and Communities of Practice

The Enviro Champs are embedded within a strong network of environmental and water quality related organisations. By operating as a collaboration between UMDM and DUCT, the Enviro Champs are positioned at the interface between Government, non-government organisations and the local community. In addition, the accessibility of Mpophomeni and the links to people linked to both the University of KwaZulu-Natal and Rhodes University has led to high quality research within and into the Enviro Champs. This networking is enabled and enhanced by a strong collaborative disposition of some of the key partners in the network. This includes a recognition that the networked partners share a collective responsibility within the catchment, rather than being separate groups seeking to bring about change in 'the other'. This collaboration and shared responsibility has been a powerful enabling factor for the work of the Enviro Champs and for the work of researcher, government and NGOs working with the Enviro Champs.

In addition to the collaboration to address existing challenges within Mpophomeni, the network of individuals and institutions working with the Enviro Champs (and the Enviro Champs themselves) have had a strong learning orientation. This has been supported by course supported learning often focused through collaborative projects that relate to a particular issue or opportunity related to water or waste management. The Enviro Champs have also played an active role in supporting other communities and in this process have built up an extended community of practice that includes individuals and institutions from government, civil society, academia and business.

Although the above may look like the only way to work, there are instances within Mpophomeni (and of course elsewhere) where there is less collaboration and shared learning. As one of the Enviro Champs noted, there are instances where initiatives (not Enviro Champs) are set up within Mpophomeni and the implementing group seeks to remain distinct from other initiatives in order to retain the ownership and control of the initiative. This disposition inhibits the building of networks and thus the ability to work with a diversity of role players.

SP 6: Data Use and Open Access Reporting

The use of the Internet to represent data gathered through the cell phones, spreadsheets and citizen science tools has been very important in terms of the use of the data. Google Earth has been used to map the manholes and miniSASS scores while heat-mapping (see Figure 6 above) has been used to visually represent the data gathered through the manhole monitoring and spreadsheets. In addition to making the data accessible for a very wide range of role players locally and nationally, the use of the Internet in innovative ways has raised the profile of the project and thus increased its ability to influence decision making at many different levels.

Finally, a range of other presentation techniques such as PowerPoint, the development of posters, newspaper reports and various project reports have also supported the uptake of the information by the many networked partners. This too has been a major enabling factor in terms of using the information that is being generated by the Enviro Champs. As one of the leading Enviro Champs noted, *"When we did not have the connection to the Internet we had so much data but people could not see what we were doing*."

SP 7: Monitoring, Evaluation and Research

Many examples of monitoring, evaluation and research linked to the Enviro Champs have been mentioned already. These include the actual monitoring of environmental issues, the external evaluation of the Enviro Champs and a number of research projects conducted by students from as far afield as Canada and Sweden. A current PhD study being conducted by one of the authors of this report focuses on Mpophomeni and the work of the Enviro Champs (Madiba, in press). These studies provide an affirmation of the work that is being done. It also provides an opportunity for reflection and learning. However, there is a risk of "research fatigue" as researchers come in, gather information, write a report and then disappear. This has led to community members wanting some direct compensation for the time that they spend with researchers. In addition, it would be useful to provide ongoing feedback to the Enviro Champs on how this research is informing policy, practice and the potential for supporting CBWQM and livelihoods for the local communities.

Synthesis of key dimensions relevant for the 2019 scaling workshop

- The political economy of initiatives such as Enviro Champs in resource-poor contexts is undermined by an assumption that these should be 'volunteer'-based. There is a need to develop sustainable economies that recognise and compensate for the value that these groups and initiatives add to ecological, social and economic well-being.
- The positive, but informed and robust, engagement with political structures has built possibilities for collaborative action and change rather than service delivery protest and violence. This should, however, not be taken for granted and requires commitments from both sides.
- The ability to gather data with citizen science tools, collate this data through shared platforms such as miniSASS, Matuba and Google Earth mapping has motivated the Enviro Champs and significantly enhanced their impact on water quality monitoring.
- Capacity development that highlights existing challenges and develops new perspectives on the scope and depth of these issues through courses, door-to-door engagement, and work in the field has been important for developing new knowledge skills and agency. At the same time, capacity development initiatives that respect and build on local knowledge is also vital to ensuring relevance and building local confidence. The strong orientation to social learning informing many of the capacity development initiatives linked to the Enviro Champs is important to take forward into future engagements with communities.

CASE 3: Adopt A River – National Project

Rationale for choosing the case

Adopt-a-River stands out as a project that has its roots in parliament. This makes it an unusual project that is worthy of reviewing because of the strong support it has received from ministers and leaders in government. It has many flagship characteristics as well having volunteer and job creation potential. In 2006 the need to create awareness amongst all South Africans of their precious and scarce water resources was highlighted, along with suggestions to facilitate public participatory processes in their management (DWA, 2008). In response, some members of parliament volunteered to "adopt a river" and act as a patron for its management. These actions were taken to foster public participation and as a sign of commitment of government officials towards protecting and managing South African water resources (DWA, 2008). To formalise these actions, the minister requested that DWA develop and implement a suitable programme to cater for and support a volunteer response to riverine management. This public and ministerial interest led to the initiation of the Adopt-a-River Programme (DWA, 2008).

Data sources

Main documents and literature reviewed

Graham, M., Taylor, J., Ross-Gillespie, V., Ditlhale, N. & Mahood, K. (2016) *A Revised Adopt-A-River Programme: Stakeholder input on the Institutional and Financial Frameworks with a Focus on an Implementation Strategy* WRC Report no. KV354/16 Technical Report. Report on the revised Adopt-a-River Programme.

Department of Water Affairs (2009). Adopt-a-River Programme Phase 2: Development of an Implementation Plan/ Institutional Aspects and Governance Structures. DWA. Pretoria.

Interview and interactive engagement processes

The research team (Jim Taylor) participated in the review process of Adopt-a-River and interviewed a number of key stakeholders.

Case analysis

SP 1: Political Economy and Policy Support

Adopt a River is a high profile project designed at a parliament and ministerial level. It is designed to fulfil the needs of the key water policies in South Africa. The project also has the potential for creating jobs although immediate successes in this regard are not apparent. The project is designed to support government in its custodianship of South Africa's water resources. It also provides a strong citizen science contribution to a growing body of science understood from a grass-roots perspective.

Political commitment to adopt a river in KZN

Political support for the Adopt-A-River programme (Source: WRC website, 2010)

Adopt a River is designed to have two streams of funding. This, in effect, allows for multiple sources of funding to be used to resource the programme and better enables long term sustainability. Business cases for both prongs of the funding framework include: 1) EPWP Working for Water programme funding (i.e. state funding) serves to illustrate a tested business case of the governmental prong, while 2) the DUCT case study illustrates the use of mixed funding sources to operate a non-profit community benefit organisation.

SP 2: Knowledge Commons and CBWQM Tools

As a volunteer programme targeting pensioners, school pupils, industries, catchment forums, water user associations, municipalities, communities, etc., the project has a strong knowledge commons potential that never appeared to reach its full potential. The spin-offs are water saving, skills development for youth, empowerment of the general public on Integrated Water Resources Management (IWRM), improvement of water quality and of the state of the rivers.

SP 3: Capacity Development

A strong focus has been placed on training and capacity building within the revisioned programme with the provision of more opportunities for career pathing and a focus on the development of additional useful skills apart from first aid or snake handling. Training and skills development also follows the structure of the institutional and governance framework, whereby different skills, training and career pathing opportunities are provided for river care technical teams under the DEA Expanded Public Works Programme as opposed to the volunteer/river monitoring teams under the management of the and implementing NGOs. The involvement of schools will be a primary focus of the revisioned AaR and is emphasised.

SP 4: Communication and Profiling

Adopt a River is designed to act as a direct communication channel with municipalities and Catchment Management Agencies, regional/provincial, national water resource management authorities and to hold them accountable for the quality and quantity of water resources (see WRC, 2011). The future Adopt a River programme is designed in a way that the Catchment Management Agencies (CMAs) and Catchment Management Fora (CMFs) will play critical and central roles in the revisioned AaR Programme. The CMAs (essentially regional offices and co-ordinators) will function at the regional and local level and act as the primary channel of communication between the national coordinator, DEA and the implementing NGOs, reporting directly to these organisations.

SP 5: Collaboration and Communities of Practice

The role of citizen science in the revisioned AaR is being developed with opportunities presented for the integration of the programme with other citizen science monitoring (to be carried out by river monitoring teams and volunteers) as well as the continued pairing of the programme with the National Aquatic Ecostatus Health Monitoring Programme (NAEHMP) (to be carried out by technical teams).

SP 6: Data Use and Open Access Reporting

Where the original programme design had limited means of assessing the success of the programme, provision has been made in the revisioned programme to use several indicators to measure success (both biophysical and social) which will form a critical component of the reporting of the programme.

SP 7: Monitoring, Evaluation and Research

The institutional and governance framework for the programme was completely redesigned based on a review of the original framework and problems experienced with its implementation from 2009-2015. The new framework includes more sectors of society and more clearly defines the linkages of each role player. The roles and responsibilities of each stakeholder/role player were similarly reviewed and discussed. Furthermore, the

framework was redesigned to have an innovative two-prong approach to the AaR (a governmental prong and public/private partnership prong). This approach is intended to limit risk (i.e. by having more than one implementing agency and organisation control the programme) and provide opportunities for more sectors of society to take part in the programme and includes scope for broader collaboration between government departments (specifically between and DEA).

Synthesis of key dimensions relevant for 2019 scaling workshop

- It is important to note that in any form of citizen science participation there is a risk that an excessive emphasis on branding and portrayal of one organisation can override the sense of belonging and participation from other groups. It is important to be sensitive to the different needs and profiling of various organisations so that these can develop and build an affinity to a localised approach. Inter-sectoral collaboration therefore needs to be emphasised and clearly defined and planned for.

- Adopt a River is designed to have an innovative two-prong approach (a governmental prong and public/private partnership prong). This approach is intended to limit risk (i.e. by having more than one implementing agency and organisation control the programme) and provide opportunities for more sectors of society to take part in the programme and includes scope for broader collaboration between government departments (specifically between and DEA).

CASE 4: Wise Wayz Water Care – KZN

Rationale for choosing the case

The community groups working under the banner of the Wise Wayz Water Care are currently (2018) supported by AECI, ImproChem and Acacia Operations Services through the AECI Community Education and Development Trust. This initiative provides an important example of corporate support to a community CBWQM programme. The two main areas that have active community groups are Folweni and Uzimbokodweni. These areas have inadequate stormwater drainage and the sewage infrastructure has been poorly maintained which results in sewage surcharging into the water courses. Some of the streams are blocked by solid waste and alien plant infestation resultant in stagnant water that exposes the local community to risks from flooding and waterborne disease.

Due to the close proximity of the community, directly upstream from a major industrial complex this project also has the potential to be a world first in terms of water stewardship. Given the direct value being generated for both the industrial complex and the local community, this project could provide an important case study of payment for ecosystem services. This initiative was specifically mentioned in the Presidential Jobs Summit Framework Agreement (2018).

Data sources

Main documents and literature reviewed

- Ward, M. (2016). *Review of Emvelo-Wise, Qondimvelo and Rural Community Upliftment Community Initiatives.* GroundTruth, Hilton.
- Video on WWWC – link https://www.youtube.com/watch?v=obwtzZZQUos
- Dithale, N., Mzobe, C. & Mahood, K. (2018). *A community-based aquatic monitoring programme for the Mbokodweni Catchment through Citizen Science: A case study for the Wise Wayz Water Care Programme.* Case study commissioned for this review.
- Dithale, N., Mzobe, C. & Mahood, K. (2018). *Reducing the effects of storm episodes through the development of green jobs.* Case study commissioned for this review.

Interview and interactive engagement processes

- The two launch events that brought the three community groups, Acacia Operations Services (AOS), ImproChem, AECI CEDT, Durban Solid Waste and Ground Truth together were attended and recorded. Over 100 interviews were conducted with individuals involved in WWWC. This included government officials, community members, project staff and funders. In addition, a number of field visits were undertaken.

Case analysis

SP 1: Political Economy and Policy Support

Emvelo-Wise, one of the community organisations originally involved in Wise Wayz Water Care, grew out of the community engagement programmes of Durban Solid Waste (DSW). DSW conducted a number of education programmes and clean-up campaigns in Folweni following severe flooding in the area in 2009. This flooding had been exacerbated by the dumping of solid waste into the natural water courses and the DSW programmes thus benefitted from a new community interest in cleaning up the local streams. At this time, over 200 people would voluntarily participate in river clean-ups. This group won a number of awards for their activities but needed funding to support its activities. They approached the local businesses and this led to the involvement of AECI. At this time (2015-2016) the Expanded Public Works Programme supported 60 people to participate in river clean-up and agricultural work in the area. AECI Community Education and Development Trust, recognising the

dedication of the group as well as the benefit to the industrial complex in the area contracted GroundTruth, a consultancy focusing on water management, to work with the community members. An NGO, i4WATER, was formed to implement this work.

The political economy of WWWC remains tenuous and is dependent on continued support from AECI CEDT as EPWP funding is no longer allocated to the group. Attempts are being made to develop other 'green economy' initiatives but these are seldom capable of cross-subsidising the water quality monitoring activities of the community. It must also be noted that as business funding became available, the involvement of government institutions such as the EPWP seemed to diminish at least from a funding perspective. Most of the community members are volunteers who benefit from capacity building initiatives linked to the WWWC project but are not paid for their work in the catchment.

The failure to develop a viable 'payment for ecosystem services' (PES) system means that it is extremely difficult to build a sustainable political economy for this kind of initiative.

SP 2: Knowledge Commons and CBWQM Tools

The involvement of GroundTruth in WWWC initiative meant that much of the learning from Mpophomeni as well as decades of work with citizen science including miniSASS was shared with the community groups involved. Detailed mapping of the catchment as well as identification of key monitoring points helped the WWWC groups to progress quickly. In addition, direct links were made between the Enviro Champs and the community groups involved in WWWC. This led to the incorporation of a number of practices from other community groups including sewer mapping, door-to-door engagement, and miniSASS activities. This access to both the knowledge commons and CBWQM tools provided a solid basis for the activities within WWWC.

WWWC monitoring team engaging with the local community during one of their monthly monitoring exercises

As was noted in the case study developed for this review:

> "In regard to aquatic monitoring and citizen science, the WWWC community-based monitoring programme has a number of objectives. These are:
>
> - To use the monitoring programme as a tool to create awareness and educate the community about the catchment and its role, as well as the direct benefits to the community;

- To develop capacity and scientific skills in the community with high shortage of skills, particularly in the field of science;
- Hydrological and climate factors
    - To identify pollution sources and take appropriate action to address the issues;
    - To build a database that will help the beneficiaries of the WWWC to understand whether their interventions are creating positive change in the health of the catchment". (Dithale, Mzobe & Mahood, 2018)

SP 3: Capacity Development

From the beginning of WWWC capacity development has been a central focus. Much of the capacity development has focused on equipping the community groups with the knowledge and skills required to run projects on their own. This has included support for setting up governance structures, strategy development, project management and financial management. Another focus with regard to capacity development has been supporting the community groups to identify and implement income generation activities.

In terms of CBWQM the WWWC project has focused extensively on developing the mathematical and scientific skills linked to the collecting and analysing of water monitoring data. One participant is quoted as saying: "*I was never fond of counting, dividing and multiplying, which is how I ended not taking science at school, but now I am doing all the calculations as if it's natural, which is a major change in my life"* (cited in Dithale et al., 2018).

SP 4: Communication and Profiling

The initial / community initiatives in the catchment benefitted from a number of awards that raised the profile of their work. In 2012 DSW entered Emvelo-Wise into the Mayor's Excellence Award and in 2013 the organisation placed first in the environmental category. In 2013 eThekwini came second in the Greenest Municipality Competition and received R3million. DSW motivated for the funding to be allocated to Emvelo-Wise and managed through a well-established NGO. It was at this point that Acacia Operations Services approached AECI to fund the work of the local communities.

The consultant who developed the first evaluation of the WWWC for GroundTruth works extensively in the environmental sector in South Africa and has used various platforms to profile the work of WWWC. With the support of AECI the project has produced a number of videos that have been used extensively to profile the work of WWWC. The combination of ongoing use of the WWWC as a case study and the high quality of the video productions has meant that the WWWC project is profiled regularly at a national level.

SP 5: Collaboration and Communities of Practice

The collaboration between local government () and the local community was stimulated by the tragedy of flooding in the area in 2009. This led to a deep commitment by community members to address catchment and community development issues in the area. As one of the participants in the 2016 evaluation noted: "*We are driven by the passion for development as well as to see the community progress. We have a desire to be involved in positive actions*." It is interesting to note that in the 2016 evaluation capacity development was "*never referred to as a process of individualised capacity development but always as capacity development for and of the community. Even when the building of self-confidence was mentioned as an important part of what had been achieved, it was spoken about as the self-confidence of the group*." (Ward, 2016)

At the launch of WWWC the aspiration to build a strong collaborative disposition and hence an effective community of practice was expressed by all of partners involved. As the CEO of GroundTruth noted at the launch of WWWC:

"Like a river many different streams needed to come together to make [WWWC] possible. From AECI, ImproChem, AOS, eThekwini Water, Durban Solid Waste and all of the community groups represented here. We come together to make a healthy river, the kind of river that [the Acacia Operations Services representative] would like to see coming into Acacia … We are growing stronger like that river… through skills development and equipment we will make a difference here and we can show the country what we can do."

It must be noted that this building of collaboration has not always been easy. Early on tensions between one of the community groups and the rest of the project resulted in eventual separation from the project. In addition, the NGO i4WATER that was established by GroundTruth to implement the project separated from GroundTruth and this strained a number of relationships around the WWWC community of practice. New relationships and approaches have, however, been enabled by these ruptures. The challenge and opportunity is to keep the bigger picture of community development and sustainability in mind within an expanded notion of collaboration and communities of practice.

SP 6: Data Use and Open Access Reporting

As has been mentioned above, WWWC has access to a range of citizen science tools and processes developed by a community of practice working with the Water Research Commission. These tools include the miniSASS website and thus the ability to upload water quality testing data onto the mapping platform. The project has also developed the mathematical and scientific skills of the community to enable them to understand and share citizen science findings.

WWWC Monitoring teams in action, with results uploaded on the miniSASS website

SP 7: Monitoring, Evaluation and Research

WWWC is an important example of collaboration between local communities, business and government. For this reason, it is vital that the monitoring, evaluation and research linked to this initiative be carefully done and shared within a broader community of practice.

As noted in the case study produced to inform this review (Dithale et al., 2018):

"*The results derived from the monitoring programme also serve as an encouragement to the rest of the WWWC participants who are involved in other interventions as results indicate that their efforts in removing waste and alien vegetation from the streams and creating awareness in the community are creating change and thus giving their catchment a chance to survive and function as intended".*

This points to the importance of the monitoring work and the sharing of the results with the community and broader stakeholders.

One of the striking features of the community groups that originally formed WWWC was that most of their work was done on a volunteer basis. This meant that very little formal reporting on their work existed in 2016. The evaluation conducted in 2016 provided the basis for a number of subsequent reports (e.g. TIPS) and submissions to the Jobs Summit Colloquium. There is still a need to extend insights from these emerging and more recent evaluations, and it is hoped that this will form part of the ongoing extension of engagement on CBWQM in the sector, with project teams, as the project progresses.

Synthesis of key dimensions relevant for the 2019 scaling workshop

- The development of a sustainable political economy linked to the WWWC project has been a focus of this project since its inception. Innovative work is being done on developing 'green economy' initiatives to generate income for the local community. This work deserves more attention and profile in the CBWQM field.

- It must be acknowledged that collaboration in these complex, multi-actor contexts will not occur without occasional tensions and ruptures. More attention needs to be given to building the capacities to avoid, mitigate, recover from and in some instances acknowledge the potential benefits of these ruptures.

- The monitoring, evaluation and research work done on projects like this has the potential to profile CBWQM and to integrate it into local, national and potentially global planning for sustainability.

CASE 5: Khulumani Water for Dignity Project – Eastern Cape

"To change from just complaining, to becoming part of the solution"

Rationale for choosing the case

The citizen science case described below forms part of a larger, ongoing engagement around catchment management and quality water provision in the Makana Municipal area and the Upper Kowie River catchment. The case provides useful insights into co-engaged learning, distributed cognition and networked partnerships, and their usefulness in engaging with complex social-ecological challenges which have proven to be wicked in nature.

The case is particularly interesting because it brings together three key groups of stakeholders, who co-led different aspects of the project. Authentic co-engagement was a key principle of the project – both among the project team, and within the citizen science aspect of the project.

- Civil society activists from the township area of Grahamstown East – self identifying as a civil organisation, and adopting the name "Water for Dignity", and leading the citizen science aspect of the project;
- Researchers from the Rhodes University Institute for Water Research (IWR), under the name of the WRC funded TPNP research programme (Towards Practising a New Paradigm). The IWR has a long history of engagement with water issues in the region from a number of perspectives; and
- The civic rights NGO, Khulumani Support Group (KSG). KSG has been working nationally since the end of Apartheid to mobilise civic society towards engaging enduring injustices arising from the Apartheid system. KSG engages in a number of national initiatives promoting active citizenship.

Through their collaborative efforts, these three civic groups brought to bear a range of larger activity systems, interests and skills, clearly illustrating the embeddedness of the local within larger scales (Palmer et al., 2018).

While the citizen science aspect of the project was led by Water for Dignity, it should be noted that the project was nested within wider systems of activity, both within the IWR and KSG. More detailed reports of these aspects of the project can be found in the data sources below. The focus below is on the citizen science aspect, with references made to the other activity systems as relevant, with the understanding that the features discussed below are embedded in the larger activity systems, while at the same time exhibiting unique features within the local citizen science activity system.

Water supply in the area is subject to the following system stressors (see Hamer et al., 2018; Palmer et al., 2018; Weaver et al., 2017 for more detailed descriptions and implications):

- Hydrological and climate factors
- Historical factors related to Apartheid social arrangements
- Aging infrastructure and a lack of sufficient budget and/or municipal expertise for renewal and maintenance of systems
- Insufficient wastewater treatment, leaking sewage and lack of budget for system upgrades
- Complex social and economic issues, including an apparently gentrified distinction in water quality across more and less (and predominantly black) affluent social groupings
- Lack of municipal capacity, including corruption and serious skills shortages, budget and infrastructure mismanagement, etc.
- Poor communication within the local municipality and between municipality and civic society
- Significant political issues both within the municipal council, and across political parties.

Data sources

Main documents and literature reviewed

- Burt, J., Wilson, J., & Copteros, A. n.d. Unpublished report on learning, reflection and evaluation based on social learning.

- Hamer, N. G., Lipile, L., Lipile, M., Molony, L., Nzwana, X., O'Keeffe, J., ... & Palmer, C. G. (2018). Coping with water supply interruptions: Can citizen voice in transdisciplinary research make a difference? *Water International*, *43*(5), 603-619.

- Holmes, J. K. C., Slinger, J. H., Mbulawa, P. & Palmer, C. G. (2015). *Modes of Failure of South African Local Government in the Water Services Sector*. Paper for 33rd International Conference of the Systems Dynamics Society, 19-23 July 2015. Cambridge, Massachusetts.

- Palmer, C. G., Munnik, V., du Toit, D., Rogers, K. H., Pollard, S., Hamer, N., ... & O'Keeffe, J. H. (2018). *Practising Adaptive IWRM (Integrated Water Resources Management) in South Africa*.

- Vallabh, P. (2017). Chapter 5: Transforming epistemic cultures in ESE with citizen and civic sciences as means for reframing participation in the commons. In P. B. Corcoran, J. P. Weakland & A.J. Wals (Eds.) *Envisioning futures for environmental and sustainability education* (pp. 540-549). Wageningen: Wageningen Academic Publishers.

- Vallabh, P., Lotz-Sisitka, H., O'Donoghue, R., & Schudel, I. (2016). Mapping epistemic cultures and learning potential of participants in citizen science projects. *Conservation Biology*, *30*(3), 540-549.

- Weaver, M. J. T., O'Keeffe, J., Hamer, N., & Palmer, C. G. (2017). Water service delivery challenges in a small South African municipality: Identifying and exploring key elements and relationships in a complex social-ecological system. *Water SA*, *43*(3), 398-408.

- Wilson, J., Pereira, T., Munnik, V. & Burt, J. (2016). Report containing a description and assessment of the case studies.

Interview and interactive engagement processes

One interview with the lead social activist of Water for Dignity (WfD) was conducted as part of Vallabh's (in press) PhD study.

Case analysis

SP 1: Political Economy and Policy Support

A key focus of the citizen science project was engagement with local water management policy – primarily through the function of the local municipality – Makana Municipality. The interest was in engaging the municipality to fulfil its water provision mandates, and to hold them to account.

At a broader level, one of the primary partners in the project was the Institute of Water Research at Rhodes University. As part of a series of broader national engagements, the IWR engaged with water-related policies within various contexts. This knowledge was brought to bear within the context of the local project – albeit indirectly. Findings from the project are also fed into policy engagements through the same channels. This is evidenced through the prominence of site case studies documented within a number of Water Research Commission reports.

SP 2: Knowledge Commons and CBWQM Tools

- The Report Card used for the community survey was adapted and refined from a sister project (not citizen science) previously conducted in the Sundays River Valley Municipality project. The Report Cards were hardcopy photocopies, which was appropriate for the context of activity.

- Case studies about the project form part of a number of other national systems, and the researched aspects of the project form part of research commons.

- Participation in the project was open to all, with a range of diverse community participants engaging in a variety of activities. While this is certainly not a digital commons, it did form part of a lived local commons.

SP 3: Capacity Development

The social activists took part in all aspects of the project, including learning how to analyse data with support from the IWR, and improving their civic rights knowledge around water quality issues. This was done through attending and presenting within regular transdisciplinary seminars (Palmer et al., 2018, p. 2), and study and discussion of responsibilities of local government through engagement with water policy and legislation at various levels. The project adopted a community of practice approach to learning, supported by ongoing and regular interactions amongst the three main partner organisations, all of whom were learning from each other how to strengthen water management and water quality management practices in a local government context (ibid.).

Lack of capacity impacting the project negatively was evidenced in the failure of community activities to make the transition to independent social entrepreneurs after the three-year formal project period. During the project lifespan, one of the key areas of failed capacity development was the inability to manage the scale and scope of community-related activities to within manageable scales, in spite of a shared recognition of over-extension on the part of community activists.

At a context level, serious lack of capacity at municipal level resulted in ongoing dysfunction, lack of service delivery, community mistrust and compromised water supply and quality.

SP 4: Communication and Profiling

The community activists engaged with local media in the form of newspaper articles and radio programmes (sometimes in collaboration with researchers, and sometimes independently). Several peer-reviewed academic papers and national project reports for the Water Research Commission were written (see data list of data sources above). One paper was co-authored by the citizen science group and Rhodes University research team (see Hamer et al., 2018). The programme was also profiled through the Khulumani Support Group, through their website and other project media.

One of the key drivers of the programme was the need to establish functional communication systems between municipality and community. This was never achieved during the lifespan of the citizen science project. However, a functional Water Forum, of which the municipality is now an active member, was one of the outcomes of the combined citizen science and TPNP activity systems.

SP 5: Collaboration and Communities of Practice

The citizen science aspect of this project involved four collaborating and one problematic community of practice:

1. ***The civic activist group, Water for Dignity***, led the majority of civic engagement activities. They reframed the original intention of the project (which initially designed to investigate microbial pollution of a local stream) to more strongly align with the community priority of water supply and quality (see Hamer et al., 2018). The group engaged in four key forms of activity:
1. The group adapted an earlier citizen Report Card towards this end, with the support of Rhodes University researchers, and then collected household data from 135 households in Grahamstown East. The survey focused on exploring water service delivery experiences in the area;
2. Establishment of Community Water Forums – which aimed to serve as neighbourhood-based communication hubs and communication pathways between municipality and community;
3. Installation of emergency water storage infrastructure, with funding from Unilever (see below); and
4. Establishment of School Water Forums, which acted as educational and outreach hubs focused on sanitation and water quality.
2. ***Rhodes University Researchers within the TPNP programme*** – the TPNP programme is a larger national initiative, encompassing a number of sites with diverse social-ecological risks and challenges. University researchers engaged in a diverse range of activities beyond purely research functions, adopting the role of civic partners with research skills. While they led the research aspect of the Khulumani Water for Dignity project, a large part of their role was to support the community activists to strengthen and develop their skills, mediate between various partners, and support the development of entrepreneurial activity within the civic group.
3. ***Khulumani Support Group*** – this NGO strengthened the civic rights aspect of the project, bringing resources to support activists 'knowledge development in this area. They also brought national credibility and alliance to bear behind the small local activist group, both raising visibility and leveraging their long history of rights-based work nationally.
4. ***Unilever***, as a corporate funder and partner within the TPNP programme, was able to unlock seed funding for various aspects of the citizen science project, including for stipends, emergency supply water tanks, and at a wider scale, research funding in support of the broader programme.
5. A fifth activity system formed a key part of the context – that of the local ***Municipality of Makana***. While this activity system sat at the heart of many of the social-ecological issues related to water quality and supply in Grahamstown East, they were not a functional part of the network of collaborative partners. While they are now

(after the conclusion of the project) a part of the local Water Forum, a number of issues and tensions remain, with many of the municipal responsibilities still unmet.

The citizen science project has now ended, in part because the core activist group seemed unable to expand its system of activity to include independent activity, and entrepreneurial self-sufficiency (see Palmer et al., 2018). The initial approach relied on community mobilisation, coupled with small levels of external support and a stipend system to support initial participation.

SP 6: Data Use and Open Access Reporting

Data collection was done through Report Cards – hard copy data sheets which activists used during the household survey. The Report Cards were an adaptation and refinement of a survey research tool (not citizen science) used in a sister project site within the TPNP. Data processing tools and technologies were housed within Rhodes University and the WRC.

Data was mirrored back to the Grahamstown East community annually over the project's three-year lifespan. Ongoing insights were also engaged with during the Community Water Forums.

While the data has been used to inform a range of activities and research processes at a local and national level, it is not technically open.

SP 7: Monitoring, Evaluation and Research

The project had the benefit of being part of two PhD studies (one in water resource management, and the other in environmental learning), in addition to being a case study within the WRC funded TPNP programme. This meant that formal monitoring, evaluation and in-depth research were conducted via a number of avenues. While the two PhD studies are still in process, four journal articles have already been published.

Ongoing reflexive engagement with project findings were evidenced within the local activist group – although they reportedly struggled to integrate some insights (especially around scale of activity).

Synthesis of key dimensions relevant for 2019 scaling workshop

- The value of networks of co-engaged partners in engaging the wicked nature of water quality and provision in South Africa. Of particular interest was the careful and purposeful approach of authentic co-engagement, where communities and community activist partners were collaborators, rather than implementers of externally originated activities.
- The need to carefully consider realistic expectations for ongoing project activities and activity systems within civic society – especially in terms of sustained capacity of civic partners to engage with processes beyond funding lifespans.
- Project sustainability should be framed in ways which provide a nuanced understanding of sustainability within the context of multiple scales of activity and shifting loci.

CASE 6: Municipal Services Unit (MSU) – KZN

Rationale for choosing the case

The water, sanitation and waste issues troubling Umsunduzi Municipality are common across many municipalities in South Africa. By forming a partnership with DUCT, Msunduzi has been able to address service delivery issues in an effective and informed way. There is much learning from such cases.

Data sources

Main documents and literature reviewed

Taylor, J. & Cenerizio, C. (2018). *An Evaluation of the Msunduzi DUCT Pollution Monitoring, Maintenance and Community Education Project (from 2016-2018).* UKZN/ DUCT, Pietermaritzburg.

Interview and interactive engagement processes

Extensive interviews were undertaken with staff of Msunduzi Municipality as well as staff of DUCT and with community members in the affected areas.

Case analysis

SP 1: Political Economy and Policy Support

The project records how various policy processes were achieved through the project actions. These include meeting the SDGs, National Development Plan, the KZN Provincial Government Development Strategy, the National Water Resources Strategy 2013 (NWRS2) the National Water Quality Management Policy and Strategy (NWQMP, 2017).

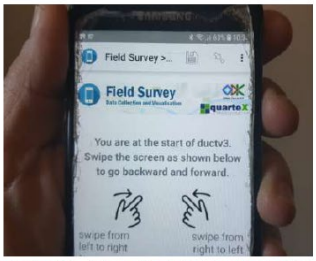
The project provided temporary jobs for many unemployed people. By addressing serious waste, sanitation and water pollution problems the project saved funds that would otherwise be used to address such risks.

A key policy related enabling factor was the articulation with the KZN Provincial Government Development Strategy (PGDS).

SP 2: Knowledge Commons and CBWQM Tools

The project built considerable knowledge in the various communities it was serving, namely Sobantu, Ashdown and Mbali. This knowledge is evident in 11 authentic stories of change gathered in the various communities (Taylor & Cenerizio, 2018, pp. 23-28). The use of cell phones to access and record field-data contributed a great deal to the 'knowledge commons'.

Enabling factors here included project staff interacting with community members through dialogue-based processes, rather than the more inhibiting awareness raising actions where people are told or informed how to act. A social learning orientation was thus evident in the developing knowledge commons within township communities.



THE FIELD SURVEY MOBILE APP USED TO REPORT LEAKING SEWERS

TWO DUCT SEWER MONITOR TEAM MEMBERS REPORTING A LEAKING SEWER

13

Mobile phone technology being used for CBWQM monitoring and reporting

SP 3: Capacity Development

The project was steeped in capacity building and community members were trained in alien invasive clearing and herbicide treatment. Understanding catchment management and the implications of water pollution, solid waste dumping and other sanitation related issues such as surcharging sewers were also part of the capacity building process. Most significant was how people learnt that they had a right to healthy clean environment and that it was the municipalities 'responsibility to address issues of solid waste dumping and water pollution.

"Izinto zizonakala ngokuma komsebenzi wethu, kubalulekile ukuthi umsebenzi wokuhlola izitamkoko uqhubeke ngingawuqhuba mina lowo musebenzi ngingawuqhuba" (The current situation will get worse with a halt in operations most especially the monitoring and reporting, I am willing to continue this work without pay).

A MEMBER OF THE DUCT SEWER MONITORING TEAM CLEARING THE AREA AROUND A LEAKING MANHOLE

An example of what the CBWQM projects do

A key learning realisation was that there is always someone who lives downstream and who will suffer if people upstream degrade the river catchment. This was mentioned in a number of discussions with community members. Capacity development that placed the tools of science in people's hands and helped them learn to understand issues and risks, such as through the application of miniSASS, were most significant in this area.

SP 4: Communication and Profiling

The communication and profiling in the three focal townships was excellent thanks to staff members being able to engage in dialogue issues around the various problem areas and issues they were facing. The project also used an innovative smartphone friendly video, in addition to a 32-page evaluation report, to share key evaluation findings. This proved useful to government officials, councilors, and other people in authority.

The relationships that project staff developed with community members were very important in this context and proved a key enabling factor. To paraphrase Stenhouse, 'community is more important than communication if meaningful social change is to come about'. This means it is not so much the message that is conveyed and

received but who is sharing the message and how. Where project staff were genuinely interested in community concerns and issues the 'joint meaning-making' and dialogue that resulted was much more significant than where information was simply conveyed to people.

SP 5: Collaboration and Communities of Practice
Considerable collaboration resulted from the project activities. This included local community members working with government officials as well as local businesses engaging with project teams. Most importantly has been the building of relationships with local municipality staff and a deepening in the understanding of the role of the municipal officials. Collaboration also took place as staff members consulted other citizen science projects, e.g. Mpophomeni Enviro-Champs. The responsibilities of the local municipality became increasingly clear as the project progressed and community members were able to understand what roles the municipality should play and how. This proved a helpful enabling factor in the project processes.

SP 6: Data Use and Open Access Reporting
The project used an innovative customisation of the Geographical – Object Driven Knowledge (GEO-ODK) which functioned as a field-survey app. This meant that social, numerical and spatial locations (with recorded GIS positions) could be saved in the 'cloud'. It also helped track issues and convey them to the responsible authorities.

The Stream Assessment Scoring System (miniSASS) was a further tool that the project used extensively. miniSASS is a simplified version of the South African Scoring System approach (SASS 5) which uses over 80 taxa to establish a river health index. A key enabling feature of miniSASS is that since only 13 species of macro-invertebrate are used as indicator species citizens, or indeed children, with little scientific training, can participate in developing and recording a River Health Index (RHI). The miniSASS activities were instrumental in building capacity amongst the river care team staff and by using a Google plane, the data can be transferred and save in the 'cloud' through the website www.minisass.org.

SP 7: Monitoring, Evaluation and Research
The project had a detailed monitoring process which recorded all incidents of pollution using live digital data which recorded the event, follow-ups as well as other key issues and risks related to waste, water and sanitation. Such monitoring data can be followed up on a smart-phone and is recorded in the 'cloud'.

The MSU project has also been the subject of a detailed 'depth deliberation 'evaluation process using a realist and appreciative enquiry methodology (Taylor and Cenerizio, 2018). Other evaluation research that contributed to a deepening of understanding with regard to the DUCT project work was undertaken by Mugwedi, Hadebe and Hay (2018), who also noted the importance of civil society structures working with local government.

> *"Probably the most important lesson learnt (and one we continue to reinforce) is that individuals and communities need to be engaged about their priorities rather than our own project priorities."* (Hay et al., p. 2).

Synthesis of key dimensions relevant for 2019 scaling workshop

- Realist evaluation methodologies combined with appreciative enquiry are more powerful at eliciting underpinning insights, causal factors and trends than more conventional questionnaire survey tools. Survey tools can be supplemented with realist and appreciative enquiry methods to produce stronger evaluations.

- A partnership between government (Local Municipality and CoGTA), civil society (e.g. DUCT), and business is a key means of addressing service delivery issues related to water and sanitation. Each institution has particular strengths which can then be used to complement each other.
- Leadership of such projects that is calm, thoughtful, diligent and caring proved to be invaluable.

CASE 7: Citizen Science Leadership Seminars – Provincial

Rationale for choosing the case

Citizen science offers many 'bottom-up 'processes for mobilising society around key water and catchment management processes. Unfortunately, such processes may be strong at a community level but leaders in society may be left out of the engaged activities. To address this issue a 'power-mapping 'process was conducted in the uMngeni Catchment (Rowlands, Taylor, Barnes & Morgan, 2013). The power-mapping process identified key leaders in the catchment, who, through their own acknowledgement, felt that they lacked an understanding of ecological infrastructure issues and risks. Such leaders included councilors, traditional leaders and municipal managers. A number of leadership seminars, supported by key resources were therefore conducted. All the leadership seminars were supported by citizen science activities.

This project worked in collaboration with CoGTA, WWF and WESSA.

Data sources

Main documents and literature reviewed

- Rowlands, K., Taylor, J, Barnes, G. & Morgan, B. (2013). *Securing Ecological Infrastructure in the uMngeni Catchment: A Socio-Ecological Contextual Profile*. WESSA, Howick.
- Dambuza, T. (Ed.) (2017a). *Key performance areas and responsibilities within the local authorities that enable environmental projects*. This booklet outlines the KPAs of officials and political and traditional leaders as well as offering links to legislation and compliance. WESSA, WWF, Pietermaritzburg.
- Dambuza, T. (Ed.) (2017b). *Tools and teaching resources for enhancing water care in catchments* Resource drawing on the WRC Citizen Science tools project. WESSA, WWF, Pietermaritzburg.
- Dambuza, T. (Ed.) (2017c). *Our stories of change.* This resource overviews how leaders and other influential people, are changing their lives, and those they represent, towards more sustainable water management practices. WESSA, WWF, Pietermaritzburg.

Interview and interactive engagement processes

Interviews were held with many leaders across KZN. Such processes were sustained before, during and after the 'Leadership Seminar' processes. Over 300 leaders from various parts of the uMngeni catchment have been involved. This project has been offered in support of the SANBI managed uMngeni Ecological Infrastructure Project (UEIP). Although leadership seminars are ongoing, funding constraints have led to the project being placed on hold.

Case analysis

SP 1: Political Economy and Policy Support

This project directly implements policy processes and potentially strengthens a local economy especially where leaders work with communities to address catchment restoration projects. Such projects are often funded through EPWP processes and are documented in the "Stories of Change" booklet (Dambuza, 2017c). A key enabling factor here has been that the Leadership Seminars directly address the key performance areas of the officials in leadership positions. It thus helps them fulfil their job roles.

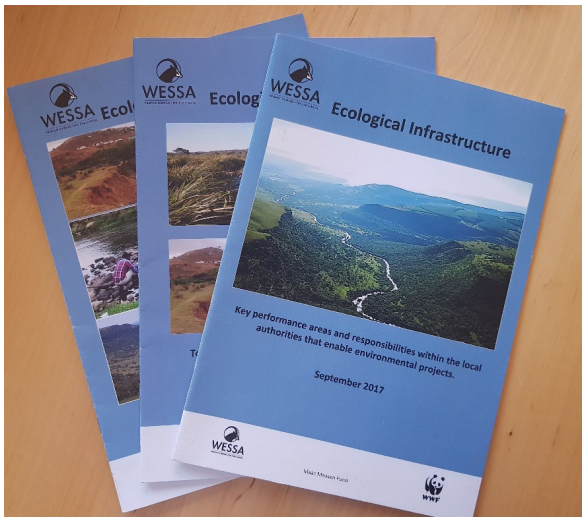
SP 2: Knowledge Commons and CBWQM Tools

Leaders were able to learn about CBQWM via practical learning process. Leaders were introduced to a wide range of citizen science tools such as the clarity tube, velocity plank, miniSASS, and the River Health Assessment Tool. This allowed for wider sharing of how these processes operate, and leaders developed a better understanding of water quality concerns, as well as CBWQM work.

SP 3: Capacity Development

The capacity development processes support leaders to meet their mandated responsibilities. The workshops usually have three phases:

- Phase 1: Clarifying the KPAs and obligations of the leaders through a dialogue-led discussion. This process is supported by the KPA resource (Dambuza, 2017a – see figure below).
- Phase 2: Fieldwork in a local area. Here leaders are supplied with gum-boots and may, for example, undertake a full miniSASS study. Being in the field, together, with facilitators leads to rich and meaningful dialogue. Phase 2 is supported by the 'tools resource' (Dambuza, 2017b – see figure below).
- Phase 3: Taking the work further. Phase three addresses the question of how leaders equip their staff and colleagues with meaningful learning related to ecological infrastructure.



Three resources supporting the Leadership Seminars: Key performance areas, Tools to achieve the KPAs, and Stories of Change (Evidence of Change)

Leaders can then recommend that their staff engage in similar training processes (usually Work Skills levels 2 to 5 depending on experience). Here the enabling processes include course-activated learning provides participants with the orientation, the learning materials and the tools to strengthen their work in a 'situated, relevant and applied' manner.

SP 4: Communication and Profiling
The leadership seminars are a professional support structure that enable capacity development that is based around the goals and objectives (KPAs) that the leaders are seeking to achieve. Communication amongst leadership groups spread quite quickly as different leaders joined in at other seminars and shared their experiences. Ward Committees and war-rooms (ANC-led structures initiated through the 'war on poverty' concept) became fruitful places where leaders could share their ideas and knew ways of working.

SP 5: Collaboration and Communities of Practice
By working with CoGTA and people in leadership positions, the leadership seminars strengthened communities of practice.

SP 6: Data Use and Open Access Reporting
Although miniSASS data was inputted on the miniSASS database at www.minisass.org, data use and access was not a key part of the project.

SP 7: Monitoring, Evaluation and Research
No formal evaluations were done on the leadership seminar concept, however regular reporting to WESSA and WWF helped document the processes.

Synthesis of key dimensions relevant for the 2019 scaling workshop

The concept of working with leaders, and including citizen science practices, was a key contribution from this case study. The manner in which the workshop facilitators 'attuned' the workshop topics to the participants was also important. Additionally, the focus on KPAs of leaders helped to link the practice of CBWQM to their governance practices.

CASE ANALYSIS: Significant insights informing CBWQM scaling, alignment and resourcing emerging from the case studies review

In this section we synthesise some of the more significant insights gained from the review above for informing the scaling, alignment and resourcing of CBWQM in South Africa. The emphasis is on insights that can be used as 'mirror data' or as material that can be used for ongoing reflection in the sector that is engaged with and is supporting CBWQM practices, water stewardship, and environmental and social justice. We continue to use the scaling pathways identified in Figure 2 to guide these reflections, and we highlight enabling and constraining factors where relevant.

Scaling Mechanism and Pathway 1: Political Economy and Policy Engagement

Political Economy: In this study we have deliberately used the concept of political economy, as used also by Ager (2006) in the context of environmental risk and vulnerability (a condition created by poor water quality management):

> *… it is widely noted that vulnerability to environmental change does not exist in isolation from the wider political economy of resource use. Vulnerability is driven by inadvertent or deliberate human action that reinforces self-interest and the distribution of power in addition to interacting with physical and ecological systems."* (p. 270)

A recurrent theme in the case studies is the difficulty of creating sustainable economies for citizen-based water quality management. One dimension of this challenge links to whether citizen engagement is a requirement of policy. Munnik et al. (2011) have referred to these as 'invited spaces' where citizens have a mandate to participate in water management decisions. A second dimension related to those spaces where citizens create and shape their own possibilities for involvement in water management. These are sometimes referred to as 'invented spaces' (Munnik et al., 2011). A third dimension is related to the underlying political economy of development and contradictions that exist between a neo-liberal and developmental state framework where it would either be in the interest of the state to fully support CBWQM in order to improve the well-being of people and protect the country's water resources for development, or to ignore these benefits as profits accrue to the few via either exploitation or corruption (Wilson et al., 2017). The high level of social protests in South Africa around service delivery efficacy would appear to indicate the latter rather than the former.

Where participation is a policy requirement, there tend to be greater opportunities for resourcing these processes although some of the processes may be superficial and may actually suppress citizen activity, especially in cases where the data may be revealing inadequate compliance or compliance management. Where civil society create spaces for engagement, there is a tendency for these processes of engagement to rely substantially on volunteer commitment. In addition, where multiple sectors of society recognise common areas of interest (such as access to quality water resources), the possibilities exist for multiple resourcing options and thus the potential for securing less restrictive and more sustainable political economies. This **polycentric approach** to the political economy of CBWQM does however require a capacity and commitment to work with multiple resourcing options and to manage the underlying systemic structures and the power relations they shape between participating institutions. It also requires distributed forms of management and leadership, and distributed capacity and roles and responsibilities.

Policy Support: There is significant policy support at the international and national level for citizen-based water quality management. These 'invited spaces 'form the subject of a separate deliverable in this project (Deliverable 4) and have been introduced in the induction meeting and in the inception report (Deliverable 1). It is however important to acknowledge that these policy openings may be latent, misunderstood or even deliberately

subverted as was highlighted in case study 1. Future work in this project will focus on unpacking the policy support for CBWQM.

Enabling factors:

- Policy references to consultation and collaboration between government and civil society enables spaces for engagement and potential funding.
- Legislative requirements related to corporate social responsibility and transformation in South Africa as well as reputational issues create opportunities for collaboration between business and local communities.
- The common interests between large international and national civil society organisations and local community-based organisations enable the flow of funding from large and complex funding mechanisms to local projects.

Constraining factors:

- Policy commitments to consultation and engagement may be misinterpreted or subverted due to political concerns related to service delivery and broader governance failure, or due to underlying contradictions in the policy framework governing water quality and development in the country [this will be probed in more depth in the next deliverable].
- Corporate commitment to citizen-based initiative tends to be limited to shared benefit although it is often portrayed as 'social investment' in local communities. This funding is often insecure and tends to work on three-year funding cycles.

Scaling Mechanism and Pathway 2: Knowledge Commons and CBWQM Tools

There is a long history of CBWQM in South Africa, building on the early Project Green (early 1990s) and interactions with Bill Stapp which led to the adaptation of these citizen science tools for use in environmental education programmes in South Africa via Share-Net. Water quality test kits and tools are therefore a key feature of the South African CBWQM landscape. Share-Net also established an ethos of knowledge sharing, or the concept of a knowledge commons which promotes the sharing and free access to knowledge and knowledge resources for the common good. In all CBWQM projects reviewed, this legacy is evident, in other words, the legacy of shared resourcing of a practice via tools and materials that are easy to access, low cost and that can be used by more than one group without high costs or other access blockages (e.g. Intellectual Property constraints) is enabling of a field of practice such as CBWQM. Various efforts have been made to strengthen the accessibility and availability of these resources, but these also require ongoing maintenance and management support. For example, the potential exists for making better use of the www.catchments.org website and the landscape map for accessing the available CBWQM tools by a wider group of citizen science practitioners.

Another feature of the knowledge commons and CBWQM tool is the ongoing processes of innovation associated with these. In earlier years, the tools were mainly text- and material-based, nowadays the use of ICT in conjunction with the material and text base of the tools allows for more sophisticated data capturing and reporting, e.g. via use of GIS mapping, etc. This ongoing investment in innovations around the CBWQM tools therefore needs to be supported and enhanced.

Another critical feature of a knowledge commons approach to CBWQM is a shared commitment to the common good amongst landscape or catchment-based project partners who are willing to share and adjust roles and responsibilities in response to the contextual dynamics, risks and opportunities within multi-actor and multi-institutional partnership frameworks. This requires both inter-sectoral co-operation, inter-institutional co-operation as well as inter-disciplinary engagement. Co-operative competences, and sensitive leadership, as well as

adequate capacity for co-engaged relational engagement appear to be important for establishing and maintaining such an ethos and knowledge commons practices.

Enabling factors:

- A key enabling factor for CBWQM scaling and alignment is the long history of developing citizen science tools for WQM in South Africa, from the earlier miniSASS to more recent innovations associated with ICT-based CBWQM tools.
- A second enabling factor are the many examples that show the diversity of potential partnership and co-operation structures and models, and the lessons that can be learned from these for scaling and alignment.

Constraining factors:

- Adequate resources are required for a) producing and sharing, and b) updating and innovating, and c) maintaining systems of support for the ongoing development and use of CBWQM tools from a platform (e.g. similar to the role Share-Net used to play in the past) that allows for expansion of the use and innovation of tools within a shared knowledge commons system and structure. With the loss of Share-Net, this is an urgent priority for CBWQM continuity and expansion in South Africa.
- Use of the CS tools, especially when set up to provide 'living data' and reporting (e.g. with the miniSASS), requires stable institutional support for especially verifying and managing the incoming data from the various monitoring sites. This is critically important for ensuring that the CBWQM data is a) properly captured, b) visualised in accessible form, and c) shared in meaningful ways that d) inform decision-making and change processes.
- Not all water quality issues are easily dealt with by low-cost CBWQM tools. There is therefore a need for accessible systems of support for more complex water quality problems (e.g. testing of heavy metals). Here stronger alliances between CBWQM groups and universities, and relevant laboratories with capacity for this kind of WQM testing are needed, with adequate resources provided for the full value chain associated with these processes.

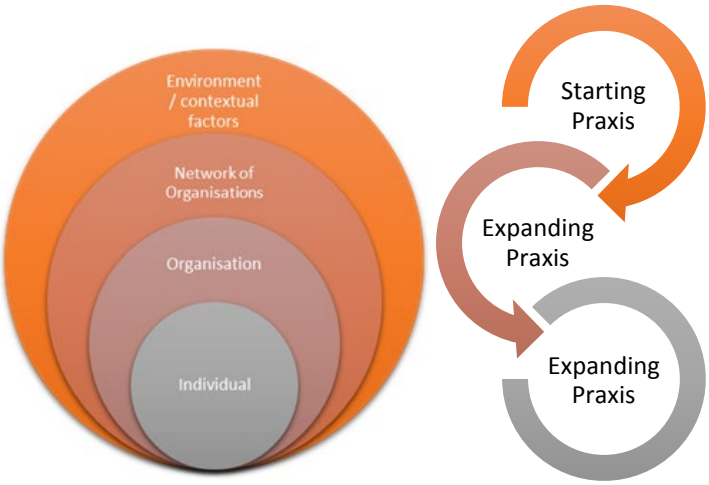
Scaling Mechanism and Pathway 3: Capacity Building

The cases, questionnaires and supporting data revealed a very strong commitment to capacity building in the CBWQM activity system in South Africa. Every project had invested greatly in capacity building in a range of different ways which ranged from practical hands-on field training in how to use CBWQM tools, to more deep-seated transformation training and social learning processes supporting activists to develop confidence and capabilities for responding to very complex conditions in heavily polluted environments where power relations were also very skewed, at times impacting on the safety of the activists (as found in Case Study 1). Capacity building is also spread and includes not only those undertaking CBQWM, but also those responsible for water quality management (e.g. government officials with compliance and leadership responsibilities). Overall there is an understanding that responding to the seriousness of the water quality concerns affecting people and environments, will require a wide ***system of capacity building*** that involves technical aspects, as well as social and communication and advocacy aspects.

The active tension that exists between realistic expectations for core activities and expansion beyond core activities in CBWQM projects is also an important space for thinking about capacity building. This tension rests also at the interface between volunteerism, civic engagement, and jobs with a civic responsibility, each having different implications for capacity building and its purpose.

Project durations and a general project-based approach to CBWQM, especially amongst the larger NGO groups and organisations affects the continuity and depth of capacity building opportunities. There is need for developing longer term, more sustainable social and economic infrastructure for CBWQM projects, so that capacity building can also be conceptualised within longer time horizons and with adequately conceptualised learning pathways, especially for potential job creation options and occupational relevance (e.g. the environmental technician occupation could well provide a good longer term framework for CBWQM capacity building programmes). Important here though would be to maintain the ethos of the CBWQM sector's work and engagement, which is more aligned with an interest capacity development for collaborative sustainability, not only for independent sustainability (individual or project-based mentalities). In such a collaborative sustainability capacity building model, the value of distributed capacity and distributed leadership and distributed resource base is crucial, as was modelled in the EMG social learning course activated learning network system of activity.

Importantly, as shown across the cases and contributions, there is need to enhance capacity to work across different levels and scales, as outlined in the figure below. This framework has potential to provide a starting point for deliberating a sector-wide capacity building programme, modelled along the lines of the RU/EMG social learning course with Change Projects at the centre (Case Study 1) which emphasises reflexive change oriented social learning over time (second part of figure below), which can also be aligned with the notion of different types of capacity building at different levels (the example of the leadership training – Case Study 7), and strong emphasis on use of CBWQM tools and knowledge commons and accountability monitoring and enactments (all cases).



Layers of capacity development / Reflexive capacity development
Both can be supported by situated praxis (use of CBWQM tools and approaches in specific contexts)

Enabling factors:

- The CBWQM community have a strong interest in, and a wide range of expertise to share to support ongoing capacity developments in the sector.
- A tradition of being willing to learn together and to support each other to learn is a strong enabling factor that can support scaling and alignment.
- Expertise exists in the sector for diverse types of capacity building at different levels of the capacity building sector. This is, as yet, not well aligned for sector wide impact.
- There are experiences of a wide range of, and diversity of types of capacity building activities that address different purposes across the CBWQM community. A strong inventory of these together with more in-depth insights into their efficacy would assist with development of a wider social learning system for CBWQM in South Africa.

Constraining factors:

- Capacity building programmes are often in situ and are driven by immediate needs. Therefore, capacity building experiences and expertise are not always widely shared for wider sector benefit. This is impacted on by resources and availability of resources, as well as certain levels of fragmentation amongst CBWQM stakeholders, which is also influenced by geographical spread of initiatives.
- Adequate resources need to be made available for quality capacity building programmes. Experiences show that capacity building is not a once-off event, but a longer-term process over time which allows people to develop expanded areas of expertise, confidence, networks, new practices, scientific competence, social competences as well as ethics of care, justice and co-operation.
- Additional support and alliances should be in place for more complex forms of WQM, that CBWQM programmes have access to when needed (e.g. testing of toxins).

Scaling Mechanism and Pathway 4: Communication and Profiling

As can be seen from the case study reviews above, communication and profiling is an important dynamic in validating and expanding the work of the CBWQM projects. This takes a number of forms including use of video material, gaining exposure via television programmes and competitions, project websites and via the support of mediating organisations such as national NGOs who have capacity for profiling the work of grassroots CBWQM initiatives. However, communication and profiling is not only media-based or related to media exposure. It also involves direct contact with communities on the ground via door-to-door campaigns and interaction, and via linking up with other relevant local forums, networks and landscape level initiatives and governance and leadership structures, especially also the CMA structures where these are operating well. Thus, communication and profiling is both broadly oriented towards wider public media attention, but also quite targeted within relevant systems and structures for ensuring more effective support, and for sharing the findings that are being generated by the CBWQM projects. Communication and profiling is also important for enabling cross CBWQM project interaction, so that projects can learn from each other.

Enabling factors:

- Links to high profile networks, national NGOs and government structures can help to facilitate improved communication and profiling of CBWQM activities.

Constraining factors:

- Communication and profiling activities need to be targeted as well as broad, and this requires investment and time, as well as relevant competences and skills for this work. This needs to be adequately supported.
- Institutions with stronger brands can co-opt smaller initiatives, and care needs to be taken not to appropriate the work of smaller institutions, but to adequately profile them within the larger partner brands and programme structures within networked partnerships.

Scaling Mechanism and Pathway 5: Collaboration and Formation of Communities of Practice

As can be seen from all of the data reported on above, CBWQM projects are highly dependent on a diversity of partnership arrangement for their success. As outlined via the choice of the cases presented above, these can be variously initiated, i.e. out of civic action and citizen organisations, from local or national government, from business partnerships, or via university and national NGO partnerships. In all cases, there is a need to sensitively nurture these partnerships, and *relationality, dialogical structures and sensitive and enabling democratic leaderships* is therefore a key feature of these projects. These relational dynamics need to be given special attention in CBWQM projects. As shown above the EnviroChamps model appears to be gaining ground

as being a successful approach to establishing and maintaining relationships and building on-the-ground rtnerships and for mobilizing community participation in CBWQM projects. This model, however, requires sustainable support both in terms of funding, but also in terms of capacity building and support for the relational, dialogical and co-engaged work that needs to be done in CBWQM.

Not all relational arrangements work, and there are cases where relationships between partners are tension-laden, or break down. However, evidence from the cases show that new relationships and approaches can be enabled by these ruptures. The challenge and opportunity is to keep the bigger picture of community development and sustainability in mind within an expanded notion of collaboration and communities of practice.

Enabling factors:

- Partners who have a sensibility towards relationality and co-engaged partnership building appear to be able to foster the kinds of relationships necessary for successful CBWQM. This is, however, often a taken-for-granted aspect of the programmes, and requires support and also capacity building for building and sustaining these relationships and partnerships.
- Wider partnerships between powerful actors at landscape or catchment level can provide support for CBWQM projects and the building of CBWQM communities of practice within these wider structures.
- Learning networks and programmes that build links between smaller grassroots CBOs, NGOs, and local and provincial governments in social movement structures appears to also hold potential for strengthening CBWQM practices, i.e. investing in interlinked and multi-levelled structures and networks. However, as shown in Case 1, the practices of the CBOs should form the primary focus of the networks, and the networks and partnership building should be in service of these practices and their validity and expansion.

Constraining factors:

- Competing interests, especially competition for similar sources of funding can cause rifts in existing partnership structures.
- Short-term funding frameworks can lead to some partners not being able to participate in CBWQM projects, which can lead to a fragmentation or demise of relationality in projects.
- Partnerships and building of communities of practice can break down around a lack of clarity re: different roles, or when one partner overpowers others (i.e. around poorly managed power relations).

Scaling Mechanism and Pathway 6: Data Use and Open Access Reporting

In all cases the collection of data on the status of rivers or water bodies, sewer lines and other CBWQM foci is crucial for the foundation and success of the CBWQM project. As shown in the cases above, data can be generated via a range of CBWQM tools and approaches, and there exists a strong system of tools for data generation above. However, generating the data is not adequate for successful CBWQM. More important is the storage, representation and use of the data.

The CBWQM community in South Africa shows evidence of innovating to use mobile phone technology and the Internet to capture and represent data gathered through the cell phones, spreadsheets and citizen science tools. This has been very important in terms of the use of the data. Google Earth has been used to map the manholes and miniSASS scores while heat-mapping has been used to visually represent the data gathered through the manhole monitoring and spreadsheets. However, not all CBWQM sites have access to these technological innovations as yet, and there is need to build capacity across the system for a) using such approaches, b) strengthening the representation and data sharing aspect of CBWQM, and c) developing means of verifying and

storing the data more centrally to build up more systematic views of WQM issues in South Africa. The miniSASS website and data representation system, and the heat maps are two strong innovations in this regard.

However, these also need to feed into proper systems of decision making, and here local, provincial and national government capacity is crucial for making sense of the data and for responding to reported concerns. Without this, the data generation processes can have little impact, and citizens involved in the CBWQM projects can become demoralized. This brings the need for strong relationships between CBWQM projects and local governance systems to the fore in a) supporting the data generation and representation, and b) using the data for decision making, and c) reporting back to citizens on actions taken. This value chain is currently not strong overall, and significant investment is needed to strengthen this relational value chain for CBWQM systems to operate at their full potential and impact.

Enabling factors:

- In addition to making the data accessible for a very wide range of role players locally and nationally, the use of the Internet in innovative ways has raised the profile of the projects and thus increased its ability to influence decision making at many different levels.
- Creating living data tools for CBWQM is possible with internet and cell phone technologies. Capacity to develop and share these is, however needed, but they are popular, and are a motivator for many who are involved in the projects, especially as they offer living data sets that can easily be represented.

Constraining factors:

- There are constraining factors associated with using the technologies above, not least of which are the cost of actual data in South Africa, and assumptions about availability and usage of smartphones at community level. These constraints need careful analysis, and reflexive engagement.
- There are also deeper underlying factors that constrain the recognition and use of CBWQM data, which are related to lack of compliance monitoring and management when vested interests or corruption skews normal practice. In such cases, data being generated by CBWQM activists could at worst, create situations of danger and risk for them. While this could seem far-fetched at first glance in a democracy, there are many examples of cases where environmental activists are being threatened by their practices by more powerful interests.

Scaling Mechanism and Pathway 7: Monitoring, Evaluation and Research

As shown by the data generation as well as the analysis of the cases above, monitoring, evaluation and research are important for making CBWQM initiatives visible. Additionally, these processes are important for learning, and especially for cross learning across CBWQM initiatives.

There are different approaches being used to M&E in the CBWQM projects, including surveys, as well as qualitative appreciative enquiries, stories of most significant change, and realist evaluations that probe enabling and constraining mechanisms and factors (as has been done in this initial review). Overall, this mix of approach offers useful insights into an important field of practice. It was noticeable that those projects with government and external donor or larger NGO support were more likely to be monitored and evaluated than projects that are volunteer driven. Additionally, it was also noticeable that the M&E processes all had a similar interest, in working out how CBWQM projects could be strengthened in the interest of the public good, as well as livelihoods and job creation opportunities especially for those who were affected by unemployment and poverty related conditions. Although the M&E projects point to how this can be done, it is clear that a *system wide* response is required both to strengthen the collective use of CBWQM tools and data systems, as well as creation of more sustainable

political economies and systems of operation. Research, especially into the processes of capacity building is also important as this helps to improve ways of working within and across projects. This aspect of CBWQM also requires more substantive and sustainable support.

Enabling factors:

- M&E expertise with a sensitivity to the practice of CBWQM and its potential benefits for the common good can go a long way towards strengthening the practice, and facilitating co-learning across projects. M&E should therefore be conceptualised within a MERL (Monitoring, Evaluation, Reporting and Learning) framework.
- Research, especially action-oriented research that supports ongoing improvements in praxis both from a tools development and capacity development perspective is proving to be a powerful influencer of innovations within CBWQM practices.

Constraining factors:

- The field of CBWQM lacks a synthesis of best practice from an M&E perspective. This will be taken up in the next deliverable, especially also in relation to impacts that are related to policy, as well as changes on the ground (i.e. social-ecological system change). This can help to 'make the case' for strengthening support for CBWQM practice.
- Research, M&E (conceptualised within a MERL (monitoring, evaluation, research and learning) framework) requires dedicated time and resources. There are a number of research institutions with capacity to undertake such research, but more synthesis work across the research initiatives is needed to strengthen the research platform. There is also a need to avoid over-emphasising certain case studies at the expense of others (also to avoid research fatigue), and for this there is need for a more substantive database on CBWQM practice and better systems of communication for research and MERL purposes. Research fatigue in communities can also be avoided through approaches to research that are co-constructive of the practice, rather than simply analytical (this does not mean that the research is not analytical, it means that the research practice needs to extend beyond analysis only to include generative co-engagement components or approaches).

APPENDIX B: **RESPONSES TO THE REPORT AND RESPOND INSTRUMENT**

Jaqui Golden: I have made a few comments in the document. It's a great idea to have a 'report and respond' – something perhaps the WRC can consider as part of the template for draft final deliverables (also the visual representation of deliverables)? The document has enormous value and the work is so important. I look forward to us forming that 'critical mass' I refer to in my final comments. But congratulations to you and your team for really important and very well presented work.

Report and Respond Question: What other government mechanisms, departments and programmes are investing in water quality management? What is the scope and scale of this investment?

So here I would say that its not just about 'money' but about willingness, motivation, organisation, partnerships. Also perhaps missing is the more grassroots reality which is tribal authorities. The rural/urban skew is also important. Within the urban setting the 'partners' are likely to be different. Within the rural we would want to see agricultural unions, tribal authorities, etc. What about Water Boards? So far I haven't seen reference to wastewater treatment plants though I am sure you will be talking about these later – but of course the non-maintenance of so many plants impacts on water quality. Water quality – contamination through pesticides, etc. is a rural concern. Also mining – water quality effects is another focus (I see you address this below!). It might be helpful to have a table which picks up on this. Where the contamination is, its source and who is accountable – or what mechanisms are in place to address these concerns of quality?

Report and Respond Question: What other examples are there of existing business initiatives that are investing in CBWQM water quality management? What is the scope and scale of this investment? What other opportunities (e.g. the example of the legislative compliance requirements in the mining sector) may there be for leveraging stronger CBWQM partnerships within a more sustainable co-operative governance framework? Who can partner to open up these possibilities (e.g. CER noted above)?

Who is 'obligated' and who would voluntarily contribute. It's a bit of a carrot and stick dilemma I guess

Report and Respond: We invite respondents to help us to clarify this argument –
For water resources to be able to continuously sustain a healthy society and economic development, the quality of our water needs to be maintained within predetermined parameters. Most of the country's water resources are negatively impacted by a combination of wastewater discharges and run-off from land-based activities. We need to involve citizens in water quality management, to facilitate collaborative management of our water and build a participatory democracy. This can create jobs and learning pathways that develop skills and values for integrated water resources management. All actors need to be involved.

I have one concern here – and that is 'job creation' as opposed to volunteerism. Job creation implies funding and you have already well outlined the funding constraints. Citizen Science (CS) is often quite different in that it engages with volunteers (not always sometimes they are paid that is true). I am all for the volunteer aspect where there are other non-monetary incentives to maintain a healthy environment. I speak here of attributes such as empowerment, feelings of pride and other 'quality of life' aspects that I have found to be fundamental to the success of CS – again it is not a given. Its often tentative but then so is the job creation side of it. Money flows in and out – more often very limited resources and often not sustainable – for instance in the case of public works any monetary remuneration is short lived (I can't remember the exact months of duration of pw project but it's between 6 months and 2 years absolute max – thinking here of the Working for Water programme

Report and Respond Question: Are there any other significant policy leverage points that we should be giving attention to for the funding of CBWQM practices in South Africa?

Well I guess, being passionate about CS, I would say we need to lobby are a community of practice for much more support for CS

Report and Respond Question: Are there any other aspects that should be considered in the multi-partner context of CBWQM as this currently characterises the way in which CBWQM is being resourced in South Africa?

We should have a webinar on volunteerism and sustainability – we seem to disagree on the power or potential of volunteers to fill a gap – where funding is minimum or not at all available. A lot of space here for discussion!

Jo Douwes: eThekweni Municipality: "This is a very interesting read – thanks for sharing! It's not really my space, but I will share a few thoughts that came to mind while I was reading:

At a municipal level (and I suspect the same is true at provincial and national level), it feels like it is becoming more and more difficult to 'move money' to entities that are doing good work. A lot of this links to the fact that we have to operate within the boundaries of the MFMA and SCM legislation. As an example, some years ago, we managed to use Section 67 of the MFMA to transfer funds to the Kloof Conservancy, but these options are tricky and the transaction costs can be quite high for the recipient entity (which your report also highlights). The other challenge is the time limit – most agreements don't last beyond 3 years, and so sustainability of finance is really difficult. This is especially important with initiatives like water quality monitoring, where you want continuous data. Gary Cullen seems to have made things work on a longer-term basis with the relationship between the City and Durban Green Corridors. Might be worth chatting to him – I think he's used the same mechanism, but somehow seems to have managed to 'roll it over' beyond the usual 3 years.

Linked to the above, I think there might be opportunities to integrate water quality monitoring into existing programmes, rather than setting up new programmes. This would likely be less costly, and would be less of an administrative burden, given that the programme mechanisms are in place. For example, we are looking to see whether programmes like Sihlanzimvelo can broaden their 'scope of work' so that the same co-ops who are doing waste and IAP removal can also be involved in other activities. This is also important in terms of skills development/growth. We are unlikely to fundamentally change Sihlanzimvelo in the next 'contracting cycle' with co-ops, but these opportunities should be explored. There might be others, for example in EWS.

I remember when I was managing an NGO that we really battled with the reluctance of funders to cover operational costs (which you also point out). In that example, the director used her connections to build relationships with surrounding businesses who contributed relatively small monthly amounts to the organisation, with no specifications on how this should be used. The 'quid pro quo' was that we sent our nursing sisters to do HIV testing and education with their staff on a regular basis. These amounts became the lifeblood of the organisation in terms of stability. So we mustn't forget the value of smaller, but reliable and sustainable, amounts of funding, where a direct benefit can be articulated for the contributor.

In my own spaces, it has been interesting to see the apparent shift of some international funding organisations towards 'technical support' for local governments, rather than direct funding. I suspect this is because of the challenges of managing such transactions and accounting for spend.

Important to strongly emphasise the 'eyes on the ground' value of water quality monitoring. This comes in later in the report but is so critical. So the spotting of sewer leaks, etc. is so important in terms of reporting and monitoring.

Municipal effectiveness – In terms of engaging with local government, perhaps the argument that needs to be made is about improved efficiencies. A key challenge with water quality monitoring is that (a) coverage is not enough; (b) monitoring is sporadic and doesn't allow major events to be picked up timeously (in many cases). So, in a time of resource deficits and budget cuts for all spheres of government, a key part of any argument must be about efficiency. How can this intervention improve response-ability, and reduce human and financial resources spent?

I was interested to read about the app that is being used for water monitoring, etc. A colleague has just been involved in a Covid pilot, using an app to collect data from informal settlements on issues related to fault reporting, etc. – one of the big challenges was integration of this data with the existing municipal fault reporting system. It's something we are still looking at!!

Mark Dent:

p. 21 Report and Respond: We invite respondents to help us to clarify and address this argument –
For water resources to be able to continuously sustain a healthy society and economic development, the quality of our water needs to be maintained within predetermined parameters. Most of the country's water resources are negatively impacted by a combination of wastewater discharges and run-off from land-based activities. We need to involve citizens in water quality management, to facilitate collaborative management of our water and build a participatory democracy. This can create jobs and learning pathways that develop skills and values for integrated water resources management. All actors need to be involved.

"All actors need to be involved"
The last sentence is VERY important and needs to be remembered when considering the merits of the proposed way forward, below. Acceptance of this implies that there is an organisational entity of some form or other in which ALL ACTORS can find a place to interact, gracefully & wisely. It also implies that the actors organise themselves into appropriate groupings to make practical the functioning of the widely inclusive & continuous dialogues that are required to co-generate the details and make sustainable the systems, I am advocating. The Strategic Water Partners Network is ONE such self-organised entity that is worth engaging seriously, in this regard.
I propose that the entity, of which I speak, seeks to achieve 4 key strands of activity. These are listed below & then expanded upon.
Derive holistic & trusted methods of estimating a monetary value for the individual portions of CBWQM work, carried out by citizens.
Derive methods of monitoring the activities of citizens engaged in CBWQM.
Derive methods of rewarding citizens engaged in CBWQM
Derive methods of achieving all the above with the lowest possible transaction costs so that the vast percentage of the project funding is paid to the citizens engaged in CBWQM, at grass roots level.

The work carried out by the project, of which this Deliverable 8 is a part, demonstrates strongly that the **monitoring** and **rewarding** at low transaction costs are entirely possible and in many cases it is being carried out at present.

Establishing a **monetary value** for the individual activities is a much more difficult task, but one which cannot be avoided if CBWQM is to be funded outside of the current mechanisms. A form of collective self-organised action that leads to socially robust knowledge (aka actionable knowledge) being co-generated by relevant actors, is needed.

The actions that appear in Deliverable 8 Figure 4, are entirely consistent with what I am proposing and so I have listed them below for easy reference.

Scaling process as an expansive learning process in and across multi-partner groups
Communicating co-learning and shared IP and IT as part of knowledge commons development.
CBWQM networking, planning, resourcing, organising and tool construction.
CBWQM monitoring, data capturing and reporting.
CBWQM data synthesis (e.g. in models), reporting and co-generating real and imagined options and responses

I am proposing that a core element of this co-generation be a process known as Participatory Agent-Based Social Simulation Modeling (PABSSM). This will be explained in more detail below. Suffice to say at this stage, that such a process must be as inclusive as is practical and must work with tried and tested world-class methods, processes and technologies. The PABSSM process will require a coalescing contribution of resources, to coin a phrase from Deliverable 8. The PABSSM process, if engaged seriously and repeatedly, by the appropriate actors (agents), will bring down the transaction costs of establishing a **monetary value** considerably and increase the social robustness of the actionable knowledge thus generated. The appreciative inquiries that surface implicit assumptions and make them explicit will stimulate the crafting of systemic understanding, by all actors, of the biophysical, social, ecological and economic processes embodied in CBWQM. The stage will then be well set for the PABSSM led dialogue to establish a consensus around the monetary value of individual CBWQM activities. If practiced extensively along with the phenomenon of installed modelling systems, such a process can considerably lower transaction costs and increase trust around the matter of estimating monetary value of individual CBWQM activities.

Another key element of this process should be that the benefits side of the monetary balance (costs vs benefits) should include at least 3 if not more of the UN-SDGs. In the past the mistake of only valuing 1 outcome, e.g. water quality or water quantity, has led to serious under valuing of other benefits of such CB activities.

A brief explanation of the terms & their context in this case, that make up the name Participatory Agent-Based Social Simulation Modeling (PABSSM) may be helpful.

Modeling is understood to be the process of making implicit assumptions explicit. In this sense modeling is a conversation that brings together and reconciles the mental models of the social actors.

Simulation is the process to linking the assumptions and their consequences in a meaningful sequence of systemic connections and relationships so that "what if" scenarios can be followed through the socially constructed system of related assumptions that have been made explicit through an inclusive, process in which agents of all relevant stakeholders participate.

There are many tried and tested building blocks to this process of PABSSM and these can be used to catalyse the process going. There is no need to start from a zero base. However, even as these initial building blocks are brought into service of the PABSSM process they should be subject to the same continuous, transparent and inclusive processes of scrutiny that all the elements of the model should undergo is a never-ending dialogue amongst the stakeholders. A dialogue that is characterised by transparency and appreciative inquiry, to name a few attributes.
If these ideas enjoy some measure of support and members of the Research Team and the Reference Group wish to know more, I would be happy to engage further.

p. 23
Report and Respond Question: Are there any other significant policy leverage points that we should be giving attention to for the funding of CBWQM practices in South Africa?

The funding of CBWQM through the mechanisms proposed in my responses may run into difficulties in the realm of labour laws & policies. It is not my area of expertise so I would recommend that discussions begin to identify and address any such potential difficulties. It would be unfortunate if innovative ideas were blocked due to the selfish use of labour laws by those fearing the transparency and accountability which will inevitably result from deployment of monitoring and rewarding of CBWQM through ICT systems.

p. 27
Report and Respond Question: Are there any other aspects that should be considered in the multi-partner context of CBWQM as this currently characterises the way in which CBWQM is being resourced in South Africa?

The proposals outlined in the first part of my response would need multiple partners to work together. The proposal factors into the 17 UN-SDG and as such should be viewed as an incentive for potential partners who need to report on their SDG related progress.

p. 50
Report and Respond Question: Resourcing of CBWQM activities along the value chain:

The section above covers some of the past and current resourcing developments in the CBWQM context in South Africa. It also points to new areas that could provide potential advantage for further development of resourcing approaches for CBWQM approaches. Overall, the picture presented above shows that CBWQM in South Africa is an important social-ecological innovation, and could be further developed with a resourcing approach and strategy that gives careful attention to the needs for resourcing across the different dimensions of the CBWQM value chain. Importantly, is the insight that not all of the resourcing is financial, much of the resourcing lies in more invisible dimensions such as relationship building, values such as commitments to open source, knowledge commons approaches and accessible, inclusive approaches. However, these approaches also need financial investments that are more sustainable if the practice is to be scaled in meaningful ways. Thus, care should be taken to develop resourcing proposals and partnerships that maintain the integrity and values of the practice itself. It is essentially a values-based social-ecological innovation proposition.

We would appreciate comments on the above insights in guiding resourcing strategy development for this particular social-ecological innovation and its further advancement and development.

My response to the Report & Respond invitation on p. 21 contains many of the elements of behaviours to reduce the financial contributions required, for example:-
in-kind contributions;
use of commons;
open source;
transparency &
inclusivity
mentioned in this p. 50 invitation.

Report and Respond Question: The above offers a framework for developing a resourcing strategy / a series of funding proposals for CBWQM scaling in South Africa.

Could you consider the above critically, and make any recommendations that could strengthen or complement the overall approach being suggested here? Next steps would be to practically identify the specific potential funders, develop a programme document, and then approach a diversity of funding partners to make coalescing contributions to resourcing the CBWQM sector's practices over the next 5-10 years. Please share any insights or recommendations in this direction.
/
Coalescing contributions to resourcing that focus on developing installed PABSSM systems in the Catchment Management Agencies with the SWPN as an umbrella convened space providing the critical mass and economies of scale. Please contact me if you would like to know more details on how this could work.

APPENDIX C: CONCEPT NOTE / PROPOSAL SUBMITTED TO THE PRESIDENTIAL EMPLOYMENT STIMULUS VIA THE DEPARTMENT OF SCIENCE AND INNOVATION

CONCEPT NOTE:

10 000 Mzanzi Enviro-Champs

Work for the Common Good and Learn for the Future in South Africa's Living Catchments

This concept proposal combines social, economic, and ecological innovation, within a transformation innovation framework. It proposes taking the successful PES supported AmanziEthu Nobuntu Enviro-Champs programme to scale nationally, creating a nation-wide movement of 'Mzanzi's Enviro-Champs'; young people capable of working and learning for the common good in South Africa's Living Catchments on water-related work that involves strengthening the River / Water Commons, Biodiversity and Coastal Commons, as well as the Food Commons (cf. Appendix A). It seeks to catalyse a just recovery to the unemployment crisis, and the ecological crisis in two ways: 1) by creating and unlocking 10 000 new work opportunities for young people with a substantive 'education futures' impact, and 2) address the fundamentals of sustainable development, especially (but not limited to) improved monitoring and management of South Africa's water resources and catchment health, with added emphasis on biodiversity and food.

BACKGROUND AND MOTIVATION

South Africa's current UNEMPLOYMENT rates are rising. The jobless rate is now at 32.5%, and unemployment according to the expanded definition is now 43.2%. Restrictions to curb the spread of COVID-19 have exacerbated the unemployment crisis. Unemployment continues to be mostly concentrated among youth, and stands at 63.2% for those aged between 15 and 24 and 41.2% for those aged between 25 and 34, with black Africans (especially young women) being most vulnerable (StatsSA, 2021). Unemployment has cumulative devastating impacts on individuals, households and communities. Addressing the issue of unemployment is not just a technical matter, it is also a social matter. While the economic structure itself is a problem in terms of employment creation, unemployment in South Africa is also partly correlated with poor skills and learning outcomes that must be reversed for the young people concerned for viable futures. Social innovations are required to not only produce work, but also to produce more skilled, confident and engaged youth, able to work and learn for the future and contribute to their communities and society in positive ways. To address the limitations of the market to create work at the scale that society needs, it is necessary to embrace a paradigm of social employment that includes work for the common good, i.e. work that allows for the development of civic action skills, values and practices of sustainable development, and competences for improved social-ecological security and well-being (e.g. capacity to grow food, help to keep rivers clean, etc.). There is much work to be done to secure South Africa's river, food, biodiversity and coastal commons (see Appendix A).

South Africa is also facing critical challenges with its ENVIRONMENTAL AND WATER MANAGEMENT, (see Appendix A), as well as with BASIC FOOD SECURITY. Water quality is negatively affected by mining, manufacturing industries, agriculture, crumbling infrastructure and poor wastewater treatment and waste management services, with the latter both being in crisis across the country. At the same time we are facing a myriad of climate change threats, losing our biodiversity, and local, more sustainable food systems are under-developed. Furthermore, it is estimated that 37% of South Africa's clean, potable water is being lost and wasted through poor infrastructure such as leaking pipes. South Africa is a water scarce country (30th driest in the world) where predictions are that the country's demand will outstrip supply by 2030. This impacts economic development, food production, and future opportunities, and there is no doubt that there is a need for a significant boost in capacity for enabling better water resources management and other sustainable development actions in South Africa, including advancing low impact agro-ecological food production principles at local and household levels, given the food security crisis facing so many people (see Appendix B).

Many innovations for employment creation have been put in place, but ultimately they failed to support a whole system or social systemic approach to employment creation with many initiatives lacking sustainable skills development approaches, and civic action for the common good during or following the temporary 'job opportunity'. The PES supports a mix of public employment, livelihoods and job retention programmes, and for this, resources need to be mobilised from state, private sector and community partners, to compensate for the failure of the market to create employment at the scale that society needs.

A massive national transformative innovation 'work for the common good' programme to assist with monitoring water quality and related ecological degradation concerns within a systems-based, citizen science and civic action approach is needed.

PURPOSE AND OBJECTIVES

To create and support a nation-wide transformation innovation system centred around 10 000 Mzanzi Enviro-Champs, through a work for the common good and learn for the future programme in South Africa's Living Catchments.

Objectives

1. Implement a Community-Public-Private Partnership model for employment creation in at least five of South Africa's Living Catchments, and develop relevant institutional innovations that support the sustainable use and roll out of this model [e.g. ICT-based payment for value exchange innovation]
2. Create and Unlock employment for 10 000 young people to undertake 'work for the common good' in Living Catchments, in partnership with the DWS Adopt-A-River programme, and SANBI's Groen Sebenza programmes [including civic-action / common good work for River Commons, Food Commons and Biodiversity and Coastal Commons – see Appendix A]. (cf. below for how this differs from and extends the existing EPWP / DFFE EP work opportunities approach)
3. Develop and expand the use of citizen science and civic action tools and approaches that support work for the common good in Living Catchments {for River, Estuary, Biodiversity and Coastal monitoring and civic action, as well as agro-ecological Food production – cf Appendix A} including ICT tools such as applications for monitoring and reporting water quality, biodiversity health, etc.
4. Develop a substantive, innovative mobile 'Learning for the Future' accredited learning programme citizen science and civic action that supports and expands work capabilities for 'work and learning', and re-skills young people who have become excluded from viable learning pathways.

TRANSFORMATION INNOVATIONS APPROACH

The concept of 'social employment' and 'work for the common good' in South Africa requires imagination and transformative innovations, if the challenges above and outlined in Appendix B are to be addressed. South Africa has already an extensive social employment programme which is most well known as the EPWP programme, which is primarily state driven and mobilised to create employment opportunities. In this proposal, we put forward an alternative that can extend and complement the EPWP / DEFF EP programmes, via the development of a Community-Public-Private Partnership (CPPP) model that will be anchored in South Africa's Living Catchment Communities. This model will mobilise green economy and civic action mechanisms that reach beyond the market only. It will develop the transformative innovation practice of work for the common good by mobilising state, community, education sector, and private sector partners in a drive to create decent work for the common good, while creating future's focussed learning pathways for young people.

The proposal addresses inter-alia, the Economic Reconstruction and Recovery Plan of the Presidency put forward in October 2020, the objectives of the NDP to govern with the people, the National Environmental Management Act of South Africa (and associated biodiversity, waste management, etc. policy); South Africa's commitment to the Sustainable Development Goals, the National Climate Response White Paper, and the Integrated Water Quality Management policy of South Africa. All of these policies emphasise citizen engagement. While these policies exist with good intentions, there is a clear need for transformation innovation approaches to realise their objectives.

This proposal is firmly positioned within the transformational change objectives of the Transformative Innovation Policy Consortium (TIPC) framework – led by DSI – which emphasises that giving attention to social and environmental welfare are transformative foundations of reducing inequality and expanding productivity, catalysing new forms of economic well-being and work in the process. Transformative innovation requires government, science, industry and civil society partnerships, and focussed on grand challenges that extend to multiple scales exceeding geographical, sectoral, technological and disciplinary boundaries. Such approaches are both systemic and experimental. The project will focus on 4 interrelated transformation innovations (see Appendix B for further detail on the Innovations):

- INNOVATION 1: A community-public-private partnership (CPPP) model for creating and supporting work for the common good
- INNOVATION 2: Creating, unlocking and defining work for the common good for 10 000 young people
- INNOVATION 3: #datafree, mobile, accredited 'Learn for the Future' programme
- INNOVATION 4: Citizen science and civic action tools development – ICT innovations (including innovations for payment for value created) and Knowledge Commons development

OPERATIONAL MODALITIES AND HIGH LEVEL PROCESS FRAMEWORK

Implementation process

Building on lessons learned in the Amanzi Ethu PES pilot project, as well as lessons learned from the Groen Sebenza programme, EPWP NRM programmes, the ESSP and Biodiversity HCD and associated interventions, Global Change and Social Learning Systems research, RESILIM-O, WRC studies (various), and the SADC REEP / UNESCO / UNEP 20 year experience of practice-based learning in the environmental sector (across types of practice, networks, countries and more), the YES Programme, Activate! Youth social movement, NBI and other initiatives to develop green work and learning in South Africa, we propose the following process of implementation:

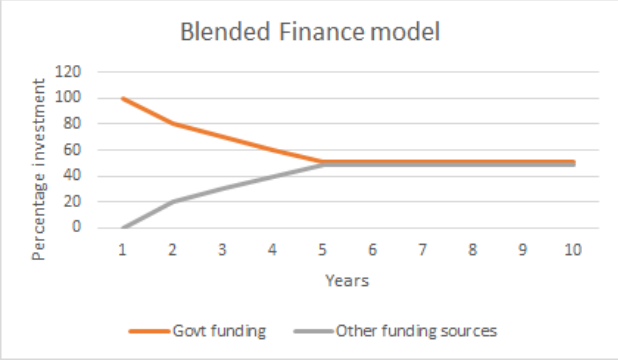
Inception period (6-8 months in Year 1):

- Partnership development, Set up networks and hosting partners, co-financing arrangements, collaboration agreements, tools and training development, selection of youth participants with community organisations.
- This period will also be vital for mobilising co-financing contributions that already exist and that will be built on, e.g. the EI4WS (GEF funding in SANBI/WRC), Groen Sebenza, DWS Adopt-a-River, the DSI/ SANBI Living Catchments; NRF/DSI DSI Chairs and DSI/NRF Community of Practice focussing on transdisciplinary social learning and sustainable development (11 Chairs); the Biodiversity Human Capital Development Strategy, Green Skills commitments of SETAs, etc.)
- Theory of Change, MERL and Leadership enhancement (throughout)

Implementation period – Focussing on placements, training, mentoring and enviro-practices work, career pathing, enterprise development(s) and results monitoring

Evaluation and dissemination – to extend the impact more widely and potentially expand key success factors for further scaling

Blended Finance Model



Given the commitment to a blended finance model in the CPPP, from the outset the goal of "50-50" funding – 50% from government, and 50% from other sources will be sought. Government investment is to be focussed on contributing to core government mandates in terms of the management and protection of our natural resources, as well as basic services delivery. However, it comes with performance incentives attached, that require investment from other sources, most notably the private sector. This needs to happen in a phased approach, with the government providing the set up and planning costs to shift an existing partnership in a catchment into the blended finance model. In year two, the requirement will be for there to be 20% other sources of co-funding – this includes co-funding in non-monetary forms as a recognition of the huge investment that communities/NGOs and other groups that are implementing on-the-ground. Each year, the balance of investment should shift so that within 5 years there is a 50-50 relationship. This is a tight time frame, but is viewed as possible if the programme is set up with the right support systems at a national level, and that catchments are only brought on board when they are ready to mobilise.

At the outset, in the first year of the programme, it is recommended that a very clear set of criteria is developed to determine if an existing catchment network/partnership programme is ready to shift to the next level. Note: from recent Water Research Commission work, as well as SANBI and DSI programmes already in play, it is understood that there are several partnerships at a tipping point, and could be the beneficiaries of the first funding investment. The proposed programme needs to expand naturally as different catchment partnerships develop. It is key that this is not implemented where such networks do not yet exist. The model relies on a strong foundation already being in place.

The following is a basic 5 year plan for any partnership that can be beneficiaries of the programme:

Year 1	Year 2	Year 3	Year 4 & 5
Identification of an existing host entity to champion transition. Planning of scale up Legal constitution of an NPC, including the appointment of a business leader. Set up of MERL (developed once, then tailored for each catchment; and applied throughout Yr1-5) Set up of ICT tools (developed once, then tailored for each catchment) Identification, selection, and training of implementation partners. Agreements in place. Mobilisation and training of unemployed youth. First opportunities for income generation in the last quarter.	Further mobilisation and training of additional unemployed youth. Co-funding mechanisms explored, implemented, and tracked – 20% co funding required in year 2.	Full scale up across catchment, with now a 30% co-funding requirement NPC focus on building a clear business case for investment using examples of real impact in year 2. Investment for long term becomes a clear business focus. Implementation partners focus primarily on sound, well managed projects in communities, generating data, measuring impact, and providing clear learning journeys for youth. Community of practice within, and across catchments is well-established.	Consolidation, growth, solidify investment path for sustainability, dissemination

See Appendix C for further detail on the implementation plan and high level budget.

Figure showing the node-based approach and process framework to be developed within each of the participating Living Catchments for creating and unlocking opportunities for 10000 Enviro-Champ work and learning for the common good.

EVALUATION

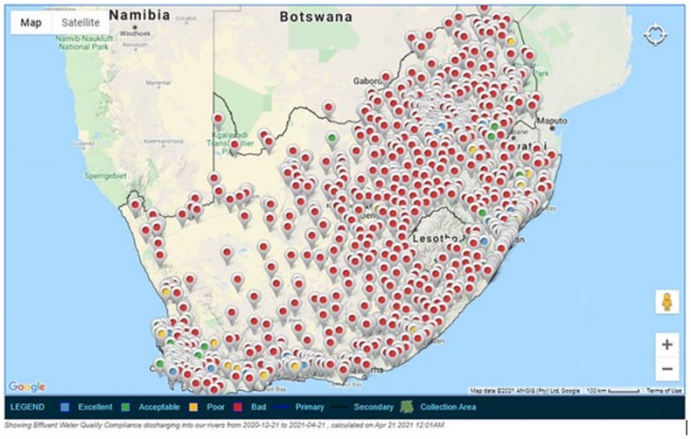
Aligned with the transformation innovations framework, the programme will adopt a social innovation model for evaluation of system change, which points to the need for monitoring the following 5 principles and associated practices:

1) Ability to embrace complexity and adaptability
2) Quality of the evidence base (social-ecological-economic changes)
3) Creation, and co-ordination of coalitions that work
4) Engagement of and with government
5) System changes and expansive, co-operative forms of learning

APPENDIX: EXTENDED RATIONALE: Why SA needs urgently needs this Mzanzi Enviro-Champs 'work for the common good and learn for the future' programme?

WORK AND LEARN FOR THE RIVER / WATER COMMONS

Water quality management and monitoring in South Africa is in crisis (cf Figure 1 below). It shows that almost all of South Africa's wastewater treatment plants are failing at operational and monitoring levels. Closer scrutiny shows a significant gap in water quality monitoring capacity. The Mzanzi Enviro-Champs work will therefore be to complement and support water quality monitoring at local level in South Africa's catchments, using citizen science tools. Two recent research projects in the WRC have shown these tools to be robust in monitoring local water quality, work for the common good, that can be done by Mzanzi Enviro-Champs in partnership with, and in support of local governments. Water quality monitoring, as well as biodiversity monitoring is needed upstream as well as downstream to secure ecological infrastructure for water security in South Africa. This is not the only challenge that the Mzanzi Enviro-Champs can work on for the common good.

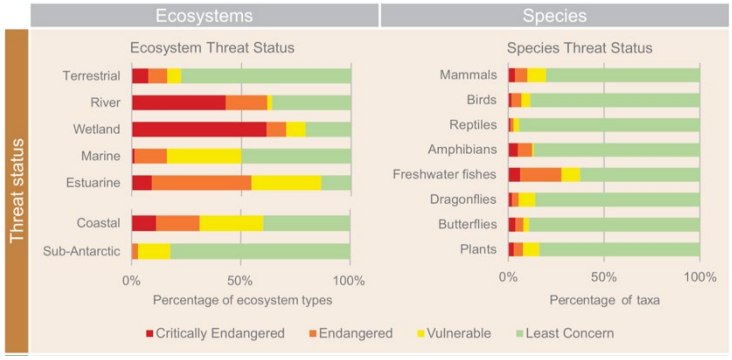


WORKSTREAMS:
Monitoring and Reporting; Rehabilitation; Extension; Citizen Science and Civic Action Tools Development

Figure 1: DWS map showing effluent water quality compliance discharging into our rivers from 2020-12-21 to 2021-04021 – calculated on April 21, 2021. Source: DWS IRIS Dashboard (http://ws.dwa.gov.za/IRIS/mywater.aspx)

WORK AND LEARN FOR THE BIODIVERSITY AND COASTAL COMMONS

Related to the River / Water Commons outlined above, is the challenges faced in managing South Africa's biodiversity. South Africa is one of the world's 17 megadiverse nations, ranked in the top three nations globally when it comes to plant and marine species found nowhere else on earth, with a wide variety of ecosystem types across the landscape and seascape. However, almost half the of the 1021 ecosystem types assessed in the National Biodiversity Assessment of 2018 are categorised as threatened. Relevant to the water focus above, is that overall, estuaries and inland wetlands have the highest proportion of threatened ecosystem types[25]. This represents a major crisis for South A



[25] In terms of natural ecosystems, the National Spatial Biodiversity Assessment (NSBA) of 2018 reports that **22%** of 485 **terrestrial** ecosystem types are threatened; **64%** of 222 **river ecosystem** types are threatened, **86%** of 22 **estuarine ecosystem types** are threatened, **50%** of 150 **marine ecosystem types** are threatened, **60%** of 186 **coastal ecosystem types** are threatened. Additionally, more than 85% of threatened birds, plants, freshwater fishes, amphibians, mammals and butterflies.

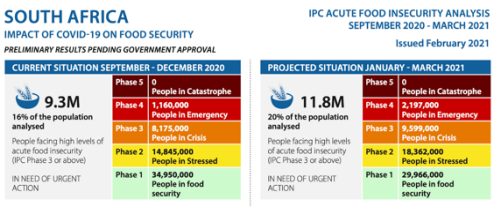
frica's biodiversity, including the biodiversity economy in the longer term. The NBA of 2018 also states that "Investment in existing and future strategic and cooperative biodiversity monitoring programmes is essential to strengthen our ability to detect and report on trends, plan accordingly and manage effectively." It mentioned that while South Africa has some robust biodiversity monitoring programmes, many involving citizen scientists, there has been a decline in resources allocated to monitoring programmes and some key monitoring datasets are very old or not secure.

WORKSTREAMS: Monitoring and Reporting; Rehabilitation; Extension; Citizen Science and Civic Action Tools Development

Figure 2: Data from the 2018 National Biodiversity Assessment (SANBI, 2018), showing high levels of ecosystem threats to river, wetland, estuarine and coastal ecosystems in particular.

WORK AND LEARN FOR THE FOOD COMMONS

Agro-ecological and small scale household food production support, which includes water work in the form of rainwater harvesting practices) in all communities, urban and rural, can go a long way to address the national problem outlined by STASSA (2019) that "Food inadequacy and hunger are still a challenge. Poverty-stricken households lack money to buy food and are unable to produce their own food", a situation that has been exacerbated by COVID-19. South Africa's deteriorating food security is mainly driven by the COVID-19 pandemic and mitigation measures as well as high food prices, drought and economic decline. The most recent IPC report projected that up to 11.8 million people (20% of the analysed population) were expected to be in Food Crisis (IPC Phase 3) in early 2021. The problem still exists.



WORK STREAMS: Water harvesting, Agro-ecology food production; Homestead gardening; Eco-Schools, School and Community food production; Extension, local level market development

Figure 3: Source: Graphic showing food insecurity levels in South Africa in 2020/early 2021 (IPC 2021)[2]

APPENDIX B: FURTHER DETAIL ON THE INNOVATIONS

INNOVATION 1: A COMMUNITY-PUBLIC-PRIVATE PARTNERSHIP MODEL FOR CREATING WORK FOR THE COMMON GOOD

Creating and unlocking work for the common good for 10 000 young people in the areas listed under objective 2, will require a CPPP model with implementation innovations. This will be to create collective systems of support for such work, potentially also unlocking new instruments and processes for developing and opportunities of the Green Economy. We emphasise community as an addition to the traditional notion of PPPs, as this transformative innovation programme will be located in, and accountable to local communities.

- Community structures will be the primary decision makers for selection and holding the EnviroChamps accountable at a local level, and community structures will be key partners, co-hosting EnviroChamps where possible in partnerships with CBOs.
- Capable intermediaries (e.g. experienced NGOs, universities and research programmes (e.g. NRF/DSI Chairs and the DSI/NRF Community of Practice and CoE partners), environmental and water management organisations and forums (e.g. CMAs, CMFs), parastatals (e.g. SANBI, SANParks), networks, e.g. UIEP, water resources management, biodiversity and agro-ecologically oriented local food systems institutions (e.g. Food for Africa) will host or co-hosting Enviro-Champs and supporting their work and learning.
- Specialist intermediary partners (e.g. science and education institutions) will co-operate to develop citizen science and civic action tools, mobilising the already extensive capacity that exists for this in South Africa, and develop and monitor the mobile 'Learn for the Future' skills development programme that all 10000 EnviroChamps will complete. The WRC has a Graduate Employment Programme model that will be used for supporting graduate mentoring employment, while the SETA structure / DHET will be engaged to support the innovative 'Learn for the Future' skills programme.
- Private sector and state sector partners will provide both expertise and resources for the employment creation, and tools development, as well as hosting some of the Mzanzi Enviro-Champs where appropriate.

The fundamental assumption of this concept proposal is that sustainable change will require innovation, shared resources, shared accountability, and shared success. This can only happen with deliberate, and determined co-creation of the CPPP

[2] http://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_South_Africa_AcuteFoodInsec_2020Nov2021Mar_Report.pdf

model, along the lines of the collaboration continuum illustrated below. Blended financing will be core to this model, which will require a node-based approach and development of common good business models and entit(ies) (Not-for-Profit Company / NPC) to enable and facilitate sustainable development of collaboration in the different living catchments. These entities will:

- Build strong relationships of trust with key stakeholders
- Intentionally build communities of practice linking grassroots community members with government decision makers, private sector players, and NGOs active in the catchment. A learning network is a key element of this – including learning across projects, along the value chain, and formal course-activated learning modules
- Attract investment, and manage the dispersal of funds to various implementers in an open, accountable manner, according to an agreed strategy of priorities
- Set up a monitoring, evaluation, reporting and learning (MERL) framework to record progress, impact, and change over time. Key is that this is an open, and consolidated data and reporting repository for use by all stakeholders.

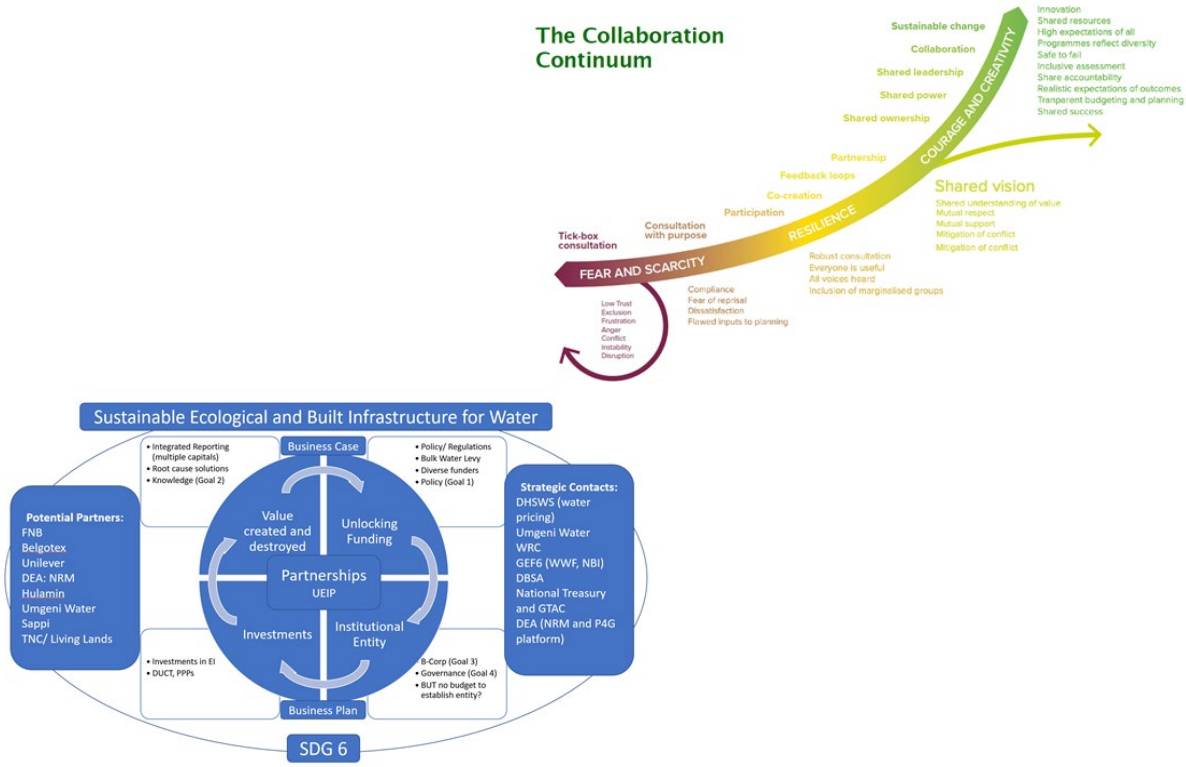


Figure 1: The pathway to innovation (source: Barbara Holtman, Fixed Africa, May 2021) Fig 2. A common good business approach model (NPC)

INNOVATION 2: CREATING, UNLOCKING and DEFINING WORK FOR THE COMMON GOOD

There are many job creation programmes in South Africa – some successful, and others not so. This programme is NOT about job creation, instead it is about creating and sustaining effective partnership networks at catchment level that can open up and facilitate opportunities for youth to engage in meaningful environmental work for the common good, and be rewarded for it.

This will require innovating a system of payment for value created by the young people 1) for their communities in terms of the citizen science / civic actions taken, 2) their own development on the Learn for the Future programme. An ICT-based payment system will be developed using an App that can transfer payment for work done and learning programme completion(s).

INNOVATION 3: LEARN FOR THE FUTURE PROGRAMME

At the heart of this proposal is learning and training with a difference. Rather than an instructional and instrumental approach, the Learn for the Future programme will be designed to develop young people's agency for change. The Learn for the Future programme is NOT a traditional skills, or content knowledge development programme. It will be designed as an Education Futures innovation that 1) develops work and learning skills, 2) explicitly develops young people's environmental and social agency for civic action and the common good, and 3) develops enterprise development, social innovation and life skills.

The Learn for the Future programme will be co-designed by skills system, university and community partners, and intermediary organisations. It will be delivered as a #datafree online mobile learning course, to be completed in small units along an emerging learning pathway that addresses the three key focus areas above. Innovation will also be needed in co-operation with the SETA and DHET systems to accredit a qualitatively new type of learning programme for young people. A multi-levelled and multi-focussed mentoring system will be put in place, with university students from all of South Africa's universities, will be recruited to provide high quality mentoring support for the 10000 Enviro-Champs, supporting a peer-based learning support model. The university students will, in turn, be mentored by selected intermediaries.

INNOVATION 4: CITIZEN SCIENCE AND CIVIC ACTION TOOLS DEVELOPMENT – ICT INNOVATION AND KNOLWEDGE COMMONS DEVELOPMENT

As indicated above, the programme focusses on citizen science and civic action-oriented work for the common good in areas of river/water, food and biodiversity/coastal commons. As shown above, and in Appendix B, 1) there is a gap in community-based monitoring of water and biodiversity resources at a national scale (currently isolated, localised initiatives); which lends itself to 2) the opportunity to create ICT infrastructure to be able to leverage the data collected to inform decision making and action. Hence there is need for advancing ICT innovation in citizen science and civic action.

This will involve,

- Development and use of ICT innovations (apps) for implementing, tracking, environmental monitoring and managing work for the common good across sites, contexts and partners
- Open source, online mobile learning innovations (e.g. data reverse system for the mobile learning programme, modules completed on phones, etc.)
- Knowledge commons / knowledge hub / Citizen science and environmental practices tools development
- MERL innovations

Additionally, ICT innovation for payment of work is needed: The shift will be away from stipends as a mechanism to employ thousands of people in entry level work, as they do not encourage people to take initiative, or to create new opportunities. Nor do they incentivise performance. With mobile ICT developing so fast, it is key to develop innovative means of exchanging value real outputs emerging from 'work for the common good' (e.g. Good Green Deeds). Here, current innovations around a Value Exchange Bank which packages tasks against a value, and builds on the concept of 'loyalty programmes with credits', that then has a trade currency to reward people for completing tasks to an explicit quality would be a powerful tool for mobilising work and learning at community level.