Water sector reform, climate change and climate-resilient planning in central Tanzania

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Water access is the cornerstone of livelihoods for most rural communities in Tanzania. Yet limited capacity for effective planning, management and governance of water sources is deepening vulnerability to the increasing and often unpredictable impacts of climate change. This paper assesses Tanzania's recently centralised approach to rural water planning through a climate-resilient development lens, drawing on consultations in Dodoma Region. We find that integration of climate resilience principles including integration of local knowledge and cross-sectoral collaboration could be improved. We also find growth of a scarcely regulated private sector for water access with mixed outcomes for resilience of communities.

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Acronyms

CBWSO	Community-based water supply organisation
COWSO	Community-owned water supply organisation
IIED	International Institute for Environment and Development
LCRWP	Local Climate Resilient Water Planning Programme
O&OD	Opportunities and Obstacles for Development
PO-RALG	Presidents' Office – Regional Administration and Local Government
PPP	Public-private partnership
RUWASA	Rural Water Supply and Sanitation Agency
SEMA	Sustainable Environmental Management Action
SMF	Sokoine Memorial Foundation
TARURA	Tanzania Rural and Urban Roads Agency
TSH	Tanzanian shillings
TMA	Tanzania Meteorological Authority
URT	United Republic of Tanzania

Executive summary

Water is the cornerstone of livelihoods for most rural communities in Tanzania. The ability to access water for domestic use, agriculture or livestock is crucial for delivering a range of development outcomes associated with income, health, education, food security and public service provision. But Tanzania is highly vulnerable to climate change impacts, with climate-related disasters increasingly undermining the economy and causing serious disruption. With most agricultural livelihoods depending on rain-fed, surface water sources, increasingly unpredictable and intense precipitation caused by climate change is deeply disruptive. Too much water in a short time, or not enough overall, leaves water sources damaged or dry with a range of negative consequences. Strengthening local adaptive capacity within the water sector is key to mitigating the negative effects of climate change and achieving climate-resilient livelihoods.

This report presents findings from research in Tanzania's Dodoma and Arusha Regions, conducted as part of the UK Foreign, Commonwealth & Development Office-funded project, Local Climate Resilient Water Governance and Planning. The research explores experiences of rural water planning and governance in Dodoma and Arusha, to identify the extent to which the region is integrating climate resilience principles into planning and governance. The research took place in 2020. We use four principles for climate-resilient development to analyse local experiences:

- A whole-of-society approach
- Transparency and accountability
- Building on local priorities and knowledge
- Climate risk-informed planning.

We developed the research to inform institutional strengthening on climate resilience and thereby strengthen processes, tools and capabilities for climate-resilient water resource planning within formal (local government) and informal (community-led) planning.

Tanzania has recently reformed its approach to rural water planning and governance. Responsibility for rural water investment has moved from local government authorities to a new centrally managed agency, the Rural Water Supply and Sanitation Agency (RUWASA). This centralisation brings both opportunities and risks — for example, short-term efficiency or technical capacity gains may be undermined by reduced community participation, reduced downward accountability, and a loss of in-depth local knowledge that reflects local priorities. But customary and informal institutions continue to dominate most people's experience of water use and governance, integrating with local livelihoods and resource management systems. A regulatory gap has also enabled an emerging, small-scale water private sector to emerge, featuring stakeholders with little serious understanding about how future climate risks might affect them or their community. A climate-resilient approach will need to recognise the challenges inherent in these institutions to make progress. The emerging analysis strongly suggests that more could be done to integrate principles of climate-resilient development, particularly in a sector that is in a state of change.

First, opportunities for public participation that can enable vital integration of local knowledge and priorities into the planning process remain limited, particularly under the new centralised approach. Community consultation has been reduced, in favour of a more top-down approach that is presumed to be more efficient, particularly in completing short-term planning processes. But increasing participation can ensure that water source improvements or construction projects incorporate local knowledge about what is appropriate and support customary natural resource management systems, which have evolved over time to suit the context. Over the medium and long term, this is likely to be both more efficient and cost effective. Tools such as participatory digital resource mapping or participatory learning and action approaches can help articulate local knowledge and priorities effectively and in a language or format that government can understand and build on.

Second, cross-institutional coordination and inclusion of governments, civil society, academia and private sector and different spatial scales of governance — a whole-of-society approach — is rare. In some cases, new reforms have hampered collaboration between local government districts and their former colleagues from the water sector, who are now employed by RUWASA. New reforms have created three overlapping formal systems on top of the many long-standing informal or customary regimes and an unregulated private sector. The result risks poorly coordinated investments that miss opportunities to integrate crucial perspectives or find synergies. Formalising and funding opportunities for greater integration of local government authorities, basin water boards, RUWASA, and private sector operators

could enable planning that is future-oriented and robust to a range of risks and contexts.

Third, the quality of accountability remains an ongoing challenge. Previous systems, which relied on local community committees to manage water sources, struggled due to the time demands and lack of member expertise. Under the new system, top-down accountability dominates, with community-based water supply organisations under more pressure to report upwards to RUWASA than to the communities themselves. This development, alongside their professionalisation, favours short-term efficiency over accountability, which could have negative consequences as a result of reduced local ownership and responsiveness.

Consideration of climate risk in the planning process is most notable for its absence. While there is recognition in national policy documents about the risks to the water sector, there is little evidence of planners actively considering how climate impacts might affect local water sources in the future, in terms of either longevity or day-to-day governance. Water planning does little to recognise how climate risks might affect particular groups in different ways, and what that might mean for water infrastructure improvements or new construction. Future-oriented planning tools that extrapolate from lived experiences of previous climate impacts could be a low-cost way of considering how to mitigate future challenges, while partnering with meteorological agencies would allow government planners to combine local and scientific knowledge to inform decision making.

Despite their central importance to local people, customary knowledge and institutions remain marginal, as CBWSOs have few spaces for water users from traditional leadership who could represent community priorities and experiences. Working with these different systems will ensure deeper ownership of local water investment and, because they integrate water with local livelihoods and other central priorities, they can be an asset to sustainable long-term development. This will require flexibility across locations and livelihood systems, recognising where customary rules differ to reflect local needs and priorities. A bottom-up approach is the clearest way to ensure that CBWSOs shape local planning and governance of water planning and access.

1 Introduction

Tanzania is highly vulnerable to the impacts of climate change. Despite some uncertainty, projections confirm an ongoing rise in average temperatures, increased frequency of drought and likelihood of flooding events (Future Climate for Africa 2017). Climate-related disasters are estimated to cost the economy 1–2% of gross domestic product by 2030, largely through impacts on agricultural productivity on which much of the population depends (Watkiss et al. 2011). Dodoma and Arusha Regions, where people practice pastoralism and rain-fed farming, are particularly vulnerable to flooding and drought, deepening food and water insecurity.

Household vulnerability is compounded by growing overall water scarcity. The main challenge lies not in the quantity of available water but in the quality of water planning and management (World Bank 2018). As a result of poor planning or inappropriate governance, fewer than 50% of people in rural areas have access to improved water sources (WHO and UNICEF 2021). At the same time, 40% of Tanzania's 83,000 known water points are believed to be non-functional (World Bank 2018). Women, responsible for provisioning households, risk gender-based violence and reduced incomes to access water during drought (Meyiwa et al. 2014). Reduced clean water access also leaves children vulnerable to waterborne diseases, which contributes to stunting, delayed childhood development and increased mortality (World Bank 2018).

The importance of water in rural contexts has social and political dimensions. Scarcity is sometimes associated with conflict — for example, overusing land for livestock or farming — which can undermine customary natural resource management systems, the foundation of many rural livelihoods (Casciarri and Staro 2019; Franks et al. 2013). And when livelihoods are undermined by conflict, young men often migrate to cities for work, leaving rural households with labour shortages for farming and grazing. This creates vulnerability for those that cannot hire labour or generate income for their own adaptation investments (Goldman and Riosmena 2013).

Uncertain climate futures make rural water sector development even more challenging, as investments need to address long-standing governance challenges while preparing for a range of variable and uncertain risks. Introducing climate risk management is essential to ensure local infrastructure investment and governance is sustainable, resilient and poverty-reducing. Indeed, if standard development approaches fail to incorporate climate risk, they can increase future vulnerability (Scoville-Simonds et al. 2020). But communities hold in-depth knowledge of local contexts, priorities and conditions that can be of high value to development planning (IPCC 2022; Van Aalst et al. 2008; Smit and Wandel 2006). Bridging this local knowledge into the formal planning system can create conditions for investments that support resilient local livelihood systems (Greene 2014).

Tanzania has recently centralised rural water development planning, establishing new national and local-level institutions, including the Rural Water and Sanitation Agency (RUWASA). This transition offers an opportunity to address some of the previous systems' inherent failings while incorporating measures that consider the new and increasing challenges of climate risk, variability and uncertainty.

The Local Climate Resilient Water Planning Programme (LCRWP) — implemented by Sustainable Environmental Management Action (SEMA) and the Sokoine Memorial Foundation (SMF) and funded by UK Aid

with technical support from IIED — sought to address these challenges. The LCRWP aimed to build on learning from previous efforts to decentralise climate-resilient investment finance and planning, including the Decentralised Climate Finance Programme, which identified that community-led institutions could effectively identify resilience-building investments based on local knowledge and priorities, climate information and participatory resilience assessments (Greene 2019; Msangi et al. 2014). Working in Mpwapwa, Kondoa and Chamwino, three districts in the Dodoma Region, the LCRWP aimed to build on local knowledge and priorities to develop a system to finance climate-resilient water investments identified through community consultation and climate-resilient planning.

In November 2020 partners carried out two studies that could inform the approach to identify climate-resilient water investments. The first identified climate impacts in project districts and detailed the nature of rural water infrastructure planning. It focused mainly on formal top-down government planning systems. The second explored the strengths, weaknesses and challenges of formal systems and detailed the nature of informal, customary, and other bottom-up engagement with water planning institutions and infrastructures.

The studies produced data based on discussion with a wide range of stakeholders that can enable a tentative assessment of rural water planning systems' capacity to integrate principles of climate-resilient development.

This working paper presents findings from those studies. Drawing on project-related and scholarly literature and primary research from three districts in Dodoma Region, it assesses Tanzania's capacity to plan and coordinate rural water investments that recognise and respond to climate risks. It also reviews the implications for climate-resilient rural water delivery of changes in formal rural water planning, the nature of customary and informal water management, and the growing private-sector water delivery industry. We conclude with recommendations for adapting the formal planning system to better incorporate effective principles for climate-resilient planning.

2

Methodological approach

Our research combines literature reviews and fieldwork across three districts in the Dodoma Region, which includes transect walks, focus group discussions and one-to-one key informant interviews. We selected one ward in each district to ensure fair representation of the types of water source, water use and livelihood.

Ensuring that local government development planning can plan and prioritise investments that respond to current as well as future climate risks is a priority for many countries. Globally, new strategies are emerging for integrating climate considerations into planning, such as the Tanzania Climate Change Response Strategy (2021) or Ethiopia's Climate Resilient Green Economy Strategy (2011). Yet getting this planning right presents a significant political and technical challenge for governments and communities.

A political challenge because vulnerability to climate change impacts is rooted in historically entrenched unequal societal and financial power structures that undermine the capacity of those with less power to adapt their livelihoods to new realities created by climate change. A technical challenge because, while climate impacts require a meaningful and immediate response, the exact nature of future impacts are unpredictable and uncertain. They also cut across geographies, traditional roles, sectors of government and communities. Climate impacts interface with a range of context-specific realities at local level, including geography, gender, ethnicity, age, livelihood type and marginalisation.

These issues are equally relevant to the wider water sector and the provision of infrastructure for accessible, clean and safe drinking water. For example, Tanzania's climate strategies prioritise climate-resilient infrastructure provision and participatory and integrated water basin management.

In recent years, academic and other literature has begun to identify principles for climate resilient development planning. Climate resilient development refers to processes that reduce societal exposure and vulnerability to climate hazards, reduce emissions, preserve nature and biodiversity, and address the root causes of poverty and vulnerability. Planning for climate-resilient development requires application of a set of principles that ensure governments, communities, and other development actors are focussing on the necessary issues in an appropriate way. (Soanes et al. 2021; Crick 2021; IPCC 2022). These principles can be used to shape new programmes, modify existing programmes, or to assess climate readiness or existing planning and governance capacity.

This paper applies some of these principles to data from two separate studies, to explore the extent to which Tanzania's water sector incorporates or mainstreams climate-resilient development planning principles. This understanding is tentative due to the limited nature of the research, but can indicate emerging trends, potential risks, and avenues for future research. We applied individual principles for analysis that are relatively common in the literature, and which we felt could be justifiably applied to the data we had. These include:

- **A coordinated, cross-institutional, whole-of-society approach** that brings together actors from civil society, the private sector, different government sectors and levels, academia and others: This collaborative approach ensures greater representation and allows us to apply multiple perspectives to the challenge of ensuring water access (IPCC 2022; Soanes et al. 2021; Mogelgaard et al. 2018).
- **Accountability and transparency**, which allows stakeholders and service users to understand how and why decisions are made, and hold decision makers accountable: Downward accountability emphasises accountability to communities, rather than to higher levels of authority (Soanes et al, 2021).
- **Valuing local, indigenous and traditional knowledge**, which reflects local priorities and an understanding of context, customary natural resource management and local, flexible strategies for allocating resources: This ensures that climate-resilient adaptation interventions are built on existing institutions and practices and requires processes to ensure the meaningful participation of communities and their representatives in decision making (Gannon et al. 2020).
- **Risk-informed planning** that takes into account the uncertain and variable nature of climate risks into the future: This includes integrating local knowledge and experience of climate risks with scientific forecasts, and considering how future impacts will affect investments (IPCC 2022; Vincent and Conway 2021).

To apply these principles to Tanzania's water sector as a whole presents a challenge of scale. The range of formal, informal, national, local and regional institutions and stakeholders have many overlapping roles and responsibilities. This paper focuses predominantly on infrastructure provision and governance of water for drinking or domestic use, rather than irrigation or industrial supply. The major stakeholders are government actors, communities that use water sources, an emerging cadre of private small-scale borehole or well operators and the cottage industries that have sprung up around them.

To help organise the application of the climate resilience principles detailed above, our analysis makes a rough distinction between public, private, and informal or customary institutions with a role in planning. At the same time, we recognise that in practice these realms are not distinct, and that boundaries are often blurred.

The findings in this paper are based on a review of available literature and data collected over the course of two separate studies, in March and May 2020. The studies were led by independent researchers and supported by individuals from SEMA and SMF.

2.1 Literature reviews

The literature review for the first study aimed to develop a deeper understanding of the formal government planning system and previous experiences of mainstreaming climate change into development planning in Tanzania. It reviewed policy documents relating to rural water planning and climate change responses.

The literature review for the second study examined published and internal documents relating to previous efforts to mainstream climate into planning through the Devolved Climate Finance approach in Monduli, Longido and Ngorongoro Districts in Northern Tanzania. These included published papers as well as documents outlining participatory planning and digital mapping exercises carried out with community members.

2.2 Context in the study districts

The three districts have different physical and geographical features. Mpwapwa is the most diverse, with four agroecological zones: highlands, intermediate, lowlands and rift valley (Mpwapwa District Council 2017); Kondoa is characterised mostly by plateau (Kondoa District Council, nd); and Chamwino has a mix of drylands and flat lowlands (Chamwino District Council 2019).

Around 90% of all households are engaged in agriculture and 46–60% keep livestock (Table 1), and people use several types of community water access site across the three districts, including developed gravity schemes (with tap stands); improved boreholes (both private and public); unimproved traditional/shallow wells; hand-dug wells; 'traditional' dams; small streams; springs; and other informal water sources. Access to clean and safe water is better in Chamwino than Kondoa and Mpwapwa (Table 1).

Table 1. Basic livelihood and water statistics in the three study districts

DISTRICT	TOTAL HOUSEHOLDS	TOTAL WATER PROJECTS (FUNCTIONING)	PEOPLE WITH ACCESS TO WATER SERVICES	HOUSEHOLDS ENGAGED IN AGRICULTURE	HOUSEHOLDS ENGAGED IN LIVESTOCK KEEPING
Chamwino	73,807	1,224 (784)	83%	68,162 (92.4%)	34,828 (47.2%)
Kondoa	55,990	483 (273)	57%	50,197 (89.7%)	33,577 (60%)
Mpwapwa	66,275	1,063 (695)	52%	59,670 (90%)	30,832 (46.5%)

Sources: URT 2016; URT 2020.

The first study highlighted several impacts of climate change in the three districts, including lower water flow, more intense droughts, unpredictable rainfall, and an increase in pests and diseases, such as lamb skin and foot and mouth disease. These have affected crop harvests and livestock breeding, which are the mainstay of the communities in all three districts. Climate change has also increased the intensity of rainfall events, causing flooding and damaging settlements, farms and public infrastructure.

2.3 Data collection workshop

A one-day workshop in March 2020 explored the existing top-down government planning system, with stakeholders engaged in government planning. These included individuals from the President's Office, Regional Administration and Local Government (PO-RALG), the district commissioner, district administrative secretaries, district executive directors, district council department heads from three districts, regional staff from the RUWASA, and representatives from the Wami-Ruvu basin water boards.

The workshop sought to enable participants to articulate the:

- Nature of and procedures for government planning and budgeting at local level for both water and other development investments
- Interactions (or lack of) between institutions
- Nature of formal and informal structures for water and climate change planning
- Types of climate initiative present in project districts and overall awareness of climate issues
- Considerations for integrating gendered priorities into planning and budgeting.

Interviews

Some of these stakeholders could not join the workshop, mainly due to the onset of the COVID-19 pandemic. The team interviewed some of these individuals by phone or virtually, using questions derived from the workshop activities.

Fieldwork

The fieldwork took place in June and July 2020 in the following villages:

- Ilolo, Kikombo and Kiboriani: Mpwapwa Urban Ward, Mpwapwa District (three days)
- Magungu, Zajilwa and Gwandi: Zajilwa Ward, Chamwino District (four days)
- Bukulu, Soera, Humayi and Kwadinu: Soera Ward, Kondoa District (three days)

Working with a district council planning officer, the team selected one ward and several villages in each district to ensure diversity of: water sources, ownership of water sources—including state-supported, informal, and private ownership—and livelihood types, including farmers, pastoralists and private traders.

Transect walks and observation

The research team surveyed several water access sites in villages across the three districts, including one gravity scheme (Mpwapwa), six improved boreholes (private and public, one in Mpwapwa and five in Chamwino), two springs (Mpwapwa), one dam (Chamwino), and one small river (Mpwapwa). In Kondoa, due to challenges of accessibility, the team did not conduct transect walks, opting instead for large group discussions with representatives from Bukulu, Soera, Humayi and Kwadinu villages.

The objective of the transect walks was to map natural resources, water and other public infrastructure, village institutions (schools, hospitals), and their relationship to each other, and to identify prescient issues raised by

accompanying participants. To ensure representation from government and community, two separate teams carried out walks accompanied by village councillors or executive officers, water management committee representatives, local women's representatives, SEMA project officers and district council planning officers.

Observations led to selected interviews with water stakeholders, including water source users, traders and water committee members. These focused on strategies, risk management and problem solving, informal and formal water abstraction rules, water resource allocation and the quality of the water source design and construction planning process.

Focus group discussions

To gain further information on the nature of customary, informal and formal water management from a community perspective, we held two types of focus group discussion. The first was with selected community members, including village leaders, individuals and community-based organisation representatives. These discussions focused on informal water management institutions, changes in water use and management with the seasons and climatic extremes, external forces influencing customary institutions, and relationships to formal government. In the second round of focus group discussions — which were with selected community members and district planning officers — we used problem tree analysis to identify specific issues. This is a participatory discussion tool designed to map out the cause and effect of perceived challenges.

Validation workshop

The team held a validation workshop in July 2020 with selected stakeholders to discuss the initial findings from both studies. Participants represented key water stakeholders in the project districts, and included district council planning, water and community development officers from the three districts, representatives of the Wami-Ruvu Basin Water Board, RUWASA and PO-RALG, national and local SEMA project staff, selected village leaders from the study sites, and water management committee representatives from the study villages. The one-day workshop involved the presentation of initial findings and group discussions to add further detail, clarification or address false inferences made from research data.

2.4 Data analysis

The consultant and SEMA project team analysed the research findings after concluding the fieldwork. Group analysis was prohibited by the onset and continuation of the COVID-19 pandemic, so some discussions took place on an individual basis. We applied the climate resilience principles to the research findings to support an analysis of the extent to which those principles exist in the changing water sector in Tanzania.

3

Public sector water and climate planning

This section provides an overview of three overlapping government institutions that support planning and delivery of rural water infrastructure. It also identifies the challenges of institutional coordination and public participation as weaknesses that undermine the use of climate-resilient development principles.

Tanzania's Water Sector Development Programme (2006–2025) provides a strategy for delivering on the priorities identified in the country's updated Nationally Determined Contribution to the United Nations Framework Convention for Climate Change. These include integrated water resource development and management practices; protecting and conserving water catchments, including flood control and rainwater harvesting structures; wastewater reuse and recycling technologies; and developing and exploiting groundwater resources (URT 2021). Additionally, the National Climate Change Response Strategy (2021) promotes the sustainable exploitation of groundwater resources.

After various laws that enshrine community rights to participate in water governance, the Water Supply and Sanitation Act (2019) divided Tanzania's rural water planning and investment between three formal planning systems (Table 2), created among the bricolage of local-level informal, customary and previous government systems (Mosha et al. 2016).

This analysis draws on our literature review and interviews with RUWASA and district council staff. Basin water board staff were unavailable during the research period.

Table 2. Tanzania's layered planning system

LEVEL	INSTITUTION	APPROACH TO PLANNING	METHODS FOR IDENTIFYING PRIORITIES	REPORTS TO	REFERENCE DOCUMENTS AND LAWS
Central	RUWASA	Technical	Surveys: marginal community involvement	Ministry of Water	National Water Policy 2002 Water Sector Development Programme II
Local government	District councils, working with ward councils	Participatory Multistakeholder	Opportunities and Obstacles for Development (O&OD) approach to identify and support priorities set by communities	Regional administrations PO-RALG	Guidelines for the Preparation of Plans and Budgets (Ministry of Finance and Planning)
Water catchment	Basin water boards	Internal to basin water boards	Water User Associations submit recommendations	Central basin water boards	Water Resources Management Act of 2009

3.1 Institutional layers

3.1.2 Centrally-led planning: RUWASA

RUWASA, a centralised institution established under the Ministry of Water by the Water Supply and Sanitation Act (2019), replaced the departments of water that were previously overseen by district councils. It aims to bring greater efficiency and technical knowledge to water planning.

With the establishment of RUWASA, the former community-owned water supply organisations (COWSOs) and village water committees that governed local water access and management were replaced by community-based water supply organisations (CBWSOs), a new system of village-level committees that place greater focus on local-level technical or professional expertise (Box 1). CBWSOs have nine members, which should include a head teacher, a health professional, representatives from ward and village-level state institutions, a water users' representative and a women's representative. Unlike village committees or COWSOs, where members are elected, CBWSO members are appointed by virtue of their profession. A community water management team, which should have members with accountancy and engineering accreditations, is responsible for day-to-day operations and reports to RUWASA on behalf of the committee (SEMA 2020). Where CBWSOs have not been established, pre-existing COWSOs or water management committees remain the de-facto local water management institutions.

This new system will face the challenges of carrying out resilient water management in a context where climate change is already having a significant influence on longevity and availability of water supply, and with the certainty of rising costs of adaptation and future unpredictable climate variability.

BOX 1. COWSOS AND THE LACK OF COMMUNITY OWNERSHIP

COWSOs were established in 2009 to formalise informal or customary water management systems that had no formal connection to state institutions such as the village committee or ward council. Consisting of elected community members, their main roles were managing fee collection and maintaining water sources, with strict regulation and reporting overseen by local government authorities (Wesselink et al. 2015). COWSOs sought to enhance local ownership while extending state supervision of water infrastructure village committees.

Unfortunately, their limited technical and financial capacity and lack of transparency mechanisms created street-level bureaucracies that did not reflect real ownership at local level (Wesselink et al. 2015). Communities did not embrace the need for these institutions, while complex and costly registration processes led many to ignore registration altogether, creating greater opportunities for corruption and misuse (Fierro et al. 2017).

Centralising water planning and supply aims to prioritise the necessary hydrological, engineering and technical environmental expertise for developing water resources. As an independent authority, RUWASA is expected to implement projects swiftly and efficiently, using hydrological surveys and maps to identify new opportunities.

3.1.2 District-level planning: the O&OD approach

In principle, O&OD is a participatory multistakeholder process involving all levels of local government from subvillage to ward level (SEMA 2020) and overseen by PO-RALG. Local officials work with ward and village committees to carry out participatory discussions and identify local priorities, which may include water source construction or rehabilitation. They then detail these in their district annual development plans to channel technical or financial support towards them.

But O&OD has historically been beset with challenges. Technical and financial capacity to implement participatory planning has been limited (Msangi et al. 2014) and work is often rushed, as government officials struggle to deliver a viable budget on time. Many have little participatory planning experience and their highly limited budgets prevent them from visiting all the villages to facilitate participatory discussions in the required time (Greene 2019). Funds for investing in local priorities identified by O&OD are also extremely limited, so officials work with limited resources to deliver on promised investment, limiting public trust or willingness to engage in the process. To overcome these shortcomings, O&OD tends to focus on village executive officers, who are technically accountable to communities, to identify potential development investments that can benefit communities, rather than work directly with community members.

O&OD has recently been reformed to make it more streamlined, but it is not clear how well the new system is working, particularly following the outbreak of COVID-19. The new legislation also removes water development from the O&OD remit. So, despite water being central to many communities' concepts of — and requirements for — development, district councils have far less ability to respond to water-related requests that come through the O&OD system.

3.1.3 Water catchment-level planning: basin water boards

A third major water-related institution further complicates the overall planning system. Basin water boards are responsible for assessing and allocating water resources, monitoring and controlling pollution, managing water use conflict, and research and development (SEMA 2020). Their planning and budgeting start at water catchment level with existing water users' associations, which are responsible for managing, distributing and conserving water from shared sources.

3.2 Coordination and participation in the new system

We held discussions with participants across multiple interviews and workshops to identify the extent to which the reformed public sector planning system applies principles for climate-resilient planning. Pervasive challenges include ensuring cross-institutional coordination to apply a whole-of-society approach, and the nature of participation.

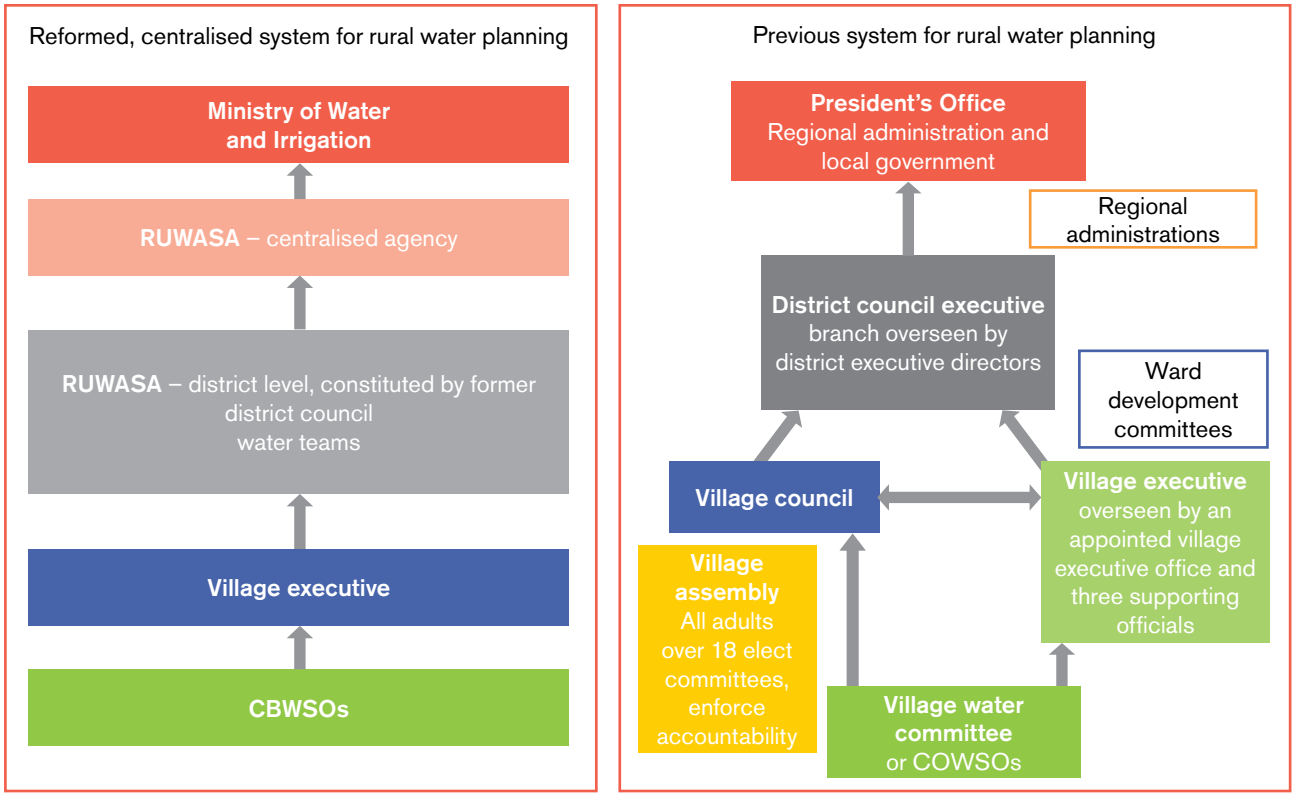
3.2.1 Coordination between agencies and institutions

"The problem is not so much when it comes to implementation. If money is there, the implementation will be ok, but councils get their money from the central government and people's taxes, while RUWASA gets their funds directly from the ministry. This leads to problems when it comes to planning together and coordinating because the two entities may have money available at different times of the year."
District council official

Institutions receive their funds from different sources, at different times of year, with different reporting requirements. Reference and guidance documents also differ: RUWASA focuses on targets set in the Water Sector Development Plan, while district councils use the Ministry of Finance and Planning's Guidelines for the Preparation of Plans and Budgets (SEMA 2020). This has implications for planning more ambitious projects and maintaining existing infrastructure, as siloed budgets are harder to pool together.

Another consequence of separating the district councils from the RUWASA budget is that district departments can no longer work on joint activities. Water departments used to hold larger budgets that enabled counterparts in other departments with more meagre budgets to achieve some of their objectives. Now, with RUWASA managing water separately, district environment and community development departments can no longer carry out environment and social impact assessments. From a planning perspective, the physical separation of basin water board and district officers undermines their capacity to interact, share research and learning or explain plans for a particular district or catchment.

Figure 1. Coordination between agencies under the new and old rural water planning systems



These challenges do not support the whole-of-society approach needed for coordinated climate action. The three planning systems have the potential to bring together funds, a landscape-level spatial approach and higher-level technical knowledge. But the lack of provision for meaningful coordination undermines their collective effectiveness to support climate-responsive planning and has further negative implications for smaller council departments.

3.2.2 Community participation, transparency and accountability

Interviews also identified challenging trade-offs between efficiency and participation. The most striking effect of establishing RUWASA is the shrinking of spaces for community representation and participation. The disconnect between centralised, RUWASA-led water sector planning and district council-led O&OD reduces the spaces for public participation in water issues and for linking water to the multifaceted nature of livelihoods in practice. However, when combined with limited financial resources, the previous district-led approach could (and often did) lead to a failure of effective action.

"Assume we start discussing about the building of a classroom in a certain village; officers meet including the technical staff that will do the estimates for the costs. But prior to the implementation of the project, the decision will go through the decision-making process in the council. At this stage, there will be talks about splitting the money to different villages instead of using all the money in one village only… Now, this whole process takes long and is political; it can create problems because we know that the classroom to be built needs all money budgeted and if you split the money, you can't build even one classroom but you'll only be able to repair existing projects. However, the system has got its advantages because the people's representatives are involved, so indirectly more people are part and parcel of the decision-making process."
Staff member, Chamwino District Council

But while the need to compromise and allocate resources across wider areas for political purposes may be fairer, it also hinders meaningful investment in practice. This can be particularly contentious because water is so central to local livelihoods and the flow of funds associated with user fee collection for most water sources.

BOX 2. THE CONSEQUENCES OF DECREASED COMMUNITY PARTICIPATION

The parallel case of the Tanzania Rural and Urban Roads Agency (TARURA) highlights the advantages and disadvantages of replacing district council departments with an independent technical institution that reports directly to a central ministry. Established in 2017, TARURA reports to the Ministry of Works, Transport and Communication, aiming to drive efficiency and reduce corruption. But our respondents highlight how its lack of community engagement has compromised projects and led to waste.

"TARURA works mainly in the rural areas where we have different levels of governance all the way down to the village, and then we have the district councillors; and all the representatives at these different levels have political affiliation. So you see, inevitably when people have to come up with their priorities about the road projects to implement, there will be clashes and divergent opinions. So, what we do is we just send our road engineers and surveyors because they understand what is urgent and what is not, so they will be the ones in charge of listing the priorities in a certain area."
TARURA staff member, Chamwino

"I remember once when I was working as community development officer in Kondoa district, [TARURA] came to build a bridge. All of a sudden, we saw the bridge being constructed and finalised while the local residents stood there watching the bridge being constructed… only to see it collapse after a very short time. So, we went there and asked the residents if they knew what had happened and why they didn't advise on how to construct the bridge and they told us they had not been involved in the process so they couldn't have a say on it.

With insufficient funds and technical capacities for O&OD, there has been limited success in enabling local governments to engage deeply with local livelihoods, vulnerabilities and priorities. In practice, the process is limited to consulting with appointed village officers and developing estimations for possible investments before attracting political actors who decide where and how to allocate the money. This results in local councillors and residents fighting for investment in their area, which RUWASA's expert-led approach aims to settle with technical expertise and top-down decision making to reduce friction.

When developing new water sources, RUWASA's main community-level consultation is with village executive officers — that is, appointed civil servants – rather than elected representatives; after which it submits bills of quantities for construction directly to the Ministry of Water. These are neither discussed nor endorsed at district council level (SEMA 2020). This approach of cutting out local contestation and negotiation may increase tangible action, but it removes a layer of scrutiny and accountability by locally elected councillors who live and work in the area. It also risks further removing water planning from local knowledge and an understanding of local priorities, which are both necessary for long-term sustainability.

Looking ahead to how RUWASA will operate, informants identified similar potential risks to those experienced by TARURA (Box 2). A limited grasp of local knowledge around land allocation, conflict over water and networks of influence could all undermine RUWASA's ability to deliver on its objectives, as some of our respondents pointed out.

"Now if RUWASA plan and operate without consulting the council and local leaders, I can expect one day sooner or later they will drill their boreholes on people's plots, and that will lead to huge conflicts that the council will not be able to settle."
Land department staff member, Chamwino District Council

"A citizen living in a specific area understands their environment more than a professional when it comes to implementing a certain project or building infrastructures because citizens know and understand their needs at local level and so they know if a project is really needed. This has important effects on how a project will be managed by the locals after it has been built or implemented."
Officer, Chamwino District Council

Community representation problems raise the question of how planning can deliver effective results while responding to local priorities. Although O&OD was beset with challenges that led to top-down decision making in practice, the new system could result in similar outcomes through a different process. It is not clear whether the new CBWSOs — or the old village water committees, which remain common — can bridge the gap.

3.2.3 Old local institutions: village water committees

CBWSOs are being established across the country but until they begin functioning, the old system remains widely used. Elected village water committees retain legal authority for financial management, collecting user fees and managing funds for the maintenance and upkeep of water access infrastructure. The committees are also responsible for byelaws and local informal rules that keep the environment around water sources free from destructive activities. Communities have tended to elect respected individuals who will maintain traditional values and represent local priorities, incorporating customary or local institutions into water source management.

The committees have been hampered by challenges that undermine their capacity. Participation is time consuming and has no financial reward, and traditional community elders can be pressured into the role without any real interest or capacity for the associated responsibilities. As a result, members frequently fail to attend or organise meetings, or stop attending altogether. Committees must also include female participants, but women are often already burdened with significant domestic responsibilities that make political engagement difficult to maintain. This is a problem across all three research areas.

"I have been a member of [the] village water committee for years but many times I almost quit because it was adding a lot in my already busy schedule. Many other women like me had to quit because of their husbands and other commitments. I am a livestock keeper, I value livestock, livestock need water and livestock keepers need a person like me who understands their water needs, but it's hard to continue."
Village water committee member, Zajilwa (Chamwino)

Water management is an often contentious topic due to its revenue-raising potential through daily user fees. Conflict between water committees and village councils over financial resources for water source maintenance and management is exacerbated by members' limited ability to commit, as highlighted above. In such cases, village councils sometimes take over the water committee's financial resources and management while committee members retain their formal positions with no real involvement. This erodes villagers' trust, undermines the election process and reduces accountability.

"Most people do not feel to have representation in the village for water affairs; they never call the committee members, unless there is a problem, in which case they would start to show some interest in how things are handled." Village officer, Chamwino

3.2.4 New local institutions: community-based water supply organisations

By including paid professionals, CBWSOs are expected to have better technical knowledge, while including local government representatives and other civil servants aims to make them more accountable. By streamlining communication between water users through experts, their policy objective is professional, entrepreneurial and efficient financial and technical water project management.

"Some villages and water projects are far away from urban centres and need professionals to be improved and managed as those in charge from the communities sometimes lack the necessary foundations and understanding of how water projects should be run."
RUWASA representative, Kondoa

However, CBWSOs report to RUWASA, not to village-level elected institutions. Upward accountability removes power and reduces agency from the water users, as they do not set targets or achievement indicators. Rather, these are the responsibility of central government staff, who have limited ability to feed back on water source management, design features, maintenance requirements and other ongoing issues. This approach also undermines subsidiarity, as decisions are made neither at the level where the impacts will be felt nor where most knowledge rests.

"Having public servants in the committees will lead to some improvement because they will be accountable to the government and if they misbehave the government can even cut their salaries. But what are you going to do with a community member?!"
Executive officer, Soera Ward, Kondoa

Although CBWSOs have to include a representative of both water users and women, they are outnumbered by professional appointees. This risks marginalising local — as opposed to technical — knowledge, undermining local adaptive capacity to understand how climate change and its impacts play out in practice within the local social and environmental context. With less access to local knowledge about the impacts on vulnerable groups — and hence how to set priorities in a context of climate variability — this could lead to maladaptive investments that ignore both local priorities and climate risks.

Table 3. Pros and cons of the new RUWASA/CBWSO system

PROS	CONS
Bypass lengthy and cumbersome procedures	Weakened community representation
Faster and more efficient project implementation	Lack of buy-in to customary knowledge
Greater potential for applying technical and professional expertise	Weakened representation of women and other vulnerable groups

"I admit that in the past, our water committees have failed. But just consider that, for instance, village executive officers are not originally from the local areas where they work and could be transferred anytime. This is a problem. My opinion is that having locals in the committees has got advantages because we know the area and reside in it. We can and will bring the important local knowledge that is needed to manage something so difficult like water projects"
Rangi traditional leader, Kondoa.

From a climate-resilient planning perspective, the new system privileges technical, scientific and managerial knowledge over local direct experience and accumulated first-hand knowledge. But rather than build ownership and solutions that integrate different perspectives, the new legislation risks driving them apart and alienating communities from the solutions they are being offered. As a result, projects run greater risks of failure, as priorities are more likely to be disregarded and projects ignored and neglected.

4

Informal and customary systems for governance and management

This section outlines informal water planning and management approaches and local customary institutions in the two study areas and the case for working with — rather than against — them. We explore how these approaches can inform risk-aware, locally rooted investments.

Informal or customary protocols, rules and traditions dominate many people's daily experience of using key resources. Local and customary management takes many forms, from informal local rules based on established practices to more defined customary institutions rooted in complex social organisation systems. Local practices and priorities are built on in-depth knowledge of the local environment, institutions and social relations between different groups, which in turn enable (customary) natural resource and environmental management (Bicker et al. 2004). Local practices, while highly context-specific, play a significant role in shaping water use in practice. Customary water resource management regulates water use and access through rules and established practices, supporting local, context-specific priorities.

Customary management is geared toward sustainable access to water and water-related services to ensure basic access rights for all by leveraging cultural obligations and values of mutual support. With the right support, it can help communities deal with situations of water stress caused by climate change and other challenges. But customary management varies between districts and villages, so support must be structured and adaptable to each context.

4.1 Informal rules, protocols and practices

Literature review, interviews and observation identified several established local rules, protocols and practices for using, supervising and managing water resources across our study districts. Contextual drivers for these rules include available natural resources, livelihood types, sociocultural and ethnic composition, water resources (including infrastructure) and management systems. A patchwork of heterogenous customary water management systems running across the country is geared towards securing sustainable access to water for most people, while also reproducing traditional, gendered and age-related roles. Informal rules and protocols apply to water-specific activities, such as:

- Where people can wash clothes or dishes
- The amount of water allocated to each person per visit, particularly during times of scarcity
- The ability to carry out livelihood-related activities such as farming or watering livestock near a water source
- Access to water at different times of year
- Prioritising access for certain people or groups of people
- Prioritising domestic, farming, livestock, construction and other water uses.

The nature of local rules and how strongly they are enforced varies by season, water source type, and environmental and historical contexts, and between villages. Often, these flexible, locally managed and negotiated water use protocols and institutions are tied to broader informal or customary natural resource management practices that aim to support dominant livelihoods and preserve cultures. However, pressures from poor local governance, scarcity, climate risk, urbanisation, population growth and other factors can overwhelm these systems. Two case studies highlight this variety: the first, identified during transect walks in Gwandi Village, Chamwino District; the second, drawn from literature associated with the Devolved Climate Finance Programme and reinforced by previous scholarship.

Case study 1: Gwandi Village, Chamwino District

Gwandi Village is home to farming and pastoralist communities. Many farmers keep livestock when farming conditions are poor (Chamwino District Council, nd), and the area hosts pastoralists who graze their animals here at specific times of the year as part of their own resilience strategies. The village dam is divided into two areas: a larger one for human needs and a smaller one where animals drink directly from the water. During the rainy season, the dam is a single swamp filled with rainwater, with the separate areas emerging more distinctly at the onset of the dry season, as it starts to dry up. At the peak of the dry season, the area reserved for livestock is dry and the water is prioritised for human consumption only.

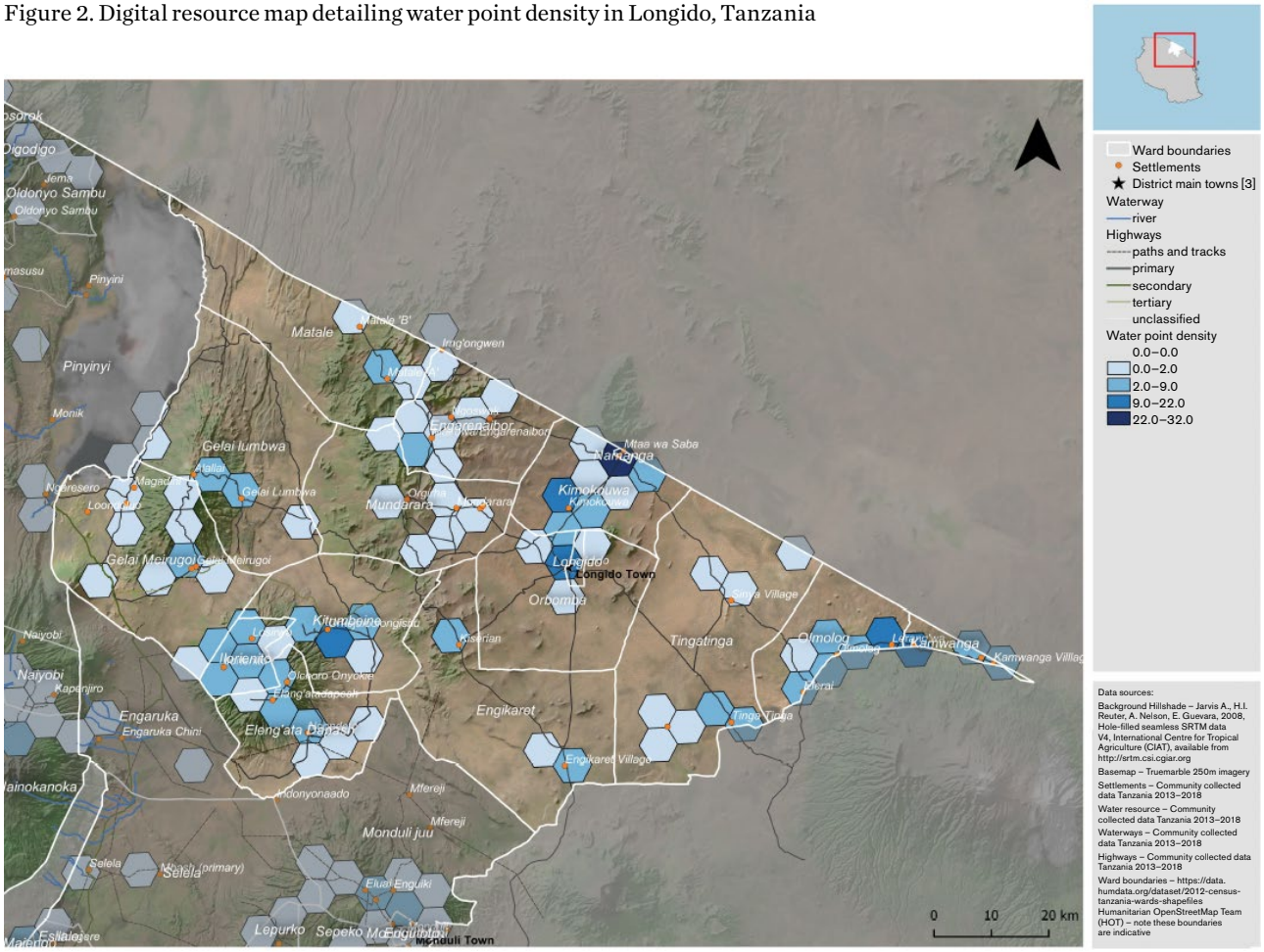
But this equilibrium is fragile, particularly when intra-community differences create a range of potentially competing water priorities. During times of water stress, local byelaws and informal institutions that prioritise human consumption may not be strong enough to overrule local need. For example, respondents reported that livestock keepers have shattered underground tubing to enable their livestock to drink. Recognising different groups' water priorities in times of stress is an important part of climate-resilient development and conflict reduction. A combination of village byelaws and an informal security system called *sungusungu* (Box 3) embedded into unwritten rules helps maintain the socioenvironmental equilibrium in Gwandi.

BOX 3. THE SUNGUSUNGU SYSTEM

Originating in Tanzania's Sukuma and Nyamwezi areas (Mwanza, Shinyanga and Tabora Regions), *sungusungu* aims to protect cattle and other properties from theft in the absence of formal state institutions such as a national police force. In Gwandi, *sungusungu* enforces rules and regulations for water source maintenance and safety, and for enforcing access rights and priorities.

Sungusungu requires individuals from another village — including pastoralists entering the village for livestock grazing and nearby water resources — to introduce themselves to the local village authorities, explaining the purpose of their visit and their expected length of stay. If resources are unavailable or in short supply, they may be refused, thus buffering climate variability and hazards for local people by ensuring priority access to local pastoralist residents. Secondary access rights for pastoralists from outside Gwandi are mostly seasonal, granted if and when conditions allow.

Figure 2. Digital resource map detailing water point density in Longido, Tanzania



Source: IIED (2018) Scaling up Devolved District Climate in Tanzania: Community-based mapping of pastoralist resources and their attributes. Internal report. Unpublished.

Case study 2: Longido District, Arusha Region

Longido District is an arid and semi-arid area dominated by semi-nomadic livestock keeping. Pastoral societies have developed in variable and unpredictable environmental conditions, shaped by variable rainfall, across time and space. Taking advantage of this variability, Maasai pastoralists use a multitude of strategies that maximise productivity during wetter periods and minimise loss during drier seasons (Krätli 2015). The district's most important strategy is planned and targeted mobility towards open access grazing areas made available through intercommunal negotiation and reciprocal access rights. Water availability is central to seasonal livestock routes, which alternate between dry and wet season grazing areas determined by customary leaders. When able to function, this system can be highly resilient to variable climate risks, using constant adaptation, adjustment and negotiation to manage change as a community.

Customary institutions are central to this process. Traditional leaders meet regularly to assign some grazing areas as reserves and declare the availability of wet and dry season grazing zones at particular times (Msangi et al. 2014). They also identify strategic locations for new water sources and prevent construction in areas where permanent water sources may lead to overgrazing and undermine the customary management system. These decisions are enforced by the *morani* (warriors), men in their 20s whose role has grown from merely providing local security to overseeing livestock movements and providing physical labour for water source construction and maintenance.

Given the centrality of livestock to local economies, livelihoods and food security, it is often prioritised over human consumption at water sources. In the context of increased water scarcity, this has a negative effect on women, who are responsible for provisioning households with domestic water. With livestock prioritised for access, particularly during the dry season, women must wait long periods to access water,

reducing their income generation and food production opportunities as well as their resilience to climate risk in general (Greene et al. 2020).

4.2 Customary institutions: incorporating flexibility, local and indigenous knowledge

Customary management objectives can be geared towards absorbing shocks, ensuring equitable distribution or maximising productivity through unpredictable wet and dry season cycles. Strategies include promoting or limiting certain types of usage or modifying water use to prioritise access for some people or livestock. Embedded in local environmental, social, cultural and economic conditions, traditional institutions do not simply maintain stability. Rather, they reflect people's and communities' ability to develop new skills and capabilities, adapting old institutions to new challenges and making adaptive capacity part of more dynamic resilient systems that incorporate adjustments (Adger 2000; Wong-Parodi et al. 2015). Their diversity reflects the realities of local livelihoods, and their dominance demonstrates their importance in everyday life.

Informal rules (Table 4) can also foster greater cooperation, communal care and a spirit of mutual assistance. In Kiboriani village, Mpwapwa, individuals adjust their behaviour at water sources and springs during the dry season to ensure access for a majority of people — for example, by reordering their priorities to use less water for showering or washing and reducing water use in proximity of the spring.

"Water is no one's private good, water is for everybody, so we must strive to let everyone get their share in times of scarcity". Village council leader, Kiboriani, Mpwapwa

Table 4. Customary water management in our three study areas

	TYPE OF WATER USE				
TYPE OF COMMUNITY ACCESS SITE	WATER ABSTRACTION	DOMESTIC (WASHING)	LIVESTOCK DRINKING	IRRIGATION AND GARDENING	CONSTRUCTION
Tap stands (gravity schemes)	✓	At home after fetching	Not allowed	Large-scale irrigation not supported	
Boreholes (improved and unimproved)	✓	At home after fetching	At functioning cattle troughs only	Large-scale irrigation not supported	
Large dams	✓	Allowed at a distance (determined by byelaws)	Wet season only (fetching water for goats at home allowed year-round)	Not in proximity of water source	Allowed at a distance (determined by byelaws)
Traditional/ hand-dug wells	✓	No restrictions	Not allowed		
Springs	✓	At a short distance, dry season only	Not allowed	Not allowed	
Small streams	✓	Tolerated in proximity or directly in the stream	Tolerated, especially in wet season	Tolerated in proximity	

But stability and equilibrium in these socioecological systems are fragile. A range of increasing pressures, exacerbated by climate risks, are increasing vulnerabilities that risk driving people to undermine these systems with detrimental consequences. Water is central to resilience in rural contexts and integrated into livelihoods in multiple ways. As such, the way investments are planned, shaped and developed must vary according to context, drawing on local knowledge and building on existing adaptive customary and informal systems. Longido District's water investment and governance requirements, for example, differ from those of Chamwino and Mpwapwa.

The new centralised planning and CBWSO management systems have less capacity for taking on board inputs from community members. Drawing on technical and professional services rather than elected local members or elders reduces their capacity to respond to water source management shocks as identified by the people who experience them directly, every day. Central appointees, who may be distanced from rural life, are unlikely to have in-depth understanding of rural customary systems and communities' appreciation of these systems. Yet recognising this appreciation is central to local ownership and sustainability.

The risk is the deepening of parallel systems, whereby communities follow customary rules that are not recognised by CBWSOs; and CBWSOs attempt to impose management strategies that water users neither respect nor own. This will increase coordination challenges, which in turn will undermine access during climate hazards and therefore the resilience of vulnerable people.

5

The emerging private sector

The emergence of new private sector water abstraction and supply actors and their interaction with community stakeholders presents risks and opportunities, depending on local conditions. This has implications for water supply and with it, local resilience. This section explores this phenomenon and highlights implications for water sector planning.

Local water planning and governance are constantly evolving as new actors and the impact of climate risks intersect to affect water availability and supply. In the absence of widespread state provision and in the context of increasing water variability and stress, local private sector actors are emerging to abstract and supply water in poorly serviced areas, leading to the commoditisation of water.

The rise of a thriving and diverse private sector has implications for the overall clean and safe water access rights system and the climate resilience of both people and their environments. The growing role of small-scale private providers is at least partly driven by government management shortcomings and a lack of investment in reliable water access infrastructures.

5.1 Commoditisation, inequality and conflict

In Mpwapwa Urban Ward, rapid population growth has led to the development of tap stands to improve water provision for the town's growing population, while rural locations around the town rely on springs with little improved infrastructure. However, the urban tap stands are not well maintained and run dry in the dry season. The rural springs, on the other hand, provide water all year round. In response to water scarcity in the town, three types of private actor have emerged:

- Private individuals developing their own water infrastructures — from hand-dug wells to modern boreholes — for their own consumption but also selling water to others.
- Private individuals or groups of individuals that enter into partnership with village councils to manage public water projects following a tendering process. Tenders are open to local and non-local groups, who also take on security, fee collection, infrastructure maintenance and daily supervision. The fees collected cover service provision, while maintenance funds are held in accounts supervised by village institutions.
- Cart owners who supply water to urban residents after fetching it from the outskirts of town. This type of provider is common in Mpwapwa, where urban water taps are malfunctioning.

As a local councillor points out, this growing commoditisation of water has created unequal access

and a gap between the services available to wealthier and poorer citizens:

"Water scarcity has created two social classes here in Mpwapwa, those who can afford to buy water and those who can't. The first can shower whenever they want, the second has to wait for the rains." Local councillor

Wealthier citizens can pay for soft water from improved boreholes, either in the town or carted in from the outskirts, that is suitable for cooking or washing clothes. In most villages, fees stand at TSH 100 (£0.03) per gallon, TSH 100 for a cow to drink, and TSH 50 for sheep, and remain stable throughout the year. In Gwandi, private operators are known to raise prices to TSH 500 (£0.15) during the dry season, capitalising on scarcity. Data to show this as a percentage of household income was not available, but residents reported that wealthier residents are typically able to pay higher fees when charges rise, securing year-round access with minimal effort and cost to their day. For poorer households, these charges accumulate into significant sums during the course of the year.

Poorer citizens typically rely more on rain-fed sources, which they often have to fetch from several kilometres outside of town. These undeveloped sources provide hard water, which is less suitable for cooking and washing. The extra time spent accessing water and the lower quality of the water reduces the amount of time these households have to generate income or focus on childcare.

This intersects with the gender-based inequalities embedded within customary water management system in rural areas. Men, women, boys and girls all play different roles in providing, using and managing domestic water at household and community levels. In our study villages, fetching water is mostly done by women and young girls (Table 5). In Mpwapwa, these gendered responsibilities translate into widespread inequalities and differences in vulnerability to risks between men and women, as well as women from wealthier and poorer households.

Water scarcity, coupled with rapid population growth, has created tension, with long queues forming at tap stands and individuals with few ties to each other competing for access. For example, women collecting water for domestic use compete with cart owners fetching sizable loads for trade, creating potential for gender-based and other forms of violence. Without greater matching service provision, this is likely to worsen as scarcity increases.

"Not more than a few months after I was transferred here, I went to fetch water for my house needs. People did not know me yet too well, so I was queuing for my turn to fetch water and when the time came for me to fill my buckets, this guy, a cart owner came behind me and pushed me over saying that it was his turn and he was 'doing business' so he couldn't wait for women to fetch their water just for their houses!" Key informant, Mpwapwa

Table 5. Gendered and cultural aspects of fetching water in selected study villages

	KIBORIANI (MPWAPWA)	ZAJILWA (CHAMWINO)	MAGUNGU (CHAMWINO)
Water source	Traditional springs	Boreholes	Boreholes
Geography	Mountainous topography	Drylands	Drylands
Dominant ethnicity	Kaguru	Gogo, Rangi and Burunge	Maasai
Fetching responsibilities	Women, often accompanied by girls aged 5–13 Boys (sent by their mothers)	Women Young men	Women Young men (herding livestock)
Equipment and arrangements	Women carry 20-litre buckets three times a day 5 to 13-year-old girls carry 5 to 10-litre buckets Boys fetch water in groups during recreational play while girls fetch individually to return home quickly	Bicycles, motorcycles, handcarts	Donkeys shared among women as a sign of reciprocity, with water 'gifts' offered to donkey's owner in return

5.2 Public-private partnerships and private provider accountability

The Water Supply and Sanitation Act (2019) advises promoting public-private partnerships (PPPs) when it is "conducive" for communities and private actors to become joint partners in developing improved water and sanitation services (UTR 2019). PPPs are one of the Act's main objectives, envisioning a tendering process whereby service providers — individuals, groups or companies — take on the management of village infrastructure.

This approach has two challenges. First, village water committees — still dominant in many villages — lack the organisational and operational capacity to properly scrutinise the performance of these companies. Committees with few active members are unlikely to monitor maintenance to a high standard, and the accountability failures described above apply here in particular. Workshop participants identified a further challenge in collecting revenue, either because boreholes do not have a meter to measure water drawn or due to limited revenue collection capacity.

Second, the Water Supply and Sanitation Act (2019) does not account for situations where private citizens drill boreholes and sell water to the public, despite the important role these water sources have for communities. Across our study villages, it was clear that people favour private boreholes — especially those improved with petrol engine water pumps — over state-run projects. Some villages, such as those in Soera Ward, Kondoa, are almost entirely dependent on private boreholes. Yet they remain effectively unregulated: there is little to suggest that any of these individual boreholes are drilled with a clear understanding of existing hydrological context or future climate risks.

"Our situation here in Gwandi is dismal. To get water, we have to walk for kilometres, we have to withstand rules [at the private borehole] that are not from the government, and all this to get water that is not even clean and safe." Village elder, Gwandi

This lack of regulation leaves households vulnerable to price rises and changes of supply by effectively unaccountable, private suppliers. In the context of drought, this can be extremely dangerous for poorer households without funds to pay for water access. Local government institutions have little meaningful mandate to influence privately owned water projects. Private actors do not hold a licence apart from the title deeds proving ownership of the land on which projects are built. Not only does this lead to pricing issues for communities; changing climate conditions could also leave them with water infrastructure that is not fit for future unpredictable and variable climate conditions.

"The private owner(s) can do whatever they want, even raising the price for a gallon to TSH 500. They could even deny water to somebody they have a squabble with going on. Can you believe it? You walk with your donkey or drive your bike for 10km and when you're there he denies you water." Village elder, Gwandi

At the same time, many believe that private actors investing their own money and resources should not be accountable to the public. Most of these investors are wealthy individuals and important local actors with influence over the community, which increases the problem of accountability.

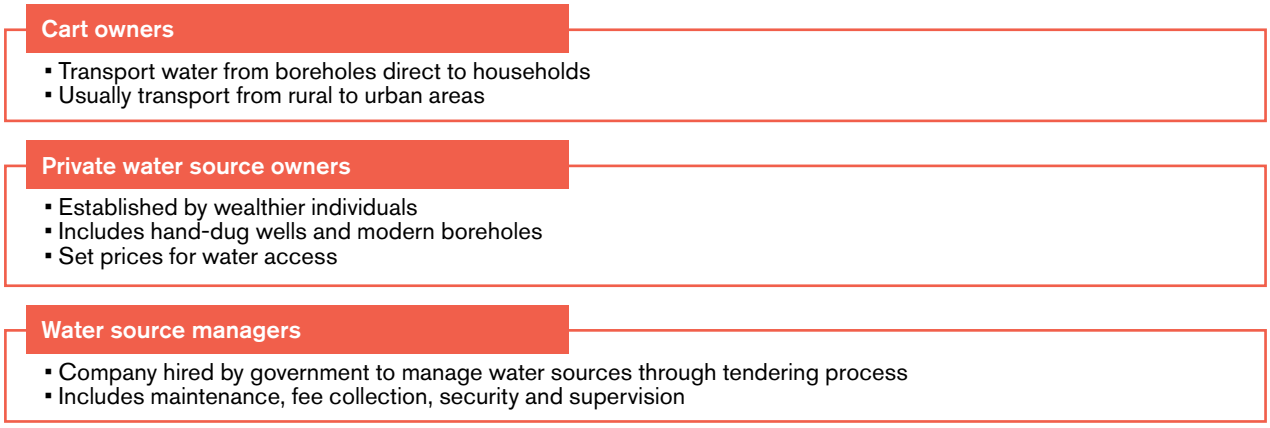
5.3 Private water stakeholders: flexible local institutions?

While significant, these risks are not insurmountable. Private water stakeholders blur the line between the public and private realms, as they effectively privatise an essential public service. It is possible to view them as an example of the capacity and flexibility at local level to respond to water stress. Several types of stakeholder were identified during discussions with local residents (see Fig. 3).

Water source managers are groups of individuals who win contracts to oversee water sources on behalf of local governments. Depending on the contract, they can be responsible for revenue collection, security, and various aspects of maintenance. This arrangement is described as a public-private partnership (PPP), and regulations are specified in the Water Supply and Sanitation Act (2019). However, local village water institutions, in whatever form they exist, typically do not have capacity to properly scrutinise their performance. Revenue collection by these groups also raises challenges — objective measures of water abstraction such as water meters are rare and some water source managers have not returned revenue to village authorities in several years.

Cart owners, typically young men capable of physical labour, have seized income-generating opportunities, bringing water from the outskirts of town to urban households in areas where (public) water taps are malfunctioning. In this context, many private actors and cart owners are meeting local priorities and are directly connected to local social networks and conditions. Cart owners, who can make a significant, albeit seasonal, profit by ferrying water around the town directly to households with minimal financial investment, offer opportunities for flexibility. "Pay later" schemes are

Figure 3. Private water stakeholders in observed villages



common, and some cart owners deliver for free at certain periods.

Although they cannot ensure universal basic rights of access, private infrastructure owners offer opportunities for flexibility to regular customers that can support adaptability to risks (Box 4). For example, they can offer regular customers water at low or no cost, take on low or no-interest loans for water access, to be paid back when the customer has funds available. However, there is some resentment to these private operators, particularly in villages such as Gwandi, where rates for water rise 500% during the dry season. Poor households are effectively priced out.

"My prediction is that this business will grow even more in the next few years. The more [the] population grows and Mpwapwa becomes a real town, the higher water needs will be. If you add the chronic lack of formal employment, you'll see that more people will shift to water trade to support their families and livelihoods."
Male focus group participant, Mpwapwa Urban Ward

BOX 4. NEW PRIVATE ACTORS IN THE WATER SECTOR

The borehole owner: Having gained experience as a labourer on other borehole projects, Mathew developed his own borehole in 2003 and now runs a successful business. He maintains the borehole as a hygienic and respectable place that is clean, organised and conflict-free. These activities require significant effort, and customers offering labour get access at reduced cost.

"I know that water is such an important thing for people. I do this for my own development, but I also have to help others who are in difficult financial situations. My rule is that one can fetch water up to reaching the amount of TSH 1,000 which is ten buckets if they pull the rope on their own, or five buckets if I do it for them. After that they will have to repay at least part of the debt before they can continue using my borehole. That's how we help each other."

Cart owner: John began ferrying water with a cart some years ago, switching from wholesale salt trading. Like Mathew, cleanliness, respectability, hygiene and the offer of flexibility are important for him.

"I saw that the possible losses in the business of water would be low. You could fill a bucket for TSH 50 and resell it for up to TSH 500 in Mpwapwa while the only investment was TSH 250,000 to buy the cart and 35 buckets at TSH 3,000 each. That is not much when compared to other businesses. Plus, a whole year can go before incurring in expenses for maintenance such as replacing the tyres of your cart."

Like Mathew, John sees hygiene and flexibility as key to keeping good relationships with long-term customers and establishing new ones:

"First of all, you have to take care of the hygiene, both personal and of the gallons. If people see that both you and the buckets are clean, they'll know that even the water is clean, and they will know that you are a 'mstaarabu' [a quiet and respectable person]. So they will call you again next time till they become your long-term customers.

"You also need to be ready to give out loans. Sometimes I can deliver water to a customer for up to TSH 100,000; you never know if you'll get your money back but it's a risk you need to take if you want to build a large clientele."

*Names have been changed to maintain anonymity.

5.4 Private water sources and climate resilience

Mpwapwa's growing, privately driven water sector raises significant challenges for efforts towards equitable climate-resilient development. Climate risk does not feature in the development of locally run private water sources. There is a risk that it will become an unregulated free market whereby those who have the funds to drill boreholes can turn a profit, and those who can afford it have access to better quality water. It is unclear whether private actors are required or encouraged to consider the environmental and social impacts of their investments, such as implications for local water supply from aquifers or the future climatic conditions in which they will be operating.

While private providers can and do offer credit for individuals or households struggling to pay for water at a particular time — for example, during a drought or other crisis — this is at least partly based on goodwill and personal preference. There is no guarantee for more vulnerable households that expanding privately owned water sources will increase water access and therefore resilience.

Research also points firmly to the need to recognise that, as an integral part of the management of overall ecosystems, water management must be integrated into the management of other local resources. Land management, agricultural strategies and energy provision require multistakeholder, cross-sectoral engagement to build resilience and support local development. Without better oversight, the consequences for future availability of water inside and outside of urban areas could be dire.

6 Conclusions

This paper has reviewed the changing rural water planning and governance sector through the lens of four principles for climate resilience. This closing section summarises these challenges and makes tentative recommendations for incorporating them in future.

The research shows that there is a great variety of actors entering Tanzania's water sector, including small-scale operators taking advantage of high demand and insufficient or unclear regulation. At the same time, new government institutions are changing the way planning takes place, using a top-down approach to address the perceived inefficiencies of previous reforms. The private sector has grown to fill a clear gap in government service provision – water sources are constructed where publicly owned sources are damaged or insufficient. But the flexibility of owners to offer loans only extends to those who can pay them, pricing out those with lower incomes and likely to be more vulnerable to climate risks. The lack of regulation also means there is little meaningful protection for vulnerable people from arbitrary price hikes.

For many rural people, the customary systems that continue to dominate day-to-day water management remain highly influential, and will be the main lens through which they understand climate risk and water use in the future. Climate-resilient planning for — and governance of — potable water access must build on emerging evidence to increase accountability and transparency, take a whole-of-society approach, value local and traditional knowledge and make risk-informed decisions. Here we summarise the challenges and opportunities in these areas.

Accountability and transparency

Tanzania's new legislation is built on a top-down accountability model in which CBWSOs report upwards to districts on their progress. Limited engagement of community members on these committees reduces ordinary people's power to hold them accountable for financial management and decision making. Removing responsibility for water from district councils has also made it more difficult for communities to report problems through their democratically elected ward or district council representatives. However, it is not clear yet whether the recent changes are increasing access to water, or improving the ongoing maintenance and upkeep challenges.

Given the centrality of water access to livelihoods, bottom-up accountability could develop the ownership local actors need to ensure water investment works in the long term. Communities repeatedly show great interest in water sector development but note the growing distance between their ability to influence and take ownership of change. As a result, independent actors are becoming de facto water service providers without the recognition that could enable them to abstract water responsibly. By reducing opportunities to incorporate local knowledge or priorities, this also means there are fewer avenues for communities to ensure they are part of the planning process.

Whole-of-society approach

Coordinating RUWASA, basin water boards, district councils, legacy water management committees and the customary systems that are still active at local level is a significant challenge. Yet each of these groups has perspectives and resources that could be pooled for deeper integration and coordinated planning. Removing responsibility for water departments from district councils has had negative implications for other departments with smaller budgets, so collaboration must be made possible across the different institutions.

Formalising consultation procedures for RUWASA to engage with key actors — councils, water basin boards, other central ministries and community representatives — could begin the process of integrating this knowledge. Going beyond merely consulting with village executive officers, and using participatory tools to explore local-level water use and resources would help to bridge the gap between local or customary knowledge and RUWASA staff's technical understanding. A range of participatory learning and action tools exist to articulate local knowledge of water resources and their use which could effectively inform water sector planning. Finally, adapting CBWSOs to include greater community voice in resource management and governance is particularly important to ensure a gender-transformative approach that addresses the root causes of men and women's different vulnerabilities.

Establishing modalities for financial and technical cooperation between water basin boards, district councils and RUWASA would help resolve some of the issues caused by centralising rural water service delivery. District councils have been largely removed from the planning cycle, despite being responsible for socioeconomic development within their borders. Establishing meaningful cooperation and avenues for pooling funds for collective, landscape-level investment that supports livelihood systems could help resolve this.

It is also important to recognise the growth of smaller private sector actors and involve them in integrated and concerted planning to ensure equitable access to water resources, particularly during periods of climate-related water stress. The PPP framework and guidelines for creating CBWSOs could be extended to include these key actors, providing a legal framework or directives to set limits and liabilities for private providers to ensure basic access to water at village level. Private providers could be invited to express their priorities in the existing platforms where priorities are set at local level.

Participation, valuing local priorities and customary knowledge

Despite their central importance to local people, customary knowledge and institutions remain marginal, as CBWSOs have few spaces for water users from traditional leadership who could represent community priorities and experiences. Working with these different systems will ensure deeper ownership of local water investment and, because they integrate water with local livelihoods and other central priorities, they can be an asset to sustainable long-term development. This will require flexibility across locations and livelihood systems, recognising where customary rules differ to reflect local needs and priorities. A bottom-up approach is the clearest way to ensure that CBWSOs shape local planning and governance of water planning and access.

Tools are available to support the kind of knowledge gathering that can articulate how water is integrated into local livelihood strategies and customs. For example, participatory digital resource mapping of the type used in Longido enables communities to articulate their knowledge of local water resources in a way that is integrated with their livelihood strategies (Greene and Hesse 2017). By allowing community capacity to take a holistic, rather than a sectoral approach, this can ensure that water sector development integrates other priorities such as hygiene, healthcare and education.

Risk-informed decision making

The extent of risk-informed decision making in Tanzania's new planning and governance system is unclear. Indeed, the integration of risk is notable for its absence. While RUWASA is taking a technical approach to identify new water sources, there is no evidence to suggest that assessing climate risk is part of this process. For example, there are no formal interactions in the planning process at any level with the Tanzania Meteorological Authority (TMA), which is responsible for identifying and disseminating climate information to government and communities. As a result, TMA information sharing is sporadic. Similarly, district councils have not adapted O&OD to integrate climate risk and future considerations into the planning process.

Creating deeper interaction with communities' lived experiences of climate trends may be one low-cost way of beginning to consider risks that inform key decisions such as water source placement and design. Extrapolating from lived experience of climate change may help inform future viability of water projects. Another

option, albeit one that requires more resources, is to increase the understanding of climate risk within RUWASA by institutionalising interactions between agents. Combining scientific and local knowledge can be a powerful way of understanding how climate change is likely to affect water sources and water access more generally in the future.

Collectively, efforts to put these principles in place would help bridge the knowledge gaps in the sector and ground future development in local priorities and local needs. With communities responding to climate risks every day, deepening relationships between local actors and government could enable some recognition of how water access deepens or reduces those risks. Further research might also explore how other principles of climate resilience — such as the need for institutional capacity building, or the consequences of gender exclusion in planning — might be put into place. This could inform the development of new tools and regulatory changes, enabling RUWASA to invest in rural water systems that reflect current needs and prepare for future risks.

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Appendices

Appendix 1. Transect walk and interview locations

DISTRICT	TRANSECT WALKS	FOCUS GROUP	DISCUSSION OBJECTIVE	ONE-TO-ONE INTERVIEWS
Mpwapwa	Ilolo Village Kikombo Village	Local women	Explore gender-based dynamics of water access and use	Local cart owner Local borehole owner
		District council officials	Explore institutional planning and management challenges within the local formal planning system (at village and ward level)	
Chamwino	Magungu Village Zajilwa Village	Community members, Gwandi Village	Understand interactions between agricultural and pastoralists groups in relation to water access and use	Magungu Village representative Village council livestock officer Borehole owner Village water committee representatives including one male, one female
		District council officials	Discuss progress and implication with establishment of RUWASA	
Kondoa		District council officials	Assess progress with establishing a CBWSO in the council	Improved O&OD ward facilitator Two ward councillors
		Rangi/Wasi traditional leaders	Define the outlook of Rangi/Wasi customary leadership for water management and planning	

Appendix 2. Nongovernment activities in Chamwino, Kondoa and Mpwapwa

DISTRICT	ORGANISATION NAME	INITIATIVE/FOCUS AREA
Chamwino	Good Neighbors	Sustainable development, tree planting and sustainable livestock keeping
	Institute of Rural Development Planning	Eco-village, value addition to leather products
	Sokoine University of Agriculture	Transect project: climate-smart agriculture interventions
	United Nations World Food Programme	Zero Hunger Community Project: solar pumps, boreholes and food warehouses
Kondoa	African Wildlife Foundation	Forest conservation
	Christian Council of Tanzania	Women's empowerment project: livelihoods and life skills
	Japan International Cooperation Agency	Greenhouse project
	INADES-Formation	Fruit tree planting, support for donkeys in degraded areas
	LEAD Foundation	Restoring natural resources: tree planting (sustainable farming, awareness raising
	Local Investment Climate	Cattle abattoir and markets
	NGO Network for Dodoma	Environment conservation: tree planting and beekeeping
	Subira Women's Environment Conservation Organisation	Tree planting, wood stoves, beekeeping and awareness raising
	United Nations World Food Programme	Supporting drought-resistant crops
Mpwapwa	Action Against Hunger	Nutrition for infants and mothers
	Farm Africa	Drought-resistant crops: sorghum
	Forestry and Value Chains Development Programme	Forests conservation for sustainable development, land use planning
	INADES-Formation	Conservation agriculture, fuel-efficient cookstoves, village community banking
	LEAD Foundation	Restoring natural resources: tree planting (Kisiki Hai), sustainable farming, awareness raising
	Local Investment Climate	Cattle abattoir and markets
	Norwegian Church Foundation	Boreholes
	Save the Children	Nutrition
	Tanzania Horticulture Association	Agriculture (fruits and vegetables)

Related reading

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Water access is the cornerstone of livelihoods for most rural communities in Tanzania. Yet limited capacity for effective planning, management and governance of water sources is deepening vulnerability to the increasing and often unpredictable impacts of climate change. This paper assesses Tanzania's recently centralised approach to rural water planning through a climate-resilient development lens, drawing on consultations in Dodoma Region. We find that integration of climate resilience principles including integration of local knowledge and cross-sectoral collaboration could be improved. We also find growth of a scarcely regulated private sector for water access with mixed outcomes for resilience of communities.

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