Governing river rehabilitation projects for transformative capacity development

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ABSTRACT

River rehabilitation projects are framed as water security interventions in South Africa. They aim to address water quality and water quantity issues, as well as to improve socio-ecological relationships. These projects acknowledge the value of capacity building and social learning in enhancing water security. However, they adopt different governance approaches and hence have different knowledge construction and capacity building outcomes. This paper employs a ‘governmentality’ framework to analyse the capacity development processes within three river rehabilitation projects in Durban, South Africa. The analysis revealed that the three projects with their different governmentalities produced different capacity development modalities which are utilised to sustain ‘the object of intervention’ in each river rehabilitation project. However, despite these differences, information as the currency of action; the context or site of learning; the importance of building state–citizen relationships; and the need for bridges or intermediaries, emerged as common elements which support capacity building and knowledge sharing across all three projects.

Key words: Capacity building, Governmentality, Knowledge sharing, River rehabilitation projects, Social learning, State–citizen relationships, Water governance

HIGHLIGHTS

- River rehabilitation projects are socio-ecological processes.
- Capacity building modalities emerge from different governmentalities of river rehabilitation projects.
- Locally driven river rehabilitation projects emerge through institutional voids.
- Sharing knowledge, understanding socio-ecological relations, state–citizen relations and intermediaries are critical to transformative river rehabilitation projects.

1. INTRODUCTION

Rivers hold, move, and address multiple urban challenges through their hydrological and ecological processes. In South Africa, these challenges include rapid urbanisation and increasing informality; pollution; poor delivery of services; path dependencies created through hydro-modernist strategies, which use rivers as buffers when engineering systems fail; sand winning; densification and hardening of catchments; poor stormwater management; and cycles of droughts and floods, exacerbated by climate change. If rivers, the ‘veins and arteries’ of urban systems, are unhealthy and neglected, the entire system is compromised and the quality of life of urban residents, particularly the poor, declines (Turpie et al., 2017a; Anderson et al., 2019). Since 2013, localised river rehabilitation...
projects, each with their distinct imaginaries, knowledge claims and hydrosocial territories (Boelens et al., 2016; Mills-Novoa et al., 2020) have emerged in Durban, creating territories of intervention (objects) with communities (subjects) to sustain them (Mills-Novoa et al., 2020). These projects have been established by different networks of actors, each with their own governance arrangements and framings of river rehabilitation; and they have created environmental subjects and built capacity in different ways. While they each have their own governmentalities, or rationalities and practices, they all aim to improve water quality and quantity and enhance social learning through the imaginary of river rehabilitation. River rehabilitation projects take on various forms reflecting a wide range of approaches, including technical, socio-technical, and community-based interventions (Keil, 1998; Jewitt et al., 2020). This raises questions about what a rehabilitated river looks like, what the appropriate geographical scale or hydrosocial territory of river rehabilitation should be, and who is responsible for the governing of river rehabilitation (Martel et al., in press).

Traditionally, river rehabilitation projects have tended to focus on the ecological characteristics of rivers and, therefore, aimed to improve the ecological functioning of degraded ecosystems (King et al., 2003; Grêt-Regamey et al., 2016). The hydrosocial territory of these projects is determined by the spatial demarcation of land-use impacts on rivers at various scales, with the catchment being the most commonly used scale in South Africa. River rehabilitation projects have tended to prioritise technical, scientific, and engineering-based approaches, which do not always consider the socio-economic and political relations that exist within the catchment (Grêt-Regamey et al., 2016; Jewitt et al., 2020). Scientific and technical approaches often render problems technical, de-politicising solutions. This hegemonic imaginary results in the governance context becoming obscured, limiting the imagination and negotiation of alternative paths (Keil, 1998; Moore, 2013; Steelman et al., 2015; Boelens et al., 2016; Hommes et al., 2020). Harrington (2017) states that with the increased range of actors involved in collaborative water governance at both the global and local scale, there is a growing need to consider political and governance processes as being at the core of water issues, including river rehabilitation projects.

This paper compares the capacity building interventions of three river rehabilitation projects established in Durban between 2011 and 2016, using a governmentality framework. The Palmiet Catchment Rehabilitation Project (PCRP), the Aller River Pilot Project (ARPP), and the Sihlanzimvelo Stream Cleaning Programme (SSCP) (see Figure 1) have different imaginaries, logics and rationalities, with capacity development seen as a way of rendering water and people governable in each project. The logics of these projects are self-reinforcing, as the cultivation of subjects helps to sustain the objects of intervention for each project. The flow of knowledge in the capacity development processes is shaped by the initial framings and imaginaries of each project, which impacts the level of transformation achieved (Mills-Novoa et al., 2020). Figure 1 shows the location of the three river rehabilitation projects in Durban.

This paper first outlines the methodology adopted for the study. It then presents the context of Durban’s river rehabilitation projects. Next, it explores the meaning of river rehabilitation projects, their imaginaries, and ‘what they look like and aim to achieve’. It then defines the hydrosocial territory and analyses the formation of environmental subjects in each case study, revealing the different governmentalities that were established. Finally, it presents the different modalities of capacity building within river rehabilitation projects that emerged in Durban, identifying four characteristics of capacity building in projects that aim to be transformative.

2. METHODOLOGY

The paper draws on research conducted from 2014 to 2020 on emergent river rehabilitation projects in Durban. The authors have been directly involved in or conducted research on all three projects, and therefore acknowledge the impact of their positionality in shaping their understanding and analysis. The research is based on a wide range of primary data collected through interviews, focus groups, and learning laboratories on governance
approaches and capacity building in river rehabilitation projects, through various water governance research programmes the authors have been a part of (SANCOOP Climways, WRC 2354, GCRF U-RES, LIRA 2030)\(^1\). In this paper, primary data and project-related data (grey literature) on governance approaches and capacity building in the three case studies is analysed using a thematic approach, identifying each project’s actors, hydrosocial territory, imaginary or rationality, discourses and practices. From this, the rationalities of government and technologies of rule for each case study are identified. Foucault’s concept of governmentality

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\(^1\) SANCOOP CLIMWAYS, funded by the National Research Foundation, South Africa, and Research Council of Norway, title: *Climate Change and Urban Water Governance* (2014–2017). Pathways to social transformation which focused on river rehabilitation projects; Water Research Commission (WRC) 2354, title: *Enhancing Water Security through Restoration and Maintenance of Ecological Infrastructure: Global Lessons from the uMngeni Catchment, South Africa* (2014–2020), which focused on investing in ecological infrastructure, including in social learning to enhance water security; Global Change Research Fund Resilience Foundation Awards, title: *Foundations for Climate Resilient and Sustainable Growing Settlements (U-RES)*, (2017–2019), which focused on building resilience in the Palmiet Catchment; LIRA 2030 Africa, title: *Transforming South African Cities in a Changing Climate*, 2018–2020, which focused on understanding the role and governance of river rehabilitation projects in Durban.
was employed to analyse how different forms of governing result in different forms of knowledge and capacity building outcomes for the partners in these projects, including state, civil society organisations, citizens, and research institutions.

3. RIVER REHABILITATION PROJECTS IN THE DURBAN CONTEXT

River rehabilitation projects in South Africa are classified as water security interventions, as they aim to address both water quality and quantity concerns, which impact on human and environmental well-being (Jewitt et al., 2020). These projects aim to promote change, including to invest in ecological infrastructure, promote behaviour change, improve waste management, reduce flood risk, address water pollution, remove invasive alien plant species, support socio-economic development and poverty alleviation and build social cohesion through partnerships between the local state, civil society organisations, and research institutions (Martel et al., in press; Jewitt et al., 2020, C40 Cities Finance Facility, 2021). Both globally, and in South Africa, the protection and enhancement of ecological infrastructure, defined as ‘ecosystems that deliver services to society, functioning as a nature-based equivalent of, or complement to, built infrastructure’ (Cumming et al., 2017: 53), is recognised as being essential to river rehabilitation projects (Daily & Matson, 2008; Jewitt et al., 2020). Jewitt et al. (2020) expanded the definition of ecological infrastructure, recognising that ecosystems both produce and deliver services. Protecting and rehabilitating biodiversity and ecosystem services is, therefore, a main aim of these programmes. In the global South, particularly in Africa, the protection and enhancement of ecological infrastructure cannot be addressed in isolation. It needs to be integrated into poverty alleviation and development programmes, ensuring co-benefits for humans and nature (Roberts et al., 2012).

Under South African legislation, river catchments and their sub-catchments fall under Water Management Areas (WMAs) with their associated Catchment Management Agencies (CMAs). The National Water Act (No. 36 of 1998) requires the establishment of CMAs to govern water in South Africa. CMAs require engagement between state and non-state actors and have a strong focus on the biophysical health of catchments, as well as social transformation, supporting the principles of integrated water resources management (Meissner et al., 2017). Within this institutional imaginary, each CMA is required to compile a Catchment Management Strategy and ensure water resources planning. A catchment management strategy must set principles for allocating water to existing and prospective users, taking into account all matters relevant to the protection, use, development, conservation, management, and control of water resources (National Water Act, 1998). In the Breede-Gouritz Water Management Area’s Catchment Management Strategy, improving river health is considered a main priority, with the vision of this strategy, or its imaginary stated as ‘Healthy water resources, for all, forever’ (Breede-Gouritz Catchment Management Agency, 2017). However, seven of the nine CMAs in South Africa, including the Pongola-Mzimkulu WMA, within which Durban is located, do not have a functional or influential CMA in place, due to human resource and financial constraints and a lack of political will to support decentralised water management (Meissner et al., 2017).

At a regional scale, the uMngeni Ecological Infrastructure Partnership (UEIP), established in November 2013, promotes the participation of multiple organisations, including national, provincial and local government departments, business and academic institutions, as well as civil society, in water governance in the uMngeni Catchment. This catchment, located in the Pongola-Mzimkulu WMA, KwaZulu-Natal, supports over six million people, including the residents of Durban, in South Africa’s third largest regional economy (Hay, 2017; Jewitt et al., 2020). Given the absence of a functioning CMA, the UEIP focuses on integrating investments in ecological infrastructure, built infrastructure and social learning, to address water security.
3.1. Durban’s river rehabilitation efforts

Durban, or the eThekwini Municipal Area (EMA), is located on the east coast of South Africa, in the province of KwaZulu-Natal. It is the country’s third largest city, with a population of 3.7 million people. The city experiences high levels of poverty and inequality, with 42% of residents considered poor, and a quarter (26%) living in informal settlements (eThekwini Municipality, 2016/2017). The EMA is located within one of 36 global biodiversity hotspots, the Maputaland Pondoland Albany biodiversity hotspot. As a result, it contains a wealth of natural capital, much of which is located within the Durban Metropolitan Open Space System (DMOSS). The environmental assets of the city include 18 major river catchments and 16 estuaries (Turpie et al., 2017b; see Figure 2).

In terms of water resources management, eThekwini Municipality falls within the dysfunctional Pongola-Mzimkulu WMA. This has created an institutional void, as a government structure designed to govern water and support the implementation of legislation and policy, is not active. In response to both this governance vacuum, and concern about the quality of rivers, a diverse range of river rehabilitation projects have emerged within the municipality. These projects have adopted different governance approaches, each with their own imaginaries, hydrosocial territories, knowledge construction processes and capacity building approaches and outcomes.

![Environmental Assets in eThekwini Municipality](Map produced by Michela du Sart, EduAction, 2021).

**Fig. 2.** Durban’s environmental assets (Map produced by Michela du Sart, EduAction, 2021).
The C40 Cities Network (2017), in examining community-based interventions to improve river health in Durban, highlighted the importance of cultivating active and engaged citizens who play a vital role in mobilising local action and contributing towards broader resilience objectives. Capacity building includes awareness creation, knowledge building and skills development, which enables citizens to find employment and to contribute towards a resilient society and economy (C40 Cities Network, 2017). Capacity development includes activities such as education and training, joint research, as well as knowledge networking and partnerships.

Durban’s urban resilience efforts, through the leadership of the Environmental Planning and Climate Protection Department, support the development of an informed and educated citizenry for transformative sustainable development. In 2013, Durban was selected to participate in the Rockefeller Foundation’s 100 Resilient Cities (100RC) Programme (Roberts et al., 2020). A key output from this programme was the development of a ‘Resilience Strategy’ for the city. Through a range of engagements, city stakeholders identified resilience focus areas. This included the importance of the natural environment as the foundation for sustainable development, human well-being, and resilience. The need to develop active, educated and engaged citizens was acknowledged (C40 Cities Network, 2017; Sutherland et al., 2019a).

Drawing on the goals and outcomes of Durban’s Resilience Strategy (eThekwini Municipality, 2017), a number of municipal departments, including the Environmental Planning and Climate Protection Department, eThekwini Water and Sanitation Unit, Coastal Stormwater and Catchment Management Department, and the newly established Sustainable and Resilient City Initiatives Unit, increased their focus on capacity building and social learning for environmental citizenship. This focus on community engagement and the co-production of knowledge, along with the emergence of collaborative river rehabilitation projects, created new platforms of governance. These platforms began to intersect with the efforts of the C40 Finance Facility to support climate adaptation in the city, through the leadership and visioning of the Coastal Stormwater and Catchment Management Department and the Climate Protection Branch. The imaginary of river rehabilitation, with its hydrosocial territory of the river or the catchment, was rationalised as a means to address multiple environmental and social challenges in the city. This led to the development of Durban’s Transformative Riverine Management Programme in 2019, with the first phase being the development of the business case for riverine management (C40, 2021). This programme has now become the frame for Durban’s multiple river rehabilitation projects, its climate adaptation efforts in catchments, and its river-based socio-ecological poverty alleviation programmes.

In this paper, we conceptualise river rehabilitation projects as ‘improvement schemes’ (Li, 2007), and endeavour to understand what these projects aim to change, and what calculated means are applied to improve conditions through capacity development – by highlighting which actors are targeting different objects and subjects. The local actors framing the river rehabilitation projects (their imaginaries and hydrosocial territories) and implementing particular interventions and activities, include local government officials, civil society organisations, university-based researchers, and in one case, consultants. Despite their different aims and objectives, all three projects have involved the state and local community members, capacitating these groups to varying degrees, in order to satisfy project specific requirements.

4. CREATING ENVIRONMENTAL SUBJECTS: THE GOVERNMENTALITY OF CAPACITY BUILDING

Governmentality, developed by Foucault (1977–1978), focuses on the art of governing. This notion analyses the organised practices through which citizens are governed and self-govern, and how they are produced as subjects of the state or those doing the governing, in order to fulfil policy (Foucault, 1991). Governmentality, therefore, examines how the conduct of humans is shaped by calculated means to achieve certain ends (Li, 2007). With a focus on governmentality, this paper argues that capacity development is a crucial consideration, especially when people are used as a calculated means to achieve a certain end. Different governmentalities, therefore,
shape the outcomes of capacity development as they frame the training, skills, and practices learned, as well as how social learning takes place. In our work, we use two governmentality terms for analysis. First, political rationalities, defined as a specific form of reasoning, which outlines the telos, or ultimate aim of action, or the means to achieve it (Lemke, 2002). Secondly, technologies of rule, which are the particular tools and tactics used to govern (Li, 2007). Hydrosocial territories, as a conceptual framework, aligns with governmentality theory, as it ‘grounds and bounds the object created through the regime of practices’ surrounding river rehabilitation projects (Mills-Novoa et al., 2020: 91).

Governmentality explores the ‘everyday relations of power extending beyond the central state, … that order societies and make human beings into subjects, i.e. subjects to government by others and to self-government’ (Merlingen, 2003: 366). Governmentality can be indirect and unseen, shaping political decision-making and social behaviour, by influencing the generation of expert knowledge, regulatory practices and societal expectations (Foucault, 1991). Power is exercised through the rationalities or mentalities of government and technical means or ‘technologies of rule’, which are the policies and practices of those in power, who do the governing (Merlingen, 2003; Li, 2007; Dean, 2010).

Li (2007) identifies two main practices required to transform ‘the will to improve’ into precise programmes. First is the practice of problematisation, which identifies and frames the challenges that need to be resolved. Second is the practice of rendering problems technical, through a range of practices associated with characterising the domain to be governed (Li, 2007). Political rationalities are an element of government in their own right and produce a discursive field in which exercising power in a particular way and framing targets of government, such as river rehabilitation, is considered to be rational (Lemke, 2002; Djama et al., 2011). Technologies of rule signify the particular tools and tactics used to govern (Djama et al., 2011) and represent the organised, structured, controlled, and reproduced modes of power that follow a specific rationality when governing (Lemke, 2002), which in this case are capacity building approaches. These are ‘the actual mechanisms through which authorities of various sorts have sought to shape, normalise and instrumentalise the conduct, thought, decisions, and aspirations of others [the governed] in order to achieve the objectives they [authorities/governors] consider desirable’ (Miller & Rose, 1990: 8).

In order to govern the environment, three strategies are required (Agrawal, 2005). These are the creation of governmentalized localities, able to be regulated in specified domains (catchments); the opening of spaces (territorial and administrative) (river rehabilitation projects) in which new regulatory communities can function; and the production of environmental subjects, defined as ‘people who have come to think and act in new ways in relation to the environmental domain being governed…’ (citizens) (Agrawal, 2005: 7). The making of environmental subjects is based on the different forms of regulation and the practices through which people get involved in them (Agrawal, 2005), with the subject and the environment being simultaneously remade and redefined in particular contexts, leading to new technologies of government (Agrawal, 2005).

River rehabilitation projects create environmental subjects in various ways, including through capacity building or development initiatives. Eade (2007) emphasises that capacity development cannot be reduced to a universal blueprint. Rather an engaged outsider who understands the local context should ‘support the capacity of local people in determining their own values and priorities, to organise themselves to act upon and sustain these for the common good, and to shape the moral and physical universe that we all share’ (Eade, 2007: 632). The United Nations Development Program (UNDP, 2011: iv), drawing on research undertaken at IHE Delft, define capacity development for environmental sustainability as ‘the process by which individuals, organisations and societies strengthen their ability to address environmental issues, manage natural resource issues, and mainstream environmental sustainability into development policies, plans and decisions’. Central to capacity development for environmental sustainability is the complex interrelationship between the environment and socio-economic development, and the relationships between the actors involved in these relations (Ziervogel et al., 2021).
Capacity development modalities, being programmatic in character, represent a form of technologies of rule. The capacity development activities are conceptualised by project actors as a means to solve their various water-related challenges or to facilitate some form of change. The understanding and application of capacity development has changed over time, from primarily focusing on training, to a wider range of modalities, including education and training, joint research and co-production of knowledge, advisory services, e-learning and distance learning, and knowledge networking and partnerships (Wehn de Montalivo & Alaerts, 2013; Wehn et al., 2015). Although the principle of including stakeholders in river management has become widely accepted, consensus has not been reached on the specific goals or forms of stakeholder involvement and the nature of capacity building (Buchecker et al., 2013). Despite this lack of consensus, these processes are recognised as promoting co-ownership of the process design and providing opportunities for learning between stakeholders.

5. THE GOVERNMENTALITIES AND CAPACITY BUILDING OUTCOMES OF DURBAN’S RIVER REHABILITATION PROJECTS

The three case studies represent a range of water-related interventions with the same imaginaries (river rehabilitation for social and environmental benefits), but different rationalities, hydrosocial territories, and technologies of rule (forms of capacity building). The ‘government’, or those doing the governing, varies across the projects.

5.1. The governmentalities of Durban’s river rehabilitation projects

5.1.1. Palmiet Catchment Rehabilitation Project

The Palmiet Catchment is a sub-catchment of the uMngeni Catchment, which was selected as eThekweni Municipality’s proof-of-concept case study in the UEIP for assessing the value of investing in ecological infrastructure in securing water (Vogel et al., 2016; Jewitt et al., 2020). In 2014, local government officials from the Environmental Planning and Climate Protection Department, together with researchers from the School of Built Environment and Development Studies, University of KwaZulu-Natal (UKZN), and civil society organisation Palmiet River Watch, as well as community members from Quarry Road West informal settlement, established the PCRP. The aim of the PCRP is to rehabilitate the Palmiet River and its catchment, to improve water and climate governance, and to provide evidence of the value of ecological infrastructure in securing water (Martel & Sutherland, 2019). The PCRP comprises of a voluntary network of actors who form the PCRP’s Community of Innovation that guides the project. The collective object of intervention in the PCRP is the Palmiet Catchment, and being reflective of self-government, the ‘loose’ environmental subjects are those who co-produced the Action Plan. Given the informal and voluntary nature of this project, more formal arrangements are associated with small-scale initiatives – which target specific sites or communities and are based on the respective project actor’s interest and aspiration. The premise is that actors voluntarily align their initiatives with the PCRP’s co-produced Action Plan.

Prior to 2019, the project was funded through international and national research programmes led by UKZN researchers and Durban’s Research Action Partnership (DRAP), which includes municipal funding. The PCRP has evolved into an innovative governance platform that supports a wide range of local government-led and community-based initiatives to support the resilience and sustainability of the Palmiet Catchment (Sutherland et al., 2019a, 2019b). The PCRP has shown its resilience as a governance platform by remaining functional since 2014, attracting new funding and projects over time. The most significant of these is the investment by the Development Bank of Southern Africa in a four-year project (2019–2022) managed by eThekweni Municipality and

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2 SANCOOP CLIMWAYS, Water Research Commission Project 2354, GCRF U-RES, City of Bremen-GIZ, NRF Community of Innovation, University of Manchester’s SCI Urban Data Justice Project.
implemented by consultants, GroundTruth, that serves as a proof of concept for investment in ecological infrastructure. While the PCRP has remained in place, its governance platform has come under threat as a result of conflicts between different actors, who frame river rehabilitation in different ways. The most significant tension arises around the acceptance and management of informality in the catchment and the failure of the municipality to address water pollution and service-related issues. One of the main challenges is that the Climate Protection Branch is not an implementing department, but rather informs and facilitates implementation by departments such as the eThekwini Water and Sanitation Unit and the Coastal Stormwater and Catchment Management Department. This has led to dissatisfaction from residents in the catchment around the issue of water quality and service provision, which is yet to improve, resulting in mistrust of the outcomes and benefits of the PCRP. Protests by communities in informal settlement and letters of complaint sent to city officials are evidence of this lack of faith in transformative change. City officials and researchers from UKZN have highlighted how challenging it is to improve water quality across a catchment over the short term (7 years), arguing that progress has been made, but that real change takes a long time, particularly in a city facing multiple challenges and competing priorities. Table 1 outlines the governmentality elements structuring the PCRP.

5.1.2. Aller River Pilot Project

The Aller River is located in a sub-catchment adjacent to the Palmiet Catchment and flows into the lower uMngeni River. eThekwini Municipality funded several pilot projects as part of the development of its Resilience Strategy, including the ARPP, which focused on river rehabilitation and water governance along a section of the

Table 1. | The governmentality of the Palmiet Catchment Rehabilitation Project (PCRP).

| PCRP | Collection of actors: UEIP, state, research institutions, and civil society.
| Problematisation | River rehabilitation requires rehabilitation of the catchment, treating ‘the cause and not just the symptoms’ through an understanding of and change in socio-ecological relationships across the entire catchment.
| Political rationalities | Understand socio-economic, political, and environmental relations in the catchment to achieve transformative change.
| | River rehabilitation needs to address both formality and informality in the catchment.
| | River rehabilitation needs to emerge through the co-production of knowledge and engagement by multiple actors to produced what a ‘rehabilitated river looks like and is’ in each particular context.
| Technologies of rule | Multiple actors produced an action plan for catchment rehabilitation through co-engagement and recognition of different forms of knowledge.
| | Emergent projects, which arise through co-engagement and context-specific challenges, form the focus of catchment rehabilitation projects.
| Spatial scale (hydrosocial territory) | Palmiet Catchment
| Environmental subjects | All actors engaged in the PCRP, and communities living within the Palmiet Catchment.
| Social learning and capacity building | Capacity building of multiple actors through co-production of knowledge and co-engaged learning around socio-ecological relations and transformative catchment management.
Aller River (Martel & Sutherland, 2019). The ARPP was initiated by a civil society organisation, the eThekwini Conservancies Forum (ECF), in 2016, as part of their broader Take Back Our Rivers Programme. Conservancies are voluntary conservation organisations, which link communities, state departments and conservation efforts, to promote stewardship of natural resources and achieve broader socio-economic benefits at a community level. The project aimed to develop and implement community interventions to restore the health of a 5.6 km section of the Aller River, which is characterised by poor water quality (Martel & Sutherland, 2019). This stretch of river, as well as the local community impacting on it, represents the object of intervention. The ARPP harnessed the knowledge and resources of the conservancy movement to develop a community-based approach to river rehabilitation. It was envisaged that the ARPP would contribute to improved stewardship of eThekwini Municipality’s water resources; enhance livelihood opportunities in low-income communities; and strengthen resilience in the face of climate change (Martel et al., 2017). The project succeeded in building state–citizen relationships around pollution reporting and river management, and led to environmental education activities within local schools. There is a strong focus on behaviour change, where selected community members have been employed as Eco-Champs (community-based champions) in order to engage with local community members – with the goal of promoting river health and community ownership and responsibility. However, the impact of the project was limited due to a lack of sustained funding and the need for Conservancy members to continue to manage the project, which had not become self-sustaining, both in terms of leadership and funding. Conflict between stakeholders was less evident, as the ECF designed the programme and implemented it, with limited space to debate the problematisation and objectives of the ARPP. The governmentality elements structuring the ARPP are summarised in Table 2.

Table 2. | The governmentality of the Aller River Pilot Project (ARRP).

| ARPP                                                                 |
|---------------------------------------------------------------------|
| The ‘government’ or ‘authority’ (who does the governing)            |
| eThekwini Conservancies Forum (civil society organisation).         |
| Problematisation                                                    |
| River pollution is a result of failed relationships, and a lack of education and accountability of actors responsible for river pollution and rehabilitation: namely community, state, industry. |
| Political rationalities                                            |
| Improve river health through community responsibility and ownership. |
| Cultivate local influencers to create environmental awareness; build relationships between communities, industry, and the state. |
| Technologies of rule                                               |
| Community-based eco-champs identified, appointed, and trained: build their capacity to influence and engage with other actors. |
| Eco-champs engage with the local community and municipal officials around pollution issues. |
| Community awareness raising and education by eco-champs. River walks (monitoring). |
| Spatial scale (hydrosocial territory)                              |
| Riparian zone and communities adjacent to riparian zone along 5.6 km of Aller River. |
| Environmental subjects                                            |
| Eco-champs and by association community members in communities adjacent to the 5.6 km of the Aller River. |
| Social learning and capacity building                              |
| Capacity building of eco-champs through knowledge transfer from the Duzi UMngeni Conservation Trust (DUCT), which is then transferred on to community adjacent to Aller River and local schools. |
5.1.3. Sihlanzimvelo Stream Cleaning Programme

The SCCP was implemented in 2011 by the eThekwini Municipality Roads and Stormwater Maintenance Depart-
ment in consultation with City Councillors. The programme aims to remove litter/waste and invasive alien plant
species from waterways to reduce stormwater blockages and create employment. With a predominantly opera-
tional focus, the initial design of the programme focused on improving cost efficiencies in service delivery.
Within the programme, community co-operatives, funded by the local state, employ local community members
to clean 300 km of stream banks and culverts, removing solid waste and invasive alien plant species. The streams
are located in high density, low-income settlements, where poor river quality has negative impacts on human
health, and there are risks of flooding. A consultant is responsible for managing the project, including appointing
community assessors to monitor implementation and build local awareness (C40 Cities Finance Facility, 2017).
The programme has been successful in building state–citizen relations around service delivery and has been used
as an exemplary river rehabilitation programme upon which the business case for financing river rehabilitation in
eThekwini Municipality is being built (C40 Cities Finance Facility, 2021). The programme predominantly focuses
on cleaning and clearing, with the co-benefits being employment for local communities and the raising of environ-
mental awareness around the value of rivers and their catchments. As a technical stream cleaning programme,
which includes training and awareness raising of community members employed through the co-operatives,
the project has been a success. It has cleaned up rivers and stormwater systems and has created jobs for local
community members in partnership with the municipality, which has been a political goal for poor urban com-

munities for many years. However, it remains a technical and operational programme with limited input from
communities living adjacent to rivers and stormwater systems about their relationships with these systems.
Table 3 highlights the governmentality elements structuring the SSCP.

Drawing on Mills-Novoa et al. (2020), each project has constructed a territory (the object) that is in need of
intervention and has used capacity building as a means to target certain populations (subjects), both internal
and external groups, in order to achieve project goals. The governmentalities or ontologies of rule (Rose &
Miller, 2010) evident in each case study (Tables 1–3) produced different modalities of capacity building. The
form of governing, problematisation and type of environmental subjects created shaped the capacity building out-
comes, which in turn reproduced the modes of governance, relations of power and the type of environmental
subjects best suited to fulfil the rationalities or policies of the government. This resonates with Li (2007) concept
of trusteeship, where those who govern, develop the capacity of others and direct it in benevolent ways. This
power is often exercised at a distance, structuring the field of possible actions and modifying processes in
ways that appear as ordinary or part of everyday life. In this way the desires and actions of these powerful
actors are not overt nor immediately evident and are not perceived as impositions (Li, 2007).

5.2. The modalities of capacity building in river rehabilitation projects in Durban

Three modalities of capacity building, or technologies of rule, which produce particular environmental subjects,
have emerged through the process of governing river rehabilitation projects. These are creating community-based
champions, adopting a developmental social justice approach, and producing environmental subjects through
community-based stream clearing co-operatives (see Figure 3).

5.2.1. Creating community-based champions

The creation of community-based champions in the ARPP (environmental subjects), using the eco-champs model
developed by DUCT, reflects the first modality of capacity building. These community-based champions are
agents of change. They are influencers and bridges, promoting positive environmental behaviour and ownership
in targeted communities, and connecting citizens to the local state. At the outset of the programme,
### Table 3. The governmentality of the Sihlanzimvelo Stream Cleaning Programme.

| Sihlanzimvelo                                    |
|--------------------------------------------------|
| **The ‘government’ or ‘authority’ (who does the governing)** |
| Thekwini Municipality (with support from consultants). |
| **Problematisation**                              |
| Dense settlements adjacent to river courses are poorly serviced and experience poor waste management which results in poor environmental management of riverine corridors. This results in damage to urban infrastructure through flooding and build-up of solid and ecological waste. |
| **Political rationalities**                       |
| Maintenance of waterways through alien invasive clearing and removal of pollution prevents damage to built infrastructure (culverts) during flooding. Job creation through investment in ecological infrastructure. Cost effective means to secure infrastructure. |
| **Technologies of rule**                          |
| Technical and operational interventions undertaken by community co-operatives, overseen by consultants, with support from municipality led SSCP. Clearing of alien invasive species, collection and removal of solid waste and erosion prevention interventions undertaken by community co-operatives. Training of community co-operatives to undertake rehabilitation tasks, provision of protective clothing and tools. |
| **Spatial scale (hydrosocial territory)**         |
| Watercourses (5 km stretches) identified by the SSCP project manager. |
| **Environmental subjects**                        |
| Working members of the co-operatives, stream cleaners, and by association community members. |
| **Social learning and capacity building**         |
| Capacity building of co-operatives around stream clearing, business development, health and safety who work in local spaces on rehabilitation of water courses. |

### Creating environmental subjects

**Community-based champions**
- Aller River Pilot Project
- Eco-champs as agents of change
- Network governance
- Led by civil society organisations (CSOs)
- Environmental messages transferred from CSOs to Eco-champs through capacity development training
- Prioritizes building of relationships between community and local government officials
- Co-construction and co-engagement of knowledge
- Collect, generate and use information
- Eco-champs as an intermediary

**Social justice**
- Palmiet Catchment Rehabilitation Project
- Project prioritises the co-production of knowledge, transdisciplinarity, participatory governance and inclusivity
- Network governance
- Social justice approach - driven by multiple actors through action research
- Multiple forms of capacity building in different catchment communities
- Capacity building by different actors (RiverWatch, Climate Protection Branch and UKZN) which leads to different framings and outcomes
- Building state-citizen relationships through university intermediaries

**Community co-operatives**
- Sihlanzimvelo Programme
- Local government project
- Hierarchical governance
- Strong operational focus
- Infrastructure maintenance and poverty alleviation
- Project decision-making and calculation lies at the project manager level
- Community co-operatives do not engage in knowledge generating or construction processes

**Fig. 3.** Creating environmental subjects through different modalities of capacity building.
environmental knowledge was transferred from DUCT and the ECF to environmental champions (eco-champs) through capacity development in the form of training. This established a frame within which the eco-champs thought about the environment and took action for its protection, in relation to the built environment and social systems. During the capacity development training, the eco-champs were encouraged to engage and reflect on their own experiences in relation to how environmental challenges along the river were being framed, thereby connecting their imaginaries and knowledge with those of the ECF and the rationalities of government of the ‘Take-Back-Our-Rivers’ programme. This ensured that knowledge produced reflected the realities on the ground and encouraged social learning.

The building of relationships and partnerships was prioritised, as these champions interacted with community members, as well as with local government officials in departments related to river pollution. One of the tactics used in this modality of capacity building was the collection, generation, and transfer of information. This included the use of mobile phones or other GPS enabled devices; the population of spreadsheets (capturing details on surcharging manholes, response times, causes of blockages); citizen science (miniSASS); and visual observations during river walks. This information enabled the eco-champs to participate in broader governance networks, particularly with local government officials. The data were also used as evidence of their local environmental expertise when they acted as bridges between the community and local government. The eco-champs became the first group of environmental subjects produced through the project. They then imparted their knowledge and used their data to produce environmental subjects in both their community and in the local state, requiring positive responses from both sets of actors to achieve the goal of river rehabilitation. The hydrosocial territory of this project, which was a zone adjacent to 5.6 km of the Aller River, contained and created boundaries for the knowledge production that took place between those doing the governing, both the ECF and the environmental subjects the project created.

5.2.2. A developmental social justice approach

Environmental subjects can be created through a developmental, social justice model which is not hierarchical, but rather horizontal in nature. The PCRP is framed by network governance, prioritising participatory governance, the co-production of knowledge, and transdisciplinarity. Within the governance arena of this project, a diverse range of actors learn from each other, in understanding risks and opportunities in the catchment, in the context of formality and informality.

Different kinds of environmental subjects are produced and transformed by this network of actors, through the issues and projects that emerge in the PCRP. For example, the Palmiet River Watch invokes environmental subjects who engage in citizen science and the reporting of environmental pollution, focusing on the ecology of the river. Researchers from UKZN encourage the creation of environmental subjects within Quarry Road West informal settlement, who act as a voice and as agents of change for informal communities, with a focus on shifting socio-ecological relations. The state invokes environmental subjects through the Action Plan of the PCRP and short-term river clean ups, using a model similar to that used in the SSCP.

The capacity development methods employed include joint research activities and the co-production of knowledge, reflecting that all actors in the PCRP have become environmental subjects, who are benefiting from shared learning. Tacit and experiential community-based knowledge is moved through the networks of the PCRP’s governance arena, using co-engagement, presentations in meetings, social learning, dialogue, and publications to inform policy makers within the municipality. This approach has been instrumental in building state–citizen relationships, with university researchers and Palmiet River Watch acting as intermediaries (Sutherland et al., 2019b). This co-produced knowledge has moved into other government programmes, including Durban’s Resilience Strategy, iQhaza Lethu Informal Settlement Upgrading Programme, and Durban’s Transformative Riverine
Management Programme, through the efforts of officials, academics and community members, and has supported local government’s understanding of the politics and challenges of rehabilitating a catchment with multiple land uses. Given the complexity of the hydrosocial territory of this project, namely the catchment with its multiple land uses and challenges, the boundaries of the project and what it seeks to achieve shift and are broadened as issues in the catchment arise. Similar outcomes of the benefits of locally produced knowledge are evident in Ziervogel et al. (2021) action research undertaken in Cape Town on climate adaptation programmes.

5.2.3. Environmental subjects within community co-operatives

Environmental subjects have been cultivated through eThekwini Municipality’s Sihlanzimvelo Stream Cleaning Programme, which has an infrastructure maintenance and poverty alleviation focus. Working within community co-operatives, these environmental subjects have an operational focus, and hence their capacity development modality reflects a more practical orientation, aligned with a technical and managerial form of governance. Prior to the implementation of Sihlanzimvelo, the concept was presented to local councillors and ward committees, who helped to shape the tactics of government used in the project. This includes the identification of the most polluted water courses, the selection of co-operatives, the level of payment for services and the form of training, including environmental and business training, and the provision of tools and safety equipment. The model uses money as the incentive for change, as co-operatives and their members do not get paid if they do not achieve their stream clearing tasks and activities.

Within the SCPP, the collection of data is completed by consultant assessors, who convey this information to the project managers. Project decision-making and calculation lie at the project manager level. This means that community co-operative members are not responsible for knowledge construction processes, and hence are not required to develop capacity in knowledge production. Community co-operative members are provided with basic business and administrative skills. This ensures that the co-operatives are managed as businesses and have the capability (and required paperwork) to re-apply as community co-operatives every 3 years. This is in line with the technical, managerial, and hierarchical form of governance evident in this project. The hydrosocial territory of each co-operative is defined as a local area requiring a clean-up, which has been identified by local councillors in conjunction with municipal officials, and so the boundaries of the territory are clearly defined, which makes project implementation focused and efficient.

While the governmentalities of each river rehabilitation project have produced different capacity building approaches and outcomes, four main themes have emerged as being central to all three projects.

5.3. Central and critical capacity building elements

Four common themes of capacity building were evident across the three projects: information as the currency of action; the site of learning; the importance of building state–citizen relationships; and the need for bridges or intermediaries (see Figure 4).

Information is used as the value add or currency for non-state actors engaging in governance networks. Here, the collection and use of information, and context specific, local knowledge has empowered citizens to engage with the state, and other actors. In some cases, this information and knowledge has been produced within predetermined frames (community-based eco-champ modality), while, in other cases, communities themselves have constructed what knowledge or information matters and should be included (developmental social justice modality). In the co-operative modality, the information and knowledge are framed by what is required by the operational practices of the project. The governmentality of each project shapes the level of openness or control.

3 When translated from Zulu into English, Sihlanzimvelo means ‘we care for our environment’.
over the production of information and determines where this knowledge can flow. Building capacity in people enables local actors to exercise power to govern themselves, their communities, and the local state, as was evident in the ARPP and the PCRP.

The second theme focuses on spaces and sites of learning. The spaces where the learning or co-engagement takes place are shaped by the modality of capacity building, as co-produced modes result in an open and emergent learning space, while the transfer of knowledge creates a more formalised space of learning. In all three projects, the site of learning and capacity building is focused on the river catchment itself. In some cases, the knowledge and learning emerge from this physical space, for example in the PCRP; while, in the other two cases, learning is transferred into the space. In the case of the PCRP, the form of learning is more transformative as it enables co-engaged learning pathways and produces learning environments that are more participatory, reflexive, and learner-led (O’Donoghue et al., 2018). However, this is more challenging, as environmental subjects are not produced through calculated means in the form that those managing river rehabilitation projects may require to ensure their goals and objectives are met, which can result in conflict between project actors. However, the benefit of this approach is that all actors are included in the institutionalisation of river rehabilitation projects, as practical engagement, inclusive participation, critical review, re-visioning, and the deliberation of the way forward is achieved (O’Donoghue et al., 2018). In all projects, the cultivation of environmental subjects is of benefit to the state, as departments within local government have access to more grounded information about built infrastructure, the local social and political system, local environmental knowledge, and practices within catchments. This creates the potential for the state to fulfil its mandate by having access to this information.

Thirdly, capacity building in all three cases has resulted in the building of relationships between citizens and the state, which is considered critical in river rehabilitation projects. The power relations between citizens and the state vary in all three models, with the developmental social justice model producing a more horizontal and less vertical set of relations, due to the co-production of knowledge that takes place. However, in each
case, state–citizen relationships are strengthened, and this leads to the potential for, and realisation of, social and environmental change. The environmental subjects also develop a deeper understanding of how they can use, interact with, and access municipal systems.

Finally, bridges or intermediaries have emerged as essential to achieving the goals of river rehabilitation projects and ensuring that the knowledge produced through capacity building is transferred into spaces where it can begin to make a difference. The presence of, and need for, intermediaries reveals that capacity can be built in individuals, but bridges become important in the transfer of knowledge between communities and local government (Sutherland et al., 2019b).

6. CONCLUSION

Rivers are a nexus of socio-economic, political, and environmental relations that constitute a city. They receive, move, and process the outcomes of urban life, and in turn they shape and transform the environments they flow through. The relations between society and rivers are mediated by hard engineered and ecological infrastructure, and human action, which can have both positive and negative effects. The improvement of relationships between rivers and society needs to be built through adaptive, emergent, interdependent and dynamic interventions, rather than the technical, linear, and deterministic interventions of the past (Ziervogel et al., 2021). This paper has presented the different governmentalties that have emerged in river rehabilitation projects in Durban at the local scale, as the actors doing the governing (a network of actors; state, university and civil society; a civil society organisation and the state) have produced their own problematisation, rationalities of government and technologies of rule for each project within particular hydrosocial territories. In the absence of the overarching CMA imaginary and its technologies of rule, each project develops its own tactics aligned with its rationalities, which creates different environmental subjects, and different outcomes.

Capacity building and social learning are identified as a technology of rule, as a means of shaping the behaviour and action of those living adjacent to rivers. Each governmentality produces its own form of capacity building, ranging from the direct transfer and uptake of technical knowledge to a more open and transformative approach of knowledge building from below. This shapes the outcomes of the river rehabilitation projects as it creates the frame within which social change can take place, which sustains each projects specific imaginary, based on their object of intervention. Four main themes emerged as being central to capacity building. Knowledge and information, and the way it flows and where it flows to, is critical in all projects. Information is the currency of exchange, however, the movement of this knowledge through the data information chain to policy makers, will determine the extent of transformative change (Sutherland et al., 2019b; Ziervogel, et al., 2021). The site of learning and its openness determines whose knowledge matters most in shaping river rehabilitation outcomes. Building state–citizen relations through the capacity building of all actors is a cornerstone to transformative river rehabilitation projects. Finally, the role of bridges or intermediaries is essential, while state–citizen relations are being developed and secured.

River rehabilitation projects are framed in different ways, with technical and ecological approaches being broadened to include social, political, and economic dimensions. By including a wide range of environmental subjects in social learning processes, which are inclusive and participatory, those with the will and power to promote change, can begin to pursue the much-needed goal of rehabilitating catchments and rivers. The challenges of urbanism in the global South means that this is a challenging task that cannot be easily achieved in the short term; however, new modes of governance and capacity building are emerging, which have the potential to support transformation and sustainability over the longer term.
ACKNOWLEDGEMENTS

The authors would like to thank the multiple stakeholders involved in Durban’s River Rehabilitation Projects for sharing their knowledge and insights with us. They would also like to thank the Durban Research Action Partnership (University of KwaZulu-Natal and eThekwini Municipality) for funding this research. The anonymous reviewers who provided valuable comments on this paper are thanked for their input and insights.

DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

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First received 27 March 2021; accepted in revised form 1 October 2021. Available online 18 October 2021