



Water Risks and Institutional Change in Kenya

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ABSTRACT

Global progress towards the goal of universal, safely managed drinking water services will be shaped by the dynamic relationship between the risks faced by water users and decision-makers, their perceptions of these risks, and the institutions that exist to manage them. This thesis argues such progress may be facilitated through pluralist arrangements that reallocate risks and responsibilities between the state, market, and community. The question of how water institutions transform to manage water risks more effectively and deliver sustainable water services to the rural poor is examined in the context of Kenya's water sector.

Two processes of institutional transformation are at the centre of this investigation: devolution leading to the establishment of 47 county governments and the concurrent professionalisation of rural water services. The uptake of new institutional arrangements and the subsequent paths of institutional change depend on risk perceptions and management responses. This research is grounded in conceptual and theoretical frameworks pertaining to the overarching themes of risks influencing public, collective and individual choices; institutional pluralism providing a dynamic approach that allows risks to be pooled; and institutional persistence through processes of homogenisation and regime change. These frameworks are empirically tested through a survey with all 47 county water ministries in the first devolved county governments, a 3,500-household panel survey in coastal Kenya from 2013-2016, and case studies of three professional service providers for the maintenance of rural water infrastructure.

Advancing a sociopolitical risk model drawing on public choice theory, the thesis shows that high socioclimatic risks, budgetary allocations, and narrow election margins are likely to boost devolved decision-makers' perceptions of responsibility for improved water service delivery. Considering criteria of quantity, quality, accessibility, and non-discrimination, results also reveal that county water ministries recognise their responsibility to serve the poor and those outside current provision areas. Such areas are further scrutinised by applying cultural theory of risk to rural waterpoint management and assessing the operationalisation of pluralist arrangements in the form of a professional maintenance service model through networking different management cultures at scale. The findings reveal that the main factors influencing rural water users to contract the professional provider are organisational and water use factors, affordability concerns over previous arrangements, and operational factors including distance, as well as water quality. These factors vary across user-group and individual-household levels and across management cultures. The thesis presents a framework combining institutional isomorphism and cultural theory to gain insights into the theoretical tension between homogenisation and pluralism and how it is reflected in the practical tension between the professionalisation of services and local diversity.

While county government uptake of the water service mandate remains variable, this thesis shows how new professional models can fill certain service gaps in rural areas. However, their sustainability depends on community and state uptake and hence the alignment of their core principles of efficiency, equity, and enforcement. Devolution thus represents a natural institutional experiment for examining the interplay of individual, collective and public choices in navigating different institutional preferences of managing risk and paving progress towards affordable and equitable drinking water services.

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List of Acronyms

CDL	Catholic Diocese of Lodwar
CEC	County Executive Committee
CEO	Chief Executive Officer
CGIAR-CSI	Consultative Group on International Agricultural Research – Consortium for Spatial Information
CHV	Community health volunteer
CWSB	Coast Water Services Board
DFID	Department for International Development (UK)
DHS	Demographic Health Survey
DV	Dependent variable
EC	Electrical conductivity
FGD	Focus group discussion
FY	Financial year
GPS	Global Positioning System
HH	Household
IAD	Institutional Analysis and Development
ICWE	International Conference on the Environment
IEBC	Independent Electoral and Boundaries Commission
IPCC	Intergovernmental Panel on Climate Change
KES	Kenyan Shilling
KHSL	Kwale Handpump Services Limited
KIHBS	Kenya Integrated Household Budget Survey
KISCOL	Kwale International Sugar Company Limited
KNBS	Kenya National Bureau of Statistics
KWAWASCO	Kwale Water and Sewerage Company
LAPSSET	Lamu Port and South Sudan Ethiopia Transport Corridor
MCA	Member of County Assembly
MDG	Millennium Development Goal
MSP	Maintenance service provider
MWI	Ministry of Water and Irrigation
NCST	National Council for Science and Technology
NEMA	National Environment Management Authority
NGO	Non-governmental Organisation
OECD	Organisation for Economic Co-operation and Development
OR	Odds ratio

PCA	Principal Component Analysis
PPP	Public private partnership
RCD	Regional Consortium for Development
RWSN	Rural Water Supply Network
SD	Standard deviation
SDG	Sustainable Development Goal
SID	Society for International Development
SQRT	Square root
SSEE	Smith School of Enterprise and the Environment
TDS	Total dissolved solids
UN	United Nations
UNGA	United Nations General Assembly
UNICEF	United Nations Children's Fund
UNOHCHR	United Nations Office of the High Commissioner for Human Rights
UNTS	United Nations Treaty Series
UPGro	Unlocking the potential of groundwater for the poor
USD	United States Dollar
WASH	Water, Sanitation and Hygiene
WASREB	Water Services Regulatory Board
WDT	Water Data Transmitter
WHO	World Health Organisation
WPM	Waterpoint mapping
WRA	Water Resources Authority
WRMA	Water Resources Management Authority (previous name of WRA)
WRUA	Water Resources User Association
WSTF	Water Sector Trust Fund
WUC	Water User Committee

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For Ursula and Christoph

“How all things live and work, and ever blending,
Weave one vast whole from Being’s ample range!”

„Wie alles sich zum Ganzen webt,

Eins in dem anderen wirkt und lebt!“

Johann Wolfgang von Goethe, Faust (1808)

1 Introduction

1.1 Framing the research

It was an opportune moment to examine institutional change in Kenya's water sector. The 2010 Constitution set the country on a new trajectory (Government of Kenya, 2010), leading to 47 county governments being established in 2013. Together with the national government, county governments were newly responsible for the objectives of social and economic development, participation, and the provision of "proximate, easily accessible services throughout Kenya" (Article 174, Constitution of Kenya, Government of Kenya 2010). The new mandates of the county governments included water and health services as well as early childhood education. How these mandates were separated between the national and county levels was partially a matter of negotiation in the transition period while new legislation was developed and enacted. This research has evolved in conjunction with these large-scale institutional changes in the country, following the devolution process unravelling between 2013 and 2017.

Decentralisation reforms are commonly introduced to improve accountability and responsiveness of government by altering its structure and the distribution of responsibilities (Faguet, 2014). While decentralisation in general is defined as "a process of state reform composed by a set of public policies that transfer responsibilities, resources, or authority from higher to lower levels of government" (Falleti, 2005, p. 328), the most extensive form of decentralisation is devolution, which represents a form of far-reaching power-sharing between central and subnational government (Crook and Manor, 1998; Agrawal and Ostrom, 1999; D'Arcy and Cornell, 2016). It is this type of decentralisation which has been

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introduced in Kenya. Since the late 1980s, over 80 per cent of developing countries have adopted some form of decentralisation due to widespread international support for decentralised governance (Crawford and Hartmann, 2008) with the goal being to address pressing social, economic and environmental challenges. A significant amount of literature examines institutional transitions that aim to build pathways out of poverty in Africa; these demonstrate varying impacts on service delivery (Nsibambi, 1998; Conyers, 2007; Robinson, 2007; Wekwete, 2007; Palotti, 2008; Lein and Tagseth, 2009; Uhlendahl *et al.*, 2011; Mwihaki, 2018) and poverty reduction (Bossuyt and Gould, 2000; Crook and Sverrisson, 2001; Von Braun and Grote, 2002; Vedeld, 2003). However, the majority of these studies are based on secondary literature, which highlights the need for more empirical evidence to assess the links between decentralisation, the role of the newly devolved decision-makers in charge of service delivery, the implications for new institutional developments in the informal sector, especially in rural areas, and for the recipients of these services. This study builds on devolution as an enabler and parameter of institutional change in Kenya's rural water sector.

Institutional change through decentralisation reforms aligns with the challenge of 844 million people lacking basic drinking water services globally (WHO and UNICEF, 2017a) as well as the under-performing and uncoordinated institutional landscape of rural water provision (Cleaver, 1991; Blaikie, 2006; RWSN, 2009; Foster, 2013). This global challenge requires legal, policy, financial, operational and institutional changes from global to local scales. The sustainable development agenda (UN, 2015) outlines an international framework for implementing the right to water with target 6.1 committing countries to achieve universal and equitable drinking water

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services for all by 2030 (WHO and UNICEF, 2015). This research is thus motivated by the fact that only one in five countries below 95 per cent coverage globally is currently on track to achieve universal basic water services by 2030 (WHO and UNICEF, 2017a), and drought-stricken sub-Saharan African countries facing varying socioclimatic and political risks lag significantly behind (UN, 2017). To achieve progress towards universal water services, institutional change needs to occur and formal¹ and informal water provision be aligned.

Kenya's challenges reflect those of the wider continent as only around 42 percent of the total Kenyan population are within formal, piped water service provision areas and 22 percent are regulated (WASREB, 2015). Overall, the country is on an upward trajectory, as the percentage of the population using at least basic drinking water increased from 46 to 58 per cent between 2000 and 2015. This is marked by a fall in urban areas (88 to 83 per cent) and a rise in rural areas (36 to 50 percent); however, 29 per cent of rural people still use surface water (WHO and UNICEF, 2017b). In parallel with the devolution reform, a professionalisation of rural water services has been introduced in the country through innovation in mobile and water technology. It represents another institutional transformation, linking the long-standing paradigm of community management with a market element that coincides with – yet is independent of – the devolution process. Thus, the state, market, and community are realigned in the rural water sector adjusting to varying water-related risks and new global and local demands. African water entrepreneurs are emerging across Central, East and Southern Africa offering professionalised service

¹ Water service providers are licenced by Kenya's Water Services Regulatory Board provided they comply with standards of commercial viability and guidelines for association (Article 77, Water Act 2016) (Republic of Kenya, 2016).

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delivery models with the aim to create value for rural water users, government, and investors through performance-based contracts (Moriarty *et al.*, 2013; Lockwood and Le Gouais, 2015; Nagel *et al.*, 2015; Thomas, 2016; Welle, Williams and Pearce, 2016). Both forms of institutional change, one triggered through political, the other through technical transformations, are at the centre of investigation in this thesis to provide insights as to whether they indeed lead to improvements in water service delivery for those water users outside formal service provision areas.

Conducting research in Kenya during this period of rapid change also granted me unique access to and insights from stakeholders up to the highest level, including the Cabinet Secretary for Water and Irrigation and members of his Ministry. Frequent meetings with one of the directors provided me with the latest updates on the making of the new Water Act (Republic of Kenya, 2016) over several years, which outlines the institutional structure and responsibilities across the water sector. Meeting key stakeholders in the Ministry of Water and Irrigation and establishing a relationship through providing evidence on Kenya's transformation process not only allowed detailed insights into internal debates over the allocation of functions, such as regulation, but also allowed consultation on an article in the Act concerning rural water services in areas not considered commercially viable, capturing recent trends towards a professionalisation of services. Through engaging regularly with the national regulator in the Water Services Regulatory Board, the Water Sector Trust Fund, the Water Resources Authority as well as one of Kenya's leading environmental lawyers I gained important insights into the effect of devolution on water services regulation, water sector financing, as well as water resources management from a national perspective. The research at national level was complemented by detailed

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investigations at the county and local levels in selected areas of Kenya (Figure 1.1). Indeed, it is the engagement at multiple levels through which I obtained crucial insights into Kenya's transformation. Interviewing representatives of all 47 county water ministries, led by the County Executive Committee (CEC) Members for Water, following their first meeting to discuss a prototype county water bill, allowed a more thorough understanding of the opportunities and constraints these individuals and their departments faced while establishing new institutions from scratch. Such insights gained through empirical research are essential for policymakers to develop conceptual frameworks and to take practical decisions for sector development.

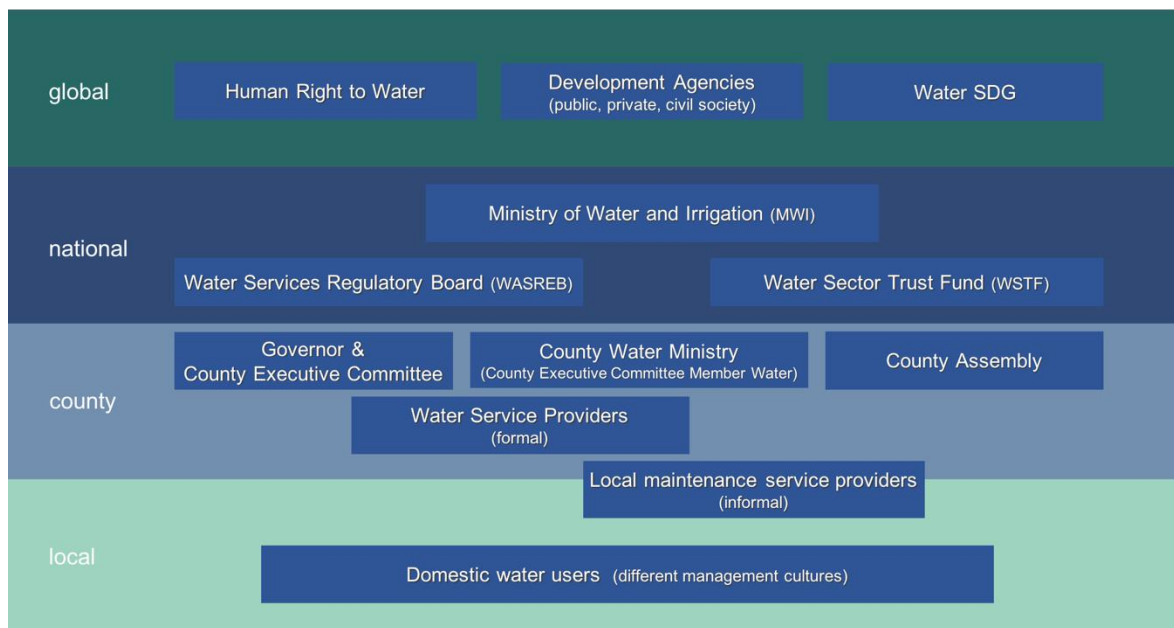


Figure 1.1 Schematic of devolving landscape of water services provision in Kenya (author)

At the local level, alongside colleagues in Kenya, I co-led multiple field studies in two counties, Kwale and Kitui, and conducted case study interviews with representatives from a third, Turkana County. These represent different regions across the country from the south-eastern corner on the Indian Ocean bordering

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Tanzania to the north-western tip bordering South Sudan. While they have varying geographies, they all have seen the emergence of professional service delivery models for rural water infrastructure. Most of the fieldwork was conducted in Kwale County. In order to better understand the political dimensions of the county's institutional transformation, I was in regular dialogue with the CEC for Water throughout the first term under devolution. This engagement also allowed me access to other stakeholders, including other county ministers, Members of County Assembly (MCA), and the local Water Resources User Associations.

The interactions at various scales made it clear that there are multiple rationalities at play; different levels of government were defined in the new constitution, but there were varying opinions as to how this transformation should translate in terms of rural water provision. Unlike the energy sector, for example, where customers tend to be individual households, water is often managed as a collective good – creating tensions between those using, those managing and those maintaining the source across several levels of decision-making. Collecting empirical evidence over several years and observing the complex web of actors across public, private and community-based institutions prompted me to use a theoretical framing – cultural theory of risk² – that allows for the accounting of these diverse rationalities at various levels. It also provides insights into whether pluralist arrangements linking the state, market, and communities can be designed to contribute to making rural

² Cultural theory of risk (Douglas and Wildavsky, 1982; Thompson, Ellis and Wildavsky, 1990; Rayner, 1991; Douglas, 1994; Hood, Rothstein and Baldwin, 2001) – which is applied in this thesis and explained in detail in Chapter 2 – uses the terms “rationalities” as well as “solidarities” to denote different ways of organising based on different risk perceptions and preferences. I use both terms depending on the context and introduce a third in the context of rural water management: “management cultures”. Cultural theorists argue that the solidarities can form clumsy solutions, which allow them to co-exist while creatively combining their fundamentally different perspectives on problem identification and resolution. This concept is extended in the thesis to “pluralist arrangements” of addressing water service risks between the state, market and community management cultures.

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drinking water services more sustainable as well as what factors lead government and users to take up such arrangements. I further explore the theoretical considerations in the review of the literature (Chapter 2) and apply the concept of pluralist arrangements empirically in Chapters 5 to 7.

The bargain of the pluralist choice – “weaving one vast whole from Being’s ample range” (von Goethe, 1808, p. 38) – would involve negotiating an arrangement that allows the different solidarities within the rural water sector to co-exist and allocate risks and responsibilities with the objective of improving service delivery. There is no blueprint for effective rural water management institutions, and relatively few examples of large-scale, successful, and sustained collective action (Thompson *et al.*, 2001; World Bank, 2017).

The remainder of this chapter is organised as follows – I provide additional background and rationale for this research on (i) water risks and the water service challenge and (ii) decentralisation reforms in the Kenyan context. The background discussion is followed by an outline of the main research objectives. I then introduce the thesis chapters. To close this chapter, I outline the thesis format.

1.2 Background and rationale

There is an ongoing debate by which entity rural water services can be effectively delivered (Arlosoroff *et al.*, 1987; Skinner, 2003; Harvey and Reed, 2004, 2006; Montangero, 2008; Kleemeier and Narkevic, 2010; Chowns, 2015; Lockwood and Le Gouais, 2015; RWSN, 2017; World Bank, 2017). These discussions relate to wider questions of distance, proximity, diversity, and scale (Clark *et al.*, 2018). In the context of this thesis, distance is related to the distribution networks of water infrastructure and the corresponding risks of water availability for users, *inter alia*; proximity is important in terms of the level of authority responsible for serving the population with water and the legitimacy of doing so; diversity is linked to the plural ways of managing water risks; and the multiple scales of decision-making influence how regimes around paradigms, such as “community management” for rural water services are created, persist and change (Hood, Rothstein and Baldwin, 2001; Molle, 2008; Whittington *et al.*, 2008). International frameworks, such as the 2030 Agenda for Sustainable Development (UN, 2015), provide an impetus for change, especially with regard to donor funding and government monitoring of progress towards the Sustainable Development Goals (SDGs). This section introduces further background around the main themes, the water service challenge and decentralisation reforms in the Kenyan context, whereas the literature review in Chapter 2 outlines the main theoretical perspectives underlying such institutional transformations.

1.2.1 Water risks and drinking water services

The thesis examines different institutional approaches to manage water-related risks. A feedback loop between risks and institutions is required to develop management responses that account for changing risks as well as allow new opportunities to be integrated into institutional responses. In the wider literature water risks include those related to environmental and social phenomena. Environmental risks include water quantity (scarcity or abundance) (Grey and Sadoff, 2007; Hall and Borgomeo, 2013; J. W. Hall *et al.*, 2014; Dadson *et al.*, 2017) and water quality (natural and anthropogenic contamination) (Fewtrell *et al.*, 2005; Howard, Pedley and Tibatemwa, 2006; Onda, LoBuglio and Bartram, 2012; Bradley and Bartram, 2013; Wambu *et al.*, 2014; Edmunds, Ahmed and Whitehead, 2015; Stauber and Casanova, 2015). While some of these environmental risks are examined (aridity in Chapter 4, and a limited set of water quantity and quality measures in Chapters 5 and 6), the major focus of this thesis is on institutional responses to risks across scales, the behaviours these trigger and the management of risks related to drinking water services. The different institutional processes are portrayed in the review of the literature (Section 2.2). The research examines institutional dynamics in the formal and informal water sectors by the example of Kenya's recent institutional transformation and efforts to improve water services for the currently unserved. The concurrent forms of institutional change therefore involve devolution on the one hand and the ongoing professionalisation of rural water services on the other hand.

At the local level, the performance of rural institutions is central to the implementation of the human right to water (UNGA, 2010) and progress towards the

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water SDG (UN, 2015). Taking little or no account of historical legacies (Mamdani, 1996) and complex governance structures through all levels puts decentralisation and its institutions at risk of failing (Ogbaharya, 2008). With regard to the rural water sector, the legal mandate to only provide water services to areas considered commercially viable and – at best – infrastructure but not maintenance in most rural areas could be described as government failure (Wolf, 1988) to provide universal drinking water services. As a result, the voluntary sector has stepped in and community management of rural water supply has been advocated as the main paradigm since the Decade of International Drinking Water Supply and Sanitation, 1981–90 (Arlosoroff *et al.*, 1987; Churchill *et al.*, 1987; Briscoe and de Ferranti, 1988). Since the Dublin Principles of 1992 (ICWE, 1992), the demand-responsive approach has provided the template for most rural water supply services, including community management (Sara and Katz, 2010). A significant amount of literature has examined the performance of rural water infrastructure with a focus on *(non)functionality* and *financial (un)sustainability* (Harvey and Reed, 2006; Whittington *et al.*, 2008; Foster, 2013; Whaley and Cleaver, 2017). However, a gap has been identified in the study of *service delivery* to rural water infrastructure. The differentiation between functionality and service delivery is a critical one as the accountability and performance of institutions becomes the central focus. This was recognised for the first time in the water goal of the sustainable development agenda (UN, 2015).

After frequent failure of the voluntary sector (Salamon, 1987) and slow progress to effect large-scale improvements in terms of service delivery through community management (Harvey and Reed, 2006; Chowns, 2015; Whaley and Cleaver, 2017), the rural water sector is increasingly looking towards the market to

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respond to the challenge (Koestler, 2009; Kleemeier and Narkevic, 2010; Foster, 2012; Lockwood and Le Gouais, 2015; RWSN, 2017). Revisiting the same households in several sites in East Africa 30 years after the seminal study on domestic water use (White, Bradley and White, 1972), Thompson *et al.* (2001, 2003) highlight the importance of the state creating an enabling environment for both the market and the voluntary sector to increase efficiency and sustainability of services. However, they also point to the ambiguous role of non-governmental and community-based organisations, as they often have close links to local elites and depend on patronage from the state and donors. Furthermore, the demand-responsive approach towards service provision depends on long-term economic growth for sustainability. As this is not guaranteed, the dependence of water services on uncertain donor support is likely to continue (Thompson *et al.*, 2003). In terms of policy implications, *Drawers of Water II* ends as follows:

“... what is clear is that the lessons emerging from *Drawers of Water II* suggest that a new vision of improved access to and use of water and environmental health services in Africa will require a combination of innovative policies and flexible funding arrangements [...]. It will also require strengthened public and private organisations to develop, operate and maintain water systems and services sustainably, and new partnerships between the state, the private sector and civil society that promote market-based water development while creating co-operative management arrangements that work for people and the environment” (Thompson *et al.*, 2001, p. 107).

This problem statement marks the departure point for this thesis to examine such new partnerships between the state, market, and civil society as well as how new policies and flexible funding arrangements may lead to sector transformation in light of challenges of the sustainable development agenda. This

thesis examines the types of institutional arrangements that emerge in response to these challenges in Kenya.

1.2.2 Decentralisation reforms in the Kenyan context

A successful decentralisation reform depends on the alignment of three core pillars, adapted from Stewart and Brown's (2010) framework on state fragility.³ Social and environmental risks interact with social vulnerabilities, highlighting the importance of the alignment of authority, legitimacy, and service delivery.

Authority needs to be clearly defined at each level of government with a clear separation of powers through clarifying the legal mandate, allocating adequate financial resources and ensuring effective sector coordination between public, private, donor and civil society institutions.

Legitimacy is a key component of decentralisation in terms of political accountability of national and county governments, as they are legitimised through their constitutional mandate and by their electorate to whom they are downwardly accountable. A functioning regulatory system for monitoring the performance of service providers is necessary to secure legitimacy.

Service delivery of devolved functions (water services being one of the core devolved functions in Kenya) is one of the key parameters used to measure the success of decentralisation reforms. Different approaches of public, private and community management for rural service delivery are discussed in the thesis.

³ Fragile states (DFID, 2016) are often characterised by “difficult hydrologies” with high inter-annual and/or high intra-annual rain and run-off variability (Sadoff *et al.*, 2015), ranging from geographies of absolute water scarcity (e.g. Horn of Africa) to high water variability (e.g. Bangladesh, Kenya, Pakistan). In the 2016 DFID list Kenya is classified as a moderately fragile state.

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After several policies of decentralisation over forty years with weak attempts of redistribution of authority and resources, Kenya's post-election violence of 2007/08, representing a failure of legitimacy, gave rise to the reform leading to the Constitution of 2010 and the present process of devolution (Cheeseman, Lynch and Willis, 2016). Failure of authority was also partially apparent, as the state was unable to protect its citizens from violence, which had claimed over 1,000 lives and left over 500,000 displaced by February 2008 (Branch and Cheeseman, 2008; Cheeseman, 2008). As a result, county elections in 2013 – concurrent with a general election – led to the establishment of 47 county governments, which form the basis for devolution (Cheeseman, Lynch and Willis, 2014). The introduction of democratically legitimated subnational governments considers the overlap of (national) citizenship and ethno-regional identification. A concept of ethno-regional devolution, *Majimboism* (literally “provinces/states”), has been propagated by national-level politicians to strengthen their power base (Maxon, 2016). On the other hand, some go as far as to describe devolution in Kenya as the “governance of governors” (Cheeseman, Lynch and Willis, 2016) – a political elite at the county level capable of acting in concert as a counterweight to the national government. Others again argue that existing patronage networks have rather perpetuated existing political dynamics than produced radical change (Cornell and D’Arcy, 2014).

Decentralisation in the rural water sector is transforming structures developed during the 1970s through to the 2000s: local government reforms with legislation and decision-making on local services and resources resting with central government (Smoke, 2003; Olowu and Wunsch, 2004); community management projects, usually initiated by donors (Lockwood, 2004); and *Harambee* (literally “all pull

together”) programmes, which propagated the division of responsibilities between communities and central government (Oyugi, 1990).

Despite different approaches, just over half of the rural population (57 per cent) had access to improved sources in 2014 (DHS, 2014). Progress is slow in achieving the human right to water, to which the Kenyan government first committed in 2002 (Republic of Kenya, 2002), and which is enshrined in the Constitution (Government of Kenya, 2010). The lack of provision to almost half of the rural population is not unrelated to the fact that in government legislation formal service provision areas only include those in which water services are “commercially viable” (Republic of Kenya, 2016), thus excluding most of the rural areas for which special provisions are put in place. The main task of this thesis is therefore to examine whether the current reform as well as developments in rural water services concurrent with the political transformation can identify an appropriate scale for delivering services and translate into improved water service delivery outcomes for the rural poor – the poverty head count being 40 per cent for rural areas (KIHBS, 2018).

1.3 Research objectives and chapter introductions

The central question of this research is: *How do water institutions transform to manage water risks and deliver sustainable water services to the rural poor?*

The study of Kenya’s recent constitutional reform offers an opportunity to understand the underlying dynamics of institutional transformations and their impact on drinking water services for the poor while the processes are evolving. Novel,

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longitudinal data, which were collected over the first four years of the devolution process (2013-2016), may contribute to wider research verifying the circumstances under which devolution is conducive to the improvement of water services of poor rural communities (Manor, 1999; Francis and James, 2003; Olowu and Wunsch, 2004; Craig and Porter, 2006; Hankla, 2009; Mwihiaki, 2018) and socio-economic development (Francis and James, 2003; Grindle, 2007). Due to its timing, this DPhil research was able to observe the emergence of Kenya's Water Act 2016 (Republic of Kenya, 2016), which translates the devolution reform into the water sector.

Sustainable institutional change may only occur if the stakeholders form part of the transformation and take up the changed institutional parameters. With this in mind, the following levels are investigated: the uptake of international frameworks in national legislation; the uptake of the water service mandate by the county decision-makers at the subnational level; and the drivers of uptake of novel pluralist maintenance arrangements by water users currently outside formal service provision areas.

Tensions can be identified between the universalist claims of international agendas and local decision-making (Dake and Thompson, 1999; Cleaver and de Koning, 2015; Gyawali and Thompson, 2016). I therefore aim to examine whether a recognition of pluralist institutions that draw on the strengths of existing management arrangements at the local level may constitute an important step in narrowing the critical gap between the performance of the rural water sector and, ultimately, the water SDG. This would require linking scales of organisation, different sets of values, including individual, community and state action as well as professional and lay

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knowledge. The research seeks to afford insights into whether and how the emergence and performance of pluralist arrangements prevailing in local water institutions can be conceptualised, operationalised and integrated into wider governance regimes in Kenya (Hood, Rothstein and Baldwin, 2001).

The thesis contains eight chapters and Appendices. After the introduction, a review of the literature (Chapter 2) discusses the theoretical gaps and opportunities of theories from economic history, political science, and anthropology applied across the chapters with regard to institutional approaches to risk mitigation. The theoretical gaps and contributions of each of the empirical chapters are also outlined in Chapter 2. Chapter 3 introduces the study sites and provides an overview of the methodologies applied for data collection and analysis, including consideration of the limitations of this research. The objectives of this thesis are outlined below and are addressed through four chapters submitted/published as journal papers (4-7).

Introduction

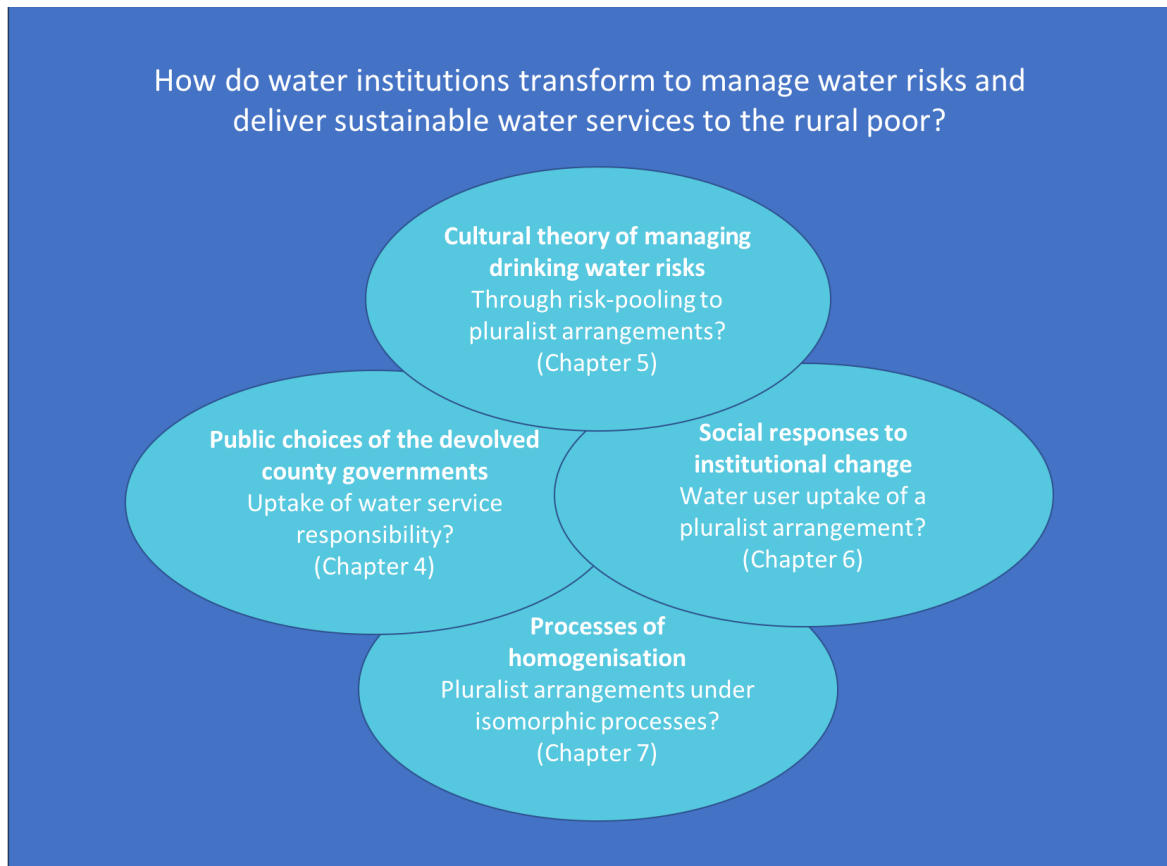


Figure 1.2 Research sub-questions framing each empirical chapter to contribute to the central thesis question

The objectives are:

1. *To explore which factors influence the newly devolved county water ministries' perceptions of their mandate to deliver water services in terms of the human rights criteria of sufficient quantity, potable quality, affordability, physical access, and non-discrimination (Chapter 4).*

Drawing on interviews with all 47 county water ministries, a sociopolitical risk model applying public choice theory is developed and tested to improve the understanding of why the devolved duty-bearers demonstrate a considerable range of responses regarding the uptake of the constitutional mandate for water service delivery both in urban and rural areas.

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This chapter examines devolution and its implications for water services across Kenya as well as questions of accountability. It assesses which drivers including water service coverage and poverty rates as well as election margins play a significant role in advancing the mandate, especially for underserved areas. This sets the scene for the following two chapters, which examine rural water services and the diversity of management arrangements in depth in one county, Kwale.

2. *To examine the plural ways of organising across different waterpoint⁴ management arrangements (Chapter 5).*

Applying cultural theory of risk, the chapter provides a framework for analysing different values and risk perceptions held by members of the four solidarities, the prevailing waterpoint management cultures – community, individualist, bureaucratic, and fatalist. It applies cultural theory beyond its common domain of conflict to cooperation by outlining a pluralist approach to waterpoint management that combines the entrepreneurial dimension with egalitarian collective action at the waterpoint level and public sector coordination.

This chapter applies the thesis framework developed in Chapter 2 in the context of rural water management and examines what an operationalisation of a pluralist arrangement can look like in practice in the

⁴ These are point sources from which water is drawn, which are not piped to individual premises. They may include, *inter alia*, public taps or standpipes as well as boreholes with handpumps, protected springs and dug wells (WHO and UNICEF, 2000). The type of rural water infrastructure on which the thesis mainly focuses includes handpumps drawing groundwater; in Kitui County (examined in Chapter 7) piped schemes are also included.

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form of a professional maintenance service model, as well as the limitations of this approach.

3. *To demonstrate which factors influence behaviour change towards a pluralist institutional arrangement in waterpoint management (Chapter 6).*

Applying cultural theory to waterpoint management, this chapter examines which institutional, financial, operational and environmental factors incentivise rural water users to take up or reject a professional maintenance service provision arrangement.

This chapter extends the cultural theory approach from the previous chapter and models which factors, including the type of management culture, influence household users and user groups to sign a contract with the service provider. It thus provides insights into the informal dynamics of institutional change as an active choice. How institutional change across the various levels of decision-making is restricted and enabled by an alignment of coercive, normative and mimetic processes is examined in the next chapter.

4. *To investigate processes of homogenisation in the rural water sector and the potential realignment towards professionalisation under Kenya's new water law and practice (Chapter 7).*

Combining the perspectives of cultural theory and institutional isomorphism (DiMaggio and Powell, 1983) provides a new understanding of the tensions between the forces of homogenisation and the plural rationalities of rural water management. Applying this framework to Kenya's water sector, the enabling environment for a pluralist landscape that pools water-related risks of the rural poor through a professionalisation of maintenance services

Chapter 1

and a new financial mechanism is examined. This chapter, thus, links the two themes of institutional change explored in this thesis, devolution and the professionalisation of rural water services, which have the potential to connect the formal and informal levels in Kenya's rural water sector.

The thesis ends with a discussion of the cross-cutting themes of regime creation, persistence, and institutional change; risk-pooling under pluralism and its limits; and devolution as a natural institutional experiment. After reflecting on the theoretical and empirical contributions, I discuss the contributions of the thesis to policy and practice, outlining a set of policy recommendations arising from it. The thesis closes with a suggestion of avenues for further research.

1.4 Notes on thesis format

This thesis takes the form of the “paper route”, whereby the substantive research chapters are academic papers provided as published in, or submitted to, peer-reviewed journals. The total of four papers present a coherent body of research investigating water risks and institutional transformations in Kenya's water sector. An additional paper⁵, which provides relevant background information for the thesis research, is attached in Appendix 2 for the following reasons: it provides insights into a) the early stages of the design and development of the pluralist arrangement through qualitative research in Kitui County, and thus complements the quantitative approach

⁵ Half of the field research for this article was conducted during my MSc thesis research (2012-13), the second half was conducted during my time as Research Assistant at the Smith School of Enterprise and the Environment in 2013-14. I finalised the article in the first year of my DPhil degree.

through surveys in Kwale County presented as the core of this thesis research, and b) it examines the institutional factors that were selected for the institutional variable “handpump clubs” in Chapters 5 and 6.

Published

Koehler, J. (2018) ‘Exploring policy perceptions and responsibility of devolved decision-making for water service delivery in Kenya’s 47 county governments’, *Geoforum*, 92, pp. 68–80. doi: <https://doi.org/10.1016/j.geoforum.2018.02.018>.

Koehler, J., Rayner, S., Katuva, J., Thomson, P. and Hope, R. (2018) ‘A cultural theory of drinking water risks, values and institutional change’, *Global Environmental Change*, 50, pp. 268–277. doi: <https://doi.org/10.1016/j.gloenvcha.2018.03.006>.

The following article is included in Appendix 2 of this thesis:

Koehler, J., Thomson, P. and Hope, R. (2015) ‘Pump-Priming Payments for Sustainable Water Services in Rural Africa’, *World Development*, 74, pp. 397–411. doi: <http://dx.doi.org/10.1016/j.worlddev.2015.05.020>.

Submitted

Koehler, J., Thomson, P., Goodall, S., Katuva, J., Hope, R. ‘Institutional pluralism and water user behaviour in rural Africa.’ Submitted to *Global Environmental Change*.

Koehler, J., Rayner, S., Mumma, A., Harvey, P., Trevett, A., Katuva, J., Thomson, P., Hope, R. ‘The paradox of and progress towards rural water sustainability in Africa.’ Submitted to *Transactions of the Institute of British Geographers*.

The text, figures, and tables in each empirical chapter (4-7) are the same as published or presented in the submitted version to the journal. Each article hence repeats elements of rationale, context and methodology that the readers of the thesis will

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already be familiar with. This format leads to several interruptions and repetitions.⁶ It also presents some benefits – in particular, each article goes in depth into one of the four objectives of the thesis, providing a singular angle on the main research aims addressed. The references to figures and citations have been standardised to provide a coherent format throughout the thesis. The references have been summarised into a single list at the end of the thesis. Supplementary information, which is provided for Chapters 6 and 7, has been included in the thesis at the end of each chapter.

⁶ The format presented here also implies a number of formal inconsistencies. Deviations in spelling – for example of “percent/ per cent” (*Geoforum/ Transactions of the Institute of British Geographers*) and “%” (*Global Environmental Change*) – add to the repetition of the same acronyms being introduced in several articles. Footnotes referring to the same facts and circumstances have been retained as they appear in the journal articles. The use of “I” and “we” also depends on whether it is a single author document or a co-authored article.

2 Review of the Literature

2.1 Water risks, culture and institutional change

2.1.1 Overview

Culture “shapes human life and the human mind” and “gives meaning to action by situating its underlying intentional states in an interpretative system” (Bruner, 1990, p. 34). This thesis argues that this interpretative system plays a crucial role in the perception and management of risk reflected in different institutional responses (Douglas and Wildavsky, 1982; Douglas, 1985). In accordance with Fiedler and Juslin (2006), risk can be defined as the likelihood of a certain event or outcome occurring over some time horizon. Lowrance (1976) adds to this definition the aspect of the severity of adverse effects, while the Intergovernmental Panel on Climate Change (IPCC) explores linkages to exposure and vulnerability, which vary across temporal and spatial scales, and depend on economic, social, geographic, demographical, cultural, institutional, governance, and environmental factors (Cardona *et al.*, 2012). From a social science perspective the term “risk” can also be used to include the arrangements for managing contingencies, the distribution of liabilities, and issues of consent to exposure to adverse events beyond the probability of their occurrence and their magnitude (Rayner and Cantor, 1987). While the individual tends to take a middle- or short-range view of probabilities, institutions have a long-term perspective. The varying focus of different institutions allows individual members to gain a differentiated experience of real world probabilities or uncertainties (Douglas, 1985). Including the social construction of risk leads to an expansive understanding, which I adopt in this thesis.

Chapter 2

Water risks are unevenly distributed across the state, the market, and communities. Traditionally communities have had to bear the largest burden in risk management of rural water services, as current policy effectively separates communities from the state or market. The two types of institutional change examined in this thesis, devolution and the professionalisation of rural water services, allow a realignment of risks between the state, market, and communities through the evolution of new norms, performance-based services (through contracts) and increased levels of regulation. I define such an arrangement as “pluralist” (Figure 2.1) that combines the different theoretical approaches applied here.

This literature review provides the theoretic framing for exploring four conceptual questions through empirical analysis: How do a variety of risks influence the uptake of new formal rules in the process of institutional change (Chapter 4)? How do different risk perceptions influence informal management behaviours and can a pluralist arrangement pool those risks (Chapter 5)? What influences behaviour change that leads to uptake of the pluralist arrangement (Chapter 6)? How are certain regimes established, and which processes trigger institutional change (Chapter 7)? These represent the broad questions that link with the wider theoretical literature on institutions and risk. They are examined empirically in the specific setting of the Kenyan water sector. The dynamic relationships between public, collective and individual choices (Buchanan, 1954; Ostrom and Ostrom, 1971; Douglas, 1999; Verweij *et al.*, 2006; Ostrom, 2010) – and the potential pluralist choice of a clumsy arrangement – are explored in the chapters that follow. The relevant literature on devolution and the water services sector and its performance is reviewed in chapters

4-7 and therefore a systematic review of the empirical literature on water services or on devolution is not the objective here.

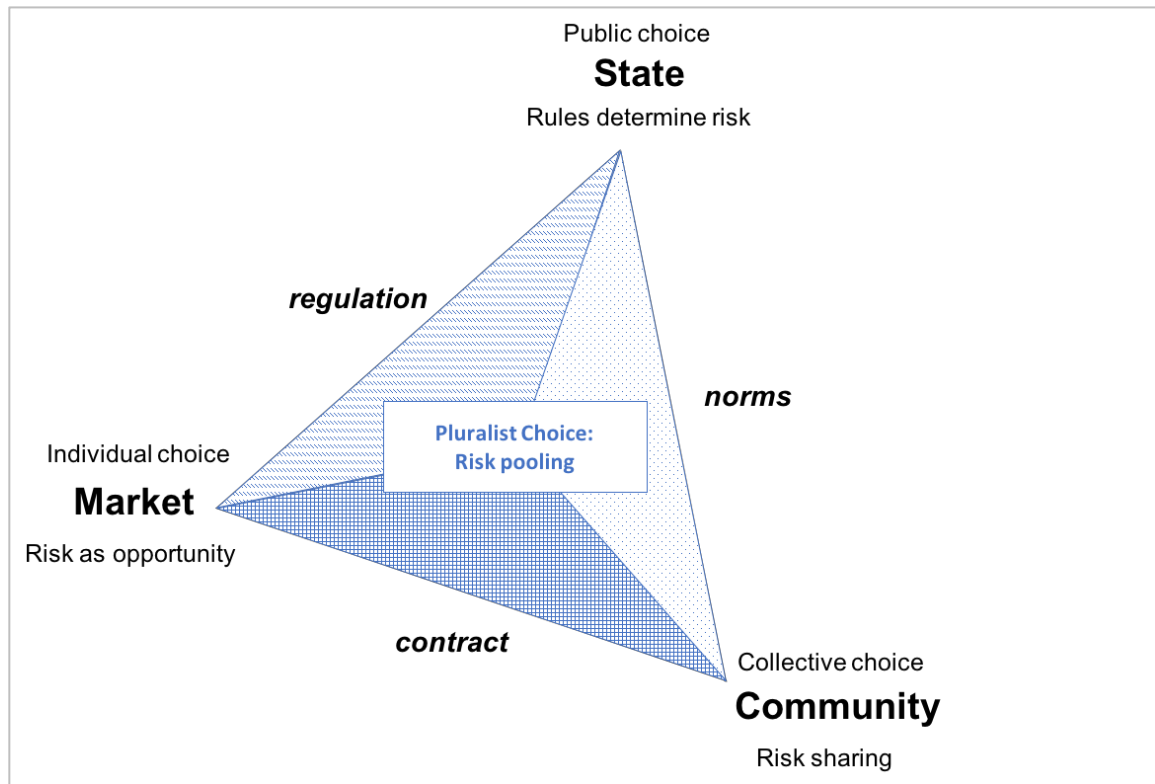


Figure 2.1 Thesis framework

To examine how water institutions transform to manage water risks and deliver sustainable water services in rural areas, this chapter reviews the literature on water risks and institutional change in this order: first, it deals with aspects of risk across types of risks in the water service sector, risk perceptions, and risk management approaches. Second, it reviews relevant institutional literature from the disciplines of economic history (Douglass North), political science (Elinor Ostrom and colleagues), anthropology (Mary Douglas and colleagues), and sociology (Paul DiMaggio and Walter Powell) to highlight their perspectives on the role of risk, the drivers of institutional change, and the different conceptions of culture that influence

this change. Risk perceptions vary depending on the individual, the cultural background and the institutions that manage risks. The objectives here are to identify gaps in the literature and develop further theoretical concepts to examine social factors of change, the co-production and feedback loop of risk perception and institutional structures. Cognitive and affective factors that influence individual water users are not the focus. The last section explores the gaps and contributions that each of the empirical chapters makes to the wider literature by discussing different aspects of the thesis framework.

2.1.2 Framing messy problems and clumsy institutions

Due to a largely uncoordinated institutional landscape the rural water sector has underperformed for decades as regards achieving universal drinking water services (Cleaver, 1991, 2012; Harvey and Reed, 2004; Banks and Furey, 2016). In order to reach this goal, legal, executive and administrative instruments need to change, along with political functions, technical innovations, and existing institutions at national, subnational and local levels. Such “messy” contexts have been reinforced through the inter-relating of global and local factors and the impact of social and economic changes over time (Mehta, Leach and Scoones, 2001). Globally, around 844 million people are without basic drinking water services (WHO and UNICEF, 2017a). In the wider water literature, the focus has also been the *performance* of rural water infrastructure (Harvey and Reed, 2006; Whittington *et al.*, 2008; Foster, 2013; Carter and Ross, 2016; Whaley and Cleaver, 2017). The sustainable development agenda shifts the global discourse on rural water from “access” to “services” – moving the focus from *vulnerability due to a lack of infrastructure* to *vulnerability due to a lack of functioning*

Literature Review

institutions. Therefore, I aim to fill a gap in the study of *service delivery* to that infrastructure and the underlying institutional changes that may support the delivery of services.

Complex social and environmental problems facing societies have been classified in similar ways in the wider institutional literature, including as “wicked”, by policy analysts Rittel and Webber (1973), “ill-structured”, by economist Simon (1973), and “messy” by systems expert Ackoff (1974). Disputes between different societal camps over such wicked problems usually require solutions which combine (inter)governmental action, civil society engagement, (social) entrepreneurship, and technological innovation to satisfy different stakeholders with varying motivations and normative perspectives. Legal scholar Sunstein (1995) uses the term “incompletely theorised agreements” for such solutions to problems in the family, the workplace, social and political life. Rawls (1989) speaks of the domain of “overlapping consensus”, implying that the main religious, moral and philosophical doctrines endorse a political conception of justice that is designed to regulate a society’s basic institutions. Similarly, another legal scholar, Shapiro (1988), coined the term “clumsy institutions”, which help maintain the integrity of a set of values over time. Cultural theorists use the term “clumsy solutions” (Verweij *et al.*, 2006; Thompson, 2008, 2013), denoting tolerated spheres that are subject to a kind of Pareto mechanism: no solidarity – any of cultural theory’s four ways of organising social life – attempts to actively undermine another (6, 2003). Verweij *et al.* (2006) point to the creative, flexible mix of these fundamentally different ways of organising, perceiving and justifying that satisfies their respective adherents more than other courses of action, while no actor is left worse off. In the context of water services I

use the term “pluralist arrangements” instead of “clumsy solutions”, as the latter not only imply complex solution mechanisms but also ineffectiveness, while the type of “pluralist arrangements” at the core of this thesis are thought of as flexible and potentially make rural water services more effective.

Lodge and Hood (2010) argue that while “clumsy solutions” have been shown to arise spontaneously under certain circumstances, it has not been demonstrated convincingly how such systems can be consciously designed and maintained. This provides a gap for a theoretical and empirical analysis. I therefore investigate whether a clumsy institution – designed as a pluralist institutional arrangement in the context of rural water services – can enable risks and responsibilities to be re-conceptualised and re-allocated between the state, market and communities to create value for rural water users. The uptake by the users decides the maintenance and longevity of the institution, and whether it is indeed a solution.

2.2 Risk types, perceptions and management

Water risks and the risks of managing water service provision vary depending on the perspective of the user, service provider, government, or international donor. The thesis explores how risk perceptions shape certain ways of organising across different levels and when risk factors trigger behavioural and institutional change. This section provides an overview of the broad discussion of risk across the various risk types in the water sector, levels of risk perception, and risk management approaches.

2.2.1 Risk types in drinking water provision

The risks faced in the water sector are classified here as operational, financial, environmental, and institutional. Operational risks include the time from breakdown to repair, as well as the availability of alternative sources to which water users must resort during downtime (Carter and Ross, 2016; Whaley and Cleaver, 2017; Foster *et al.*, 2018). Financial risks include affordability, which varies across user groups and – particularly important for sustainability – revenue collection to cover repair costs (Banerjee and Morella, 2011; Foster, 2013; Foster and Hope, 2017; Sutton and Harvey, 2017). Environmental risks include water quantity and quality. Ensuing water rationing and the use of alternative non-improved sources may entail public health risks (Bartram and Cairncross, 2010; Hunter, MacDonald and Carter, 2010; Onda, LoBuglio and Bartram, 2012; Bartram and Godfrey, 2015).

Institutional risks include the management culture of user groups and the government approach to rural water services. The rural water sector has long been based on the strength of the idea of the “community” – often thought of as individuals who disinterestedly collaborate with one another to construct a collective good (Douglas, 1986). Community management of rural water supply has been advocated as the main paradigm since the International Drinking Water Supply and Sanitation Decade, 1981–90 (Arlosoroff *et al.*, 1987; Churchill *et al.*, 1987; Briscoe and de Ferranti, 1988; ICWE, 1992) as it is a mechanism to achieve the policy goal of improving rural water services at least cost while increasing local participation (Hope, 2015). However, the idea of a homogenous community has been widely criticised and recognised as one of the barriers to the success of the “community management”

Chapter 2

paradigm (Agrawal and Gibson, 2001; Schouten and Moriarty, 2003; Adhikari and Lovett, 2006; Blaikie, 2006; Roe, Nelson and Sandbrook, 2009).

Institutional risks are determined by the separation of powers between policy, delivery, and regulation, and the degree of autonomy in managing service delivery. The degree of government accountability to the water users is critical for ensuring public engagement and support. Institutional risks are closely linked to political risks relating to elections, ethnic conflicts, and nepotism (Boland and Whittington, 2000; Adserà, Boix and Payne, 2003; D'Arcy and Cornell, 2016).

Innovative information systems which facilitate transmission of timely data directly into the institutional domain allow monitoring operational and financial targets across these risk factors (Thomson, Hope and Foster, 2012a; Nagel *et al.*, 2015; Kipf *et al.*, 2016). Thus, widespread operational risks in the areas of system maintenance, performance contracts, and service levels become potentially more manageable. Limiting financial risks relates to areas such as capital expenditure (including transfers, loans, and grants), as well as operational expenditure (including cost recovery, collection efficiency, payment modes, and management performance) (Hope and Rouse, 2013). However, institutional coordination of improved monitoring and fee collection remain a critical challenge as institutional failure is likely to exacerbate socio-economic risks. The breadth of empirical literature capturing various water supply challenges (Schouten and Moriarty, 2003; Marks and Davis, 2012; Moriarty *et al.*, 2013; Chowns, 2015; Whaley and Cleaver, 2017) demonstrates the need for a theoretical underpinning of pluralist institutional arrangements that may

open up new possibilities. Such theoretical approaches are explored by looking into a range of institutional literature across the social sciences.

2.2.2 Risk perceptions

Perceptions of the risk in a societal policy or choice option are not just reflections of objective information: they are constructed judgements that differ across individuals and cultures (Weber and Morris, 2010), which correspond with cultural bias, including beliefs and emotions (6, 2002; Verweij and Senior, 2015; Verweij *et al.*, 2015). Based on a review of psychological, social and cultural factors that shape individual and social risk perceptions, Rohrman and Renn (2000) develop a structured framework to facilitate the understanding of risk perception. It integrates four context levels: *heuristics of information processing*, describing the process of forming judgements about risk; *cognitive and affective factors* which influence the perceived seriousness of risk and its acceptability; *sociopolitical institutions*, focusing on organisational constraints, social, legal and political structures, and socio-economic status; and *cultural factors* governing or co-determining the more particular levels of influence. Each of these levels is embedded in the next higher level, which reflects the interdependence between individual, social, and cultural variables (Renn and Klinke, 2016). Whilst this thesis recognises the importance of heuristics, cognitive and affective factors, they are largely deemed beyond its scope. Instead, the underlying social and cultural dimensions of risk perception are identified to be best fitted to exploring the questions the thesis addresses. The approach of the thesis is in line with the demand by Weber and Morris (2010), who explore processes in decision-making to unpick the mechanisms that underlie different cultural patterns.

2.2.3 Risk management and culture

The thesis explores the link between perceptions of risk by groups and their chosen management arrangements. This section draws on literature suggesting that perspectives from psychology, management studies, and cultural theory are compatible (Douglas, 1985; Weber and Hsee, 1998, 2000; Verweij *et al.*, 2015). A distinct difference in belief or value affects a range of judgements and actions in a variety of situations. This makes it the most parsimonious single explanation of such observed group differences. Following this strategy, Weber and Hsee (1998) develop predictions based on their cushion hypothesis, which they apply to perceptions of the riskiness of financial options. They attribute an important role to the individualist—collectivist spectrum in identifying cultural differences in risk perception and management (Weber and Hsee, 1998).

A key explanation for cultural differences in risk perceptions and responses to risk has been advanced by the “cultural theory of risk” (Douglas, 1970, 1986, 1994, 1999; Wildavsky, 1987; Thompson, Ellis and Wildavsky, 1990), also known as the theory of sociocultural viability, institutional theory of culture (Giddens and Mars, 2008), or plural rationality theory (Verweij *et al.*, 2015). This theory extends the individualism—collectivism spectrum to a four-fold typology by adding stratification from low to high regulation (Thompson, Ellis and Wildavsky, 1990; Douglas, 1999; Thompson, 2008).⁷ From an applied psychology perspective, Weber and Hsee (2000, p. 39) state: “the significance of this approach to understanding risk perception is that it provides a way of incorporating group and culture level explanations into the behaviour of

⁷ Cultural theory is presented in more depth with regard to its institutional functions in Section 2.3.3. Here its key contributions to the risk literature are highlighted.

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individuals. In other words, this cultural theory offers suggestions for how individuals come to know where their interests lie.” Applying cultural theory to Holtgrave and Weber’s (1993) model of conjoint expected risk with regard to financial and health risks, Palmer (1996) finds a relationship between worldview (hierarchical, individualist, and egalitarian) and the dimensions the individual selects for organising information and evaluating risk. An individual’s worldview can be seen as filtering and orienting their judgement of information (Weber and Hsee, 2000). Thus, instead of simply seeking an answer in personalities – being risk-averse or risk-taking – or solely in the environment, cultural theorists propose that the perception of risk is a social process (Thompson, Ellis and Wildavsky, 1990).

While Weber and Hsee (1998) refer to national cultures, distinctions are often made between the “cultures” of territorially based groups, such as nationalities or tribes, and the “cultures” of groups with common institutional interests and involvements (Rayner, 1991). Here, culture is defined in line with the cultural theory literature (Douglas, 1994) as the framework for the justification and excuses for actions providing an interpretative system for basic sets of sociocultural behaviour. The cultural theory hypothesis of risk perception states that different institutional settings generate their own characteristic cultural bias, with their own principles of justice and perceived economic interests (Rayner and Cantor, 1987). Individualists tend to see risk as an opportunity; hierarchists strive to address externalities to manage the entire risk system; egalitarians recognise risks and are prone to make accountable those they see as having generated them; and fatalists show a tendency to not knowingly take risks (Thompson, Ellis and Wildavsky, 1990). These four theoretically derived risk “cultures” can be distinguished on the ground as the

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different “management cultures” that exist in relation to rural water services – with their “risk-as-opportunity”, “rules-determine-risk”, “risk-sharing” and “internalising risk” approaches, complemented by the pluralist “risk-pooling” approach (Figure 2.1). It is these cultures that are at the centre of inquiry throughout the thesis, and which are explored in more depth in Section 2.3.3.

In line with affective and social neuroscience cultural theory assumes that humans are inherently social in the sense that social structures have an effect on their cognition and emotions (Verweij *et al.*, 2015). From the perspective of psychology, Bruner (1990) highlights the intricate link between human participation in culture and the realisation of mental power through culture, which makes it impossible to construct a human psychology on the basis of the individual alone. He further suggests that culture encodes experience, attributes value to experience, provides assessment criteria for possible courses of action and shares experiences and expectations. The experience referred to in this thesis relates to the approach to water risks and is linked to the institutions that are established to manage these risks.

Culture thus permeates and manifests itself in institutions and provides an interpretative frame for the individual, while institutions influence behaviour more directly. Governed by the interpretative frame they have acquired, individuals continuously monitor their chosen institutions (Douglas, 1985), and stabilise institutions by adhering to established rules, or change institutions by innovating them. If discrepancies between their expectations and perceptions of reality become too vast, they contribute to cultural regime change. This thesis explores these

processes by reference to how institutions are co-produced and changed to improve the management of rural water risks.

2.3 Institutional perspectives

My second overall theme is institutions. I first consider them from Douglass North's economic history perspective. I then discuss the origins of polycentricity and diversity explored by Elinor and Vincent Ostrom and their colleagues in the Bloomington School. In both schools of thought, institutions are seen as products of human design, being the outcomes of purposive actions by instrumentally oriented individuals. However, in the rural water sector, where property rights are not clearly defined, where the state and the market have historically retreated and left the "community" to establish the rules of the game (though influenced by international agencies and donors), and where water risks are managed in different ways, an anthropological and sociological angle can add new perspectives to analyses of institutional change and the possibilities for mitigating risk. For the latter disciplines, institutions are still considered the result of human activity, but not necessarily the products of conscious design (DiMaggio and Powell, 1991). Consequently, institutions are characterised by heterogeneity and pluralism. These empirically verifiable features of the social world manifest themselves in two different ways: heterogeneity brings the difficulties of cooperation and coordination into the focus of institutional theory, while pluralism utilises diversity as a factor for problem-solving, cooperation, and coordination (Aligica, 2014). However, diversity or pluralism is no guarantee that negative social outcomes will be addressed. External

forces must also be acknowledged that account for inequalities in decision-making, thus reifying power distribution (Mamdani, 1996). To understand the rural water sector and its potential for transformation both formal and informal institutions and their linkages must be examined. I do so by looking at the approaches of economic, social and anthropological theories dealing with institutions, and by analysing how they interact and rub up against each other when applied to an analysis of Kenya's rural water service landscape.

2.3.1 Economic history perspective on institutions

One of the most commonly cited definitions of “institutions” describes them as “humanly devised constraints that shape human interaction... [and] structure incentives in human exchange, whether political, social, or economic” (North, 1990, p. 3). Institutions are the rules of the game, while organisations – along with individuals – are players in the game. Organisations comprise groups of individuals bound together in the common purpose of achieving a particular objective, together with the governance arrangements that they create in order to coordinate their team action as against other teams (North, 1990). North's notion of institutions as the rules of the game in a society that determine transaction costs and efficiency gains fits with Coase's (1937) notion of transaction costs (the costs of negotiation, execution and enforcement) to shape the theoretical framework of new institutional economics. Coming from an economic history perspective, North has a broad conception of transaction costs, which includes the trading costs related to the transfer of property rights in the market as well as the costs incurred in running and operating economic and political systems. The premise of North's institutional framework is that property

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rights are protected, contracts are enforced and political authorities do not interfere with the choices made by economic actors (North, 1990). This perspective requires further scrutiny when property rights are not clearly defined, as is often the case for rural water services, where there is no demarcation of ownership of either the land, the water resource itself, or the infrastructure.

In addition to the formal rules of the game in normative hierarchies, where constitutions, laws, property rights, and contracts reign, informal rules and norms – conventions, customs, codes of behaviour – are critically important to the analysis of institutional change, not least in the rural water sector, as they govern individual behaviour and structure social interactions (North, 1990). Faundez (2016) criticises North's top-down conception of formal rules as being imposed on individuals by external forces, which is inconsistent with his view that individuals are originators of institutions, which are based on shared mental models and belief systems (North, 2005). According to North (1990), individuals attempt to maximise their behaviour over stable and consistent preference orderings. However, they do so within cognitive limits, with incomplete information, and where difficulties in monitoring and enforcing agreements exist. These would seem to be problems that need to be addressed in order to improve rural water services. In Section 2.3.4 I scrutinise the effects of the forces involved in institutional change and homogenisation by reference to DiMaggio and Powell's sociological perspective (1983, 1991). Acknowledging the fact that institutions – themselves subject to external forces – define and limit individuals' sets of choices, this thesis investigates how institutional structures shape the choices of water users, user groups and county decision-makers in the face of a variety of risks.

2.3.1.1 Risk in North's *Institutions, Institutional Change and Economic Performance*

Choices are linked to *risk preferences*. In North's seminal work *Institutions, Institutional Change and Economic Performance* (1990), risk is an inherent, though not prominent, factor and is mainly related to innovations that lower transaction costs. In a historical approach he compares tribal organisation in the suq and caravan trade as examples of patterns of very limited cooperation and long-distance trade in early modern Europe with the increasingly complex organisation that eventually led to the rise of the Western world. These innovations, he argues, consisted of organisational innovations, instruments, specific techniques, and enforcement measures to increase the mobility of capital, lower information costs and spread risk (North, 1990). Spreading risk refers to the transformation of uncertainty into risk. Uncertainty is understood as a condition wherein the probability of an event cannot be ascertained and therefore a way of insuring against it cannot be devised. Risk implies the possibility of making an actuarial determination of the likelihood of an event and hence insuring against an adverse outcome. In my research, I implicitly refer to North's basic understanding that insuring against the adverse outcomes of risk allows the reduction of uncertainty. While North focuses on a formal institutionalisation of risk, this thesis engages with his identification of the three cost margins in an informal context: the mobility of capital in terms of mobile payments for water services, lowering information costs through new monitoring technologies and spreading risk through a new insurance-type model of service delivery.

2.3.1.2 Institutional change at the stroke of a pen?

Institutions arise and persist when they confer benefits that are greater than the transaction costs incurred in creating and sustaining them. According to North (1990), formal rules can be changed at the stroke of a pen, whereas informal rules are difficult to change. This is where the role of culture is central. Any attempt to bring about economic or political change is either facilitated or obstructed by prevailing cultural values (Denzau and North, 1994). The reason why so many plans to reform an economy fail is because reformers focus on changing the formal rules of the game but disregard informal constraints. If institutional change is to be achieved, the informal rules of society have to be consistent with the outcomes that the formal rules seek to achieve (North, 2006). This hypothesis is key to the analysis of the thesis, where I examine the alignment of formal rules in Kenya's new Water Act with transformations in informal rules in the informal water sector. The two sides of institutional change in Kenya can be seen as offering potential efficiency gains through a) closer proximity between water service decision-makers and users through devolving the mandate, and b) professionalising rural water services, by putting mechanics in charge of a larger area. These two changes potentially link the formal and informal sectors. Whether they translate into the desired outcomes, depends on capacity and uptake.

2.3.1.3 The role of culture and belief systems

While North does not claim to have a fully developed theory about cultural beliefs, in his more recent work he focuses on the learning process as a means of understanding how particular belief systems emerge, thus extending new institutional

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economics toward cognitive science by introducing culture and beliefs into the analysis of institutional change (North, 2005). The choices made by individuals are shaped by their mental models, which are embedded in widely shared belief systems, which, in turn, are the product of repetitive feedback from the social environment. North also points to the importance of culture and belief systems in the process of institutional change, referring to the relevance of path dependence for understanding how informal institutions originate and evolve. Successful institutional change depends on a change in collective belief systems. However, North (2005, p. 156) also recognises that “the degree to which such cultural heritage is ‘malleable’ via deliberate modification is still very imperfectly understood”. This is a point which I explore in this research. Further, while embracing pluralism in multiple forms, North focuses on one route to get there: through decentralisation. The test for efficiency is whether institutions provide “the incentives to encourage the development of decentralized decision-making processes that will allow societies to maximize the efforts required to explore alternative ways of resolving problems” (North, 1990, p. 81). It is worth noting here that the idea of pluralism in the triad of public, private and civic engagement is not new to the field of economics. For instance, Polanyi (1944) suggests that a successful interplay of the profit-focused market and the redistributive interventions of the state only occur if both are influenced by the reciprocity that is fostered by civic forces.

This discussion demonstrates that culture and pluralism open up as further streams of inquiry to complement North’s analysis of the viability of institutions and institutional change. For example, while North (1996) argues that belief systems must change for successful reform to take place, since it is the mental models of the actors

that will shape choices, he does not explain how this change in beliefs should come about. Moreover, his analysis of informal institutions does not explain how people, as a group, acquire their beliefs (Faundez, 2016). To better understand institutional change, it is important to examine risk preferences and how they shape institutional responses. My main departure from North is therefore to carry out further inquiry into pluralism and whether it can pool risks to improve sustainability.

2.3.2 The advent of pluralism: public choice and polycentricity

Institutional economists and public choice theorists widely share the assumption that institutions are constructed by actors to achieve the desired outcomes. These approaches view institutional arrangements as adaptive solutions to problems arising from opportunism; asymmetric, faulty or incomplete information; and costly monitoring. For example, McGinnis (2011, p. 170) defines institutions as “human-constructed constraints or opportunities within which individual choices take place and which shape the consequence of their choices.” According to public choice theorists Shepsle and Weingast (1981, p. 511), the sustainability of institutions depends on “restrictions on the ability of individuals or groups to make proposals ... [as] one fundamental way in which institutions may induce stability.” Contemporary research on the outcomes of diverse institutional arrangements for governing common-pool resources and public goods at multiple scales builds on classical economic theory while developing a new theory to explain phenomena that do not fit into the dichotomy of “the market” and “the state” (Ostrom, 2009b).

2.3.2.1 Polycentricity

Elinor and Vincent Ostrom and the Bloomington scholars challenge the bias towards centralisation and promote polycentric, decentralised arrangements (see e.g. Ostrom, Tiebout and Warren, 1961; Ostrom and Ostrom, 1971; Ostrom, 1975, 2007, 2011; McGinnis and Ostrom, 2011; Carlisle and Gruby, 2017). Their starting point is the basic condition of complex human societies. In real life there are multiple, competing, and overlapping action arenas, institutional levels, and sources of decision-making and authority, from families, communities, and religious organisations to nations and states (Aligica, 2014). A polycentric political system can be viewed as “a set of ordered relationships that persists through time” that has “many centers of decision-making that are formally independent of each other” (Vincent Ostrom [1972] in McGinnis, 1999, p. 53). Due to varying access to resources and networks in a polycentric landscape, critics see the acute danger of inequality (Saunders, 2014; Singleton, 2017). Consequently, forms of cooperation between relevant decision-making centres, such as the national government, the county, and the service providers in this context, have to be explored to avoid extreme differences between regions or social groups.

2.3.2.2 Public choice revolution

Aligica (2014) termed this approach the “public choice revolution”, which is the theoretical starting point of this thesis. It applies the public choice framework to provide insights into the decision-making by devolved policymakers in relation to water services (Chapter 4). “Public Choice has the capacity to lead to a pluralistic theory of organizational life and of institutional arrangements” (Aligica and Boettke,

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2011, p. 34), as it allows choice among forms of organisation, institutional frameworks, or systems of rules, depending on the decision-making bodies. However, it does not provide a typology for pluralism, which is important for any operationalisation of solutions that try to combine different ways of organising, as is further explored below (Section 2.3.3).

The framework rules that are set in the “constitutional politics” arena and laid down in the constitution govern policymakers’ decision-making in “ordinary politics”, which has to be exercised within the constitutionally defined boundaries (Buchanan and Tullock, 1999, p. 5). National and subnational legislation is therefore guided by constitutional framework rules but is enacted through “ordinary politics” in legislative assemblies. Essentially a utilitarian approach with an emphasis on rational decision-making, public choice models give prominence to the mechanics of legislating, for example the distribution of agenda-setting powers (Ostrom, 1986; Shepsle and Weingast, 1987).

The studies discussed above contributed to the development of the Institutional Analysis and Development (IAD) framework (Ostrom, 2007, 2011) and McGinnis’ (1999) definition of the three decision levels of constitutional choice, collective choice, and operational choice. The framing of these levels of decision-making has guided the thinking throughout this thesis as the rural water sector in Kenya has received an impetus for change at each of these levels. More recent studies on behavioural public choice (Viscusi and Gayer, 2015) acknowledge that like all individuals, policymakers are subject to psychological biases as well as political pressures and incentives. Politics-as-exchange between decision-makers and their

electorate, which links political performance and success in elections, are the subject of the sociopolitical risk model developed in Chapter 4.

2.3.2.3 Risk in Ostrom's *Governing the Commons*

Ostrom's (1990) seminal work on *Governing the Commons* discusses risk as experienced in local-level natural resources management in terms of group size, environmental overuse and degradation with regard to water quantity and quality, as well as in association with geographic or temporal uncertainty. Some of these risks are tested in the sociopolitical risk model, among them urbanisation and poverty levels as well as water coverage rates (Chapter 4). In two of Ostrom's eight design principles for long-enduring common-pool resource institutions, risk features in terms of clearly defined boundaries and the requirement of applying graduated sanctions (Ostrom, 1990). This relates to the importance of adequate regulation of rural water services discussed throughout the thesis. Furthermore, her eight principles are reflected in the operational, financial and environmental factors selected for the regression models in Chapter 6. Ostrom applies these principles to test whether they contribute to making institutions robust, fragile or a failure (Ostrom, 1990). Yet, while providing insights into what may lead to successful institutions, defined as being maintained over extended periods, they afford little insight into power struggles within institutions or arrangements other than community-managed common-pool resources (Singleton, 2017). This thesis explores bureaucratically and privately managed institutions, as well as what makes community management so stable despite its limited success in improving water services for the rural poor.

In her later work, Ostrom (2000) takes up the idea of three different types of “norm-using” players: in addition to “rational egoists” there are “conditional co-operators” and “willing punishers”; she argues that this distinction helps to make “more coherent sense out of the findings of the laboratory experiments on contributions to public goods” (Ostrom, 2000, p. 142). These types of players align well with cultural theory’s individualist, hierarchist and fatalist rationalities, explored in more detail below. Such considerations open up her work towards the idea of plural rationalities. Therefore, using Ostrom’s design principles within the cultural theory typology and linking the typology to a dynamic model of socio-natural context (Singleton, 2017) may provide novel insights and demonstrate a research gap that this thesis tackles empirically (Chapters 5 and 6).

2.3.3 Cultural theory: plural rationalities and institutions

Extending the perspective that institutions are the result of human activity to include that they are not necessarily the products of conscious design, sociological and anthropological theories such as cultural theory shift the focus of analysis to social relations. This thesis builds on the perspective that social relations are constitutive to the individual, as emotional and cognitive preferences are seen to be the outcomes of accumulated experiences with interactions in social and physical environments (Douglas and Ney, 1998; Verweij *et al.*, 2015). The most extensive definition of an institution within the framework of sociocultural viability has been given by Perri 6 (2003, p. 397), who defines it as:

“a formal or an informal constraining social rule, convention or norm (North, 1990, p. 3), which structures interaction, which is recognized by those subject to it (Knight, 1992, p. 2), as creating an accountability or some

duty to provide an account of performance and be subject to appraisal and either sanction or reward, however informal (Douglas, 1986), and which leads to the forming of more or less stable social patterns (Jepperson, 1991, p. 145).”

The thesis adopts this definition as it complements and extends the economic and political perspectives explored earlier.

As property rights are not clearly defined and enforcement is dependent on factors such as risk perception and effective organisation, a sociocultural approach to understanding institutions is just as relevant as economic and political perspectives when enquiring into the rural water sector. The aim of cultural theory is to show that across a wide range of phenomena – whether perceiving risk, apathy, or ways of attributing blame – social relations generate preferences and perceptions that in turn sustain those relations (Thompson, Ellis and Wildavsky, 1990).

2.3.3.1 The grid-group typology: social regulation and collective representation

Cultural theory focuses on the ways that people bind themselves to one another and their environment, positing that these can be classified within a typology of four “ideal-typical” ways of organising social relations along the axes of social regulation (grid) and collective representation (group) (Figure 2.2): the “solidarities” of egalitarianism, hierarchy, individualism, and fatalism (Thompson, Ellis and Wildavsky, 1990). However, cultural theory goes beyond the grid-group typology (Dake and Thompson, 1993). It provides a justificatory framework that constitutes social relations and posits that the social relations for their part determine the framework of justification. Thus, it is characterised by co-production with a tight feedback loop. Institutional theories like that of Williamson (1974) have utilised

markets and hierarchies in a dualistic typology; cultural theory innovates this by doubling the number of ways of organising (Thompson, 2013). This approach is tested in Chapters 5 to 7; in particular Chapter 7 engages with the three solidarities of egalitarianism, hierarchy, and individualism across multiple scales from local to national to provide insights into transformations in the rural water sector. The fourth solidarity, fatalism, constitutes an exception, as those who adhere to it fail, or refuse, to organise. The problems arising from their behaviour are mainly dealt with in Chapter 5.

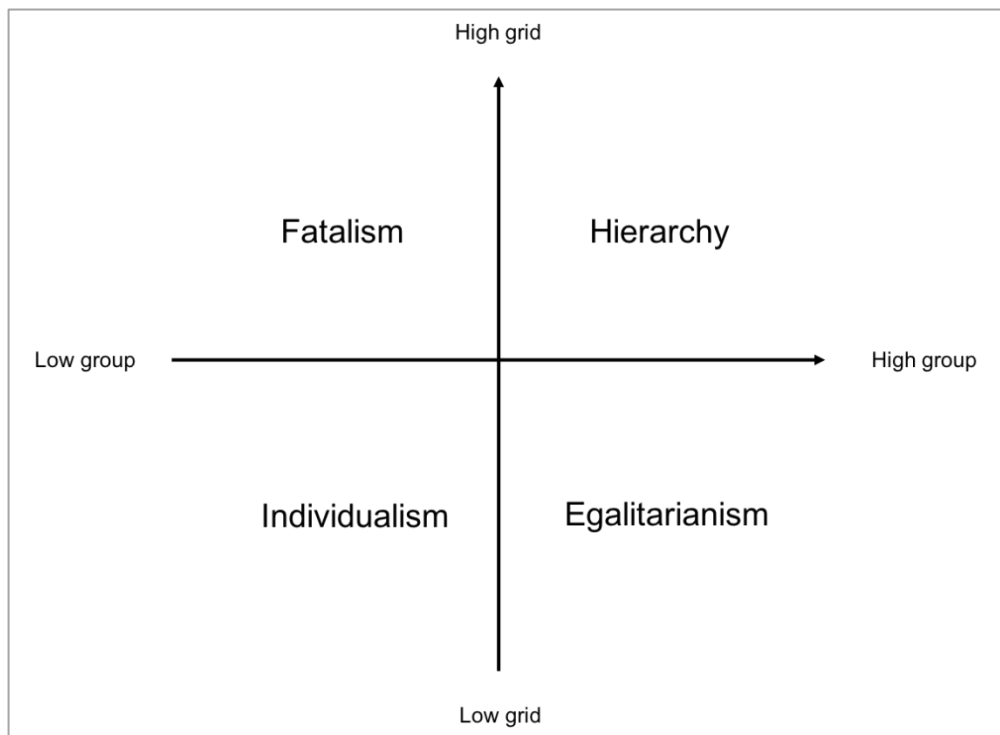


Figure 2.2 Grid-group typology, adapted from Douglas (1970; 1982)

2.3.3.2 Institutional pluralism

Pluralism is not a new concept and is not specific to cultural theory. The literature on legal pluralism goes beyond the concepts of property rights (as explored

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in the section on North (1990)) – which are usually defined in statutory law – and examines the co-existence and interaction between multiple legal orders, such as customary and religious laws (Meinzen-Dick and Pradhan, 2002; Meinzen-Dick and Nkonya, 2007; Cleaver, 2012). In one strand of the political sciences pluralism refers to polyarchy, a form of government in which autonomous organisations enjoy power, legitimacy and salience in political life, and make decisions on public matters (Dahl, 1984). Regarding the water sector, pluralism has been used to link two “incompatible” concepts: efficiency and equity (Wilder and Ingram, 2018). These two concepts are taken up in Chapter 7 and combined with a third, enforcement – thus completing the triangle of three rationalities. In this way, this thesis uses cultural theory with its lens on plural rationalities to provide insights into institutional pluralism, as discussed in detail in Chapter 7.

While several theories highlight the importance of pluralism and diversity, cultural theory defines the “minimum requisite social variety for self-adaptive socioeconomic systems” as the three solidarities of egalitarianism, hierarchy, and individualism (Rayner and Malone, 2000, pp. 59–60). These solidarities enable a dynamic rather than a static relationship, thus facilitating strategy-switching, which is an important component of institutional change (O’Riordan and Rayner, 1991; Rayner, 1995a; Thompson, 2013).

“Any of the three [market, hierarchy, collective] need the other two. Complex, overlapping, plural, interdependent civic institutions embodying diverse combinations of the three basic strategies represent the best means available to pressure and extend society’s capabilities to develop in a sustainable fashion [...]” (Rayner and Malone, 2000, p. 63).

2.3.3.3 Clumsy solutions

To return to where this chapter's discussion started, cultural theorists argue that in order to face complex challenges and solve problems, arrangements that allow the solidarities to coexist are required: so-called "clumsy solutions" (Shapiro, 1988; Lach, Ingram and Rayner, 2006; Verweij *et al.*, 2006; Thompson, 2013; Ney and Verweij, 2015). Clumsiness concerns both the effectiveness of addressing major social problems and the legitimacy of this process (Verweij *et al.*, 2006). The clumsy approach tends to combine all relevant policy styles, connecting creative market forces with governmental planning, including possibilities for local and civic action (Verweij *et al.*, 2006).

This thesis considers the idea of clumsy solutions and empirically tests them in terms of a pluralist arrangement designed to pool risks across rural water management cultures (Chapters 5 and 6) with the aim of providing further insight into whether such clumsy institutional systems can be consciously designed and maintained (Lodge and Hood, 2010). This relates to Hood, Rothstein and Baldwin's (2001) concept of risk regulation regimes. They use the term "regime" to denote:

"the complex of institutional geography, rules, practice, and animating ideas that are associated with the regulation of a particular risk [...] Institutional geography can vary in features such as scale, from international through national to local jurisdiction; integration, from a single agency [...] to highly fragmented administration and complex overlapping systems controlling related aspects of a risk" (Hood, Rothstein and Baldwin, 2001, p. 9).

Regimes are systems that include a variety of rules, targets, and practices, applied by "street bureaucrats" as well as policymakers. In the water sector, professional service providers are identified as constitutive of pluralist arrangements

through which the informal space may be integrated with the formal space at the meso level (between water user and county levels) in a comprehensive governance regime. They could thus mediate between individual and collective responses to water risks (Agrawal, 2008). In order to understand the role of institutions at the meso level it is essential to recognise that the key factors not only concern institutional norms related to the internal workings of meso-level institutions, but also their inter-relations and different forms of cooperation among public, private and civic organisations (Peters *et al.*, 2012). Peters *et al.* (2012, p. 25) call meso-level institutions the potential “bearers of solutions” – a concept that is tested in this thesis with regard to the pluralist arrangement for rural water maintenance – but also warn of their potential “twilight” character (Lund, 2006), where local conflicts, competition and coalitions manifest themselves.

A meso-level analysis is situated between the macroscopic level of whole-society characterisations, like Beck’s (1992) “risk society”, and the micro level of single-case studies of the policy settings appropriate for particular risks (Hood, Rothstein and Baldwin, 2001). Questions that arise from the literature include: can pluralist arrangements, which may be designed to be integrated into a governance regime, lead to higher efficiency? And, do pluralist arrangements represent a viable approach to the challenges of underperformance or failure of the rural water institutions to deliver sustainable services?

2.3.4 Pluralism under processes of homogenisation

A further aspect examined in this thesis concerns how certain regimes are established, and which forces trigger institutional change. This is the main question

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discussed in Chapter 7, which aims to explain how community management in the rural water sector has become the dominant regime and which processes would align it to be integrated with more pluralist arrangements. If institutions exert such a powerful influence over the ways in which people formulate their desires and work to attain them, then how does institutional change occur? The sociological perspective advanced by DiMaggio and Powell (1983, 1991) provides important insights into the drive towards institutional homogenisation against the backdrop of plural rationalities within the rural water sector.

At times, individuals change the rules of the game, at times the main forces for institutional change are system-inherent, and at times these are risk factors that are external to the system, such as climatic factors. In revisiting the “iron cage”, a term coined by Max Weber (1905), DiMaggio and Powell (1983) identify three isomorphic processes: a) coercive isomorphism, which can be attributed to political influence and contentious legitimacy; b) mimetic isomorphism, which originates in standard responses to uncertainty, especially with a high information asymmetry; and c) normative isomorphism, which is related to professionalisation.

Coercive isomorphism results from both formal and informal pressures exerted on organisations by other organisations upon which they are dependent and by cultural expectations in the society within which the organisations function. Such pressures may be felt not only as force, but also as persuasion (DiMaggio and Powell, 1983). In the context of the thesis, organisational change is a direct response to the government mandate: devolution and the creation of 47 county governments responsible for water services – who may feel coercive pressures not only through

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legal but also through electoral forces to deliver their mandate in the face of social and environmental risks.

Uncertainty encourages imitation in terms of replicating a widely propagated approach to rural water institutions – community management – at a superficial level. Such *mimetic* processes are pressures to copy or emulate other organisations' activities, systems, or structures and often stem from inadequate levels of information. Monitoring infrastructure performance and climatic conditions in arid and semiarid environments may be a first step to reduce uncertainty.

The third form of isomorphic pressures, *normative* processes, result essentially from professionalisation. They include the conditions set out and the methods applied by the members of a field, including knowledge and skills, and conform to standards that are considered legitimate.

This thesis draws on these three types of processes as they are critical in understanding how certain regimes are established and how they need to align for institutional change to be sustained. However, it should be mentioned that external forces, such as power struggles or corruption (Cornell and D'Arcy, 2014; Burbidge, 2015) may interfere with such target-related pressures, disturbing regime creation.

Originally observed in organisational analysis, isomorphic processes are examined in the rural water sector here to explain constraints on pluralism and the creation of cultural regimes. In any community, one cultural type tends to be dominant, and always strives to maintain its supremacy (Schwarz and Thompson, 1990). To allow for pluralism, which DiMaggio and Powell (1983, p. 158)

acknowledge as “a guiding value in public policy deliberations”, while encouraging diversification rather than homogenisation, they advocate new forms of intersectoral coordination, taking into account the structure of organisational fields as a whole. I apply their demand to the field of rural water services and investigate under which circumstances space emerges for new, pluralist, models to take hold when coercive, normative and mimetic processes are realigned.

2.4 Theoretical gaps and contributions

Whether the challenges of addressing water risks and finding sustainable management approaches to rural water services are called wicked, messy, or ill-structured, achieving an overlapping consensus among different solidarities appears crucial. Therefore, this review of the literature considers the combination of different policy styles, creative market forces, governmental planning, and possibilities for local and civic action that may be suited to tackle water challenges that unfold in processes of institutional transformation at international, national, and local levels. The main goal of this thesis is to explore how institutional arrangements are transformed to address varying water-related risks and to improve rural water services in a coherent governance regime. To this end, theoretical approaches to institutional change and pluralism are linked from the disciplines of political science, specifically public choice theory; anthropology, from the perspective of cultural theory; and sociology, through the lens of new institutionalism. The framework of this thesis (Figure 2.1) acknowledges the underlying rationale for dealing with risks and making choices in relation to the ideal-type solidarities, which may together form a pluralist arrangement.

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Each chapter of the thesis provides a different lens through which is examined the variation in the uptake of institutional change in the transformation of the rural water sector in Kenya. Across the literature discussed above, three overarching topics are identified for which this thesis provides empirical tests as well as theoretical contributions.

1. **Risks:** Risk perceptions vary depending on worldview, culture, sociopolitical values and socio-economic status, as well as the hydroclimatic context, *inter alia*. Each chapter examines a set of risk types, how they affect risk management and institutional choices, and how they potentially trigger strategy-switching to another type of arrangement. This can lead to a wider process of institutional change. The potential of pluralist solutions for behavioural and institutional change to respond more effectively to risks is examined across various scales, from the individual water user to the user group, the service provider, subnational governments, and national legislation.
2. **Pluralist institutions:** The research aims to provide insights into the plural rationalities of the state, market, and community in managing the water sector in response to a variety of risks. It does so in multiple ways: the rationalities and responsibilities of the newly established county bureaucracies are the subject of Chapters 4 and 7, *inter alia*; what has often been called “the community” level is examined in Chapters 5 and 6. However, instead of one distinct type of “community” approach, plural rationalities are at work in dealing with various risks in the management of rural waterpoints. The driving question of this thesis is whether the risks faced by the different solidarities

can be pooled and re-allocated in a pluralist arrangement combining market, state and community approaches to improve rural water services.

- 3. Regimes:** A regime perspective enables comparative description and analysis of the rules, institutional arrangements, and cultures that are bound up with the handling of risk within and between regimes (Hood, Rothstein and Baldwin, 2001). This thesis focuses on how actors manage water service risks at the local and the meso level but also considers certain aspects of how risks are dealt with at the county and national levels. This constitutes an initial step towards a regime perspective that includes not only bureaucrats but also the local managers. Community management can be seen as such a regime with processes of homogenisation reinforcing it in policy and practice. What it has largely been lacking is the meso level, defined in this context as the space where informal and formal institutions potentially meet, which plays a critical role in such regimes. Professional service providers are identified as constitutive of pluralist arrangements, which may mediate between the informal space and the formal space in a more coherent governance regime. By examining the clumsy imperative towards pluralism under processes of homogenisation, this thesis provides a new facet to existing theory, and it empirically tests the theory by examining how new models emerging in the water sector potentially lead to regime change. Further, it makes contributions in relation to strategies for re-scaling the Kenyan rural water sector through devolution as well as the increasing professionalisation of rural water services – all meeting at the meso level, allowing for closer proximity between duty-bearers and rights-holders.

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These three themes – risks, pluralist institutions, and regimes – summarise the core contributions of this thesis, which are to empirically test existing theories (Chapters 4 and 6) and to extend the theories (Chapters 5 and 7) by applying the empirical insights obtained through fieldwork. I conclude this review of the literature by referring back to the four conceptual questions outlined in Section 2.1.1 and applying them to the context of this study. I go on to identify the specific gaps and outline the theoretical as well as empirical contributions that each of the chapters that follow makes.

Research question (Chapter 4): *To what degree do certain sociopolitical risks influence the devolved decision-makers in accepting responsibility for the water service mandate?*

Gap: Distinguishing between “constitutional” and “ordinary” politics, public choice theory gives rise to the concept of polycentricity. Aligica and Boettke (2011) consider the theory a challenge to the “market” versus “state” dichotomy, an assumption deeply held in political and economic sciences in the twentieth century. Public choice is essentially about the choice among forms of organisation, institutional frameworks, and systems of rules. It implies that an ideal, universally acknowledged organisation or institutional arrangement does not exist but that decision-makers at all levels have to search for the arrangement that is best tailored to their needs, as it minimises the cost related to institutional instability or failure (Aligica and Boettke, 2011). Government decision-makers in the water sector face both political and socio-economic risks and, at the same time, have to mitigate some of the

socioclimatic risks faced by their electorate. The gap identified here is mainly an empirical one putting public choice theory to the test: after changes have taken place in the forms of organisation, institutional frameworks, and systems of rules through the devolution process in Kenya, how do the 47 new decision-makers respond to find suitable arrangements for the water users they are meant to serve?

Contribution: Chapter 4 develops a sociopolitical risk model reflecting the politics-as-exchange between decision-makers in the elected county governments and the respective populations. It is based on public choice theory (Ostrom, Tiebout and Warren, 1961; Ostrom and Ostrom, 1971; Ostrom, 1975, 1986; Buchanan and Tullock, 1999) and links it with the wider literature on decision-making under decentralisation (Crook, 2003; Smoke, 2003; Conyers, 2007; Crawford and Hartmann, 2008; Cheeseman, Lynch and Willis, 2016), providing empirical evidence of how sociopolitical risks shape pluralist choices across varying geographies and socioclimatic realities. The risk factors examined in this research include aridity, baseline water coverage, poverty rate, urbanisation level, water service satisfaction, and county water budgets. Together with the political risk reflected in the election margin, they all contribute to the county water ministers' perception of the responsibility constitutionally attributed to them.

While the decision-makers must target the community water users they are mandated to serve, public choice theory does not advance plural rationalities that different county policymakers may adopt. Their preferences for public, private or community provision of services are further explored in Chapter 7. As this thesis explores institutional change in the water sector across multiple scales, the following

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two chapters provide insights into the plural rationalities at the household and group levels and the degree to which they are open to institutional change towards professionalised services, the concurrent form of institutional change alongside devolution.

Research question (Chapter 5): *How are water risks managed across different institutional arrangements, and can these risks be pooled?*

Gap: Clumsy solutions have been identified by strands of the literature on the cultural theory of risk as a means to navigate the conflicts between the four solidarities that emerge in any institutional setting where representatives of several or all of these solidarities need to make decisions (Lach, Ingram and Rayner, 2006; Verweij *et al.*, 2006; Thompson, 2013). However, this thesis identifies a gap in extending the concept of clumsiness to settings that provide scope for cooperation and potentially higher effectiveness.

Contribution: Chapter 5 provides a three-fold contribution. First, it empirically tests the cultural theory framework in the rural water context. Second, it provides a new perspective on the fatalist culture – the waterpoints experiencing long-term management failure – by teasing out two types of fatalism: stoics and opportunists depending on their choice of alternative sources. Third, it provides insights into how a pluralist arrangement may be conceptualised at the meso level and implemented in the form of a professional service model pooling the risks faced by the three active cultures that are unable to tackle the problem of waterpoint

maintenance on their own. This chapter therefore further builds on North's (1990) institutionalisation of risk through innovations that lower the transaction costs explored earlier: risk-pooling through an insurance-type model, contractual agreements (Figure 2.1), and lowering of information costs through new monitoring technologies. This provides the theoretical ground for further empirical evaluation in terms of user uptake of the innovation meant to lower transaction costs in Chapter 6.

Research question (Chapter 6): *Which factors influence rural households and water user groups to sign up for a pluralist water service model?*

Gap: This chapter examines operational, financial and environmental factors that are commonly associated with Ostrom's (2011) IAD framework and her work on socio-ecological systems (2009a), and links these risk factors to the underlying management cultures developed in Chapter 5. Here, I therefore tackle the gap identified by Lodge and Hood (2010) that it has not been demonstrated how clumsy solutions can be designed and maintained. How effective is the pluralist arrangement in pooling the water risks of community-managed, bureaucratic and individualist cultures introduced in the previous chapter? There are few examples of empirically testing cultural theory through household surveys – which include the studies by Dake and Thompson (1993, 1999) – and even fewer that operationalise and examine the concept of pluralist arrangements, which this chapter addresses through analysing a 3,500-household panel survey.

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Contribution: Chapter 6 provides empirical insights into whether household users have the intent to, and whether water user groups actually change their behaviours and agree to contractual institutional change in managing their water services. Potential large-scale uptake might constitute the beginning of a regime change; however, this study only examines the first year of contract commitment. The legitimacy of the pluralist arrangement is examined through inquiring into the motivations for user groups to contract a maintenance service provider. The results show how effective the pluralist approach is in addressing different operational, organisational and affordability concerns by the different management cultures. Environmental context and management cultures interact in shaping behaviours, which can reduce risk and inform future policy and practice.

Research question (Chapter 7): *Which processes influence the realignment of state, market and community management arrangements towards a pluralist management regime?*

Gap: The SDGs – along with previous international agendas – have a normative and at times coercive power (DiMaggio and Powell, 1983) on agenda setting, as they tend to be associated with financial commitments, which frequently translates into the establishment of certain cultural regimes. Cultural theory provides vertical universality to explain four ideal-type solidarities from the household up to the national level (Grendstad and Selle, 1995). However, there is limited evidence of how cultural regimes are established and which forces are exerted on them or change them. This chapter extends the analysis of institutional transformation beyond county government decision-makers (Chapter 4), while acknowledging their different

rationalities; and it provides a theoretic approach to examine change occurring at state, market and community levels.

Contribution: Chapter 7 combines the theoretical perspectives of cultural theory (Thompson, Ellis and Wildavsky, 1990; Douglas, 1999) and institutional isomorphism (DiMaggio and Powell, 1983) to understand the forces of homogenisation exerted on the sociocultural institutions linking state, market, and communities, present at each level of analysis in the rural water sector. This allows insights into the various scales, into how community management has become the predominant cultural regime, and into the potential for realignment to allow for dynamic institutional change at national, subnational and local levels. The chapter therefore offers a theoretical and empirical opportunity to examine the tension facing pluralist arrangements under forces of homogenisation.

Overall, the theoretic tensions between the approaches of public choice, plural rationality and institutional isomorphism are juxtaposed in this thesis. They reflect the practical tension between universality and sustainability. Definitions of acceptable service levels vary across different user groups – however, international norms allow for little discretion (Gyawali and Thompson, 2016). The objective of applying these theories is to provide a theoretical argument for the challenges that pluralism faces despite accounting for variability. If the forces of homogenisation are too strong – or a set of sociopolitical risks pushes policymakers into decision-making pathways that do not allow for pluralism – such arrangements of overlapping consensus may be jeopardised. On the other hand, after failures of any single one of

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the state, market and community solidarities in achieving universal service delivery, pluralist arrangements for such ill-structured problems appear to be a worthy area for research – both theoretically and empirically.

3 Methodology

3.1 Introduction

Here I discuss issues around ontology, epistemology, and positionality, and outline research context as well as the methods applied in the doctoral research. How the data are used to pursue the thesis objectives is laid out in the section on analytical approaches. To coordinate the data collection campaigns, I spent more than one year in Kenya (mainly in Kwale and Kitui Counties, but also in Nairobi and some other county capitals). These campaigns co-led by myself and my colleagues in the Water Programme form a major component of the data pool, which is outlined in Table 3.1. Prior to data collection, research permits and approvals were obtained from the Government of Kenya's National Council of Science and Technology and Oxford University's Central University Research Ethics Committee. I close this chapter by outlining the limitations of the research.

3.2 On ontology, epistemology and positionality

3.2.1 Philosophical background

“[Is] there a ‘real’ world ‘out there’ that is independent of our knowledge of it” (Furlong and Marsh, 2010, p. 185)? Water users in sub-Saharan Africa would certainly answer this ontological question in the affirmative, with their whole existence depending on “real” water. However, the question is not limited to physical phenomena but also relates to social and political ones. The extension of this line of questioning in relation to access to water would therefore be: are there specific ways

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of organising waterpoint management that can be demarcated from each other? Beyond this first hermeneutic level, where actors interpret the world (for example reflected in data obtained through household surveys or interviews), there is a second hermeneutic level, where the actors' interpretations are in turn interpreted by the observer or researcher. The epistemological question is: can an observer identify "real" or "objective" relations between social phenomena (for example, how group affiliation influences risk perception), and if so, how (Furlong and Marsh, 2010)? These are also questions upon which I had to reflect while doing my research. Not only are the social and political data I collected derived from subjective responses, but my role as an investigator coming from a different cultural background potentially influences the results.

The type of methods applied in the research – quantitative or qualitative – depends on whether an empirical, hermeneutic or critical approach (Johnston, 1986) is taken, corresponding with the researcher's ontological stance – positivist, interpretist, or realist. Logical positivism in David Hume's (1987) empiricist tradition follows deductive methods, whereas adherents of the hermeneutic or interpretist tradition see the world as socially constructed and the observer, being part of it, as unable to be objective. They do not consider it possible to establish causal relationships between phenomena that are valid across time and space (Furlong and Marsh, 2010). Applying a mixed methods approach, my position would be classified as contemporary realism by Furlong and Marsh (2010), characterised by the search of "real" developments in view of changes in Kenya's rural water sector; but I equally acknowledge that social phenomena and the relationships between them are often not directly observable and that the individual and the social environment are interrelated.

Hay (2007) argues that neither ontological nor epistemological positions can be proved. I take an empirical approach to water services, while adopting a position which acknowledges the social construction of human existence to afford insights into behaviour change of individuals and groups.

3.2.2 My role in the research

In line with this theoretical foundation, the thesis applies a mixed methods approach through triangulating surveys (3,500 household panel and county water ministry survey), semi-structured interviews, focus group discussions, performance data, and case studies. According to the concurrent triangulation design, qualitative and quantitative methods are used independently and concurrently. Results are compared to assess their convergence, and the corroboration between qualitative and quantitative data enhances the validity of findings (Robson, 2011).

My understanding of the rural water sector in Kenya first developed during five months of qualitative fieldwork on acceptance and willingness-to-pay for a new professional maintenance service model – similar to the one evaluated in Chapters 5 and 6 – through focus group discussions (FGDs) and interviews in June-July and October-December 2013 (see *World Development* publication in Appendix 2). This experience provided an entry point into the discourse of water services in rural Kenya. It was a crucial foundation for taking on the much larger endeavour of co-leading the panel household survey through my DPhil research from 2013/14 to 2017. However, before the methods are explained in more detail, I engage in some reflections on positionality.

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From 2013 until 2017, I spent anything between four months to about two weeks at a time in my main research sites in Kwale and Kitui Counties outlined in more detail below, returning multiple times and thus building a longer-term relationship with the villagers and the main staff in the maintenance companies. Reflecting on my role as a researcher, I was at all times aware of how I may be perceived and to what extent responses may be biased given my identity as a white woman, born and raised in Germany, working for a university in the United Kingdom. My inability to have a sustained conversation in Swahili and to speak any of the tribal languages in the study sites – Kamba, Digo and Duruma – has, without doubt, had an impact on this research project. I had to work with translators, which often proved to be helpful in gaining access but may have reduced the quality of the data collected.

Depending on the context, being a Western woman had its benefits and limitations in a society that is starting to include gender norms in its political institutions but still faces severe imbalances – for example, the new constitution requires 30 per cent of the seats in parliament to be filled by women and each county to elect a Women Representative (Okoth, 2017). Whilst I was often met with an element of surprise and curiosity as to why I would spend several months away from my family to do research in a remote part of Kenya, it was exactly this longer-term engagement that opened up a more meaningful dialogue – not only with women in water user groups but also with mainly male political decision-makers. I perceived a distinct change and growing acceptance of, and at times even respect for, my work. I addressed these issues in practice by carefully weighing my options when making decisions and by being aware of and acknowledging the shortcomings that are inevitably a part of this research project. In many cases, the problems I faced during

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fieldwork taught me important lessons about the social and cultural context within which this project is situated, namely in a post-colonial environment, where tribal norms meet British-style statute and international law and regulations, and where research methods developed by international scholars are applied to remote African communities.

During the first fieldwork stay in Kitui County conducting FGDs with the 66 handpump user groups, I became very aware of the expectations that are raised when a “mzungu” – a person of white (European) descent – enters the research site. Working closely with two enumerators, I participated in the research at each of the sites, which provided me with valuable insights but at the same time with potentially biased responses. Moreover, navigating expectations, especially with regard to water services, is challenging as the majority of respondents would expect the research to coincide with improvements in their water supplies. This is – to an extent – not unfounded, as the research in both Kitui and Kwale Counties constitutes “research into action” feeding into the co-design of a maintenance service provider. It is also an important aspect in the reflection of the team’s wider research – that the design of the service provider is in a close feedback loop with the qualitative and quantitative data collected. Inevitably, these factors will have produced unquantifiable bias in the research reported in the chapters which follow.

In Kwale, I kept a certain level of distance to the researched user groups. While co-leading the training of the team of 25 enumerators, the pilot phase and the logistics of the entire 3,500 household survey across the three sub-counties Matuga, Msambweni, and Lunga Lunga, I tried to minimise my presence at homes when the

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enumerators conducted the survey interviews to avoid further bias beyond expectations produced by the wider project. I conducted quality control mainly through close examination of the recorded surveys on the tablets each night. A major challenge in Kwale relates to a certain level of research fatigue (Clark, 2008; Pascucci, 2016) among the population as development projects have operated in the area for many decades (Narayan-Parker, 1988). In areas where the main waterpoint had been non-functional for several years, we encountered some (though few) examples where longitudinal research proved difficult as the locals were dissatisfied with their situation.

I aimed to maintain a constant awareness of these dynamics both to improve the quality of the data and to reduce the negative impacts of my own presence. Being present in the main field sites for the whole duration of the research campaigns (each between three and four months at a time), I clearly reached a high level of visibility and – returning multiple times over the four years – a certain level of trust. It was during my last long stay in 2016 that I was invited to several homes to participate in the Eid celebrations – joining the family of the local imam in their home and gaining deeper insights into the local culture. I observed a similar phenomenon during my engagement with government representatives – both at the county and national levels. While initially my research interests in the consequences of devolution for the Kenyan water sector were met with surprise, continuous engagement over more than four years allowed not only increasing levels of access but was also met with a certain amount of respect from these contacts, particularly in the later stages of the research. I have shared the articles that have been published already as part of my doctoral research as well as shorter policy brief summaries (see Appendix 7) with a

number of local and national government contacts and remain in touch with them. I also plan to return to Kenya to present the final findings of this doctoral research.

3.3 Research sites and data collection

Kenya's socially diverse population of approximately 50 million belonging to forty-two ethnic groups live in a physically heterogeneous landscape between Ethiopia and Tanzania, Somalia, Uganda and South Sudan, including the Great Rift Valley (KNBS, 2014). Four fifths of the land are arid or semi-arid with extremely variable rainfall. Around a third of Kenyans live in these areas, keeping half the nation's livestock. Kenya remains a lower-middle-income country with high levels of inequality. The proportion of the population living below the poverty line was 36 per cent nationally in 2015/16 (ten per cent down over ten years), and the poverty head count was 40 per cent for rural areas (KIHBS, 2018). The country's ambition to achieve middle-income status by 2030 (Government of Kenya, 2007) and improve water supply for approximately 17 million poor people will likely be influenced by its ability to balance institutional challenges and water risks against competing growth and development goals.

The sites selected across Kenya are among the 13 poorest counties – with Kwale's and Kitui's poverty rates over 47 per cent and Turkana at the top of the list with 79 per cent (KIHBS, 2018). These three counties are along the semi-arid to arid corridor (Figure 3.1) with high rainfall variability (CGIAR-CSI, 2009). Rainfall distribution at the county level was one of the factors investigated in an analysis of

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factors potentially influencing the extent to which the 47 county water ministries have taken up their new water service mandate under devolution (Chapter 4). While each empirical chapter includes a detailed methodology section outlining how the chosen methods link with the theoretical framing, the main data collection campaigns are described in more detail below. An outline of which data collection campaigns were led by myself and which by colleagues in the Water Programme is also provided.

In terms of ethical considerations, participation in the various data collections campaigns was voluntary. Information about the study and its objectives was provided in all cases. Consent was either obtained in written form (national and county interviews) or orally (data collection campaigns in areas of low literacy in Kwale and Kitui Counties). Consent forms contained information about 1) the right to decline participation or withdraw participation at any point in time, 2) confidentiality procedures, 3) purposes of the research study structure, and 4) contact details for follow-up information. All data collected have been and will be treated confidentially.

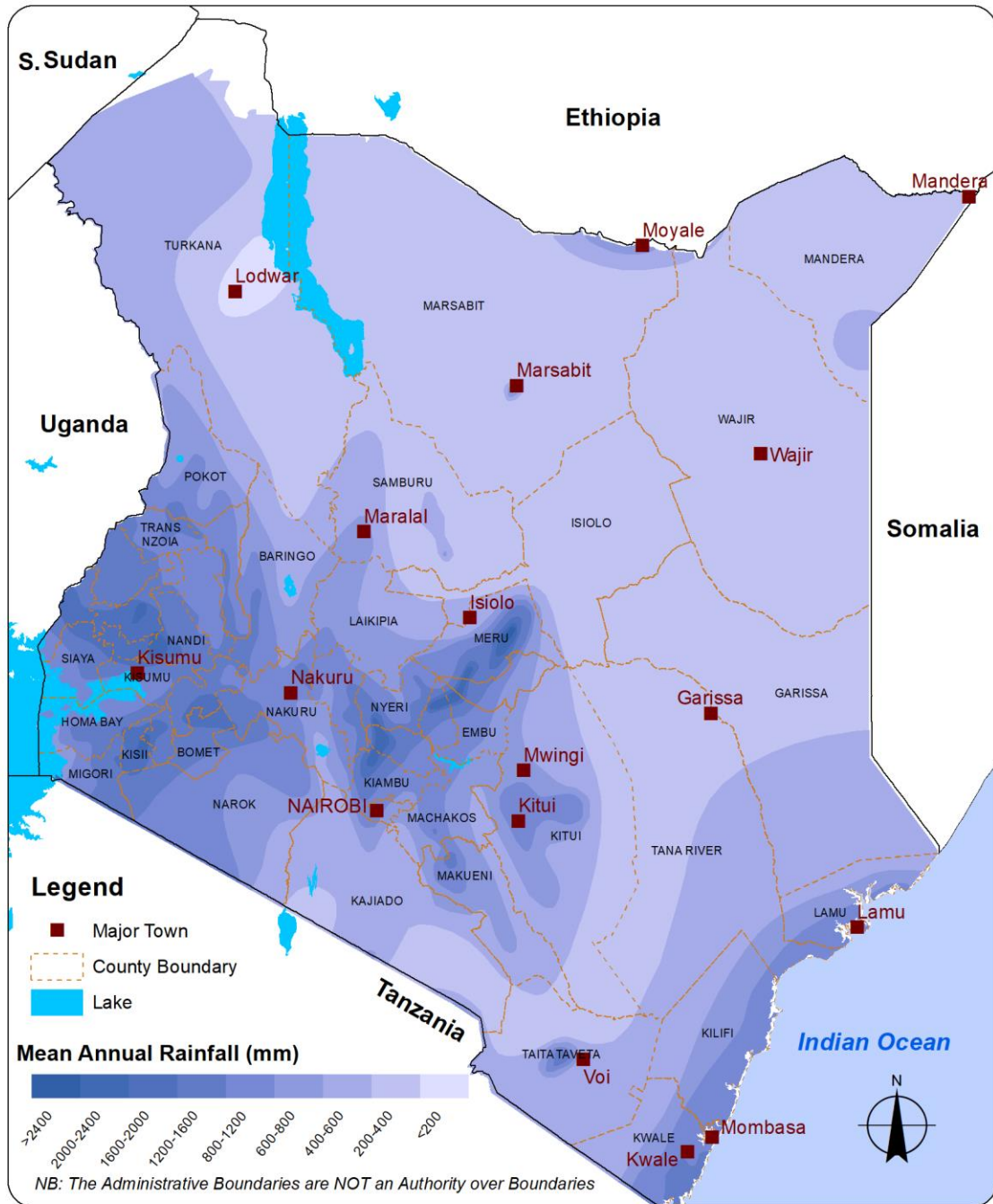


Figure 3.1 Mean annual rainfall in Kenya (CGIAR-CSI, 2009) (Map: J. Katuva)

3.3.1 National and cross-county data collection campaigns

3.3.1.1 Legal and policy document review

The thesis considers legal, political and administrative elements of the governance system. A legal document analysis of Kenya's Constitution (2010), the 2007 Water Sector Reform (Ministry of Water and Irrigation, 2007b), the National Water Services Strategy 2007-2015 (Ministry of Water and Irrigation, 2007a), the National Water Master Plan 2030 (WRMA, 2013), the 2002 Water Act (Republic of Kenya, 2002), the different stages of the draft Water Bill (Republic of Kenya, 2012, 2013, 2014), the Water Act 2016 (Republic of Kenya, 2016), County Water Bills, and Vision 2030 (Government of Kenya, 2007) has provided crucial insights into the legal framework for devolution in Kenya. It was complemented by numerous conversations with Professor Albert Mumma, University of Nairobi Law School, who has had a central role in drafting or advising on the majority of legal documents cited above.

3.3.1.2 Semi-structured interviews and county water ministry survey

In April and May 2015, 27 semi-structured interviews were conducted to guide the research on water sector transformation and the making of the Water Act 2016 (Republic of Kenya, 2016). Another 12 were conducted over the following year, complemented by more informal follow-up conversations (Appendix 6). Semi-structured interviews with policymakers at national and county levels helped to provide an overview of the changing institutional landscape and to design a survey for all 47 county water ministries examining the decision-makers' perceptions of

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responsibility for the water service mandate. In addition to selected representatives from county governments, national representatives were interviewed in the Ministry of Water and Irrigation (MWI), the Water Services Regulatory Board (WASREB), the Water Resources Authority (WRA), the Water Sector Trust Fund (WSTF), and the Water Tribunal.

Using the above information, a survey with members of all 47 county water ministries was designed to understand the uptake of the water service mandate in each of the counties, and conducted in two stages: a) through a survey at the first summit of the Members of the County Executive Committees (CEC) for Water in Baringo on 30 to 31 October 2015 organised by the Water Sector Trust Fund, where 26 of the 47 counties were represented; b) the remaining 21 surveys were undertaken either in person or over the telephone in November and December 2015. The survey instrument was explained to all participants and clarification questions were encouraged.⁸ Additionally, participant observation was conducted at the Baringo meeting, where CEC members and advisors developed a prototype County Water Services Bill to guide discussion on constitutional obligations and the implementation of their mandate.

⁸ The county water ministry survey questionnaire (CEC survey in short) is included in Appendix 3.

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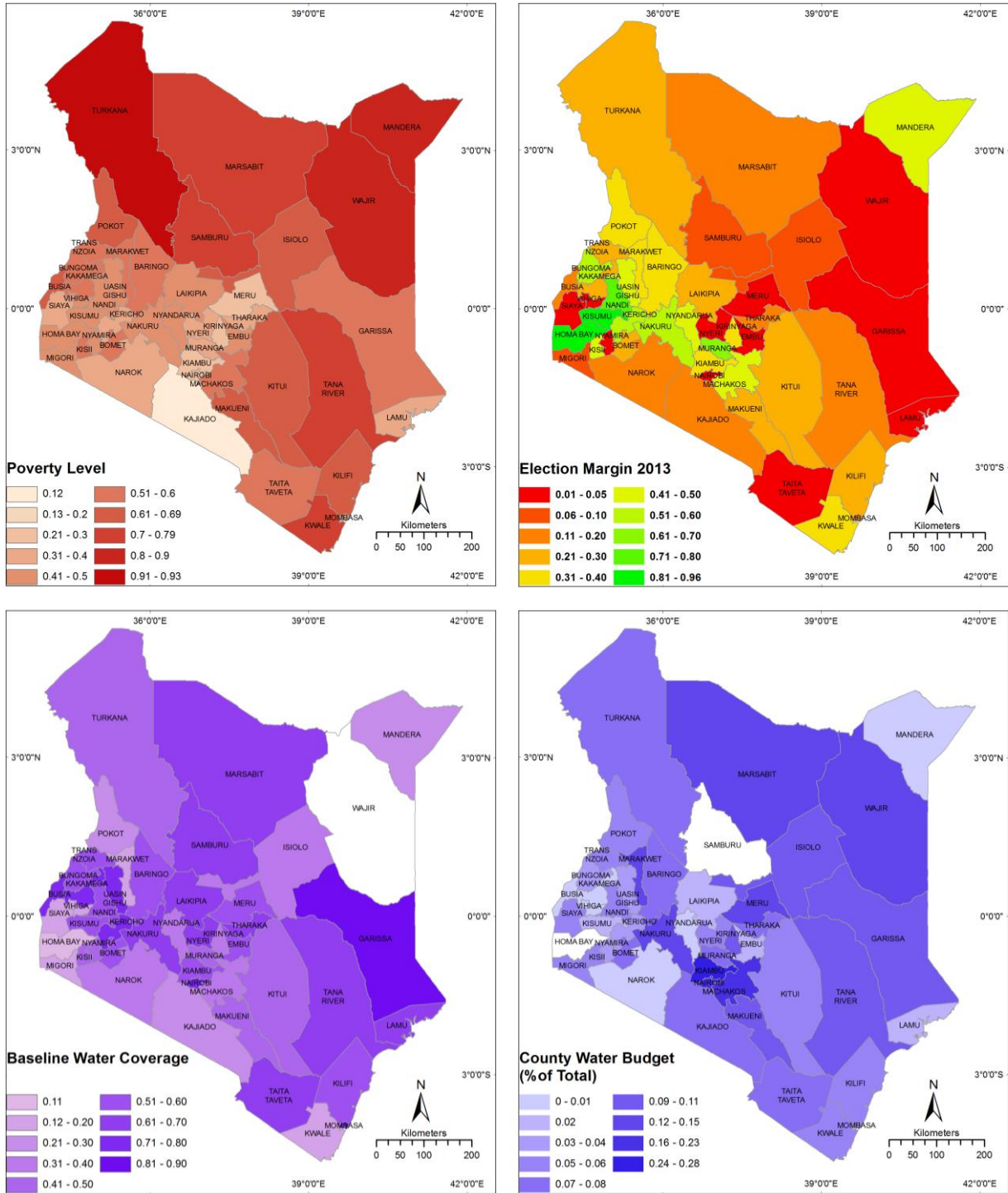


Figure 3.2 Kenya – selection of county level data

Top left: Poverty level (KNBS, 2006)

Top right: Election margin 2013 (Independent Electoral and Boundaries Commission, 2013)

Bottom left: Baseline Water Coverage (WASREB, 2013)

Bottom right: County Water Budget (CEC survey by author)

3.3.1.3 Other data sources

Other data sources (Figure 3.2) include the general election results from 4 March 2013 and from 8 August 2017 for the position of Governor (Independent Electoral and Boundaries Commission, 2013, 2017); the 2015 Afrobarometer survey (Afrobarometer, 2015); the Global Aridity Index (CGIAR-CSI, 2009); WASREB data from 2011/12 on water coverage as a baseline before county governments started operating (WASREB, 2013); the 2005/06 Kenya Integrated Household Budget Survey (KNBS, 2006) on poverty rate⁹; and the 2009 Kenya Population and Housing Census (KNBS, 2010).

3.3.2 Kwale County

3.3.2.1 Background

Kenya's challenge of rural water supply is particularly marked in Kwale County on the south-east coast with high rainfall variability. It forms the main study site of the doctoral research. At a size of 8,270 km², the county has an adjusted population of around 800,000 based on estimations since the 2009 census with a poverty rate of 47 per cent compared to the national average of 36 per cent (KIHBS, 2018). Figure 3.3 shows the welfare distribution in the study site drawn from the first household survey conducted in 2013/14 – the baseline of this research. From a political angle, Kwale is interesting due to the strong sense of marginalisation at the coast, influenced by the secessionist movement outgoing from Mombasa since 2005 (Willis and Chome, 2013). Meanwhile in economic terms, Kwale is a strategic county,

⁹ At the time of publication of the *Geoforum* article, the results of the 2015/16 survey were not yet available (released in 2018).

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being the site of Kenya's largest mine, Base Titanium Limited, which started its operations in October 2013, as well as irrigated sugarcane plantations and sugar production by Kwale International Sugar Company Limited (KISCOL). Coastal Kenya also plays host to variable but significant levels of international tourism. Rural communities and the new economic actors both draw from the same water resources, mainly the interacting shallow and deep aquifer system. Each of the circles (Figure 3.3) represents the handpump of a community, a school, a religious or health institution, or an individual household and is represented with its hourly volumetric usage (estimates based on data from "smart handpumps" with mobile-enabled transmitters (Thomson, Hope and Foster, 2012a)), which is used to understand rural water user demand across the study site.

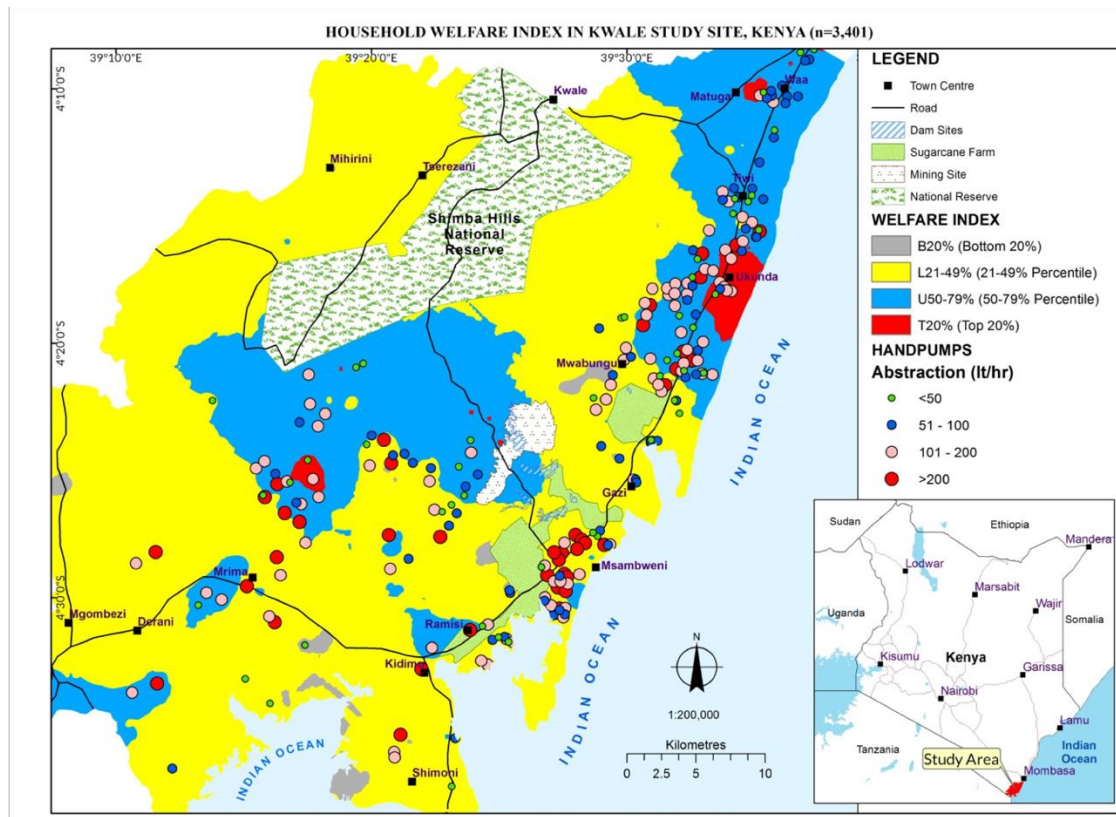


Figure 3.3 Kwale County – a site of social and economic change (Map: J. Katuva)

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In 2015, the maintenance service provider Kwale Handpump Services Ltd. (KHSL) started operating, maintaining exclusively existing water infrastructure for communities, schools, clinics, and other rural facilities. It represents one of the professional maintenance service providers examined as an example of the professionalisation of rural water services in the thesis. KHSL forms part of the FundiFix model (REACH, 2016b), which has two franchises (the other one is Miambani Ltd. in Kitui County introduced below). After a year of free service demonstrating the reduced downtime from 37 to less than three days, customers had the choice to sign annual contracts from January 2016. Under this arrangement the communities are still responsible for managing their waterpoints including fee collection among the users but they subcontract operation and maintenance tasks to the professional provider. The core component is performance-based contracts by which KHSL guarantees that professional mechanics repair rural water infrastructure within three days, supported by smart monitoring. If a repair exceeds three days, communities receive a free month of service, which serves as a penalty for poor performance. Customers are, in turn, expected to register through annual contracts and pay a monthly fee (USD 10 per user group) for the service, using mobile payments, and they receive messages on payment and service performance. The service is subsidised with local mining and agricultural companies contributing funds to a Water Services Maintenance Trust Fund (REACH, 2017b) that releases them to the maintenance service provider on a performance basis. This approach is described further and evaluated in terms of its uptake, potential, and limitations in Chapters 5, 6 and 7.

3.3.2.2 Data collection in Kwale

First, a waterpoint mapping census of 571 waterpoints was conducted in August 2013. This included structured interviews with water users capturing technical, institutional, operational, financial and geographical information.

Second, I co-designed and co-led three waves of a longitudinal household survey around these waterpoints in Kwale County. These surveys were undertaken in October 2013 to January 2014, March to May 2015, and September to November 2016 (wave 1: n=3,349; wave 2: n=3,567; wave 3: n=3,542). Household respondents across a stratified random sample from the three sub-counties Matuga, Msambweni, and Lunga Lunga were interviewed. At each of the handpumps, an average of six households were randomly selected. The household survey captured the following types of information: a) demographic, b) socio-economic, c) health, d) drinking water supplies, e) waterpoint management, f) welfare and assets, and g) devolution and governance.¹⁰ All the households surveyed were geo-referenced. A pilot survey was conducted with 25 experienced enumerators recruited from communities spanning the study area, who administered the surveys in the local languages (Swahili, 54%; Digo, 43%; Duruma, 2%; other, 1%). Attrition was due to households moving away and non-responses or refusal to participate a second time, though the majority (97%) of the households were successfully re-sampled. During these campaigns water quality tests were conducted at each waterpoint, taking measures for pH, electrical conductivity, and temperature of the groundwater.

¹⁰ The 2016 survey questionnaire is included in Appendix 4.



Figure 3.4 Household Survey, Milalani, Kwale County, 2015 (Photo: author)

Third, I also led a survey with representatives of water user committees at 531 handpumps in parallel with the first survey in 2013.¹¹ Fourth, a marketing survey was conducted with 300 handpump user groups to introduce them to the maintenance service provider KHSL and the terms of the contract. The survey was carried out by local community health volunteers following training, through pre-arranged community meetings during which the maintenance service was explained and key data were collected. Fifth, hourly data were collected on observed handpump usage over a twelve-month period from January to December 2014 from 300 handpumps fitted with Waterpoint Data Transmitters (Thomson, Hope and Foster, 2012a). Finally, data records were collected by the maintenance service provider on sign-up of waterpoint user groups, repair performance, and user payment behaviour from January until December 2016. These data are analysed in Chapters 5, 6 and 7.

¹¹ The water user committee survey questionnaire is included in Appendix 5.



Figure 3.5 Focus Group Discussion, Ramisi, Kwale County, 2015 (Photo: author)



Figure 3.6 Political campaigning at an abandoned water kiosk, Ngomeni rock catchment, Kitui County, 2015 (Photo: author)

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Table 3.1 Roles and responsibilities for data collection by myself and the team*

Data collection	Timeframe	Roles and responsibilities I assumed
NATIONAL		
Survey with 47 county water ministries	10-12/2015	<ul style="list-style-type: none"> • Co-designed questionnaire with RH • Conducted interviews • Entered and cleaned data
Semi-structured interviews	04-05/2015	<ul style="list-style-type: none"> • Designed semi-structured interview questionnaire • Conducted 27 interviews (plus follow-ups) • Transcribed, cleaned and coded data
KWALE		
Waterpoint mapping census	08/2013	<ul style="list-style-type: none"> • I was not involved in this data collection campaign – led by RH, TF and PT
Household survey 1	09-11/2013 01-02/2014	<ul style="list-style-type: none"> • Co-designed questionnaire with RH, TF and PT • Trained enumerators with RH and TF • Co-coordinated the implementation of the survey with TF over three months (logistical and administrative support provided by RFL)
Household survey 2	03-05/2015	<ul style="list-style-type: none"> • Adapted questionnaire with RH, TF and JK • Trained enumerators with RH, TF and JK • Coordinated and co-led the implementation of the survey over three months with JK (logistical and administrative support provided by RFL) • Ensured quality control throughout data collection • Cleaned data and prepared data for analysis
Household survey 3	09-11/2016	<ul style="list-style-type: none"> • Adapted questionnaire with RH and JK • Trained enumerators with RH, JK and SG • Coordinated and co-led the implementation of the survey over three months with JK (logistical and administrative support provided by RFL) • Ensured quality control throughout data collection • Cleaned data and prepared data for analysis
Water user committee survey	09-11/2013	<ul style="list-style-type: none"> • Designed questionnaire with feedback from RH • Trained enumerators • Coordinated and led the implementation of the survey along the first household survey • Ensured quality control throughout data collection • Cleaned data and prepared data for analysis

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Marketing survey	01-02/2016	<ul style="list-style-type: none"> • Contributed to design of survey • Implemented by SG and community health volunteers
Handpump usage	01-12/2014	<ul style="list-style-type: none"> • Data collection led by PT
Maintenance Service Provider Data	01-12/2016	<ul style="list-style-type: none"> • Data collected by Kwale Handpumps Services Ltd. • Cleaned and prepared data for analysis
KITUI		
Maintenance Service Provider data	01/2015-12/2016	<ul style="list-style-type: none"> • Data collected by Miambani Ltd. • Cleaned and prepared data for analysis
FGDs	06-07/2013 10-12/2013	<ul style="list-style-type: none"> • Co-designed FGD protocol with RH • Co-trained enumerators with RH • Coordinated and led the implementation of the FGDs with 639 water users • Entered, cleaned and coded data
Water audit	08/2016	<ul style="list-style-type: none"> • Co-designed questionnaire • Conducted by SG and JK
TURKANA		
Phone interviews	03-04/2018	<ul style="list-style-type: none"> • Designed semi-structured interview questionnaire • Conducted interviews • Transcribed, cleaned and coded data

* Involvement of colleagues noted with the following initials: RH = Rob Hope (supervisor); PT = Patrick Thomson (research colleague); TF = Tim Foster (PhD student with separate project); JK = Jacob Katuva (PhD student with separate project); SG = Susanna Goodall (research colleague); RFL = Rural Focus Ltd. (implementation partner)

3.3.3 Kitui County

Kitui County was chosen as a second study site as the maintenance service provider for rural waterpoint infrastructure established there in 2013 represents the prototype for the Kwale maintenance service provider. I carried out my earlier research as part of my master's degree and as a research assistant there and conducted follow-up visits throughout my thesis research. Data from the professional maintenance provider in Kitui supports the analysis of the emergence and performance of novel maintenance service providers in Kenya in Chapter 7.

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Like Kwale, Kitui County reflects the key challenges of building effective water-secure institutions in a semi-arid environment with high poverty, scattered populations, and rainfall extremes. The study focuses on the sub-county Mwingi North located 267 kilometres east of Nairobi with a population of 26,848 households (Government of Kenya, 2009). The population is almost entirely rural (89 per cent) with 47 per cent living in poverty (County Government of Kitui, 2013; KIHBS, 2018). An estimated 70 per cent of households rely on unimproved sources, such as ponds and rivers (Government of Kenya, 2009), which has negative health implications. Of the remainder, 30 per cent use wells or boreholes, which include 66 Afridev handpumps installed over the last 20 years. With support of the county government, these handpumps were equipped with mobile-enabled transmitters providing hourly volumetric data from 2013 to 2016. A local maintenance service provider was established in 2013 by which trained mechanics can respond to a breakdown within three days (compared to the previous average downtime of 27 days) (SSEE, 2014; Koehler, Thomson and Hope, 2015).



Figure 3.7 Kyuso Town, Kitui County, 2016 (Photo: author)

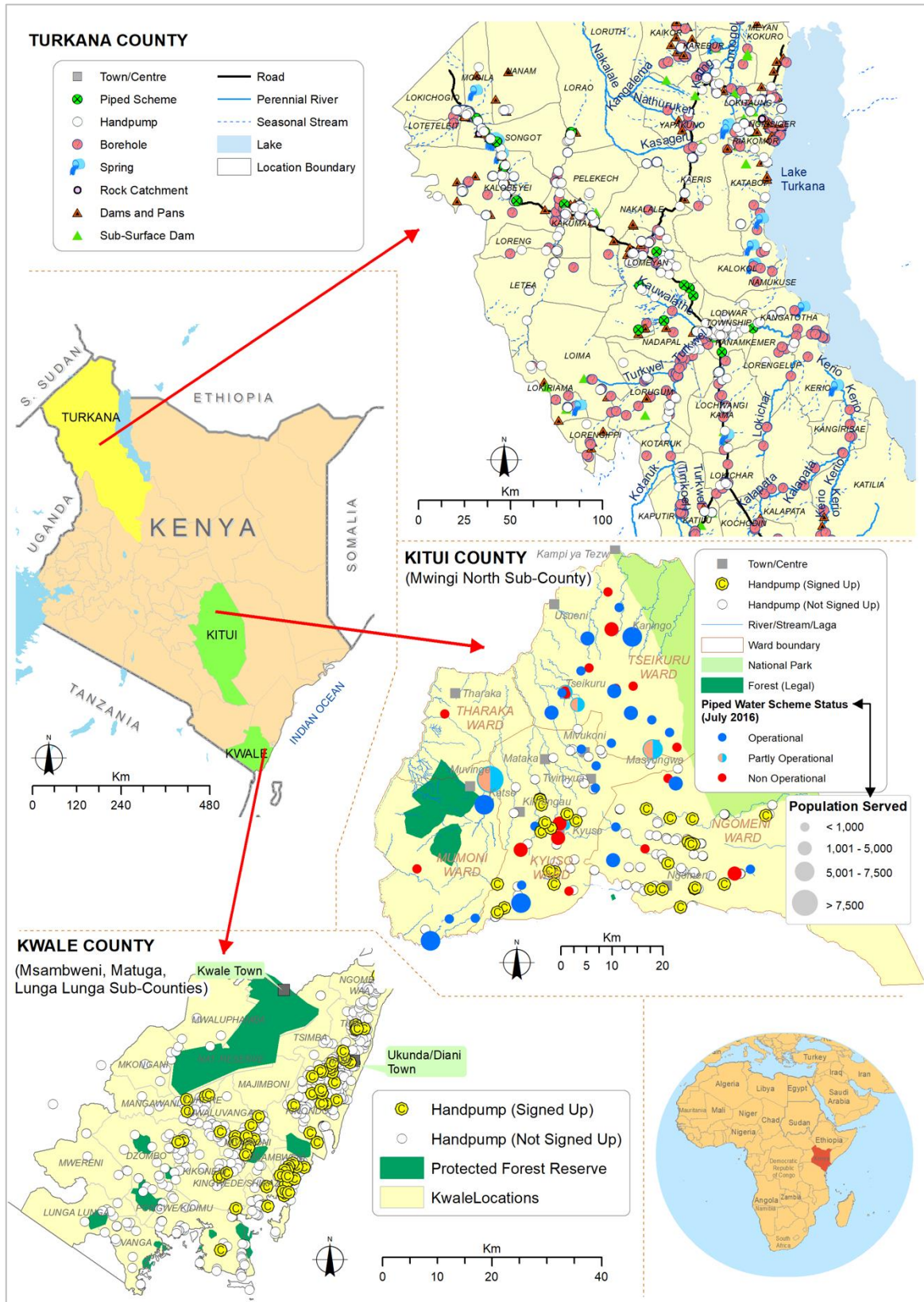


Figure 3.8 Kenya and study sites with rural maintenance service provider models (Map: J. Katuva)

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Since 2015, 44 per cent of the 66 handpump user groups have signed annual contracts with the professional maintenance service provider, Miambani Ltd., committing themselves to monthly payments in return for clearly specified maintenance services. Subsequently, maintenance services have been expanded to include piped schemes in the portfolio of Miambani Ltd., who collaborate closely with Kitui County Government. The professional service provider team visited all previously audited piped schemes to market the service, conducted a technical assessment of piped schemes to manage risks, and discussed the contracting modality with communities and their elected representatives in close liaison with Kitui County Government administrators and water department officers. By April 2018, the number of registered piped schemes was 28 serving a population of up to 60,000 people. Data gathered by Miambani Ltd. are used in Chapter 7.

3.3.4 Turkana County

Turkana County was chosen as another case study since it is experiencing some of the most severe water security challenges in Kenya and at the same time is the site of one of the longest-standing professional maintenance service models in the country and the region. The case study is presented in Chapter 7 but due to its minor role in the overall thesis, it is only introduced briefly here.

Turkana, one of the largest Kenyan counties in terms of area, with its population of over 855,000 (KNBS, 2013), is the poorest of the Kenyan counties with over half of the water users subsisting as pastoralists (KIHBS, 2018). Four recent changes have attracted new economic and political interest: a) the discovery of oil reserves in Lokichar area in 2012, which are expected to be worth USD 25 billion; b)

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the discovery of large groundwater aquifers in September 2013, including the Lotikipi Basin Aquifer with an estimated reserve of 207 billion cubic metres and the Lodwar Basin Aquifer with an estimated 10 billion cubic metres; c) the development of the Lamu Port and South Sudan Ethiopia Transport Corridor (LAPSSET), a USD 16 billion project as part of the Kenya Vision 2030 Strategy, which includes highways, railway lines, airports, oil pipelines, resort cities, and Lamu Port; and d) development of 300 megawatt solar energy installations and wind farms (REACH, 2015).

Long before these developments the Catholic Diocese of Lodwar installed a maintenance service model for rural water sources in the 1980s. Currently, two pump maintenance units fix infrastructure in all six sub-counties within two to three days, each of them serving approximately 500 sources, including handpumps, solar pumps, and piped schemes (Figure 3.8). With better access to mobile phones, water users have been able to directly inform the service provider in case of the breakdown of their water supply infrastructure. However, the long-standing model demonstrates that mobile technologies are not a prerequisite to a functioning service. Key to its long-term success is the network that the Catholic Diocese has built across the county, split into four parts with 27 parishes and offices.

The case study in Chapter 7 is based on data shared by the Catholic Diocese on rural water infrastructure maintenance as well as two phone interviews I conducted with one of the long-established representatives of the Catholic Diocese in March and April 2018. This case study is mainly chosen to demonstrate geographic and institutional variability in the study of professional maintenance service providers in rural Kenya and to account for the diversity of maintenance programmes.

3.4 Analytical approaches

The data described above comprise large datasets that can be used to explore questions related to the impact of institutional change on the rural water sector. The analytical approaches applied in each of the empirical chapters are outlined in detail in their methodology sections. Here I provide a brief overview.

Chapter 4: The level of responsibility by representatives of the 47 county water ministries for the new water service mandate is examined through the development of a Water Responsibility Index drawing on the survey conducted with the 47 county government officials. This method was chosen as the stated perceptions of responsibility allow comparisons across all counties in Kenya. The index is tested against political pressure through election margins and socioclimatic factors in line with the public choice framework by means of multivariable linear regression analyses.

Chapter 5: To examine the risks and values held by the four types of waterpoint institutions, descriptive analyses are conducted with waterpoint mapping data, household survey data including water quality measures, the survey of water user committee members, as well as the volumetric estimates from the Waterpoint Data Transmitters, all collected in Kwale County. Cultural theory (Wildavsky, 1987; Douglas, 1994) was deemed the most suitable framing to categorise the different management approaches found on the ground. This is one of the few studies that use household survey data to empirically test the cultural theory framing at a large scale (n=3,500).

Chapter 6: Sign-up behaviour of rural water users (household and group levels) to the professional maintenance service provider KHSL is tested against a number of operational, institutional, financial, water use and environmental factors by means of multivariate logistic regression analyses. In order to evaluate whether the significant factors vary across the management cultures derived from cultural theory, their differences of means are also tested. Additional evidence of both data and analytical approaches is provided in the Supplementary Information section of Chapter 6.

Chapter 7: The question of translating the SDG agenda into legislation and delivery models is addressed through a review of new water legislation, descriptive statistical analyses of the survey with the 47 county water ministries, as well as case studies of three professional service providers making use of databases kept by the maintenance service providers in Kwale, Kitui and Turkana Counties. These various methods allow insights into the tensions of pluralism and homogenisation across the different scales of Kenya's rural water sector. Additional evidence is provided in the Supplementary Information section of Chapter 7.

3.5 Statement on research collaboration and joint publication

As the doctoral research is linked to a wider programme of research work in Kwale and Kitui Counties, the data collection (Table 3.1) and preparation of papers involved collaboration with other colleagues at Oxford University, University of

Nairobi, and UNICEF. Table 3.2 outlines the specific roles and responsibilities I assumed in the relevant activities. The authorship declaration and detailed co-author agreements can be found in Appendix 1.

Table 3.2 Roles and responsibilities for publications*

Journal articles	Roles and responsibilities I assumed
Manuscript preparation	
<i>Geoforum</i> (single author) (published)	<ul style="list-style-type: none"> • Designed the sociopolitical risk model • Conducted all analyses • Wrote the paper (reviewed by RH)
<i>Global Environmental Change</i> (published)	<ul style="list-style-type: none"> • Designed the paper (with support from RH) • Conducted all analyses • Wrote the paper (with feedback from RH, SR, PT, JK)
<i>Global Environmental Change</i> (submitted)	<ul style="list-style-type: none"> • Designed the paper with RH • Conducted all analyses • Wrote the paper (with feedback from RH, SG, PT, JK)
<i>Transactions of the Institute of British Geographers</i> (submitted)	<ul style="list-style-type: none"> • Designed the paper • Conducted all analyses • Wrote the paper (with feedback from RH, SR, AT, PH, AM, PT, JK)

* Please see separate, signed co-author agreements. Involvement of colleagues noted with the following initials: RH = Rob Hope (supervisor); PT = Patrick Thomson (Oxford); JK = Jacob Katuva (Oxford); SG = Susanna Goodall (Oxford – at the time); SR = Steve Rayner (Oxford colleague & mentor); AM = Albert Mumma (University of Nairobi); AT = Andrew Trevett (UNICEF Kenya); PH = Peter Harvey (UNICEF Supply Division)

3.6 Limitations of the research

This section outlines the overall limitations of the thesis. Limitations of the empirical work are highlighted in each of the chapters (4-7). Beyond the limitations referred to in the section on positionality, six key limitations with regard to scope, methodology, theory, and data collection are presented below.

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First, the thesis represents a selective engagement with risk, which is defined in Section 2.2. It concentrates on water primarily intended for drinking, though small-scale productive uses such as livestock watering and less often minor crop irrigation are common. The examination of risk types, perceptions and management presented here focuses on a set of operational, financial, environmental, institutional, political and socio-economic risks and the behaviours these trigger. Water risks generally also include risks related to water quality and health (Bartram and Godfrey, 2015; Stauber and Casanova, 2015). Water quality is touched upon through field measurements of pH, electrical conductivity, and temperature, as well as through water quality concerns (smell, taste, colour) (Chapters 5 and 6); however, the thesis does not deal with water contamination – microbiological, chemical, or other. It does not examine health implications of drinking water services (other than subjective concerns gathered through the household surveys), neither does it engage with sanitation or hygiene behaviours and implications. To afford clarity and manage expectations of the reader, a definition of water risks is provided in the introduction and the literature review.

Second, the thesis also represents a selective engagement with institutional change in the rural water sector and the uptake of new institutional arrangements focusing specifically on the influence of risk on decision-making by devolved policymakers and water user groups. This research does not examine the “individual” *per se*, neither does it address the cognitive or affective factors that influence decision-making. Instead, this thesis focuses on the interpretative frame through which individual decisions are made against the background of a shared structuring of consciousness observable in public behaviour (Gross and Rayner, 1985; Bruner, 1990;

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Schwarz and Thompson, 1990; Rayner, 1991). Questions that remain unanswered include: What role do cognitive and affective factors play in accepting responsibility for a mandate? Why does an individual choose to become an entrepreneur? To what degree is adherence to community management a deliberate decision? Another methodological limitation is that this thesis does not provide insights into group decision-making at the “community” level: How are decisions made within a group? What happens at waterpoints where individual intent and group decision-making diverge? These are important questions but were beyond the scope of this approach to the research question of how institutions transform to deliver sustainable water services for the poor.

Third, cultural theory of risk provides the main theoretic framing for this thesis (Chapters 5-7), which specifically applies cultural theory to waterpoint management – not to wider community life. Two limitations with this approach are highlighted: first, issues of endogeneity can arise when examining the relationship between risks and management cultures as they are in a constant feedback loop. As risk perception is socially constructed, according to cultural theory, statements on risk and its severity in household interviews must also be assumed to be socially constructed. The theory is tested by observing users, what their main concerns are and how they respond to certain risks, including observable phenomena such as pH and salinity levels and breakdown times. The thesis does not draw causal relationships but tries to explain which factors may play a role in potential explanations of behaviour. Second, there is a degree of uncertainty over how intrinsic the management cultures are to belief systems and social relations of the user groups as well as the effect of external imposition of management approaches such as the

paradigm of community management long insisted upon by donors and implementers. Whether externally imposed or not, what can be observed is that users have adopted these approaches as their “management cultures” and adapted their behaviour to them.

A fourth limitation is therefore the focus on quantitative data collection for this thesis, which does not allow addressing the various degrees of how intrinsic the management cultures are nor does it provide clear insights into intra-household and intra-community behaviours. On the one hand the quantitative approach is a strength as it allows insights into and comparison of behaviours at a larger scale and thus follows one of the few quantitative studies that apply cultural theory modelling household behaviours across the four solidarities (Dake and Thompson, 1993, 1999). On the other hand, to address the points raised above, further qualitative fieldwork would need to be done in a small selection of communities to further develop the application of cultural theory to the rural water sector. This quantitative research may aid a more representative selection of different types of communities for qualitative research. More research with county water departments is also warranted as decision-making remains opaque and qualitative insights into the underlying motivations for mutually contradictory decisions, such as the building of infrastructure without plans for maintenance, would be highly valuable.

Fifth, while the household survey data collection was conducted with unreserved commitment, challenges in the field were unavoidable, including a number of duplicate interviews that had to be eliminated from the final dataset and enumerators had to be dismissed whose collected data did not match required

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standards. Though any anomalies and ambiguities evident in the records were discussed with the enumerators, the possibility of undetected errors or omitted information cannot be ruled out.

Finally, this thesis attempts to explain the complex network of factors affecting novel institutional arrangements and their uptake in the Kenyan rural water sector across local and subnational levels. A limitation and a strength of the thesis is that it examines the devolution process while it is unfolding in the country. The thesis can therefore provide detailed insights into the process but not into the outcome of the devolution reform. It should also be noted that the professional service models selected for study are not representative in Kenya. However, they do represent a trend that is emerging across sub-Saharan Africa towards professional service models in rural areas (RWSN, 2017). This thesis does not claim to provide a synthesis but offers some early insights into opportunities and barriers to uptake of such services through theoretical framing and painstaking data collection.

4 Exploring policy perceptions and responsibility of devolved decision-making for water service delivery in Kenya's 47 county governments

**Exploring policy perceptions and responsibility of devolved
decision-making for water service delivery
in Kenya's 47 county governments**

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Abstract

Improving water services is a well-rehearsed political instrument to win public support against a backdrop of a wide range of hydro-political realities in Africa. This paper examines whether devolution to Kenya's 47 counties advances the constitutional mandate for the human right to water. Specifically, it examines which factors influence decision-makers' perception of their responsibility for water service delivery in their counties. Drawing on interviews from all county water ministries, a sociopolitical risk model leveraging public choice theory is developed and tested. Information on election margin, climate risk, urbanisation, poverty levels, water budget and citizen satisfaction is modelled to explain variations in the policymakers' perceptions of their responsibilities. Results reveal that county water ministries recognise increased political responsibility for the poor outside current provision areas across water quantity, quality, accessibility and non-discrimination criteria. Affordability is the most contested criterion, with only a limited number of counties accepting responsibility. High socioclimatic risks and narrow election margins are likely to boost devolved duty-bearers' perception of responsibility for improved water service delivery. These variable factors demonstrate the interdependence of spatial and political dimensions during Kenya's devolution process and promote the conclusion that independent and strong regulation is critical to realising the human right to water for the great majority of Kenyans living in rural areas and facing unpredictable climate risks.

Key words: Devolution; Water services; Right to water; Risk; Responsibility; Kenya

4.1 Introduction

Perceptions by decision-makers in national and subnational governments are an important part of achieving sector goals. Without the support of frontline bureaucrats, political momentum may be limited (Hood, 2011). The goal scrutinised in this study is the right to safe water for all in adequate quantities (Government of Kenya, 2010; UNGA, 2010; UN, 2015). Improving water service delivery begins with the perception of responsibility by those in charge of implementing legal mandates. Change requires a strategic approach to align the constraints on achieving universal and safely managed drinking water services for all and incentives for public administrations mandated with delivering water services (North, 1990). Constraints and incentives are the focus of this study, which presents and applies a sociopolitical risk model leveraging public choice theory (Ostrom and Ostrom, 1971; Buchanan and Tullock, 1999).

The article is timely for three reasons. First, in the year of data collection, the goal of ensuring the availability and sustainable management of water and sanitation for all was endorsed by the United Nations General Assembly as part of the Sustainable Development Goals (SDGs) agenda 2015–2030 (UN, 2015). While not legally binding, this global agenda places the primary responsibility for sustainable development policies on governments. What is legally binding is national legislation; for example Kenya's 2010 Constitution mandated a new subnational level of government (counties) to guarantee the right to water and to deliver services such as water and health (Government of Kenya, 2010). The challenge facing the decision-makers is great. Three quarters of Kenya's population are not provided with drinking

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water services (WASREB, 2015), and global-level calculations indicate that only a third of the USD 114 billion of capital expenditure needed for SDG 6.1 and 6.2 is currently being spent (Hutton and Varughese, 2016). Availability of financial resources is likely to be one constraining factor on the degree of responsibility decision-makers are prepared to take. While previous studies have focused on valuation and measurement (Costanza *et al.*, 2016; Thomson and Koehler, 2016; Garrick *et al.*, 2017), this research examines a prerequisite to the attainment of the policy goals: perception and recognition of responsibility for delivering the various aspects of the right to water. This includes an investigation into the officeholders' willingness to introduce institutional change, and potential resistance to it.

Second, this is the first study to evaluate data capturing the perceptions of the decision-makers in all 47 counties mandated to deliver water services in the initial term of Kenya's devolution reform (2013–17). These data are used to compile an index on water service responsibility for the human right to water. The type of decentralisation introduced in Kenya is devolution. While decentralisation in general is defined as “a process of state reform composed by a set of public policies that transfer responsibilities, resources, or authority from higher to lower levels of government” (Falleti, 2005, p. 328), the most extensive form of decentralisation is devolution (Agrawal and Ostrom, 1999), which implies increased empowerment of subnational organisations (with county governments established as a new tier of government in Kenya in 2013). All members of the County Executive Committees (CECs)¹² – appointed by the elected governors – were required to interpret their

¹² “County Executive Committee Members” is the official term for “County Water Ministers”; however, the latter is more commonly used.

constitutional mandate and develop sector strategies and institutions during their first term of office.

Third, Kenya had its second round of gubernatorial elections in August 2017 under the shadow of recurrent droughts, which have tended to be used as a political tool to win international as well as public support for emergency and long-term interventions such as relief supplies or infrastructure investments (Wainaina, 2017). Using water in this way relies on the biopolitical significance of water governance and the capacity of water to transform human life and perspectives, from health to economic development (Hellberg, 2014). As 2.7 million people were facing starvation, President Uhuru Kenyatta declared drought a national disaster on 10 February 2017 (BBC, 2017), which brought water service delivery centre stage at national and subnational levels. This research contributes to establishing a baseline for the implementation phase at the start of the second of Kenya's electoral cycles under devolution. Just under half of the governors were re-elected (Independent Electoral and Boundaries Commission, 2017), which places great pressure on incumbents to deliver on their agendas and on newly elected candidates to surpass the achievements of their predecessors. Examining the factors that have influenced the degree of responsibility by the first duty-bearers in a devolved government may reveal stumbling blocks and highlight pathways for delivering water services for the next set of duty-bearers.

Drawing on unique data from interviewing decision-makers in all 47 county water ministries in Kenya, the variation in the perception of water service responsibility is examined across the criteria of the human right to water; the factors

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influencing these perceptions, including the role of tight gubernatorial election margins; and urban–rural dimensions across the four risk zones derived from the sociopolitical risk model. The implications are discussed along three themes: first, the balancing of risks facing county populations and decision-makers with opportunities for improving water service provision while consolidating public support, in light of public choice theory; second, the linkage between resource and responsibility; and third, harnessing the devolution process for progress towards the SDG of increasing reliable water services. The analysis shows that high sociopolitical risks are, to a large extent, acknowledged by the CEC members, but as political “entrepreneurs” (North, 1990) these devolved duty-bearers are also driven by gubernatorial election results and budget allocations. Recognising the various components of the water service mandate in light of socioclimatic and political risks is an important step in the process of translating them into implementation strategies, as variations in people’s attentional focus, perceptions and constructions of reality clearly impact on their actions (Carver and Scheier, 1981; Wood and Bandura, 1989). Providing insights into mandated decision-makers’ current perceptions and how the varying pressures they are exposed to affect them may therefore be an important contribution towards the global effort to streamline pathways to the effective implementation and monitoring of SDG 6.1 (WHO and UNICEF, 2015, 2017; Hutton and Varughese, 2016). To prevent increased regional disparities through varying recognition and implementation of the devolved mandate, national-level regulation is critical to ensure equity and consistency in the implementation of the water service mandate across varying geographies.

4.2 Background

4.2.1 Does devolution drive service delivery?

Decentralisation reforms are commonly introduced with the aim of moderating power concentration in the capital, enhancing the development of rural regions in particular (Crawford and Hartmann, 2008), and improving accountability and responsiveness within the system by altering governance structures (Faguet, 2014). The agents of change, political or economic “entrepreneurs”, are expected to respond to the incentives embodied in the institutional framework (North, 1990).

A significant amount of literature examines institutional transitions that aim at building pathways out of poverty in Africa and demonstrate varying impacts on service delivery (Nsibambi, 1998; Conyers, 2007; Robinson, 2007; Wekwete, 2007; Crawford and Hartmann, 2008; Palotti, 2008; Lein and Tagseth, 2009; Uhlendahl *et al.*, 2011) and poverty reduction (Bossuyt and Gould, 2000; Crook and Sverrisson, 2001; Von Braun and Grote, 2002; Francis and James, 2003; Vedeld, 2003; Grindle, 2007). Both background conditions (such as the political power structure) and process conditions (such as information flows) determine the impact of decentralisation. As outlined above, one important, but not sufficient, condition for effective implementation of decentralisation reforms is the perception of the devolved decision-makers of what their mandate entails. This has been identified as a gap in the literature.

Kenya has devolved certain functions and powers to the counties as a corrective to its underlying political shortcomings such as state over-centralisation,

which allowed certain ethnic groups to dominate politics, and eventually led to election violence (Cheeseman, Lynch and Willis, 2016; D'Arcy and Cornell, 2016). The election violence of 2007/08 is often cited as one of the reasons for introducing devolution, in order to promote a sense of inclusion among the multitude of ethnic groups (Cheeseman, 2011; Horowitz, 2015). In the run-up to Kenya's second general election under its devolved system, the centre of public attention was as much on the race over the hotly contested 47 governors' seats as it was on the presidential campaign (Waddilove, 2017). In line with Falleti's (2005) theory of sequential decentralisation, the 2010 Constitution gave the political process of devolution momentum from the outset, which placed political pressure on county stakeholders throughout their term and at the same time facilitated coordination among them. Some go as far as to describe devolution in Kenya as the "governance of governors" (Cheeseman, Lynch and Willis, 2016) – a political elite at the county level capable of acting in concert as a counterweight to the national government by building their own constituency while demonstrating their ability to protect local interests by fulfilling the constitutionally assigned functions. A danger highlighted by Crook and Sverrisson (2001) is the misdistribution¹³ of funds for ambiguously defined functions between the levels of government, which stable institutional arrangements may offset. Devolution in Kenya has also fostered the localisation of ethnic politics and led to the creation of new majorities and minorities in counties not overwhelmingly dominated by one ethnic group (Carrier and Kochore, 2014; Nyabira and Ayele, 2016), which may have implications for the delivery of public goods and services to all citizens, as certain areas may be unevenly targeted for investment (Kimenyi, 2006). This may also

¹³ In the sense that funds are allocated to national and county levels without precisely adapting them to the functions that the respective level has to fulfil under varying circumstances.

be a consequence of corruption (Treisman, 2002; Keefer and Khemani, 2005; Burbidge, 2015) and the “decentralisation of patronage networks” in Kenya (Cornell and D’Arcy, 2014).

A broad body of literature argues that governments subject to electoral competition are more likely to provide basic services to their citizens (Lake and Baum, 2001; Brown and Mobarak, 2009), including health, sanitation and supply of clean water (Besley and Kudamatsu, 2006). Providing easily accessible and reliable water services to citizens is a frequent election promise across Kenya’s county governments. Promises range from a certain distance – for example providing water within a 1000-metre radius of the household as specified by World Health Organisation (WHO) guidelines, depending on geography and population, to a certain timeframe, usually within a legislative period (Kimanthi, 2016; Zani, 2016; Cheron, 2017; Muthoni, 2017; Nyamori, 2017).

4.2.2 Political economy of the right to water in Kenya

This section provides an outline of the legal framework and the political economy determining the implementation of the right to water in Kenya. As part of its path towards middle-income country status, outlined in its Vision 2030 (Government of Kenya, 2007), Kenya subscribed to the human right to water and sanitation (UNGA, 2010). The conditions for the attainment of this human right include providing sufficient quantity, defined between 50 and 100 litres of water per person per day; potable quality in line with WHO guidelines; affordability (water costs that should not exceed three percent of the household income); physical access within 1000 metres, or within 30 minutes of the home; and non-discrimination, meeting

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gender, lifecycle and privacy requirements¹⁴ (UNOHCHR, 2005). The internationally defined criteria of the right to water, a constitutional right in Kenya since 2010, form the basis of the Water Responsibility Index developed in this paper (see Section 4.4.2). This right is defined in article 43 1(d) of the Constitution, which states that “every person has the right to clean and safe water in adequate quantities” (Government of Kenya, 2010). The duty-bearers mandated with its implementation are the 47 county governments through their county water ministries headed by CEC members for water. While water resource management essentially remains a national mandate, water service delivery has been fully devolved, as outlined in the Fourth Schedule, Part II, 11 (Government of Kenya, 2010). Kenya’s constitutional obligation is reflected in the Water Act 2016 (preceded by the Water Bill 2014), which more specifically defines the roles and obligations of national and county governments, also with regard to water services regulation (Republic of Kenya, 2016). Currently it is being translated into subnational laws and water strategies, following a prototype County Water and Sanitation Services Bill (Mumma and Thomas, 2016).

The reality on the ground is that only around 42 percent of the total Kenyan population are within formal water service provision areas and a mere 22 percent are actually served (WASREB, 2015). This suggests that the right to water faces several challenges from its inclusion in law to implementation on the ground. The dominance of the community-based management approach in rural areas over several decades is not least a result of the poor performance of many state systems, or forced state retrenchment related to structural adjustment (Agrawal and Gibson, 1999; Mosse, 2006; J. W. Hall *et al.*, 2014). At the household level, water continues to

¹⁴ Waterpoints should be positioned to enable use for personal hygiene, including menstrual hygiene.

feature as a primary concern. For example, in Kwale County on the Kenyan south coast, the main reason for supporting devolution is the expectation of faster access to service delivery (REACH, 2015). To increase citizen satisfaction by improving sector effectiveness, Ahmad *et al.* (2005) argue, strong relationships of accountability between the actors in the service delivery chain are critical. This is highlighted in the United Nations Universal Periodic Review for Kenya, which incentivises the country to ensure that the rights to water and sanitation are legally enforceable, particularly regarding gender and urban–rural inequalities, for which implementation gaps had been identified (UN Human Rights Council, 2015). These gaps fall under the human right criterion of non-discrimination. How the perceptions of the devolved decision-makers – with regard to addressing such inequalities and improving water service delivery – are influenced by a range of social, climatic and political risks is outlined below.

4.3 Sociopolitical risk model

How do different decision-makers respond to the risks at play in the political economies of delivering water services in terms of the level of responsibility they assume for their mandate? To address this question, the paper presents a sociopolitical risk model leveraging public choice theory, which is based on the three presuppositions of methodological individualism, rational choice and politics-as-exchange (Buchanan, 1954, 2003). More recent studies on behavioural public choice (Viscusi and Gayer, 2015) acknowledge that like all individuals, policymakers are subject to psychological biases as well as political pressures and incentives.

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Accordingly, when politicians and bureaucrats consider courses of action involving the chance of credit and the risk of blame, their expectations and attitudes to risk take centre stage (Hood, 2011). The decision-makers' determination to improve service delivery by addressing certain socioclimatic risks for the benefit of their electorate, while reducing their administration's risk of failing in forthcoming elections, can be seen as an expression of politics-as-exchange. Methodological individualism takes into account the decision-makers' perceived responsibility to implement their mandate by choosing the best possible strategy for themselves and the population they are serving. The notion of rational bargaining has to be stretched, however, in line with behavioural public choice theory, which holds that behaviour is also influenced by cognitive limitations and psychological biases, which represent political failures reflecting problems with individual preferences rather than systemic problems with incentives and institutions¹⁵ (Viscusi and Gayer, 2015). The sociopolitical risk model, it is argued, helps to examine the push-and-pull factors (risks and incentives) that the devolved duty-bearers experience in their endeavour to serve the electorate.

In a situation of high socioclimatic, or social or climatic, risks, for example through aridity, high poverty rates or urbanisation levels, which increase water demand, what effect do political risks, such as tight election margins, have on the duty-bearers' level of responsibility for their mandate – and vice versa? Following the logic of mutuality of gain, certain socioclimatic risks need addressing to avoid public bad: if those are high, there may be a high utility for duty-bearers in addressing them (Ostrom, 1975; Brown and Lall, 2006; Granados and Sánchez, 2014). If they face an incentive through competition over re-election, they may also anticipate a high utility

¹⁵ The definition is adapted from Viscusi and Gayer's (2015) behavioural economics definition.

for meeting their mandated obligations (Gutierrez, 2007; Eizenga, 2015). The sociopolitical risk model presented here provides a tool to examine how political and socioclimatic risks interact and affect perceptions. For example, it may be able to explain why, under similar socioclimatic conditions, two decision-makers have different perceptions of responsibility. They may be experiencing varying degrees of political pressure. High socioclimatic *and* political risks may imply that decision-makers are strongly incentivised for risk *mitigation* through embracing far-reaching responsibility for their mandate; high political risks but low socioclimatic risks may incentivise them for close *monitoring*; low political risk but high socioclimatic risks may lead to an *acknowledgement* of their responsibility, which may have important implications as having reliable water supply has been associated with improved levels of health and livelihoods (Hunter, MacDonald and Carter, 2010); whereas low overall risks may imply that it is less harmful to *ignore* responsibility. Therefore, the sociopolitical risk model provides a conceptual frame for the empirical analysis of socioclimatic factors and electoral competition, which are hypothesised to influence the decision-makers' perception of their responsibility across four risk zones (Figure 4.1). This model could be applied to different types of service provision, including water, health and education.

Political Risk	high	monitored	mitigated
	low	ignored	acknowledged
		low	high
		Socioclimatic Risk	

Figure 4.1 Sociopolitical risk model

Here, the model is applied to the issue of service delivery under devolution in Kenya, where the CEC members in the “decision-making centres” (Carlisle and Gruby, 2017) of the county governments play an important role, as their interpretation of the mandate determines the outcome. The framework rules set in the “constitutional politics” arena and laid down in the constitution govern their decision-making, which is part of “ordinary politics” and has to be exercised within the constitutionally defined boundaries (Buchanan and Tullock, 1999). National and county legislation is therefore guided by constitutional framework rules, yet enacted through ordinary politics in legislative assemblies. Accordingly, as part of ordinary politics the CEC members depend on the legislative behaviour of the members of the county assemblies (who, like the governors, have to run highly competitive election campaigns) (Lang’at and Ochieng, 2017). In addition to varying risks, they find themselves subject to intra- and inter-county trade-offs, and to interactions between

county and national levels. This is recognised by Kenya's Constitution, which binds "all persons and all state organs at both levels of government", described as "distinct and interdependent", to "conduct their mutual relations on the basis of consultation and cooperation" (Government of Kenya, 2010).

The first test of this study thus examines whether the decision-makers' perceived responsibility for the water service mandate is consistent with the legal norms that define it. The second test comprises an examination of why differences may prevail and if there is a declining engagement with the water service mandate with lower risks along the "mitigated", "monitored", "acknowledged" and "ignored" zones (see application to the empirical data in Section 4.5.3). As the members of the County Executive Committees are appointed by the governors, they depend on their re-election. Hence, elected politicians as well as appointed CEC members may attach value to the provision of public services, not least to convince the voters of their achievements. This internal motivation augments political pressure through the constitutional obligation as well as acts and policies of national government. The question of whether or not socioclimatic risks affect water policy choices refers to Grey and Sadoff's (2007) observation that many societies with a legacy of "difficult" hydrology have remained poor. Certainly, higher investments in service delivery are required to respond to challenges in water-scarce areas (Government of Kenya, 2015; NEMA, 2015; Hutton and Varughese, 2016), which links to the final question of the role of water budget allocations and their influence on the devolved decision-makers' perceptions of responsibility for delivering drinking water services to all Kenyans.

4.4 Methodology

4.4.1 Data collection

This paper applies a mixed methods approach. Semi-structured interviews with policymakers at national and county levels helped shape the survey examining the stakeholders' perceptions of the water service mandate. In April and May 2015, 27 semi-structured interviews were conducted to guide the research on water sector transformation and the making of the Water Act 2016 (Republic of Kenya, 2016). In addition to selected representatives from county governments, national representatives were interviewed in the Ministry of Water and Irrigation, the Water Services Regulatory Board (WASREB), the Water Resources Management Authority (WRMA), now Water Resources Authority, the Water Services Trust Fund, now Water Sector Trust Fund (WSTF), and the Water Appeal Board, now Water Tribunal.

The data underpinning this study were collected through a survey with members of all 47 county water ministries in two stages: (a) through a survey conducted at the first summit of the members of the CECs for Water in Baringo on 30–31 October 2015 organised by WSTF, where 26 of the 47 counties were represented; (b) the remaining 21 surveys were undertaken either in person or over the telephone in November and December 2015. Of the surveys, 72 percent were conducted with the CEC members for water themselves. Some directed their Chief Officers (15 percent) or Directors of Water Services (11 percent) to respond. Representing the frontline bureaucrats in the county water ministries, these individuals were deemed best suited by the CEC members for water to respond to the

question of perceived responsibility for the water service mandate, which is measured in terms of subjective statements. While these responses do not constitute formal resolutions, they indicate how county mandates were interpreted towards the end of the three-year transition period. A similar analysis should be conducted once county legislation is finalised and implemented. The survey instrument was explained to all participants and clarification questions were encouraged. Participant observation was further conducted at the Baringo meeting, where a prototype County Water Services Bill was developed to guide the CEC members' discussion on constitutional obligations and the implementation of their mandate.¹⁶

Other data sources include the gubernatorial election results of 4 March 2013 and 8 August 2017¹⁷ for the position of Governor (Independent Electoral and Boundaries Commission, 2013, 2017), the 2015 Afrobarometer survey (Afrobarometer, 2015), the Global Aridity Index (CGIAR-CSI, 2009), 2011/12 WASREB data on water coverage as a baseline before county governments started operating (WASREB, 2013), the 2005/06 Kenya Integrated Household Budget Survey (KNBS, 2006) on poverty rate,¹⁸ and the 2009 Kenya Population and Housing Census (KNBS, 2010) (see Table 4.1). Two major limitations have been identified with the selection of the independent variables. First, the 2015 Afrobarometer survey has a relatively low sample size per county. Second, the 2013 election margin, measured as the percent margin between election results of the winning candidate and runner-up in the 2013 gubernatorial elections for the position of governor, is

¹⁶ Prior to data collection, research permits and approvals were obtained from the Government of Kenya's National Council of Science and Technology and the Central University Research Ethics Committee at the author's institution.

¹⁷ Transmission date of gubernatorial election results: 28 September 2017.

¹⁸ A new KIHBS survey was conducted in 2015/16; however, the data were not yet available at the time of the analysis of the paper.

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acknowledged to be an imperfect tool to measure political pressure, as political alliances can change and have done so, and new competitors, for example senators, have entered the race. Nor does the variable capture the wider competition within counties as reflected in primaries. However, the 2013 gubernatorial election margins serve as an orientation for the first county governments in Kenya to gauge their public support. Moreover, the decision-makers' perception of responsibility was stated in 2015, which is very likely influenced by the experience of the 2013 elections in a similar way as by opinion polls providing an indication of voting preferences for the 2017 elections that were still two years away at the time of the interviews. Given the unreliability of opinion poll data even close to an anticipated election, the experience of actual election results was deemed more suitable in this context. Yet, it is important to acknowledge that election data are also disputed. While the most suitable variable at hand, their reliability is not guaranteed; and, although the introduction of new processes, such as biometric verification, raised public confidence prior to the 2013 elections, implementation lagged behind (Cheeseman, Lynch and Willis, 2014). Election margins from the August 2017 gubernatorial elections that reflect the changes in terms of alliances were also tested in the regression analysis and were significant, although with a smaller effect. This adds validity to the choice of gubernatorial election margins as an independent variable for capturing political pressure.

Table 4.1 Definitions of variables included in the analysis

Variables	Definition	Data source
Dependent variable		
Water Responsibility Index	Level of responsibility accepted by county water ministries in terms of sufficient quantity, potable quality, affordability, physical access and non-discrimination for urban and rural areas	CEC survey
Explanatory variables		
Election margin	Percent margin between election results of winning candidate and runner-up in 2013 gubernatorial elections for governors' seats	IEBC 2013
Aridity ^a	0 = sub-humid to humid 1 = semi-arid to arid	CGIAR-CSI 2009
Baseline water coverage	Percentage of people served with drinking water by a utility (percentage of the total population within the service area of the utility in 2013)	WASREB 2013
Poverty rate	Percentage of county population living in poverty, 2005/06	KNBS 2006
Urbanisation level	Percentage of county population living in urban areas, 2009	KNBS 2010
Water service satisfaction	Binary level of citizen satisfaction with current government handling water and sanitation services 0 = unsatisfied 1 = satisfied	Afrobarometer 2015
County water budget	County water budget, as percent of total county budget in FY 2015/16	CEC survey

^a Aridity was transformed into a binary variable, as averaging rainfall across the political county boundaries would not reflect the often-high variation between arid and humid regions. This variable reflects the climate zone for the larger part of each county.

4.4.2 Data analysis

Descriptive and regression analyses are applied to examine the uptake of the water service mandate in Kenya. The analysis aims to provide insights into how policymakers tailor the interpretation of their responsibilities considering the incentives and constraints they face. To analyse the difference between urban and

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rural settings in view of the human rights criteria the risk ratio is examined. A Water Responsibility Index is created, drawing on the acknowledgement of responsibility across the five criteria derived from the human right to water enshrined in Kenya's Constitution: (a) sufficient quantity, (b) potable quality, (c) affordability, (d) physical access, and (e) non-discrimination. This responsibility index is also created for only urban and only rural water services across the same criteria. The participants in the CEC survey were asked to answer "yes" or "no" to the following question across the five criteria for both urban and rural areas: "Today, is the County Government responsible for drinking water service delivery across the criteria below?" The criteria are evenly weighted for urban and rural areas. This Water Responsibility Index serves as the dependent variable in the regression analysis. The data sources for the independent variables are outlined in Table 4.1. Ethnic representation in the county was not included in the statistical analysis as it is related with election margin (D'Arcy and Cornell, 2016; Malik, 2016; Nyabira and Ayele, 2016; Abdille, 2017). This is supported by a national baseline survey by the Society for International Development (SID, 2012), which finds that over a third of the respondents are likely to adhere to ethnic considerations when electing their governor.

Kenya is a country "rich" in variability, as illustrated by the political and socioclimatic factors examined in this study (Table 4.2). The mean election margin was 27 percent in 2013, compared to 26 percent in 2017, but the range extends almost across the whole spectrum from close to zero up to over 90 percent for both elections. Similarly, urbanisation levels, poverty rates and baseline water coverage stretch across wide ranges. Even county water budgets range between close to zero to

28 percent of the overall county budgets, which inevitably drives response mechanisms to water service delivery.

Table 4.2 Characteristics of counties included in regression models

a. Summary statistics of continuous variables

Measure	Percentage			
	Mean	SD	Min	Max
Election margin 2013 (%) (n=47)	27.4	24.4	1	96
County water budget (% of total) (n=45) ^a	7.2	5.8	0	28
Urbanisation level (%) (n=47)	25.9	20.3	7	100
Poverty rate (%) (n=47)	50.9	18.1	12	93
Baseline water coverage 2013 (%) (n=46) ^b	49.3	19.5	11	81

^a One value was not available, and one outlier was removed: county ministry for water incorporated mandates for roads and infrastructure – hence the budget was not comparable to that of other counties.

^b One value was not available from the WASREB dataset.

b. Summary statistics of binary variables

Aridity	Sub-humid to humid 47% (n=22)	Semi-arid to arid 53% (n=25)
Water service satisfaction	Satisfied 66% (n=31)	Unsatisfied 34% (n=16)

Multiple linear regression models test the factors influencing county water service responsibilities in general (as summarised in the Water Responsibility Index), as well as urban and rural water service responsibility respectively. With a 100 percent response rate, all counties were captured in the CEC survey; however, the small number of observations for a regression analysis is acknowledged. Miles and Shevlin (2001) argue that with six predictors, a sample size of around 50 is likely sufficient for detecting large effects. The regression models are also mainly applied to test factors

influencing the decision-makers' perceived responsibility for the water service mandate rather than to predict the exact impact.

4.5 Results

4.5.1 Variations in the perception of the water service mandate across Kenya's counties

When taking stock of the current state of drinking water provision in their counties, 49 percent of the water ministries consider drinking water provision satisfactory for urban, and 28 percent for rural areas; between 13 and 15 percent state that they have insufficient capacity to fulfil the water users' expectations for urban and rural areas respectively. How these perceptions reflect their level of responsibility for delivering water services to all county citizens is analysed below. The following factors are examined: (a) the variation in the perception of water service responsibility across the human right to water criteria, (b) sociopolitical factors influencing these perceptions, and (c) urban–rural dimensions across the four risk zones derived from the sociopolitical risk model.

Article 174(f) of the Constitution refers to the spatial dimension requiring the devolution of government to include “the provision of proximate, easily accessible services throughout Kenya”, and Article 232 (1)(c) determines “the values and principles of public service include responsive, prompt, effective, impartial provision of services” (Government of Kenya, 2010). However, when county decision-makers were asked whether they acknowledged responsibility of the five categories of sufficient quantity, potable quality, affordability, physical access, and

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non-discrimination for water service provision, the response was mixed (Table 4.3). According to common practice, the question is disaggregated for urban and rural areas. Responsibilities are acknowledged between the 50–80 percent range – no criterion is universally adopted across Kenya. Affordability appears to be the most contested criterion for urban and rural areas. Of all the criteria, water being of potable quality stands out: the respondents are 30 percent more likely to view this as their responsibility in an urban context than in a rural one. The following section examines which factors influence the acknowledgement of these responsibilities by the duty-bearers.

Table 4.3 Summary statistics for acceptance of water service responsibilities by county water ministries

a. Water service responsibilities

Water service responsibilities	Urban		Rural		Urban vs. rural	
	Yes	No	Yes	No	RR ^a	p
Sufficient quantity	70% (32)	30% (14)	59% (26)	41% (18)	1.2	0.16
Potable quality	77% (34)	23% (10)	60% (25)	40% (17)	1.3*	0.04
Affordability	57% (26)	43% (20)	54% (23)	46% (20)	1.1	0.39
Physical access	78% (35)	22% (10)	72% (31)	23% (12)	1.1	0.28
Non-discrimination	79% (35)	22% (10)	77% (34)	23% (10)	1.0	0.48

^a Risk ratio: This represents the likelihood of a respondent thinking that a characteristic of water service delivery is their responsibility in an urban context relative to a rural one.

* indicates statistically significant association at 5% level ($p < 0.05$)

b. Fair tariffs^b and provision levels

Measure	Urban (46) ^c				Rural (47)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Fair tariff (USD/m ³) ^d	1.15	1.05	0.49	>4.93	1.43	1.08	0.49	>4.93
Fair drinking water provision (l/c/day)	43	12	10	>50	31	14	10	>50

^b This is a subjective measure captured in the CEC survey. The question, disaggregated into urban and rural, was: “What do you consider a fair drinking water tariff?”

^c Data were not available for one county.

^d Conversion Rate: 1 KES = 0.01 USD (6 March 2016)

4.5.2 Which factors influence the perception of the water service mandate?

Drawing on the sociopolitical risk model, a number of socioclimatic and political risk factors are empirically tested (Table 4.4 and Table 4.5). For purposes of interpretability, multivariate linear regression models were used rather than generalised linear models, since the difference in the root mean square error was small. The disadvantage of linear models is that the predicted values are not constrained between zero and one, and three values are beyond the valid range.¹⁹ Due to missing data, 41 of 47 cases are observed for all models. There appears to be no collinearity in the data, as there are no substantial correlations ($r > 0.5$) in the predictors. Fifty-nine percent of the variance in water service responsibilities is explained through Model 1, which appears to be a relatively good fit given that responses are driven by subjectivity and other factors that cannot be captured here. The Durbin-Watson statistic (2.17) suggests that the errors in the regression are independent. The analysis of variance test (Model 1: $F = 6.83$, $p < 0.001$) suggests that the model is significantly better at predicting the outcome than using the mean as a best guess.

¹⁹ The variable “election margin” was transformed into its square root (SQRT) as we do not expect a linear relationship of this variable with the outcome variable and the square root transformation provided a close to normal distribution. Similarly, for a close to normal distribution the variable “urbanisation level” was transformed into a natural logarithm (Ln).

Table 4.4 Results of multivariable linear regression analysis with Water Responsibility Index as dependent variable

Explanatory variables	Model 1 fit: $R^2 = 0.592$			
	Unstandardised coefficients		Standardised coefficients	
	B	S.E.	Beta	P
Aridity	0.082	0.083	0.134	0.329
County water budget	1.848**	0.659	0.356**	0.008
SQRT election margin 2013	-0.447*	0.166	-0.330*	0.011
Ln urbanisation level	0.296***	0.073	0.556***	<0.001
Poverty rate	0.881**	0.260	0.506**	0.002
Water service satisfaction	0.177*	0.081	0.277*	0.037
Baseline water coverage	-0.499*	0.193	-0.294*	0.015

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

All variables apart from aridity are statistically significant in Model 1 at the five percent level. If all other variables are held constant, Model 1 suggests that a widening of the election margin is associated with a decrease in the Water Responsibility Index (for further associations see Figure 4.2).²⁰ Higher poverty and urbanisation rates in the county are associated with an increase in water service responsibility. A higher baseline coverage is associated with a decrease in service responsibility levels. These findings may suggest that poorer and underserved (especially urban) areas tend to gain a specific level of attention by the county decision-makers. An increase in water service satisfaction is associated with higher water service responsibility, which may mutually reinforce an upward trend. An increase in the county water budget has a strong positive effect on water responsibility levels, which supports the notion that it is linked to the capacity to deliver the mandate.

²⁰ A model with the margins from the 2017 gubernatorial elections supports this trend, but the effect is smaller.

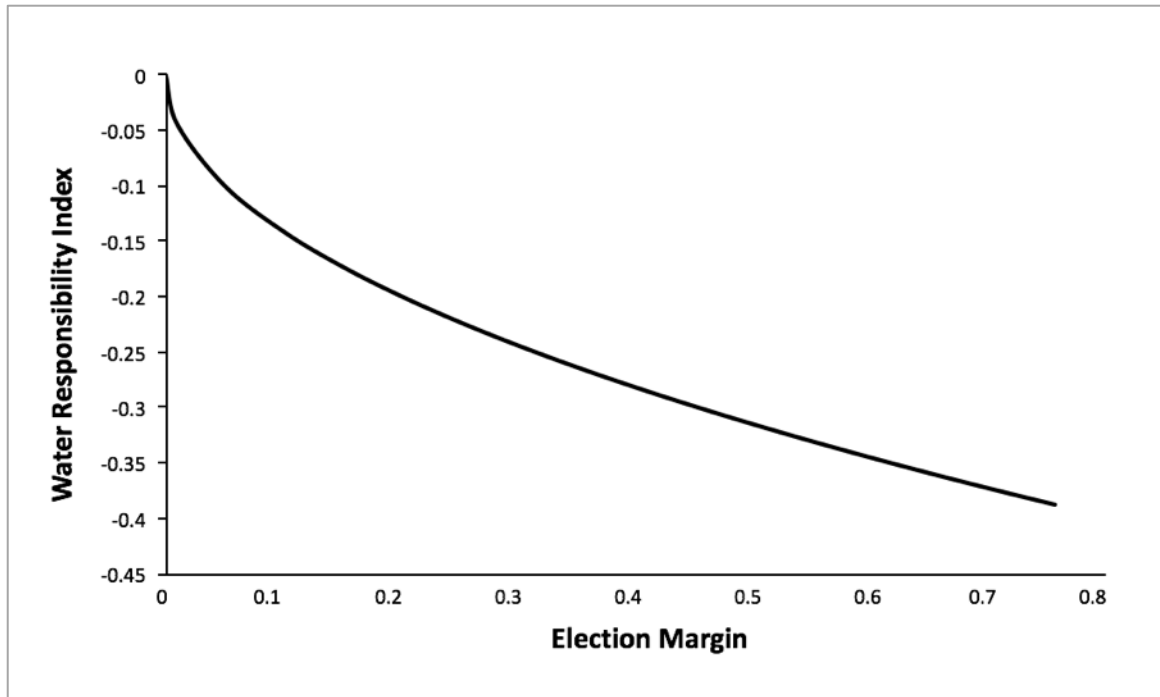


Figure 4.2 Predicted association between widening of Election Margin and Water Responsibility Index (Model 1)

These results can be further disaggregated by examining the level of responsibility across all five criteria for urban and rural areas individually (Table 4.5). Forty-one out of 47 variables are observed, and 46 percent (Model 2) and 43 percent (Model 3) of the variance in urban and rural water service responsibility levels are explained respectively. The most striking findings here are that only two variables are significant across both models; the largest effect is for the county water budget. Having access to more finance is likely to influence service responsibility for rural areas in particular, and a higher poverty rate has double the effect on water service responsibility for rural areas compared to urban areas. A lower baseline coverage seems to be a significant factor for responsibility levels in urban settings, but not in rural ones.

Table 4.5 Results of multivariable linear regression models with Urban versus Rural Water Responsibility Index as dependent variables

Dependent variable:	Urban Water Responsibility index Model 2 fit: $R^2 = 0.456$			Rural Water Responsibility Index Model 3 fit: $R^2=0.428$		
Explanatory variables	Coef.	S.E.	P	Coef.	S.E.	P
Aridity	0.000	0.103	0.998	0.132	0.120	0.277
County water budget	1.765*	0.813	0.037	2.209*	0.951	0.026
SQRT election margin	-0.310	0.210	0.148	-0.549*	0.240	0.029
Ln urbanisation level	0.268**	0.081	0.002	0.260*	0.108	0.019
Poverty rate	0.504	0.323	0.128	1.166**	0.375	0.004
Water service satisfaction	0.136	0.097	0.171	0.170	0.117	0.155
Baseline water coverage	-0.672**	0.240	0.008	-0.397	0.279	0.164

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

4.5.3 Water service responsibilities across risk zones in Kenya's 47 counties

Understanding the spatial variation of responsibility for water service delivery by the devolved duty-bearers provides important insights into the relationship between the various political and socioclimatic risks and how these can be clustered into the four risk zones of the sociopolitical risk model. Figure 4.3 shows the spatial distribution of election margins in the 2013 elections and current water service responsibility levels.

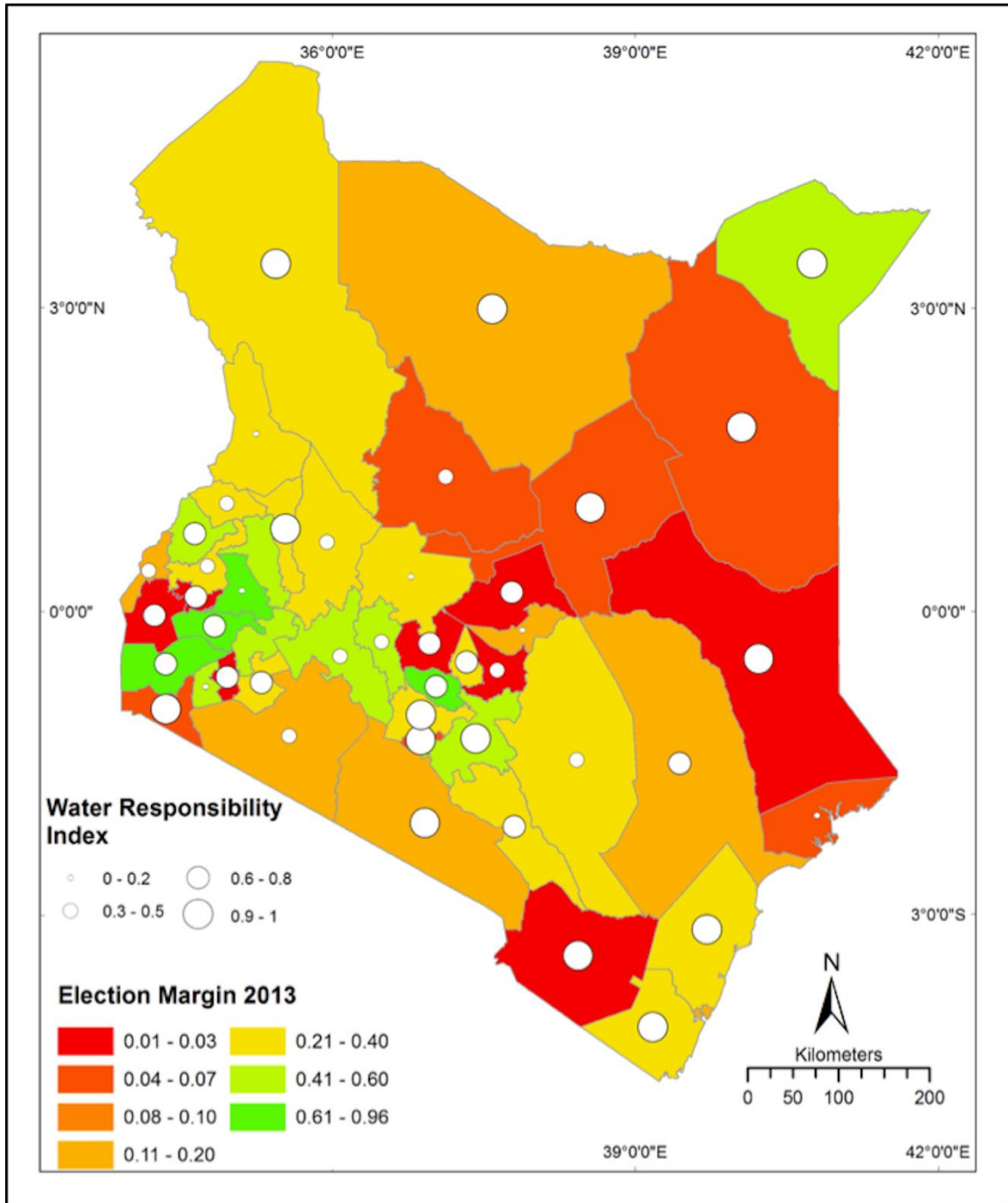


Figure 4.3 Map of Kenya showing Election Margin 2013 and Water Responsibility Index

Applying the model to evaluate the perceived responsibility for the water service mandate across varying political and socioclimatic risks (Figure 4.4) allows for the examination of the responses across the four quadrants: risk mitigated, monitored, acknowledged and ignored. The risks scrutinised here are binary variables: electoral

pressure as margins closer or wider than ten percent²¹ in the 2013 elections, and poverty levels below or above the median across Kenya (49 percent). Cross-tabulating political risk as expressed in close election margins with poverty levels, the highest level of mean responsibility appears to be in the high-risk quadrant for electoral pressure and poverty. Decision-makers in the counties falling into this quadrant appear to have a high recognition of their mandate; however, only five counties (11 percent) are covered here.

Electoral Pressure	high <10% margin	n=9	Urban	Rural	n=5	Urban	Rural
		Sufficient quantity	78%	50%	Sufficient quantity	80%	80%
		Potable quality	89%	50%	Potable quality	100%	80%
		Affordability	56%	33%	Affordability	60%	100%
	Physical access	89%	78%	Physical access	100%	100%	
	Non-discrimination	89%	78%	Non-discrimination	100%	100%	
	low >10% margin	n=13	Urban	Rural	n=19	Urban	Rural
		Sufficient quantity	64%	46%	Sufficient quantity	63%	63%
Potable quality		64%	30%	Potable quality	74%	74%	
Affordability		62%	46%	Affordability	53%	58%	
Physical access	77%	46%	Physical access	68%	79%		
Non-discrimination	75%	64%	Non-discrimination	68%	79%		
		low		high			
		Poverty					

Figure 4.4 Five water services responsibilities across the risk zones

Examining the five criteria of the Water Responsibility Index in more detail for the high-risk quadrant, it appears responsibility for physical access to water services and non-discrimination are fully accepted (100 percent) for urban and rural

²¹ The analysis was conducted for five and ten percent margins, yielding similar results. Due to small sample size for high electoral pressure, ten percent was chosen, which was also selected as a suitable threshold for tight margins by Nelson (1996) and Fisman *et al.* (2014).

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areas. Across the risk zones, the only other criterion scoring 100 percent is affordability. It is important to note that the five (mainly northern and north-eastern) counties in this quadrant have a very high proportion of poor, rural populations (Figure 4.3), which may explain the specific focus on affordability for those particularly marginalised areas. However, since the guarantee for potable quality is more difficult to provide for point sources in rural areas, it has a higher score for urban areas. In these largely arid counties, sufficient quantity is the least accepted criterion due to water scarcity (Peletz *et al.*, 2016; Okullo, Moturi and Ogendi, 2017).

Whether high acknowledgement of responsibility for the service provision criteria leads to actual mitigation strategies, remains to be shown. The acknowledgement of responsibilities appears to generally decrease across the risk zones in 's' shape from top right down to bottom left (the low-risk quadrant), where four categories in the rural domain are below the 50 percent mark. Of Kenya's counties, 28 percent are situated in the risk ignored quadrant. While political and socioclimatic risks may be relatively lower in this quadrant, the duty-bearers' mandate for these 28 percent of counties is the same, according to the Agenda 2030: water service delivery for all that are currently not served, which highlights the importance of regulation in Kenya's devolved system.

For all those 32 counties facing low electoral pressure, the water service responsibilities for the five categories are lower, on average. When it comes to affordability, those in the high poverty and low electoral pressure quadrant would face the highest tariffs if the subjective statements in the survey were implemented in practice. Duty-bearers stated that a fair tariff for rural water provision in these 19

counties would be USD 1.69 per cubic metre²² (USD 0.21 more than urban fair tariffs in this quadrant). This is extremely high considering the global poverty line, currently defined at USD 1.90 per day (World Bank, 2015b). These findings relate to important discussions about subsidies and pro-poor measures. Of the political entrepreneurs at the county level, 40 percent state that users should pay the full cost of water provision. Of those counties supporting subsidies, the majority (57 percent) state that county governments should pay for the subsidy, followed by donors (26 percent) and the national government (23 percent). Given the variability of the affordability criterion, the consideration of subsidies and who should pay for them appears to be an important implication for the capacity to deliver SDG target 6.1.

4.6 Implications

4.6.1 Balancing risks and opportunities for the water service mandate

The political entrepreneurs at the devolved governments are appointed for a four-year term to deliver the right to water to all Kenyans. They are tasked with ensuring their counties are on track with the sustainable development agenda. Their – not least fiscal – capacity to balance socioclimatic and political risks with the uptake of responsibility for the full mandate will ultimately determine the success or failure of Kenya’s institutional transformation in responding to the sustainable development challenge. While behavioural public choice theory assumes decision-making is not

²² When applying the Mann-Whitney *U* test, fair tariff levels for rural areas in high poverty counties differed significantly from fair tariff levels in rural areas in low poverty counties ($U = 356, p < 0.05$).

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only determined by goal orientation but also by cognitive and psychological factors (Viscusi and Gayer, 2015), Hood (2007, 2011) points to the decision-makers' endeavour to avoid blame and achieve positive feedback. Officeholders' perceptions are therefore likely to be influenced by the risks facing them. This section discusses the balancing of collective risks for the county population – ideally achieving *low perceived harm* – against individual risks for the officeholder with *high perceived responsibility* for underserved and poorer areas (Ostrom and Ostrom, 1971; Hood, 2011; McGinnis and Ostrom, 2011). Since all the criteria of sufficient quantity, potable quality, affordability, physical access and non-discrimination are not fully acknowledged by the decision-makers in all 47 counties, the sociopolitical risk model helps to empirically test which (a) socioclimatic and (b) political risks impact on the duty-bearers' perception of responsibility for the water service mandate. Variations in perceptions of responsibility for urban and rural areas are also highlighted.

First, in line with the principle of mutuality of gain (Buchanan and Yoon, 2000), the utility for decision-makers seems to increase with both rising socioclimatic and political risks. In terms of the collective risks faced by the county populations, the findings suggest that, across the 47 county water ministries, water service responsibility is higher for those parts of the population *outside* current provision areas. This is an important finding: in 2015, when the data underlying this study were collected, only 22 percent of Kenya's population were served in terms of water service coverage (WASREB, 2015). The distinction between urban and rural responsibility levels shows that baseline water coverage (see Table 4.1) is only significant for urban areas, suggesting that county decision-makers' responsibility focuses on urban areas currently not served but within the reach of water service

providers, whereas rural areas may appear out of reach. The second finding relating to collective risks suggests that a higher poverty level in the county has a positive effect on the decision-makers' responsibility levels. When disaggregated for urban and rural areas, this factor is only significant for rural areas (and has double the effect), which might indicate that the hotspots in rural areas receive higher levels of attention after being neglected and left to the communities under centralised government arrangements (Mamdani, 1996; Blaikie, 2006). If responsibility is correlated with delivery,²³ this finding can be considered as promising for progress towards the sustainable development agenda.

Second, the motivation for acknowledging responsibility for the unserved may be reinforced by the anticipation of positive feedback in elections due to recognisable achievements, according to the principle of politics-as-exchange posited by public choice theory, and to successful avoidance of blame (Hood, 2011). The validity of the proposition is supported by the fact that the closeness of the 2013 election margin appears to be a significant positive factor for water service responsibility by the decision-makers, who may strive for attributable successes to strengthen the position of the governor, on whose re-election they depend – and at the same time their own position within the county government. Thus, improved service delivery may reduce the political risk they face individually and offer the prospect to continue their function beyond the next election. Urban–rural

²³ A Pearson product-moment correlation was run to determine the relationship between the Water Responsibility Index and the improvement in water coverage between 2013 and 2015, for which data was available. There is a moderate, positive correlation between them, which is statistically significant ($r = 0.3$, $n = 39$, $p < 0.05$). This is not a strong correlation; however, the Water Responsibility Index relates to a mandate that is in the process of implementation, and remains in some respects an election promise rather than a solid achievement. Overall, the positive correlation suggests counties that have a higher Water Responsibility Index tend to be on an upward trend in terms of improving coverage.

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differentiation also suggests that tighter election margins are associated with a higher responsibility level for rural areas, which may be related to the fact that, despite a rapid urbanisation rate (4.15 percent per annum), 73.5 percent of Kenya's population is rural (World Bank, 2016). Generally, urban water provision outperforms rural water provision (WASREB, 2015). Demonstrating responsibility for rural areas may thus contribute to improving future election results.

While political risk has been identified as a critical driver for the duty-bearers' perceived responsibility to deliver water services, only 30 percent of the counties are faced with high competition as defined in the sociopolitical risk model. Political pressure through the tightness of the election margin alone may thus not be sufficient to drive water service responsibility, especially given the disputed reliability of election data (Cheeseman, Lynch and Willis, 2014). Opinion poll data may also represent an important factor of political pressure influencing decision-makers' perceptions, which should be tested in future research. Moreover, election alliances that break off in the course of a political term, or the formation of new alliances (for example the Jubilee Party or the National Super Alliance in 2016/2017), can change the political dynamics within a county. Corruption and nepotism can create a political economy that is unfavourable to bringing water services to all citizens in a county (Lynch, 2006; Weingast, 2014; D'Arcy and Cornell, 2016). Ethnic block voting has been identified as a prevailing factor in Kenya's political landscape (Brass and Cheeseman, 2013), which certainly limits the officeholders' scope of being rewarded for their successes. Of the governors re-elected in 2017 (Independent Electoral and

Boundaries Commission, 2017) 45 percent serve in counties with a high Water Responsibility Index.²⁴

Overall, the danger of political entrepreneurs defining ambitious targets for one group while accepting more modest ones for others – for example across the different risk zones or for urban versus rural water users – stands in direct contrast to the “universality” claim of international and national frameworks. The difficulty in achieving the five human rights criteria at once has been recognised through the principle of “progressive realisation” (UN Human Rights Council, 2013) of the right to water until “universality” is achieved. It concedes that, in case of resource or other constraints, certain rights cannot be realised immediately (UNTS, 1983).

4.6.2 Resource and responsibility, and the capacity to deliver?

Responsibility alone cannot deliver improved service delivery. The strongest effect across the three models is perceived for county water budgets as a proportion of the total county budget. The Constitution (Government of Kenya, 2010) determines that, for every financial year, a minimum share of 15 percent of all revenue raised by the national government will be allocated to county governments (Article 203(2)), but each county government sets its own annual budget (Article 224). Hence, water budgets vary from close to zero to 28 percent of the total county budget, according to the county water ministries²⁵ – and the effect is considerable compared to the other variables. Access to more funds (through higher county water budgets)

²⁴ A “high” Water Responsibility Index is assigned for the values between 0.8 and 1.

²⁵ These data were collected as part of the CEC survey and reflect the perception of the proportion of the water budget as part of the total county budget by the county decision-makers.

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appears to drive service responsibility for rural areas, which may relate to the fact that the rural proportion of the population to be served with safely managed drinking water by 2030 is considerably larger than that in urban settings.

When asked about water budget allocation, the majority of counties provide that more than 75 percent is spent on the development and construction of new water infrastructure. Apparently, incumbents favour visible achievements over sustainability. This may be due to their expectation of being rewarded for evident, favourable outcomes by the voter (Harding and Stasavage, 2014). Moreover, the question of budget allocations is also linked to water user tariffs. Two fifths of the county decision-makers state that users should pay the full cost of provision, which would include standard operation and maintenance costs. Perceived fair tariffs for rural areas are defined at higher rates than for urban ones,²⁶ the difference being particularly stark in the risk ignored quadrant (37 percent higher for rural than for urban areas). This is linked to the question of affordability, the least recognised criterion of the Water Responsibility Index, as it is relative due to varying socioclimatic realities in each county and their potential to reinforce existing inequalities.

Kenya's devolved decision-makers' challenge to deliver on their mandate is reflected globally (Hutton and Varughese, 2016). Not only are USD 114 billion needed for capital investments to meet SDG targets 6.1 and 6.2, but spending on operation and maintenance for the newly served from 2015 to 2029 is likely to

²⁶ The question in the survey used the common measurements for urban tariffs (in Kenyan shillings/m³) and rural tariffs (per 20-l jerrican), as they are the most common means to collect tariffs on the ground. The difference in measurement may also contribute to the differences between urban and rural tariffs.

outweigh capital costs by 1.4 times for basic water, sanitation and hygiene (WASH), and 1.6 times for safely managed WASH services, by 2029 (Hutton and Varughese, 2016). It is thus important that budgetary allocations not only focus on new infrastructure development but also on operation and maintenance to ensure that safely managed services can be sustained (Fonseca and Pories, 2017), affordability for the marginalised is recognised and the water service responsibility of the officeholders can translate into results.

4.6.3 Harnessing devolution for SDG progress on delivering water services for all?

The discussion above suggests that the devolved duty-bearers may act as political entrepreneurs within a bargaining situation, which puts them in a position where they can seek step-by-step progress. Situated between constitutional and ordinary politics, they have full responsibility for the water service mandate while facing diverse sociopolitical risks and budgetary constraints. The final part of this paper reflects on some general aspects of the political economy of devolution as a catalyst for institutional improvements in water service delivery, on the promises and dangers of devolution, and on the role of oversight under risk regulation regimes (Hood, Rothstein and Baldwin, 2001).

The degree of responsibility county decision-makers acknowledge for the various functions of the water service mandate is influenced by the political economy of devolution. It incentivises county governments to demonstrate improved performance compared to the pre-devolution situation. Their apparent ambition to out-perform the national government appears to manifest itself at the level of the

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Council of Governors, aiming at functioning county governments and administrations to prove the success of devolution and forming a counterweight to the national government (Cheeseman, Lynch and Willis, 2016). The vagueness of the 2010 Constitution with regard to water service *regulation* has led to further power struggles between national and county levels, with the national government leaning on Article 186(3), stating that a function or power not assigned is a function or power of the national government. Arguing that, depending on power structures, it is often local-central relations (including budget allocations) that determine the impact of decentralisation on poverty, Crook (2003) concludes that allocating resources to hitherto unserved areas can be particularly effective in generating user satisfaction. Since improved service delivery is a key element in county election manifestos (Kimanthi, 2016; Cheron, 2017; Muthoni, 2017; Nyamori, 2017) and a stated expectation by the Kenyan population (Afrobarometer, 2015), the utility of fulfilling their election promises may be high for county water ministers of the new legislative period starting in 2017.

Regarding the promises and dangers of devolution, the findings support the notion that devolution is likely to enhance downward accountability. While facing an imperative constitutional mandate to deliver universal water services, many officeholders are highly motivated to make a success of devolution (Shepsle, 1991; Pitcher, 2012) for the poorer and more marginalised county populations with lower baseline coverage – but also for themselves as self-interested individuals and members of the county governments, as public choice theory would have it. However, the citizens' capacity to make their politicians accountable depends not only on the degree of information available to them (Adserà, Boix and Payne, 2003) but also on

their power status, their efforts to ensure accountability, their desire for adequate representation, and their ability to choose the lesser of two evils, which Cho (2012) found an important factor for public trust in 16 sub-Saharan African countries. Given the varying degrees of the duty-bearers' perceived responsibility across the risk zones, and the possibility that counties pass and implement markedly diverging county water bills, there is a danger of reinforcing regional disparities – cited in the literature as one of the dangers of decentralisation (Stein, 1998; Rodden and Wibbels, 2002).

To counterbalance such developments, the role of the national regulator is critical for strict implementation and enforcement of the constitution, as well as for overseeing and monitoring the fulfilment of the constitutional mandate (Ahmad *et al.*, 2005). The regulator may thus be able to mediate some of the uneven outcomes resulting from variations in the uptake of the water service mandate. Yet, if not only incremental percentage-point by percentage-point progression towards “safely managed water services” (WHO and UNICEF, 2015, 2017a) but well-defined and measurable progress towards universal service delivery is to be achieved for the 58 percent of Kenyans still outside service provision areas, institutional rethinking and cooperation are required, particularly in rural regions and informal settlements (WASREB, 2015). Counties are responsible beyond the current reach of those service provision areas. Adequate budgetary allocations to the individual criteria of the water service mandate and the development of county legislation and water master plans for implementation are thus critical.

Instead of viewing the water sector as a hierarchical structure, it may be considered as a system with overlapping jurisdictions for different levels of operation

and multiorganisational arrangements. “Rational, self-interested public administrators” (Ostrom and Ostrom, 1971, p. 212) – here the devolved duty-bearers for water services – may consciously bargain to increase efficiency and mobilise political support from the public to avoid political deadlock while stabilising their departments within county governments.

4.7 Conclusion

The sociopolitical risk model provides a tool to analyse factors influencing decision-makers in charge of public service provision and to examine how their perceived responsibility for the constitutional mandate is related to perceived avoidable harm. The model can be applied to institutional transformations during decentralisation processes in various sectors, and also in other sub-Saharan African countries. Its operationalisation to the Kenyan case shows, first, the allocation of adequate financial resources appears to be the strongest limiting factor for the recognition of responsibilities and their translation into actual water service delivery. Second, the wide variance which the model reveals in the decision-makers’ perceived responsibility for the water service mandate needs to be streamlined across human rights criteria so that regional disparities do not grow and transformative development is sustained, especially in rural, marginalised areas. This highlights the importance of spatial concepts of central–regional, interregional and urban–rural relations for political decision-making and the crucial role of regulation at the national level for universal coverage.

Policy perceptions and responsibility

At the start of Kenya's second term under devolution with 47 county governments in charge of the provision of services in sectors such as water and health, this study observes that the devolved duty-bearers generally adopted a target-oriented approach towards the implementation of the constitution so as to achieve progressive realisation of the human right to water during the first phase of Kenya's devolution process. Their perceived responsibility appears to focus on the poor in underserved areas. However, recognition of the constitutional water service mandate is related to the varying socioclimatic and political risks they face in their counties. Thus, inequalities remain although devolution has evidently been tapped for progress towards target 6.1 of the sustainable development agenda. While no direct link with improved service levels can be established for the first legislative period, perceptions of responsibility for the constitutional mandate have started to manifest themselves in county legislation and institution building.

The sociopolitical risk model may also provide an effective evaluation tool for the perception of the water service mandate by the second round of county-level decision-makers, allowing insights into whether responsibility for the water service mandate continues to focus on the poor and can translate into service improvements. Using the model to analyse potential differences between new and continuing administrations may yield interesting results about political dynamics. Globally, the question whether the targets of the 2030 Agenda for Sustainable Development are achieved begins with the acknowledgement and uptake of the mandate by duty-bearers, before actual progress can be measured, and depends on each country's and its subnational institutions' sociopolitical and geographical realities.

5 A cultural theory of drinking water risks, values and institutional change

A cultural theory of drinking water risks, values and institutional change

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Note:

To improve the layout here, Tables 5.1 and 5.2 have been switched as compared to the published article. A footnote was added to refer to the additional paper in Appendix 2.

Abstract

Global progress towards the goal of universal, safely managed drinking water services will be shaped by the dynamic relationship between water risks, values and institutions. We apply Mary Douglas' cultural theory to rural waterpoint management and discuss its operationalisation in pluralist arrangements through networking different management cultures at scale. The theory is tested in coastal Kenya, an area that typifies the challenges faced across Africa in providing rural communities with safely managed water. Drawing on findings from a longitudinal study of 3500 households, we examine how different management cultures face and manage operational, financial, institutional and environmental risks. This paper makes the case for cooperative solutions across systems where current policy effectively separates communities from the state or markets. The contribution of this research is both a theoretical and empirical case to consider pluralist institutional arrangements that enable risks and responsibilities to be re-conceptualised and re-allocated between the state, market and communities to create value for rural water users.

Key words: Cultural theory; Water security; Risk; Institutions; Sustainable development; Kenya

5.1 Introduction

In the baseline year of the sustainable development agenda, 2015, 2.1 billion people lacked safely managed drinking water services globally and 844 million people did not have basic drinking water services (WHO and UNICEF, 2017a). Around a million handpumps in rural Africa provide water to approximately 200 million rural Africans but break frequently, wasting billions of dollars of investment (Baumann, 2009; Baumann and Furey, 2013) and forcing the poor to regularly use more distant and often dirty water sources. This situation is exacerbated by an increasing frequency of extreme events, including prolonged droughts, exerting additional stress on local water resources (MacDonald and Calow, 2009; Taylor *et al.*, 2012; James and Washington, 2013; James *et al.*, 2017). Achieving universal, safely managed and equitable water services (WHO and UNICEF, 2015) for rural water users requires progress in a number of areas. Often one or more of the requirements for them to be sufficient, safe, affordable, equitable and universal are not met depending on different management arrangements of waterpoints and diverging risk perceptions of water users. This research provides a mechanism to specify these differences by drawing on cultural theory (Douglas, 1970, 1986, 1994, 1999; Wildavsky, 1987) and to illustrate how this theory can help understand the critical gap between the performance of the rural water sector and the goals of the sustainable development agenda as well as underpin new pluralist approaches to achieving these goals. In a pluralist approach, the existing management types of community management, entrepreneurial and public-sector models can coexist, while water risks are addressed within their own value frames. At the same time, it offers an overarching response to some of the

coordination challenges of information, finance, and maintenance, which all of the waterpoint managers face irrespective of their world views.

Policy-making in relation to sustainable development is usually an issue dealt with at the global and national levels, yet the consumption it seeks to modify takes place at the household level (Dake and Thompson, 1999). More specifically, the global goal of universal water services (UN, 2015) demands equitable services for *all* but sustainability of local services may depend on user payments that result in exclusionary access, and thus compromise the principle of universality. Moreover, local preferences and choices may not conform with set institutional boundaries. Universal values and experiences of uncertainty may be in conflict at the local level. This is where culture comes in. The theory of sociocultural viability also known as cultural theory (Douglas, 1994), defines “culture” as attitudes and values that justify and stabilise an organisation, and distinguishes between four basic sets of sociocultural behaviour. From the perspective of psychology, Bruner (1990) suggests that culture has the functions of encoding experience, attributing value to experience, providing assessment criteria for possible courses of action and sharing experience and expectations. From this perspective, different ways of managing waterpoints constitute distinct organisational cultures. Much of the existing literature on cultural theory focuses on conflict between cultures (Douglas, 1999; 6, 2003; Verweij *et al.*, 2006). The contribution of this research is twofold: first, it focuses on cooperation between the cultures rather than conflict within the waterpoint management system under a professional service provider; second, it provides a mechanism for the formal recognition of a pluralist framework and for empirical support of new approaches towards managing rural water risks. The paper first reflects on the relationship

between water risks, values, and institutions in the context of the rural water sector and the global goal of universal, safely managed drinking water services. We present an operationalisation of the cultural theory framework in the context of rural waterpoint management and discuss its extension to pluralist arrangements. The theoretical framework is then applied to coastal Kenya drawing on empirical findings from a longitudinal study to examine how the four basic management cultures postulated by cultural theory handle operational, financial, institutional and environmental risks. It closes on the discussion of a pluralist institution in the form of a professional maintenance service provider that allows the coexistence of current values while taking the risks of the different cultures as an opportunity for cooperation. Combining the entrepreneurial domain of annual contracts with collective decision-making and local ownership as well as public sector support, it represents a creative and flexible combination of the various ways of organising, perceiving, and justifying social relations (Verweij *et al.*, 2006).

5.2 Background

5.2.1 Rural institutions

The role of institutions is to provide information and assurance about the behaviour of others, offer incentives to behave to the benefit of the collective good and monitor and sanction opportunistic behaviour (North, 1990; Ostrom, 1990). Ways must be explored to deal effectively with complexity, uncertainty, and institutional dynamics in the field of common-pool resource management (Ostrom,

2005). They imply interactions between ecological and social systems (Ostrom, 2009a), the diversity of livelihoods, resources and uses, the variability of actors and their practices within heterogeneous communities, multiple and overlapping scales, and the often non-transparent ways in which institutions work and power operates (Clever and de Koning, 2015). Understanding rural institutions requires unravelling their historical roots as well as the frameworks through which certain kinds of institutions have been advanced in the international development sector. Blaikie (2006) highlights that state formation following independence set the political environment for the interface between international funding institutions that have promoted community-based natural-resource management and national governments. Disregard of historical legacies, such as Africa's decolonisation (Mamdani, 1996), or the historically grown complexity of governance structures place decentralisation and institutions formed in its wake at risk of failing (Ogbaharya, 2008). The dominance of the "community-based" approach is, not least, a result of the poor performance of many state systems or forced state retrenchment related to structural adjustment (Agrawal and Gibson, 1999; Mosse, 2006; K. Hall *et al.*, 2014).

Since the advocacy of community management of rural water supply in the International Drinking Water Supply and Sanitation Decade, 1981–90 (Arlosoroff *et al.*, 1987; Churchill *et al.*, 1987; Briscoe and de Ferranti, 1988; ICWE, 1992), it has been used as a mechanism to achieve a policy goal at least cost (Hope, 2015), as these waterpoints can be independently financed and managed by communities alone or supported by government or donors, depending on perceived need or political demand. Although the assumed empowerment of communities through participation, decision-making, control, ownership, and cost-sharing seemed promising, operations,

maintenance and service delivery have barely improved (Lockwood, 2004; Blaikie, 2006; Whaley and Cleaver, 2017). This state of affairs is attributed to poor planning (Carter, Harvey and Casey, 2010), limited community financing (Harvey, 2007; Foster, 2013; Foster and Hope, 2016) and shortcomings in the institutional design of management models (Whittington *et al.*, 2008; Sara and Katz, 2010). Revisiting the same households in unpiped sites in East Africa in 1997, 30 years after the initial study (White, Bradley and White, 1972), and using the same sampling method originally applied, Thompson *et al.* (2001) highlight that improved access to water services will depend on strong public and private organisations that develop, operate and maintain water systems and services sustainably. They advocate new partnerships between the state, the private sector and civil society which promote market-based, cooperative arrangements with a flexible funding approach that work for the rural poor. The principle of popular participation is emphasised but tends to be reflected more in government and donor discourses than in the experience of rural communities (Ribot, Lund and Treue, 2010), and there is a notable lack of fit between domestic norms that constrain popular participation and “the imported institutional superstructure that is intended to facilitate it” (Dill, 2010, p. 33). This ambivalence is an issue underlying all externally developed institutional solutions to rural waterpoint management.

Cleaver (2012), building on the work of Douglas (1970, 1994), argues that if institutions can be placed in a wider governance framework, thereby focusing on the constituent processes and practices of “institutional bricolage,” then this can help us “to understand the ways in which actors both reproduce and reconfigure such governance arrangements” (Cleaver, 2012, p. 213). According to her, it is highly

unlikely that a single institutional solution will represent all users and livelihood interests. However, practical and policy approaches often require simplification and standardisation of institutional form. Drawing on the sociocultural variability perspective of cultural theory, this research hopes to contribute to the field of rural water services in theory and practice by advancing an approach recognising institutional pluralism. This concept acknowledges that the governance of resources falls upon a variety of scales with blurred boundaries between the domains of the local and the global, between which “meaning” – symbolic authority, arrangements, values – “leaks”, as it is potentially borrowed both ways (Douglas, 1986; Cleaver and de Koning, 2015). Cleaver (2012) illustrates what this may imply in practice. The user group at a waterpoint may debate exempting the poorest member from paying maintenance charges drawing on the common experience of hardship – for reasons of equity – or on notions of human rights borrowed from international development discourses.

5.2.2 Water risks and values

Delivering safely managed drinking water services requires joint progress on ensuring sufficient, safe, reliable, affordable and accessible water for everyone, every day. It reflects a bold global vision and will require an unprecedented change in institutional performance in sub-Saharan Africa, where almost half of the global population using drinking water from unprotected sources live, over ninety per cent of them in rural areas (WHO and UNICEF, 2017a). Whilst within mainstream institutionalism the outcomes are clearly defined, they may diverge on the ground due to different perceptions of risk and value. Tansey (2004) argues that risk perceptions

which are underpinned by social power are neither irrational nor simply psychological in their origins. Cultural theory provides an opportunity to identify what is being rejected or defended by whom and who is being held accountable. The risks experienced in rural water services may be of operational, institutional, financial and environmental nature. Institutional risks are determined by the separation of powers between policy, delivery and regulation, the degree of autonomy in managing service delivery, accountability, as well as public engagement and support. Monitoring the attainment of operational and financial targets across these risk factors has become feasible through novel information systems (Thomson, Hope and Foster, 2012a; Nagel *et al.*, 2015; Kipf *et al.*, 2016), which can transmit timely data into the institutional domain. This lays the basis for overcoming widespread operational risks in the fields of system maintenance, performance contracts and service levels. Limiting financial risks includes capital expenditure such as transfers, loans and grants as well as operational expenditure including cost recovery, collection efficiency, payment modes, and management performance (Hope and Rouse, 2013). Finally, risk management for waterpoints also refers to environmental risks such as seasonal or drought-related poor water quality. Ensuing water rationing and the use of alternative, non-improved sources may entail public health risks (Bartram and Cairncross, 2010; Hunter, MacDonald and Carter, 2010).

The priority ranking of these various risks depends to a large degree on the value framework of the institution managing them. By employing such a framework, institutions provide a structure to everyday life, thus reducing uncertainty (North, 1990). Risk rankings and indicators are often based on the paradigm of methodological individualism. However, this paper draws on the literature offering an

alternative perspective to understanding the social construction of risk (Douglas and Wildavsky, 1982) through processes of value identification and trust building (Rayner, 1993) as well as through examining how groups select and frame risks (Tansey and O’Riordan, 1999). This leads to the question of the viability of an institution, defined as its capability to be sustained within its environment, despite a wide range of external pressures and internal tensions (6, 2003). Human needs and wants are generated, articulated, and satisfied or dismissed in an institutionalised feedback system (Douglas *et al.*, 1998). As fairness considerations such as trust, liability distribution, and consent (Rayner, 1993) determine people’s responses, the acceptability of risks varies. This implies that rigid institutional structures with pre-determined value systems may not be well-suited to deal with such a variation of risks. Instead, a feedback loop between values, risks and institutions is required to account for changing risks and new opportunities to be integrated into the institutional response. This applies to the response to water management challenges at all levels.

5.3 The framework of cultural theory

5.3.1 Four cultures managing waterpoint risks

In the absence of a formal utility to manage rural water services, informal ways of managing shared waterpoints in rural Africa create distinct organisational challenges moderated by contextual risks and values. Cultural theory provides a framework to explain how world views cohere with different solutions to organisational problems (Grimen, 1999). In accordance with Dennett’s (1987) idea of

the person, Douglas (1999) recognises autonomy and control as prior objectives of the individual. Breaking with the assumed homogeneity of rational beings, the related understanding of risk perception assumes that four different kinds of persons adhering to four clearly distinguishable ideal cultures “use everything (including risks) to engage or disengage with or somehow control other persons” (Douglas, 1999, p. 413). We use cultural theory to trace the views and values of actors on the basis of their preferences (at the individual water-user level) and to understand the social systems that are upheld by shared beliefs and values (at the water-user group level) (Douglas, 1996; O’Riordan and Jordan, 1999). A similar empirical approach is applied by Dake and Thompson (1993, 1999), who measure household cultures in an assessment of consumption behaviours, the management of needs and resources in the household, and what they imply for sustainable development. The aim here is to explain preferences for changing cultures of waterpoint management with respect to environmental (water availability and quality), operational (functionality of waterpoints), financial (cost of service), and institutional (organisation of waterpoint management) risks. Cultural theory postulates four basic cultures – egalitarianism, individualism, hierarchy, and fatalism – which correspond with recognised “management cultures” in the rural water sector – community, individualist and bureaucratic management – as well as fatalism, characteristic of those who fail to actively organise for managing their own waterpoint but adjust to its failure.

Each culture represented in the grid-group diagram (Figure 5.1) consists of a specific way of structuring social relations (Gross and Rayner, 1985), which are supported by a variety of perceptions, values, emotions and interests. The grid axis measures the extent to which ranking and stratification constrains and facilitates the

behaviour of individuals. The group axis measures the extent to which an overriding commitment to a social unit governs the thoughts and actions of individuals (Verweij *et al.*, 2006). The typification into four “archetypal cultures” can be seen as a means to understand and catalogue struggles over the legitimacy between and within institutions (Tansey, 2004). The individual types provide some flexibility as at least three sets of persons are at work in each community: those in favour of tradition and current institutions, those opening their institution up to opportunity and those blocking the opportunities of change in favour of turning back to more fundamental structures (Douglas, 1999). If the middle group gains ground, change may occur. The inherent instability of each archetype is important, as it is the engine driving continual shifts in governance (Sharp, Macrorie and Turner, 2015). In the following discussion, the four types are described and conceptualised within the context of waterpoint management, followed by a discussion of hybrid cultures.

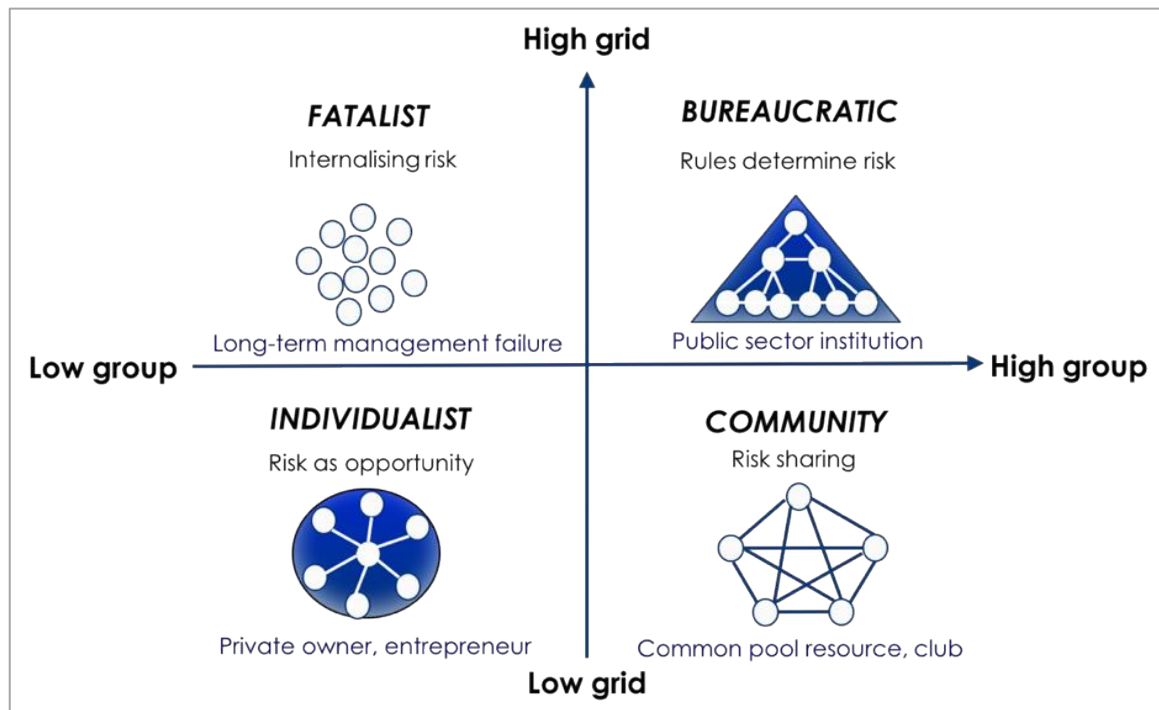


Figure 5.1 Reframing cultural theory for waterpoint management

5.3.1.1 Community

The culture classified as “egalitarian” by cultural theorists (Rayner, 1991; Douglas, 1999) is referred to as “community” culture with respect to waterpoint management – defined as informal groups with a risk-sharing approach (Schouten and Moriarty, 2003; Hope, 2014), whose members acknowledge few differentiating prescriptions (Wildavsky, 1987). As they tend to follow the strict-egalitarian preference for equality of condition (Rayner, 1988), this implies that risks are borne across the user group, for example, the environmental risk of water scarcity (Wade, 1988) is often regulated through rationing; the financial risk of high repair costs is shared evenly among all community members (Carter, Harvey and Casey, 2010). This is the most common approach to waterpoint management in sub-Saharan Africa (Foster, 2013).

Community waterpoints are usually organised collectively by water-user committees or associations (Harvey and Reed, 2004). The committee occupies a crucial role in management, administration, operation, maintenance, and repair of the waterpoint (Harvey and Reed, 2006). It is responsible for several regular activities, including holding meetings, setting, collecting, and saving financial contributions from users, devising and enforcing rules, including rules around access and use, and undertaking or securing maintenance and repair work. However, there is evidence that a well-functioning, voluntary committee represents the exception rather than the rule if acting without structured and regularised support (Moriarty *et al.*, 2013), which is one of the key reasons that one in three handpumps is non-functional at any given time in sub-Saharan Africa (RWSN, 2009). Due to limited community financing

(Harvey, 2007; Skinner, 2009; Carter, Harvey and Casey, 2010) and shortcomings in the institutional design of management models (Whittington *et al.*, 2008; Sara and Katz, 2010), the concept of community management has been criticised for not living up to expectations of being an effective and apolitical tool in natural-resource management across Africa (Cleaver, 1991; Blaikie, 2006; Hope, 2015). Therefore, approaches that acknowledge the communities' inability to maintain their water supply without support in the long term are required (Harvey and Reed, 2004; Lockwood, 2004).

5.3.1.2 Individualist

Manifestations of the “individualist culture” are those privately managed waterpoints whose social ideal is self-regulation (Wildavsky, 1987), which may in certain cases manifest itself as self-supply (Sutton and Harvey, 2017). The sovereignty over waterpoint management, including the full risk, is exercised by the owner, who may engage in entrepreneurial activities selling water from the waterpoint. Such market actors tend to be innovative while avoiding regulatory arrangements that limit their scope for decision-making (Rayner, 1991). Thus, water prices are prone to changes depending on scarcity and demand. As market forces apply, individualists use operational, financial, and environmental risks as an opportunity to fill some existing gaps in local water provision. In case of a system failure, often drastic measures, such as selling livestock, are applied in order to restore the functionality of the waterpoint.

5.3.1.3 Bureaucratic

Institutional sovereignty in decision-making is at the heart of hierarchies (Rayner, 1991). Such “hierarchist cultures” are classified as “bureaucratically managed” here. According to cultural theory, they represent “institutionalised authority” (Wildavsky, 1987), drawing on regulations that incorporate processes in people’s everyday lives into management systems (O’Riordan and Jordan, 1999). Procedures and rules regulate how financial, operational, or environmental risks are to be dealt with. Cultural theory holds that hierarchies prefer to avoid extreme uncertainty and to reduce problems to routines to which they can apply rational procedures and decision-making tools. In the context of waterpoint management, the sovereignty of bureaucratic institutions is usually held by the governing body of schools, clinics or religious institutions, bound within their rule catalogues. All members of the bureaucratic institution are assumed to consent to the legitimacy of the rules and those whose task it is to apply them. These institutions often receive a financial allocation from the state for maintenance undertakings, including water service infrastructure. Sometimes these institutions would open up the waterpoint not only to their members (schoolchildren, patients, religious community) but also to the wider community, thus creating permeability between the two high-group cultures.

5.3.1.4 Fatalist

What we define as “fatalist culture” can be split into two kinds of behaviour, “stoic” and “opportunist”. The former describes those who are resigned to their fate and see little benefit from trying to re-shape it (Douglas, 1999; O’Riordan and Jordan, 1999). Such a stoic culture may arise when the freedom to choose has been eliminated

(Douglas, 2004), the connecting networks have broken down, or when trust has been betrayed – for example when fees have been misappropriated. Often, fatalists experience risk as pervasive (Tukker and Butter, 2007), show minimal anticipation and respond, if at all, *ad hoc* at some point after the event (Hood, Rothstein and Baldwin, 2001). With respect to waterpoint management, this may imply that they fail to organise their waterpoint and once it breaks down, they adjust to its failure relying on an external actor to rehabilitate it for them (Tukker and Butter, 2007). Such management failure could stem from a lack of economic power or intra-household inequalities, often with a gendered dimension, as women and children are forced to act as water collectors and thus a no-cost alternative is accepted, discounting health and time for money.

However, fatalism may also be an active choice (Mathur, 2011) demonstrating opportunistic freeriding behaviour. The opportunist may see breakdown as inevitable but not entirely beyond their control, in contrast to the stoic. Opportunists actively choose inaction in the case where there is a likelihood that others, such as other members of their community, the government or NGOs, will step in to deal with the failure – an approach similar to the one Hollway and Enrico (2012) describe as “cynicism”. An important question is therefore what fatalists do to ensure their water supply while their main drinking water source is out of action. They will use alternative sources, such as other waterpoints, wells or surface water. The choice between improved and unimproved sources as a distinction between the two kinds of fatalist behaviour is explored further in the case study on coastal Kenya. Either way, the fatalist culture manifests itself in the failures of development projects, most commonly at the post-implementation phase (Whaley and Cleaver, 2017). A

multi-country study on rural water demand in the late 1980s (The World Bank Water Demand Research Team, 1993) implicitly indicates the dilemma. The type of alternative water sources, the socio-economic and demographic characteristics of the household and a sense of entitlement to government services were found to influence rural communities' behaviour to achieving improved drinking water access. The assumption for the fatalist culture is that the deliberate decision not to repair the main waterpoint, or its neglect, is related to organisational and behavioural reasons. While the motivation behind this decision is what distinguishes “stoics” from “opportunists”, the result is the same: their main waterpoint remains non-functional.

5.3.1.5 Hybrid cultures

The four cultures are deductively derived ideal types. Real institutions as we encounter them, seldom conform to only one, for example, community waterpoints can be organised as fully egalitarian common-pool resources (Ostrom, 1990) with rules determining usage behaviour or as clubs with distinct membership criteria, which combine community-managed and individualistic cultures as semi-privatisation occurs (Koehler, Thomson and Hope, 2015)²⁷. Public-private partnerships unite the bureaucratic and individualistic cultures – as the ownership is public, yet the management is outsourced to a private entity. It largely depends on external factors whether the hierarchy, the market, or the egalitarian orientation will be the dominant one, or whether apathy will prevail (Verweij, 2004).

²⁷ See additional paper in Appendix 2.

5.3.2 Recognising pluralist institutions

To avoid the gridlock that is likely to result from attempting to impose one culture on all, some cultural theorists advocate “clumsy solutions” (Lach, Ingram and Rayner, 2006; Verweij *et al.*, 2006; Ney and Verweij, 2015), pluralist arrangements, which allow the four ideal-type cultures to co-exist while creatively combining their seemingly irreconcilable perspectives on problem identification and resolution – including the hierarchical insistence on authority, the individualist emphasis on entrepreneurship, the egalitarian reliance on collaboration (Verweij *et al.*, 2006) and even fatalist stoicism or opportunism. However, the challenge is to achieve a solution that is acceptable to the advocates of the different ways of perceiving, organising, and justifying (Lach, Ingram and Rayner, 2006). Clumsiness concerns both the effectiveness of addressing major social problems and the legitimacy of this process (Verweij *et al.*, 2006). Such solutions have been applied to a variety of complex settings including water-related challenges such as hydropower in the Himalayas (Gyawali, 2006), water resources management in California (Lach, Ingram and Rayner, 2006), as well as tackling climate change (Verweij *et al.*, 2006). What these examples have in common is that opposing views collide and the resulting conflicts are difficult to resolve with traditional policy tools. The clumsy approach tends to combine all available policy styles, connecting creative market forces with governmental planning, including possibilities for local and civic action (Verweij *et al.*, 2006) – thus allowing for flexibility and strategy switching (O’Riordan and Rayner, 1991) depending on the development of the conflict.

Cultural theory of drinking water risks

This research enquires into pluralist approaches in the rural water sector that allow groups to be situated between the three core pillars of market, bureaucracy, and community, and which may facilitate risk management through improved information flows, sustainable finance, and reliable maintenance (Thomson and Koehler, 2016). If formally recognised, such pluralist institutions could pool the risks of the different cultures, which may lead to risk sharing through creating a network with similar economies of scale. This could be compared to piped water systems, where physical infrastructure links nodes as well as institutional domains. The benefits may include lowering costs and reducing conflicts by identifying more appropriate levels of responsibility and delivery. Through risk pooling and networking at scale, pluralist institutions aim to produce “satisficing” (Simon, 1979) solutions to rural water challenges for the different ways of organising, especially with regard to operational and financial risks.

The different shading in Figure 5.2 represents each culture’s – potentially varying – representation in the pluralist paradigm. First, community management for rural water services has been enshrined in bureaucratic norms and rules and translated into collective decision-making characterised by informal norms. Recently, formal rules have been adapted in the Water Act 2016 (Republic of Kenya, 2016) to allow for joining a professional service provision model, which may enhance service sustainability. Second, performance-based contracts outline entrepreneur and customer obligations, for example the provider’s duty to restore water infrastructure within a certain period and the customers’ obligation to pay for the service. The market characterised by individualism and competition forms the basis of this solidarity. Third, cooperative governance, including public sector support, is a critical

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component of institutional coordination through regulation of water sector activities and sustaining financial flows. Thus, the key components of operationalising such pluralist institutions would include a) services through professional artisans, b) improved information flows necessary to reduce downtimes and coordinate waterpoint maintenance, and c) financial sustainability through pooling financial risks at scale, creating incentives for user payments and thus lowering costs of bureaucratic targets (REACH, 2016b). In addressing and reducing operational, financial and managerial risks faced by the management cultures, but not bringing them into direct conflict with one another through prioritising or applying competing models of fairness (Rayner, 1995a), this approach may lead to a cooperative, pluralist solution at scale that creates value for all three cultures. This is in line with Hood's *et al.* (2001) demand to take a regime perspective on risk regulation and apply a meso-level approach considering complex institutional geographies, rules, and practices.

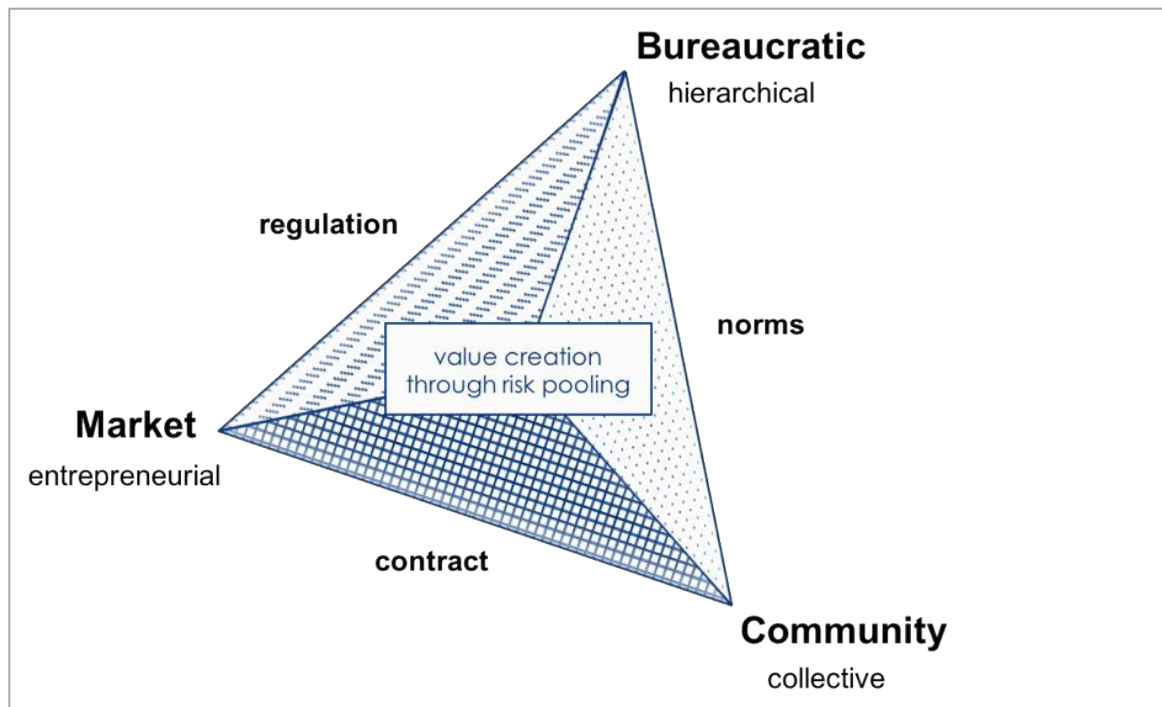


Figure 5.2 A pluralist institutional network to recognise and promote cooperative management cultures

5.4 Cultural theory of waterpoint management in coastal Kenya

5.4.1 Study location

Coastal Kenya was one of the first sites in Africa where community management was introduced along with the Afridev handpump in the late 1980s (Narayan-Parker, 1988). This constituted a large-scale behaviour change for waterpoint management. Twenty-five years later, a maintenance service provision model was introduced through action research to test community preferences for all repairs completed in 72 hours (SSEE, 2014). Kwale County has a population of around 730,000, eighty per cent rural, with a high poverty rate ranked 41st out of 47 counties (Commission on Revenue Allocation, 2013). According to the

2009 census, around 22% of the county's households use protected wells and boreholes as their main water sources (Kenya National Bureau of Statistics, 2012). The empirical data referring to waterpoints in this research draw exclusively on handpumps as the most common point sources which are not piped to individual premises. Of the 300 waterpoints that were identified as functional or short-term non-functional and included in the analysis, 75% adhere to the community-managed culture, defined here as being organised by a community committee; 14% are individualists managing their waterpoints privately; and 11% constitute bureaucratic institutions, comprised of schools, health centres, and religious institutions in this study, which usually allow the wider community to use their waterpoints. While these 300 waterpoints exhibit one or another of the three decision-making cultures, 39% of the 571 waterpoints sampled in total in the waterpoint census in August 2013 had been broken for more than one year and are defined as fatalist here.

5.4.2 Risks and the four cultures

Key operational, financial, managerial and environmental risks facing waterpoint users in Kwale County are captured in Table 5.1. Prior to data collection, research permits and approvals were obtained from the Government of Kenya's National Council of Science and Technology and the Central University Research Ethics Committee at the authors' institution. The risks assessed include perceived risks by water users and observed risks measured in terms of water quantity and quality as well as managerial responsibilities elicited in a waterpoint census. Perceived risks were captured during three waves of a longitudinal household survey conducted around these waterpoints in Kwale County in October 2013–January 2014, March–

Cultural theory of drinking water risks

May 2015 and September–November 2016 (wave 1: $n = 3349$; wave 2: $n = 3567$; wave 3: $n = 3542$). A team of 25 local enumerators was trained, the instrument was piloted and administered in the local languages, pre-dominantly Swahili and Digo. Household respondents across a stratified random sample from three sub-counties, Matuga, Msambweni, and Lunga Lunga, were interviewed. During these campaigns water quality tests were conducted at each waterpoint, taking measures for the electrical conductivity of the groundwater. These data as well as data collected during the census of 571 waterpoints fitted with Afridev handpumps in August 2013 were used for the observed data (average downtime days). Unique hourly volumetric data were collected on observed handpump usage over a twelve-month period from January to December 2014 from 300 handpumps fitted with Waterpoint Data Transmitters (Thomson, Hope and Foster, 2012a).

We first compare the active-management cultures with one another and then highlight a number of observations about the fatalists, who adjust to waterpoint failure (Table 5.2). The large standard deviations suggest that within each culture there remains a wide variation in risk perception (Table 5.1), which shows that in practice management arrangements are a bit messier than the ideal-typical typology. Hence, the mean is an imperfect measure to capture each culture's standpoint.

Table 5.1 Water risks applied to the four cultures

Risk	Variable	n	Community		Individualist		Bureaucratic		Fatalist				
			Mean	SD	n	Mean	SD	n	Mean	SD			
Operational Risk													
Perceived	Concern: distance to next waterpoint (%) (HH) ^a	1461	19.51	39.64	257	19.84	39.96	214	25.70	43.80	928	49.78	49.99
	Concern: reliability of waterpoint (%) (HH)	1461	15.33	36.04	257	17.12	37.74	214	15.42	36.20	928	24.14	42.81
Observed	Average downtime (days) (WP) ^b	201	35.74	72.53	29	23.93	72.46	34	19.53	54.58	223	>365	-
	User group size (members) (WP)	194	44.95	47.62	34	32.91	20.46	21	41.74	28.75	223	50.57	69.15
Financial Risk													
Perceived	Concern: water is costly (%) (HH)	1461	6.50	24.67	257	10.89	31.22	214	5.61	23.06	928	14.54	35.27
	Subjective poor (%) (HH)	1461	56.88	49.54	257	67.70	46.85	214	66.36	47.36	928	62.50	48.44
Observed	Regular payments (%) (WP)	189	51.85	50.10	37	48.65	50.67	30	43.33	50.40	184	40.41	49.10
	Poorest quintile (%) (HH)	1461	18.75	39.05	257	23.35	42.39	214	22.43	41.81	928	24.11	42.97
Management Risk													
Perceived	Concern: long queue at waterpoint (%) (HH)	1461	20.26	40.21	257	12.84	33.52	214	21.50	41.18	928	16.16	36.83
	New users allowed to join waterpoint (%) (HH)	1453	57.26	49.49	257	47.86	50.05	209	62.20	48.60	-	-	-
Observed	Spare parts stored at handpump (%) (WP)	189	15.34	36.14	37	24.32	43.50	30	16.67	37.90	-	-	-
	Penalty no payment (%) (WP)	200	40.50	49.21	37	29.73	46.34	31	38.71	49.51	184	35.24	47.80
Environmental Risk													
Perceived quantity	Concern: water not available all year (%) (HH)	1362	13.07	66.28	257	5.84	76.51	208	22.12	58.40	928	11.85	32.34
Observed quantity	volumetric use (mean m ³ /week) (WP)	197	10.3	7.9	37	6.9	4.7	31	9.5	8.7	16	5.7	9.9
Perceived quality	Concern: water unsafe to drink (%) (HH)	1461	8.69	28.18	257	11.28	31.70	214	8.88	28.51	928	22.31	41.65
Observed quality	Electrical conductivity (μS) (WP)	198	996.29	1159.46	37	897.50	1081.62	31	1547.81	2046.80	-	-	-

^a HH: household level; ^b WP: waterpoint level

Cultural theory of drinking water risks

First, among the three active-management cultures, the community-run systems face the highest operational challenges in terms of downtime (36%) – 83% higher than those of bureaucratic institutions – but also have the highest demand in terms of abstraction rates (around 10 cubic metres per week), which is close to one-and-a-half times the demand of individualists. Whilst just about half of the community-managed waterpoints have regular payments in place (52%), they are the culture with the highest number of penalties for non-payment (41%). Communities therefore have to strike a difficult balance between serving highest water demand for a large number of users (45 households on average) while facing the longest downtimes, and collecting sufficient financial resources. In comparison to the other cultures, observed risks for the community-managed culture in terms of downtimes, abstraction rates and payment systems appear to be higher than perceived risks such as concerns about reliability, availability or affordability.

Second, compared to households at community and bureaucratically managed waterpoints, individualists are slightly poorer, both in terms of subjectively stating they are poor (as opposed to average or well-off) and a welfare index that calculates the poorest quintile along indicators clustered into five groups: household composition, dwelling characteristics, asset ownership, sanitation and health, as well as drinking water (UPGro, 2017). Their perception of being slightly poorer may highlight their concern about the affordability of water, a concern that is almost twice as high as that of communities and bureaucratic institutions. Despite the concern about cost, they are the culture with the highest percentage of spare parts stored at their pump – almost 60% more than communities and 46% more than bureaucratic institutions – which may indicate they internalise risk to ensure that their small

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enterprises are not interrupted for too long. Moreover, they have a slightly higher concern with water quality and the reliability of their waterpoint compared to communities and bureaucratic institutions.

Third, within the bureaucratic culture, comprised of schools, clinics and mosques, there is particularly great concern over water availability – almost four times that of individualists and more than one and a half times that of communities. In addition, there are water quality concerns as salinity levels of the water at bureaucratically managed waterpoints, measured by electrical conductivity (EC), are substantially higher than at individualist and community-managed ones. Access, availability and quality appear to be the priority for this culture.

Finally, it is important to note that the fatalists' responses refer to the past when their waterpoint was still working; their reliance on recall implies limitations of the data. The volumetric abstraction rate dates from 2014 when some of the waterpoints were still operational but remained dysfunctional after a subsequent breakdown. The most striking difference from the other cultures is the downtime of over one year. On average, this group recalls a period of non-functionality of almost eight years (with a standard deviation of six years). However, even before the breakdown their concern over reliability was higher than for the active-management cultures. This may relate to a collective-action problem (Olson, 1965), as the group size was also the biggest before breakdown. The concern about costliness was a third to three times higher than for the active-management cultures.

In terms of welfare levels (subjective and welfare index), the cultures do not vary substantially (though the overall percentage of households within the poorest

quintile is highest for fatalists). The fatalists' regular payments score used to be lowest compared to the other cultures, which corresponds with the fact that their management system has since collapsed and the attitude of "let's wait for someone else to come along and fix it" prevails. Therefore, it is important to examine which alternative sources fatalists use since their main waterpoint has been non-functional for over one year. We divide them into two categories according to their adjustment to waterpoint failure (Table 5.2): they use an improved alternative, such as an actively-managed handpump, piped water, water from a submersible pump, protected well or kiosk, or an unimproved alternative, such as an unprotected well, surface water, or rainwater. In both wet and dry seasons, more than half of them use an equivalent or improved water source, which might suggest opportunist behaviour. On the other hand, 39% in the dry season and 34% in the wet season opt for unimproved sources, the implications of which are further highlighted in the discussion. This suggests that fatalists strike the trade-off between collecting water at more distant sources and having a reliable waterpoint closer to home in favour of less commitment to regular management tasks. Given the high number of unimproved sources, fatalists have by far the highest score for considering their water unsafe to drink (22%), which may explain why 82% state that if their waterpoint was repaired, they would use it as their main drinking water source.

Table 5.2 Alternative sources for fatalists

	dry season	wet season
improved alternative	54%	51%
alternative handpump under active management	22%	20%
piped	11%	10%
submersible pump (public or private)	10%	11%
protected well (public or private)	7%	6%
Public kiosk/ tap	4%	4%
unimproved alternative	39%	34%
unprotected well (public or private)	26%	12%
surface water (river, stream, pond, dam, lake)	13%	12%
rainwater harvesting	-	10%

These results demonstrate that all water management cultures face various operational, financial, managerial and environmental risks in different intensity, across both user perceptions and observation. The overarching risk of long downtimes is marked for all groups, ranging from 20 days for bureaucratic institutions to 36 days for communities and over a year for fatalists. Some of the financial, managerial and environmental risks seem to be underlying causes for non-functionality. Hence, all require an approach that allows them to continue managing their risks in their own ways but overcomes some of the obstacles that lead to system failure.

5.4.3 Addressing the risks through a professional maintenance service provider model

Risks faced by the various cultures become an opportunity for a professional service provider representing a pluralist solution which may even out some of the discrepancies between regulation and practice (Cleaver and de Koning, 2015). Such an approach has been tested in Kwale County under the FundiFix model (SSEE, 2015). Operational risks are reduced and reliability of the waterpoint is

increased through a contractual guarantee of downtime reduction to a maximum of three days – a major improvement from downtimes of between 20 and 36 days of the three active-management cultures. Financial risks can be reduced as the contract requires equal, affordable monthly payments that will, in part, insure against standard repair costs, as defined in the contract. Fees are collected in line with each management culture's preference, either through monthly payments by the committee or on a pay-as-you-go basis by an attendant. These are then transferred to FundiFix using mobile phone payments. Once the payment is received, ten community members are sent a message confirming the amount transferred and when the next payment is due. This emerging model explicitly aims to increase accountability for the often opaque financial management systems that may create community distrust and management failure (Foster and Hope, 2016). However, a further evaluation of payment behaviour and regularity over time is needed as this will ultimately determine how sustainable the approach is. Management risks are reduced by pooling, and therefore lowering, systemic risks across communities with spare parts, transport and pre-financing to promptly respond to idiosyncratic failure events (Harvey and Reed, 2004; Thomson, Hope and Foster, 2012b). Environmental risks both in terms of water quality and quantity are currently not addressed by FundiFix but could be integrated into the model in the future, for example through regular water quality monitoring and water treatment provision.

5.5 Through pluralism towards cooperation and institutional integration

Here, we advance the concept of what cultural theorists call “clumsy solutions” – policies that creatively integrate opposing perspectives on complex problems and potential resolution mechanisms (Verweij *et al.*, 2006) – towards cooperation and integration. One of the key criticisms of clumsy solutions is that they are inherently inefficient (Verweij *et al.*, 2006; Ney and Verweij, 2015). In contrast, we argue that institutional arrangements at a level combining multiple waterpoints in a network can, at least partially, reduce operational and financial inefficiencies by pooling finances and operating at scale. The active-waterpoint cultures do not have to change their own organisation, but can be nested within a larger system that addresses their operational and financial risks. Hence, instead of bringing the waterpoints into conflict or forcing them into a compromise, risk is potentially reduced through cooperation.

Another question is whether the model is truly pluralist or leans towards one of the four cultures. It clearly has characteristics of an entrepreneurial approach being organised through contracts and monthly payments. However, sign-up and fee collection are still an egalitarian process managed by the user group. Moreover, sustainable cost recovery is a necessary financial condition for system stability requiring some form of fungible and targeted funds to close the gap between user payments and full operational costs; this underlines a key dimension of the state in supporting this pluralist solution. The limited sustainability of rural water systems in

Africa reflects the fragile balance that must be maintained in linking and moderating the cultural variations of risks and values.

This approach is not a panacea as it does not, in its current form, provide a pathway towards achieving universality. Cleaver and de Koning (2015) argue that processes of bricolage produce both intended and unintended outcomes, which makes it difficult to judge the success or effectiveness of such arrangements. One such unintended outcome may be that fatalists are excluded from the pluralist arrangement under a professional service provider, unless specific provisions are made to admit them. Since they do not manage their own waterpoints to keep them functional, they have to draw water from alternative sources to survive. As outlined in Section 5.3.1.4, this choice divides the fatalists into two sub-groups. The opportunists refuse to manage their own waterpoint but choose an equal or improved arrangement managed by another user group, even if it is further away. This approach comprises more than half of the fatalists in Kwale, who may be required to pay for the water at the alternative source but are not involved in other management tasks. Those left behind, on the other hand, draw water from unimproved sources, which are usually free. The former, it could be argued, capitalise on other management schemes and can indirectly be included in the pluralist arrangement through actively managed cultures, whereas the latter, just under 40% of Kwale's fatalists, cannot. Even if their waterpoints were rehabilitated, their user groups would need to organise to regularly contribute to the maintenance model. Thus, the mechanism leaves a gap for those groups that fail or refuse to organise. How to overcome this obstacle remains a serious challenge requiring some targeted research into alternative measures, for example social policy and protection programmes. Thus, the approach constitutes a

fragile solution, which aims to achieve SDG target 6.1 while raising the important question whether all people can be reached and whether it is feasible to integrate all waterpoints.

Another limitation is that the FundiFix model has been conceptualised and implemented as an external intervention. Whether it can bridge the gap between formal and informal water institutions and form a cooperative network at the meso level (Peters *et al.*, 2012) that allows cultural plurality while advancing the sustainable development agenda, depends on its ability to integrate into the wider system of regulation and governance (Hood, Rothstein and Baldwin, 2001). Further research also needs to be conducted to better understand the factors that trigger rural water users to join the pluralist model, the potential barriers that remain for signing up, and if, in fact, it is a solution for many and not for few.

5.6 Conclusion

This study provides evidence of different local ways of managing water risks and how these practices can contribute to subnational and national policy-making. It addresses the question if and how pluralist institutions, understood within the framework of cultural theory, may represent new approaches to bridge the critical gap between performance in the rural water sector and the ambitious water goal of the sustainable development agenda. This gap stems, to a degree, from the paradox of the promotion of universal values on the one hand and the variation of values at the local level on the other hand. Drawing on cultural theory, this research recognises the

variation in values and risk perceptions and provides a framework for the discussion whether this paradox can be addressed through institutions that allow pluralism at the local waterpoint level and at the same time follow more formal rules and procedures which could eventually be integrated into formal regulation regimes. We make the case for more integrated solutions in areas where current policy separates communities from the state or markets. The paper shows how this was tested and applied in the context of rural Kenya. It also shows the potential for pooling risks in a professional service provider model, which might be capable of reducing uncertainty through new observed information flows enabling rapid responses to waterpoint failures. The contribution of this research is both a theoretical and empirical case to consider a more collective arrangement, provided results translate into meaningful benefits for the water users in the form of significant improvements in infrastructure reliability and investment accountability. However, the system requires both scale and temporal cohesion, which depends on state support. In addition, the financial sustainability of the system will likely collapse without provision of a mechanism to acknowledge variable and insufficient cost recovery from water users.

Recognising that resources are governed at a variety of scales with a dynamic relationship between the local and the global, the cultural theory of drinking water risks advanced here provides an opportunity to understand how global goals, such as safely managed and equitable water services, may be pursued while integrating local institutions into a coherent governance regime. This approach is not necessarily limited to the rural water sector or to Kenya. Other fields where energy, food, health, education, or financial services and resources intersect will be moderated by similar cultural complexities and may be subject to similarly simplistic governance regimes;

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they too may benefit from the application of the framework proposed here. To achieve a functioning model through such pluralist institutions, more profound understanding into the workings of the sector is needed. Most notably, it has to be acknowledged that for progress towards the sustainable development goals policy needs to reflect how the plurality of risks and values are conceptualised and how they are potentially pooled across community, state and market institutions.

6 Institutional pluralism and water user behaviour in rural Africa

Institutional pluralism and water user behaviour in rural Africa

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Abstract

The Sustainable Development Goal of providing everyone with safe and reliable drinking water services combines a moral imperative with an entrepreneurial opportunity. Applying Douglas' cultural theory of risk, we examine social responses to institutional change in introducing a professional maintenance provider for maintaining rural water infrastructure in Kenya. We ask (1) which factors trigger user groups at waterpoints to contract a professional maintenance service provider and households to state an intent to contract; (2) how do factors vary between different management cultures; and (3) does institutional legacy influence the decision to contract? We model panel data from 1,215 households with sensor data from daily handpump usage and community responses to a professional maintenance service provider. The predictors of behaviour change relate to organisational factors of managing payments, affordability and operational factors in terms of distance and water quality, which vary in importance across the three active management cultures. We find environmental context and management cultures interact in shaping behaviours, which can reduce risk and inform future policy and practice.

Key words: Risk; Cultural theory; Water user behavior; Rural water sustainability; Kenya

6.1 Introduction

Legacy and culture shape human behaviour related to water risks. The global challenge of providing and sustaining safe and reliable water for everyone goes beyond an instrumental approach of reducing engineering and financial risk to consider the cultural and behavioural aspects of the ways of life which have evolved in particular contexts and in the face of diverse risks facing users. Pastoralist groups in the Sahel have adapted to survive in water-scarce areas, relying on milk from their livestock (Smith, 1978). Scarcity can leave the rich and poor of Cape Town to queue side by side as distribution networks fail, levelling (and unearthing) hierarchies of access and privilege (Sorensen, 2017; Khaweka, 2018; Watts, 2018). Risks emerge in institutional, operational and environmental contexts and are often exacerbated in low-resource settings where poverty and gendered inequalities prevail.

The challenge is starkly captured by the Sustainable Development Goals' (SDG) baseline as only 20% of the countries below 95% coverage are on track to achieve universal basic water services by 2030. Almost 80% of the 844 million people lacking basic drinking water services globally in 2015 lived in rural areas (WHO and UNICEF, 2017a). In Kenya only around 42% of the total population live within formal water service provision areas and 22% are actually served (WASREB, 2015). Community management was established along Kenya's south coast as early as the 1980s and 1990s (Narayan-Parker, 1988; Baumann and Furey, 2013), making it one of the first sites in sub-Saharan Africa to experience a large-scale institutional change in waterpoint management (Black, 1998; WaterAid, 2013). Twenty-five years later, institutional change is occurring again not only with the country's decentralisation

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reform devolving certain service functions, including water services (Koehler, 2018; Mwihaki, 2018), but also with the introduction of a professional maintenance service provider (MSP). This makes it an important site to examine the evolution of local water management cultures and how rural water user behaviours change in response to new approaches that aim to address the SDG challenge.

The data collection campaigns outlined below are combined to unpack social responses both at the individual and collective levels applying cultural theory of risk (Wildavsky, 1987; Thompson, Ellis and Wildavsky, 1990; Douglas, 1994, 1999). This study builds on the conceptualisation of three actively managed rural water management cultures (Koehler *et al.*, 2018) – community, bureaucratic and individualist management – and addresses the question the previous study ended with (see Chapter 5): How do these management cultures respond to new professional service delivery at scale in terms of intent to contract and actual contract commitment? Under the new maintenance service arrangement the professional service provider aims to address varying waterpoint risks affecting the three management cultures by providing reliable and fast repairs to water infrastructure at scale while relying on innovative funding mechanisms (Welle, Williams and Pearce, 2016). Handpump users collectively (communities, schools) or individually (private ownership) sign an annual contract with the professional maintenance service provider, pay a deposit and commit to monthly payments for one year in return for guaranteed repairs within three days. We refer to this decision as “contract commitment”. We thus provide new insights into how management behaviours may change if professional arrangements of water service delivery that are emerging across sub-Saharan Africa can create value

in terms of improved reliability (Nagel *et al.*, 2015; Thomas, 2016; Welle, Williams and Pearce, 2016; RWSN, 2017).

We draw on multidisciplinary data gathered in Kwale County, Kenya, between 2013 and 2016, including mapping data of 571 handpumps, a survey of waterpoint committee representatives, a panel study of 3,500 households, and unique volumetric water usage data from “smart handpumps” (Thomson, Hope and Foster, 2012a). We first examine which factors influence households and user groups to change behaviour. Two regression models are constructed to examine (a) individual household “intent to contract” at those handpumps where the user group has not signed the contract within the first year of service and (b) observed contract commitment at handpump level (user group or individual owner). The factors tested are commonly cited in the literature on rural water services and include organisation and management of the water user group (Harvey and Reed, 2004; Hope, 2015), financial dimensions of water services (Hanchett *et al.*, 2003; Banerjee and Morella, 2011), operational factors and quality of the infrastructure (Carter and Ross, 2016; Cook and Lahren, 2017), use of the source (Carter and Bevan, 2008), availability and type of alternative sources (Sorenson *et al.*, 2011), and the performance of the service provider (The World Bank Water Demand Research Team, 1993; Koehler, Thomson and Hope, 2015). In a study of 25,000 community-managed handpumps in Liberia, Sierra Leone and Uganda, the main challenges for sustainability were identified as the absence of user fee collection, system age and distance from the district/county capital (Foster, 2013). We then discuss the variation of motivation for different organisational cultures in committing to the contract. While the three active management cultures may converge on a specific action, the underlying drivers appear

to vary depending on preferences and risk perceptions. Finally, we discuss the extent to which the professional service provider can address the different concerns and the role of legacy effects of previous interventions.

6.2 Framing the waterpoint maintenance challenge

Cultural theory of risk (Wildavsky, 1987; Thompson, Ellis and Wildavsky, 1990; Douglas, 1994, 1999), which enquires into how worldviews cohere with divergent solutions to organisational problems (Grimen, 1999), such as risk management, provides a conceptual framework to explain four prevailing cultures of rural waterpoint management. The key insight of the theory is that organisational culture leads people to direct their attention and concern to specific risks, while ignoring or downplaying others that are less threatening to their preferred ways of doing things. We apply it to afford insight into the views and values of water users and to understand the social systems that are supported by shared beliefs and values at the water user group level (Douglas, 1996; O’Riordan and Jordan, 1999).

The organisational forms postulated by cultural theory – egalitarianism, individualism, hierarchy, and fatalism – correspond to the common “management cultures” in the rural water sector – community, individualist and bureaucratic management, as well as fatalists, who fail to organise for managing their waterpoint and have to adjust to its breakdown (Koehler *et al.*, 2018). We argue that the theory can be applied to examine which set of risk factors – environmental (water availability

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and quality), operational (functionality of waterpoints), financial (cost of service and affordability), and institutional (organisation of waterpoint management) – influence the different cultures to embrace institutional change. A professional maintenance-service arrangement, experimentally incubated to significantly reduce repair times and pool risk, is explored here. With different user groups signing a contract, financial support mechanisms through the private sector and aligning with government policy, the arrangement has the potential to combine the three active dimensions of market, public sector, and collective action, allowing the different cultures to potentially coexist under a networked approach at scale (Figure 6.1). In the cultural theory literature such arrangements are referred to as “clumsy solutions” (Gyawali, 2006; Lach, Ingram and Rayner, 2006; Verweij *et al.*, 2006; Thompson, 2013; Ney and Verweij, 2015). This study examines which preferences may trigger user groups to align with the professional maintenance-service arrangement, and whether it represents a pluralist arrangement for the three active management cultures.

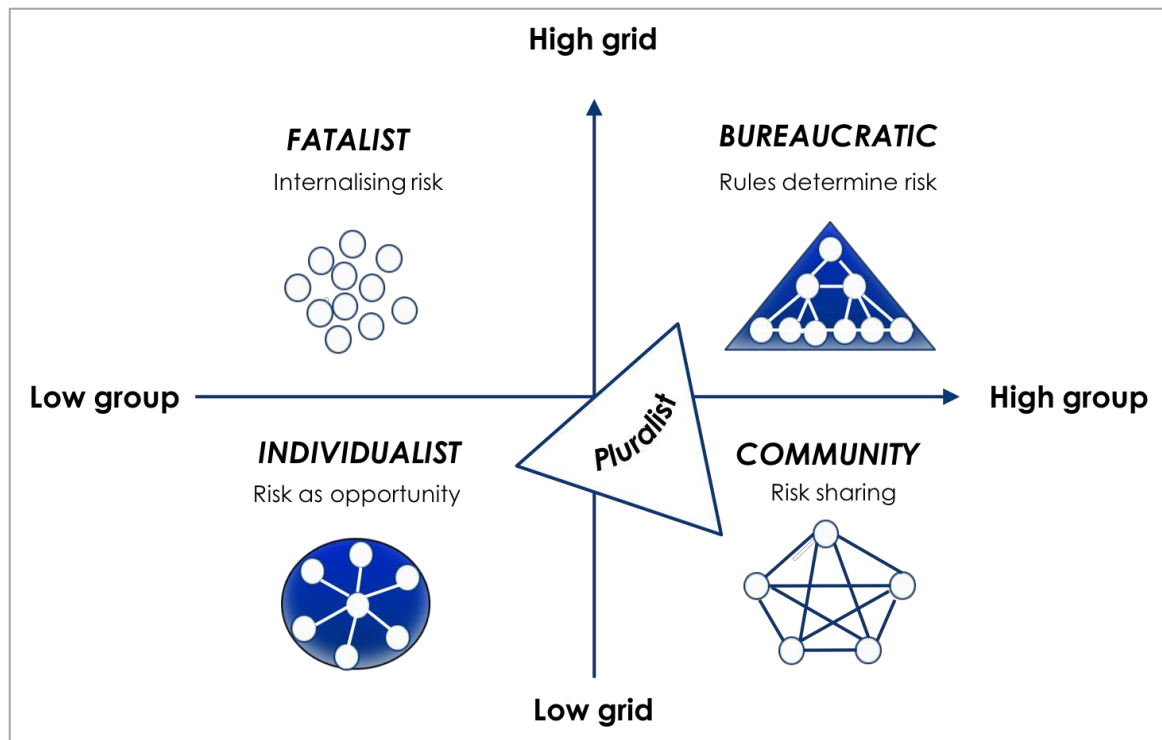


Figure 6.1 Examining institutional pluralism in managing waterpoint risks

6.3 Methods

6.3.1 Study site

Kwale County on Kenya's south coast has a population of around 730,000 with a high poverty rate ranked 41st out of 47 counties (Commission on Revenue Allocation, 2013). Around 80% live in rural areas (Kenya National Bureau of Statistics, 2012). A reason for choosing Kwale for this study was that it saw one of the first large-scale installations of Afridev handpumps in sub-Saharan Africa (Baumann and Furey, 2013). Between 1983 and 1995 around 600 waterpoints were equipped with Afridev handpumps, most of which drew water from an unconfined aquifer in Pleistocene sands and coral limestone (Foster and Hope, 2017). Initially, community-based waterpoint committees were formed, trained to service and repair the

handpumps and entrusted with the task of collecting user fees (Narayan-Parker, 1988). The programme is considered exemplary for community-based water supply management (McCommon, Warner and Yohalem, 1990; Rondinelli, 1991; Black, 1998).

In 2015, the maintenance service provider Kwale Handpump Services Ltd.²⁸ started operating, maintaining exclusively existing water infrastructure for communities, schools, clinics, and other rural facilities. The model encompasses the following components: *professional services* guaranteeing reliable repairs by qualified technicians within three days of waterpoint breakdown; *smart monitoring* where regular data flows from mobile-enabled transmitters (Thomson, Hope and Foster, 2012a) with data analytics support a rapid repair service; *sustainable finance* with regular pre-payments on a monthly basis; and *institutional coordination* through government and a Maintenance Services Trust Fund supporting business performance and extension (REACH, 2016b). The office in Kwale was set up in 2015 and the service was provided free for one year with a reduction in waterpoint downtimes from 37 days to less than three days. From January 2016 customers were required to sign annual contracts and commit to monthly payments (USD 10 per handpump) to maintain the source. The service is subsidised with local mining and agricultural companies contributing funds to the Maintenance Service Trust Fund that releases them to the MSP on a performance basis. A more detailed report of the study design, measurement and statistical analyses is provided in the Supplementary Information.

²⁸ This is one of the companies part of the FundiFix model referred to in Chapter 5.

6.3.2 Data collection

Data underpinning this study were collected in six separate campaigns. First, a census of 571 waterpoints fitted with Afridev handpumps was conducted in August 2013. It captured technical, institutional, operational, financial, and geographical information through structured interviews. Second, three waves of longitudinal household surveys were conducted around these waterpoints in Kwale County in October 2013 to January 2014, March to May 2015, and September to November 2016 (wave 1: n=3,349; wave 2: n=3,567; wave 3: n=3,542). A team of 25 enumerators was trained; the instrument was piloted and rolled out in the local languages, pre-dominantly Swahili and Digo. Household respondents across a stratified random sample from the three sub-counties Matuga, Msambweni, and Lunga Lunga were interviewed. Oral informed consent was obtained from all participants. During these campaigns water quality tests were conducted at each waterpoint, taking measures for pH, electrical conductivity, and temperature. Third, a survey with representatives of water user committees at 531 handpumps was conducted in parallel with the first survey in 2013. Fourth, a marketing survey was conducted in December 2015 to February 2016 with all 300 handpump user groups to introduce them to the MSP and the terms of the contract. The survey was carried out by local community health volunteers following training, through pre-arranged community meetings during which the maintenance service was explained and key data collected. Fifth, unique hourly data was collected on observed handpump usage over a twelve-month period from January to December 2014 from 300 handpumps fitted with Waterpoint Data Transmitters (Thomson, Hope and Foster, 2012a).

Finally, data records were provided by the local company on contract commitment by waterpoint user groups, repair performance and user payment behaviour over the period January until December 2016. Prior to data collection, research permits and approvals were obtained from the Government of Kenya's National Council of Science and Technology and the Central University Research Ethics Committee at the authors' institution.

6.3.3 Data analysis

The statistical analyses were modelled using STATA 13.1. All six datasets were appended. 112 observations for handpumps non-functional for over one year were rejected. Two datasets were created – one at household level (n=2,044) and one at waterpoint level (n=284), representing 95% of operational handpumps at the time. For the household level dataset, data concerning the waterpoint were replicated for each household observation at that same waterpoint (on average six households per waterpoint). To account for higher variation between households of different waterpoints than within the waterpoint user group, standard errors were clustered at user group level (190 clusters) in Model 1. For the waterpoint level dataset means were created for the data concerning household level. The robustness of the results was tested by running and comparing models with various subsets of the variables, for example only household level variables and only waterpoint level variables, as well as thematic subsets, such as organisational, environmental, institutional or socio-economic variables only. Moreover, three separate models for “contract commitment” were run for the three management cultures; however, because of the small sample sizes for individual and bureaucratic cultures at the waterpoint level, these models

overfit the data and therefore did not provide any explanatory value. To detect any possible collinearity with the chosen variables, linear probability models were run as a simplest specification. While no collinearity was detected (no variables were dropped), the linear model specification is more appropriate for Model 1 than 2 (for more details see Supplementary Information).

A description of all variables included in the analysis can also be found in the Supplementary Information (Supplementary Table 6.2). Those not obvious by name are briefly outlined here. *Clubs* are a special type of community-managed waterpoints that fulfil at least six out of ten management rules which have been classified as physical (lock, fence, pump attendant), financial (membership joining fee, non-member fee, regular payment, fines), and social (labour contributions, regular meetings, usage rules). This classification, derived from Buchanan's economic theory of clubs (Buchanan, 1965), was developed by Koehler *et al.* (2015) and is further elaborated in the Supplementary Information (Supplementary Table 6.3).

The variable *poorest quintile* is taken from the score in the dynamic welfare index developed by Katuva and Hope (Supplementary Table 6.4) applying Principal Component Analysis (Filmer and Pritchett, 2001; Falkingham and Namazie, 2002; Vyas and Kumaranayake, 2006). Eight indicators are clustered into five groups: household composition, dwelling characteristics, asset ownership, sanitation and health, and drinking water. Households are assigned a score of '1' if they meet the criteria for an indicator, otherwise '0'. To develop a dynamic welfare index, weights were used generated from the Principal Component Analysis. The poorest quintile comprises the households scoring a welfare index of less than 0.2. *Subjective poor* are

those households who consider themselves poor as opposed to average or well-off. *Low EC* is a binary variable signifying electrical conductivity – a measure of salinity – below 1,500 μ S. *High pH* is a binary variable indicating pH above seven.

Due to multicollinearity with “free repair” the variables “treatment during the free trial” and “number of repairs undertaken during the free trial” had to be excluded from the final reported analysis (curve and linear). For the final models presented here a “missing data” variable was created for “penalty for non-payment” as only 248 observations were recorded for it in the original dataset. Hence the value ‘0’ was assigned to the remaining 23 observations. For the “missing data: penalty” variable, the value ‘1’ was assigned to those 23 observations.

Since the regression analyses are insufficient in providing reasons for why the management cultures converge on the intent or commitment to contract the MSP, the final part of the analysis takes the significant factors of the regression models and tests whether the means of these factors are significantly different across the three active management cultures.

6.4 Results

6.4.1 Addressing risks of the waterpoint maintenance challenge

In order to examine factors influencing intent to contract and contract commitment and their variation across different users, we first present the distribution of waterpoints across the management cultures, drawing on Koehler *et al.*

(2018), and overall contract commitment over the first year of service. In the study area in Kwale County, 75% of the 300 active waterpoints are community-managed – the most common approach to waterpoint management in sub-Saharan Africa (Foster, 2013). It builds on informal, risk-sharing groups, whose members tend to rely on consensus and pay relatively little attention to rank and rules (Wildavsky, 1987). This is in clear contrast to the bureaucratically managed waterpoints, which depend on institutionalised authority (Wildavsky, 1987) and draw on rules and regulations that create a linkage between the natural world and management systems (O’Riordan and Jordan, 1999). These bureaucratic institutions include schools, health centres, and religious institutions (12% of the sampled user groups). Individualists (14%) privately manage waterpoints viewing risk as opportunity. Finally, fatalists also see few obligations towards others (Douglas, 1999; O’Riordan and Jordan, 1999). Internalising all risks, fatalists have not established a collaborative management system for their waterpoint and adjust to its failure by using other water sources. While they represent an important category with their main waterpoint being non-functional for over one year (39% of all 571 waterpoints), they are not included in this analysis, as a functioning management system was required to opt into the professional maintenance service arrangement, which did not rehabilitate abandoned waterpoints.

All four management cultures are highly context-specific. Cultural theory is deemed particularly suited for analysing this complex setting as it provides a risk management frame aiming to explain how people tend to respond to challenges. It has been shown that groups adhering to different management cultures indeed have different responses to the operational risk of waterpoint breakdown (Koehler *et al.*,

2018). Before the introduction of the professional maintenance service, community-managed waterpoints had an average repair time of 36 days, privately managed of 24 and bureaucratically managed of 20 days. The new maintenance service provider guarantees a repair within three days (Goodall, Koehler and Katuva, 2016). While, from an operational perspective, the incentive for contract commitment seems compelling, such decisions depend on multiple factors, which may be culture-specific. Further, the first household survey suggested that health insurance products have limited uptake but support with the maintenance of water infrastructure was acceptable in the area (SSEE, 2015). Our analysis demonstrates that of the 300 waterpoints examined here, 22% contracted the MSP in the first twelve months, among them 24% of community-managed, 16% of privately managed and 13% of bureaucratically managed waterpoints (Figure 6.2).

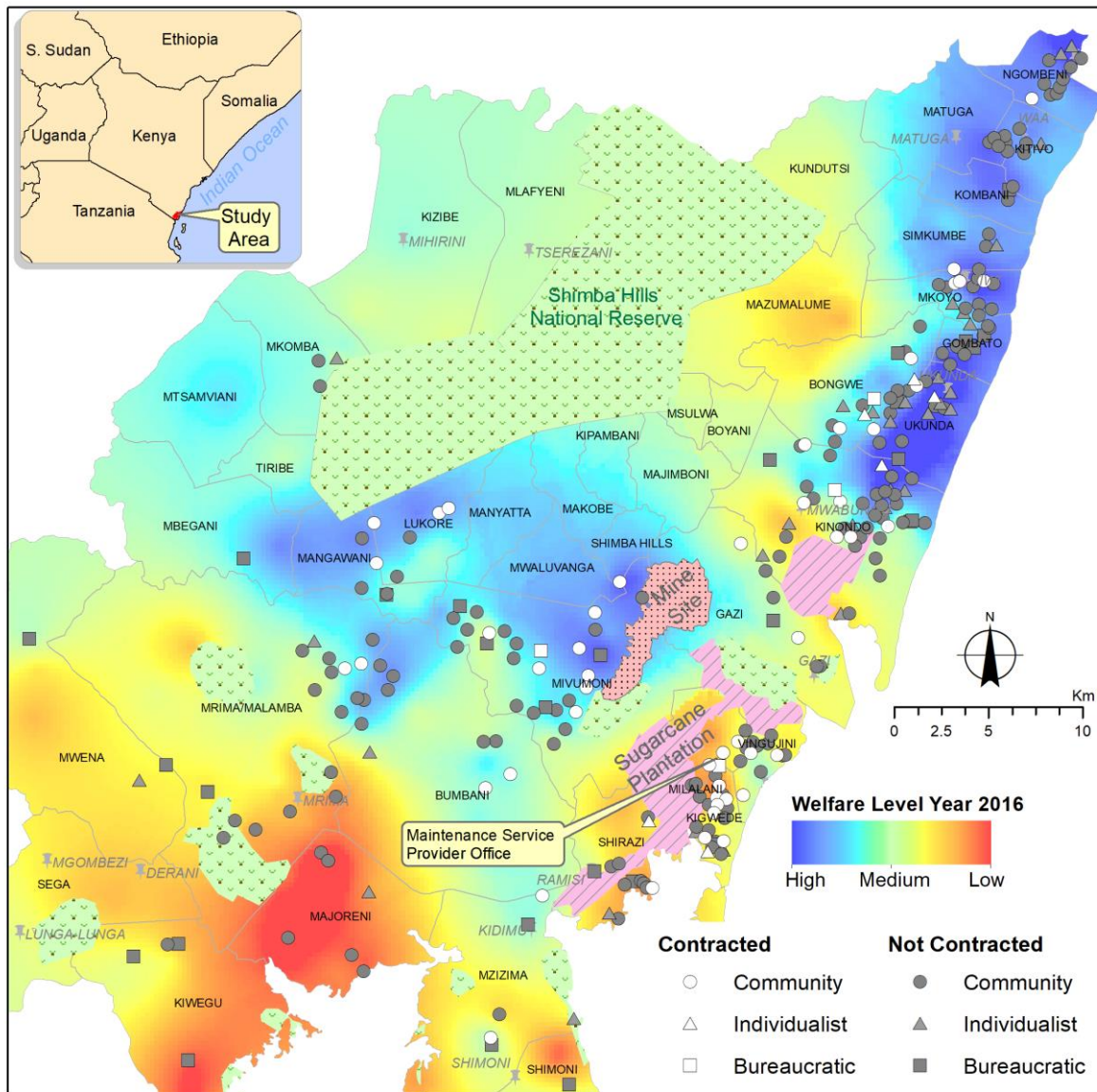


Figure 6.2 Contract commitment of waterpoint user groups to professional service and household welfare 2016

6.4.2 Factors driving water user uptake of the pluralist arrangement

We construct two regression models at different levels of analysis to predict a) which factors lead *individual households* to state their intent to contract the professional maintenance service provider (Model 1) and b) which factors influence

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the contract commitment of *waterpoint user groups* in the first year of the service (Model 2). The simplest specification (linear probability models) was also run to see if there is any possible collinearity for both models (reported in Supplementary Table 6.6). Model 1 only includes observations of households forming part of user groups that had not signed a contract in the first year. The aim is not to investigate causation or why groups and individuals make different decisions but simply to understand whether the same factors are decisive and which factors may influence either level more strongly. Multivariate logistic regression analyses were conducted to test factors categorised in six domains – organisation of the user group, socio-economic and operational factors, water usage, alternative sources (availability and type), and service performance. The two models provide different insights into the social responses to institutional change and highlight potential discrepancies between individual and group decisions.

For Model 1, the dependent variable “intent to contract” was elicited during the third round of the longitudinal household survey to understand the preferences of non-contracting households. The dependent variable in Model 2 is “contract commitment” by the user group in the first year of the service from January to December 2016. It expresses whether or not a group consensus was reached to contract the maintenance service provider (or a private owners’ independent decision).

Common socio-economic, behavioural and environmental indicators were derived from the literature (Foster, 2013; The World Bank Water Demand Research Team, 1993; Whittington *et al.*, 2009) (Table 6.1). The variable composition is described in the Supplementary Information. Some explanatory variables were

excluded in the final presentation of the models as they were not significant, did not have a significant impact on the prediction, or had fewer observations (see Methods).

Table 6.1 Predictors of contract commitment^{a,b}

a. Summary statistics of explanatory variables

	N	Mean	(SD)
ORGANISATIONAL			
Club with at least six rules (%)	267	45.32	(49.87)
Rules made by majority decision (%)	266	15.79	(36.53)
Women on committee (%)	268	61.57	(48.73)
Exclusion for not observing rules (%)	266	9.40	(29.24)
Penalties for non-payment (%)	268	38.81	(48.82)
Regular payments (%)	256	50.39	(50.10)
Attendant collects fees (%)	266	45.49	(49.89)
Committee collects fees (%)	263	49.05	(50.09)
Spare parts stored at handpump (%)	256	16.80	(37.56)
SOCIO-ECONOMIC			
Poorest quintile (%)	268	19.73	(19.84)
Subjective poor (%)	268	20.65	(19.60)
Willingness-to-pay per month (USD) ^c	268	5.89	(4.16)
Concern that water supply is costly (%)	268	7.11	(13.18)
In favour of free water for vulnerable ^d (%)	268	83.64	(21.64)
OPERATIONAL			
Distance to next handpump (km)	268	0.15	(0.30)
Distance to Maintenance Service Provider (MSP) office (km)	268	17.70	(9.82)
Distance to major road (km)	267	3.76	(4.60)
Group size of water users	249	43.03	(44.64)
Handpump age (years)	255	21.86	(7.17)
Water available all year (%)	256	86.30	(34.40)
Concern that water is unreliable (%)	268	16.82	(23.18)
Low electrical conductivity (EC < 1,500 μ S) (%)	268	78.73	(41.00)
High pH (pH > 7) (%)	268	27.99	(44.98)
Taste is considered poor (%)	268	6.34	(24.42)
Concern that water is unsafe to drink (%)	268	9.15	(17.01)
Geology coral (%)	268	36.57	(48.25)
USE			
High volumetric use (%)	268	51.10	(50.10)
Handpump water used for drinking (%)	268	54.10	(49.92)
Handpump water used for livestock (%)	268	10.45	(30.65)
Household grows crops (%)	268	74.60	(27.82)
Household owns animals (%)	268	35.17	(25.80)

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ALTERNATIVES	256	20.31	(40.31)
Alternative source: handpump (%)			
Alternative source: open well (%)	256	41.02	(49.28)
Alternative source: surface (river, stream, pond) (%)	256	11.33	(31.76)
Alternative source: piped tap (%)	256	18.36	(38.79)
PERFORMANCE			
Free repair (%)	268	55.60	(49.78)
Satisfied with maintenance provision (%)	268	69.77	(28.54)

b. Summary statistics of management variable (organisational)

	N	%
Management – community	200	74.63
Management – individualist	37	13.81
Management – bureaucratic	31	11.57

^a Description of the variables in Supplementary Information.

^b Household level data are not reported here due to high correspondence with the data at the group level (see Supplementary Information).

^c Conversion rate: 1 KES = 0.009677 USD (14 June 2017)

^d Households at each handpump were asked whether they support a remission of maintenance fees for the most vulnerable in their user group.

To examine the predictors for households intending to contract the service provider 1,215 observations at the household level were included in Model 1. The overall model fit is significant (Wald chi square=52.56, $p < 0.05$) and 16% of the variance in intent to contract is accounted for by our model (McFadden's R^2). The variable with the strongest significant positive effect on intent to contract is a regular payment system (OR: 2.66, $p = 0.019$). This is closely followed by using water from the handpump for drinking purposes (OR: 2.45, $p = 0.039$). Also significant is the distance to the next closest handpump (OR: 1.90, $p = 0.048$). Negative effects include affordability concerns. For example, where users had concerns for high water costs before the MSP service or favoured free water provision for the most vulnerable, the odds for intent to contract are reduced by half.

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We now model marginal effects for the best-case and worst-case scenarios based on the significant factors depending on the positive or negative suggested impact. Hypothesising a best-case scenario with regular payments at the handpump, affordably priced charges, no support for free water for the vulnerable, the household using water as drinking water, and a distance to the next handpump of 0.7km (for increasing distance see Supplementary Figure 6.3 and Supplementary Table 6.7) the probability for a household intending to contract is predicted to be 75% (95% CI: 0.63-0.86, $p < 0.001$), holding all other variables constant. Given the worst-case scenario – no regular payments, concerns about water cost, support for free water for the vulnerable, handpump water not used for drinking, distance to the next handpump 0.7km (for decreasing distance see Supplementary Figure 6.4 and Supplementary Table 6.8) – the probability for intent to contract is predicted to be 17% (95% CI: 0.08-0.26, $p < 0.001$).

Overall, Model 1 suggests that two major factors appear to influence household intent to contract – financial management and dependency on the source. First, with a regular payment system in place, households appear more open to a professional maintenance service. However, if the traditional system is already considered unaffordable, intent to contract is lower. Second, dependency on the source for drinking water and distance to the next alternative seem crucial.

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Table 6.2 Multivariate Logistic Regression Models

CATEGORY	Model 1			Model 2		
	DV: Intent to contract			DV: Contract commitment		
Explanatory Variables	N=	Pseudo R ² =0.1641	P-value	N=254 ^c	Pseudo R ² =0.3025	P-value
	Odds Ratio	(robust SE) ^b		Odds Ratio	(SE)	
ORGANISATIONAL						
Management (w.r.t. community)						
Individualist	0.762	(0.400)	0.605	1.549	(0.991)	0.494
Bureaucratic	1.270	(0.672)	0.651	0.886	(0.715)	0.880
Club	0.900	(0.373)	0.800	2.244⁺	(1.079)	0.093
Rules made by majority decision	0.609	(0.312)	0.333	0.930	(0.513)	0.895
Women on committee	1.333	(0.509)	0.451	2.474⁺	(1.213)	0.065
Exclusion for not observing rules	0.388	(0.275)	0.181	1.519	(1.046)	0.543
Penalties for non-payment	0.745	(0.183)	0.232	1.565	(0.711)	0.325
Regular payments	2.662[*]	(1.114)	0.019	3.149[*]	(1.677)	0.031
Spare parts stored at handpump	0.762	(0.311)	0.505	0.313⁺	(0.211)	0.084
SOCIO-ECONOMIC						
Poorest quintile	1.193	(0.259)	0.417	2.388	(2.671)	0.436
Subjective poor	0.839	(0.171)	0.389	2.597	(2.948)	0.400
Willingness-to-pay per month	1.000	(0.000)	0.739	0.999	(0.001)	0.155
Concern that water supply is costly	0.532[*]	(0.138)	0.015	1.895	(3.465)	0.726
In favour of free water for vulnerable	0.537^{**}	(0.120)	0.005	2.102	(2.460)	0.526
OPERATIONAL						
Distance to next handpump	1.901[*]	(0.617)	0.048	3.915	(3.843)	0.165
Distance to Maintenance Service Provider (MSP) office	1.043	(0.028)	0.119	0.852^{***}	(0.037)	0.000
Concern that water is unreliable	1.215	(0.301)	0.431	6.747	(8.065)	0.110
Electrical conductivity <1,500 μ S	1.324	(0.602)	0.537	4.367[*]	(3.192)	0.044
pH >7	0.880	(0.387)	0.772	2.941⁺	(1.662)	0.056
Taste is considered poor	2.002	(1.472)	0.345	2.071	(1.932)	0.435
Concern that water is unsafe to drink	0.795	(0.259)	0.482	1.949	(2.641)	0.622
Geology coral	0.885	(0.351)	0.757	0.336⁺	(0.204)	0.072
Handpump age	0.981	(0.023)	0.427			
USE						
High volumetric use	1.044	(0.382)	0.907	2.050	(0.907)	0.104
Handpump water for drinking	2.446[*]	(1.062)	0.039	0.648	(0.343)	0.413
Handpump water for livestock	0.317	(0.231)	0.114	2.042	(1.307)	0.265
Household grows crops	0.951	(0.202)	0.812	6.913⁺	(7.163)	0.062
ALTERNATIVES						
Alternative source: handpump	0.944	(0.692)	0.937	1.288	(1.149)	0.776

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Alternative source: open well	1.411	(0.964)	0.614	0.947	(0.773)	0.947
Alternative source: surface water	1.639	(1.406)	0.565	0.458	(0.478)	0.455
Alternative source: piped, tap	2.407	(1.879)	0.261	1.036	(1.047)	0.972
PERFORMANCE						
Free repair	0.995	(0.395)	0.990	1.984	(0.981)	0.166
Satisfied with maintenance provision	1.066	(0.196)	0.728	0.513	(0.471)	0.467
Missing data: penalty	n/a	n/a	n/a	0.692	(0.879)	0.772
constant	0.193	(0.234)	0.175	0.010*	(0.021)	0.028

Significance: + P<0.1, * P<0.05, ** P<0.01, *** P<0.001

^a Model 1 at household level

^b Standard Error adjusted for 190 clusters along “handpump group”

^c Model 2 at handpump level

Model 2 (including 254 observations) examines the predictors for user groups signing contracts by the end of 2016. The overall model fit is significant (likelihood ratio chi square=79.5, $p<0.001$) and 30% of the variance in contract commitment is accounted for (McFadden’s R^2). The strongest positive effect is whether households grow crops (OR: 6.91, $p=0.062$). This is followed by water quality parameters: electrical conductivity (EC) below 1500 μ S (OR: 4.37, $p=0.044$); and pH above seven (OR: 2.94, $p=0.056$). With increasing distance to the MSP office, user groups have lower odds for contract commitment (OR: 0.85, $p<0.001$). Regarding financial factors, we find user groups with a regular payment system in operation have more than three times the odds of contract commitment of those without – the only significant variable across both models. Concern for reliability falls outside the significance threshold ($p=0.11$) but has a large effect size (6.75), so is worthy of note.

The odds for contract commitment are 2.5 times higher if the committee includes women; and if the user group organises as a club, the odds for contract

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commitment are twice as high; however, these fall at the lower (10%) significance level. The strongest negative effect is an existing working maintenance system; the odds of contracting the provider are significantly lower if spare parts have already been stored at the handpump (OR: 0.31, $p < 0.1$). A similar negative effect seems to occur at handpumps installed in the coral strip along the coast where the handpump density is higher.

We also model marginal effects for the best-case and worst-case scenarios based on the significant factors depending on the positive or negative suggested impact. In the best-case scenario – waterpoint user group organised as a club with women on the committee and regular payments, water of low salinity and a pH over seven, households growing crops, not situated in a coral area nor spare parts stored close by and a distance to the MSP office of 17.7km (for decreasing distance see Supplementary Figure 6.5 and Supplementary Table 6.9) – the probability of the user group signing a contract is 77% (95% CI: 0.56-0.98, $p < 0.001$), all other variables held constant. In the worst-case scenario – no club, no women on committee, no regular payments, high EC, low pH, household not growing crops, stored spare parts, coral geology, and a distance to the MSP office of 17.7km (for increasing distance see Supplementary Figure 6.6 and Supplementary Table 6.10) – the probability for contract commitment is reduced to effectively zero (95% CI: -0.0008-0.0017, $p = 0.51$).

Both models provide significant and consistent evidence across household intent and group decision-making that behaviour change in waterpoint management is linked to already existing regular payments. The findings suggest low welfare levels of households are not a barrier to contracting the maintenance service provider, but

perception of costliness of the maintenance tariff before the introduction of the service at the household level is. Operational factors of service delivery are important, including distance to the next handpump for the intent to contract, and for contract commitment the distance to the MSP office, water quality (low EC and high pH) and reliability concerns (while not significant, they have a large effect size). If households around the waterpoint grow crops, the likelihood of contract commitment is higher (OR: 6.91, $p=0.062$). However, we do not have direct evidence that these crops are irrigated with water from the waterpoint. Thus, there are likely to be confounding factors, which limits interpretation. The organisational structure of the waterpoint plays a role for contract commitment but in different ways across the two models. Whilst women on the committee and a club structure are apparently positive drivers, a functioning maintenance system with spare parts stored reduces the motivation to contract (Model 2).

6.4.3 Which significant factors distinguish between management cultures?

Having explored which factors play a role overall for contract commitment, we further examine whether there are variations across community, individualist and bureaucratic management cultures. The models do not suggest that any one of the management cultures has a significantly higher or lower likelihood to commit to the contract than the others. It appears to be an arrangement that caters to a variety of preferences and needs. We explore the variations between the active management cultures by comparing the means of significant factors at the 0.05 level in Models 1

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and 2 (Table 6.3), thus building on a previous study by Koehler *et al.* (2018) that examined water risks applied to the four management cultures.

We test whether the difference in these factors between management cultures is statistically significant by comparing the individualist and bureaucratic management cultures with the community-managed culture, as community management is predominant in Kwale and sub-Saharan Africa more generally. Only significant factors are reported here. The highest means for the community-managed groups are water being used for drinking and having regular payments established. Individualists are 1.7 times more likely to care about the costs of waterpoint management than community groups ($p < 0.05$), even though this is only an issue for one in ten households. People at bureaucratic institutions are 1.3 times more likely to be concerned about the distance to the next waterpoint than households at community-managed handpumps ($p < 0.05$). Moreover, the waterpoints of bureaucratic institutions are 55% more saline than at community managed ones ($p < 0.05$). Though marginal and open to interpretation, there are factors which seem to distinguish between management cultures and this may be of value in shaping policy and practice in terms of maintenance systems and their design, particularly towards a universal approach to reliable water services in the home, community, schools, and clinics.

Table 6.3 Means of significant variables in regression models across management cultures (significant difference with respect to community management as the most prevalent management culture)

Management Culture	Community			Individualist			Bureaucratic		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Handpump water for drinking (HH) ^a	1362	61%	1%	257	50%	3%	208	55%	3%
In favour of free water for vulnerable (HH)	1436	82%	1%	253	87%*	2%	210	80%	3%
Concern that water supply is costly (HH)	1461	7%	25%	257	11%*	31%	214	6%	23%
Concern about distance to next waterpoint (HH)	1461	20%	40%	257	20%	40%	214	26%*	44%
Regular payments (HP) ^b	189	52%	50%	37	49%	51%	30	43%	50%
Electrical conductivity (μ S) (HP)	198	996	1160	37	898	1082	31	1548**	2047

Bold: highest mean across three management cultures

* Difference tested w.r.t. community (Risk Ratio, Fisher's exact $p < 0.05$)

** Difference tested w.r.t. community (Student's t-test, difference in means $p < 0.05$)

^a HH: Household level

^b HP: Handpump level

6.5 Discussion

6.5.1 Discussing determinants of contract commitment and the wider SDGs

Establishing and sustaining acceptable, accessible and affordable drinking water services is central to human development (World Bank, 2015a). Progress in achieving any of the 17 SDGs of the 2030 Agenda for Sustainable Development hinges not least on progress in understanding and changing human behaviour. This paper provides insights into which factors may play a role for target 6.1, while acknowledging different motivations of the plural rationalities on the ground (Gyawali and Thompson, 2016). This first part of the discussion engages with the three main findings of how and to what extent the predictors for behaviour change in

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waterpoint management may be connected with the wider SDGs in terms of a) organisational factors around regular payments, b) affordability and inclusion of the vulnerable, and c) operational factors around geographic distance and resource management.

First, organisational factors such as effective financial management by the user group appear to be critical for behaviour change. This relates to SDG target 6.b, which requires strengthening the participation of local communities in improving water and sanitation management. The odds for both commitment and intent to contract are higher for user groups already used to making regular payments. This is the clearest finding – significant and consistent across both models with a strong effect. The question arising here is what drives regular payments. This is further explored below. Contract commitment is also linked to effective organisation, which is supported by the second, weaker, finding ($p < 0.1$): organisation of community user groups as clubs appears to facilitate change (in terms of observed contract commitment but not intent). Strong community participation remains critical under a professional service provider arrangement, as, despite sub-contracting operation and maintenance tasks, the community is still in charge of fee collection and, thus, still manages their waterpoint. However, differences in payment behaviour exist as user groups collecting pay-as-you-fetch fees on a volumetric basis generate higher levels of revenue and experience better operational performance than groups charging flat rate fees. Moreover, in both cases, financial flows mirror seasonal rainfall peaks and troughs and households are more likely to opt for an unimproved drinking water source when a pay-as-you-fetch system is in place (Foster and Hope, 2017). Such confounding factors may continue to affect the overall sustainability of the system.

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Second, from a socio-economic and affordability perspective, the findings do not reveal any barriers to contract commitment for the poorest quintile and subjectively poor. Embracing a professional service arrangement may therefore be in line with SDG target 1.4 of ensuring that the poor and vulnerable have access to basic services (Inter-Agency and Expert Group on Sustainable Development Goal Indicators, 2017). However, for water users without contracts the intent appears to be lower if they perceive the current water charges (before contracting the MSP) as expensive. This is also the case for users who support free water for the most vulnerable, which might imply higher costs for the paying households, or that those who consider themselves vulnerable think water supply should be free (Model 1). Having women on the committee may have a positive effect ($p < 0.1$) on contract commitment, which could be related to the fact that they tend to bear the main burden of collecting water from more distant sources in case of breakdown (Foster, 2013) (increasing distance to the next waterpoint also has a significant positive effect on the intent to contract in Model 1); hence the appeal of a professional service provider may be higher for women.

Third, operational factors around resource management appear to influence behaviour, as they have further implications for livelihood and productive use. For the two exogenous water quality variables, low groundwater EC and high pH, positive associations with contract commitment were expected as both high salinity and a low pH are common water-quality complaints among waterpoint users in sub-Saharan Africa (Langenegger, 1989). Both of these groundwater quality measures have a strong positive effect on contract commitment in Model 2 – which corresponds to findings that higher EC and lower pH are linked negatively to payment behaviours in

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the same study site (Foster and Hope, 2016). Another supporting indicator is that the coastal area with coral geology appears to have a negative effect (OR: 0.34, $p=0.072$) on contract commitment, as karstic geology, which is prone to sea-water intrusion, increases salinity of the groundwater. In terms of productive and livelihood purposes, growing crops has been found to have a strong effect (OR: 6.91, $p=0.062$) on contract commitment, and using water for drinking on intent to contract (OR: 2.45, $p=0.039$). Overall, these results demonstrate that behaviour change with regard to waterpoint management may be linked to water quality and use indicators.

Other operational factors include distance and reliability. The negative effect of increasing distance to the maintenance service provider for observed contract commitment suggests that knowledge of and trust in the provider may also be relevant (Brinkerhoff, Wetterberg and Wibbels, 2018). As expected, increasing distance to the next handpump is a significant driver for household intent to contract. The implied value of time is consistent with a study from Ukunda, the town in our study site, from 1990, in which the authors highlight that households place a high value on the time they spend collecting water (Whittington, Mu and Roche, 1990). While not significant in the model, concerns about reliability lead to a six times higher odds ratio for contract commitment. These organisational, affordability and operational considerations appear to drive intent to contract and/or contract commitment across all users. However, for scaling the maintenance arrangement it is important to not assume a one-size-fits-all approach, which may require packaging the service in line with specific motivations of the different management cultures.

6.5.2 Management culture distinctions

The level of commitment to outsource the maintenance of the waterpoint to the professional maintenance service provider that provides subsidised services appears to be similar across all three groups as there is no statistically significant difference in sign-up. Thus, user groups of all three active management cultures are no more or less likely to commit to a contract. However, they appear to have different motivations for converging on the action of contract commitment. The difference in the significant factors in the regression models indicates that community-managed groups are most concerned about organisational and use factors; individualists express a concern about affordability; and bureaucratically managed groups seem to care most about operational factors. The following discussion applies the cultural theory of risk to highlight that motivations appear to be driven by inherent preferences and risk perceptions upheld and reinforced in the different management cultures (Rayner, 1992).

Administering and guaranteeing regular payments is part of the risk-sharing approach that community-managed groups at waterpoints adopt. As they tend to follow the egalitarian preference for equality of condition (Rayner, 1988), everyone contributes equally in regular water-user committee meetings, otherwise their group cohesion is likely to fail. The second factor that appears especially important for community-managed groups is using the water from the handpump for drinking, whereas individualists have the highest mean for using the water mainly for domestic purposes – as these waterpoints tend to be located in close proximity to the homestead.

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Questions around affordability appear to be of the highest concern for individualists. As they have to bear the full cost of repairs if their waterpoint breaks down, their perception of risk-taking includes incorporating calculated risk as legitimate costs (Rayner, 1984). Since the service offered by the maintenance provider is subsidised, joining the professional service is likely to cost them less than the full cost for maintaining their pump themselves, especially if larger repairs are needed. However, those who have less intent to commit to the contract may hope that major breakdowns will not occur in the short- to medium-term and thus prefer the high risk over making small and continuous payments. Some individualists undertake entrepreneurial activities at their waterpoints in the form of selling water, which may have two further implications. First, if their pump breaks down and it takes an average of 24 days to get it repaired, there is a much larger loss of revenue during the downtime compared to the two to three days of the contractual guarantee by the professional service provider. Second, these individualists are unlikely to have a liquidity problem as they regularly generate cash from selling water. Thus, they can guarantee the monthly contribution to the professional service if they so wish, unencumbered by the collective action problem of community management (Olson, 1965; Agrawal and Ostrom, 1999).

Operational factors appear most important for the bureaucratic management culture. Distance to the next handpump is crucial if a central institution with a large membership is dependent on the water source, for example pupils at a school, patients at a clinic, and worshippers at a mosque. Collecting water for large groups from more distant waterpoints poses a severe challenge. The dependence is not only for drinking water, but, maybe most importantly, for purposes such as

cooking in schools, washing in clinics, and ritual washing (*wudu*) at mosques. For all these purposes, high salinity levels (the mean for bureaucratic institutions being more than 1.5 times as high as for community handpumps) may demonstrate less of an obstacle for sign-up. Government rules determine that schools and clinics should have functioning waterpoints in their vicinity; hence, a service that guarantees repairs within three days may fit in their rule catalogue of system maintenance and support their routinised procedures (Rayner, 1984, 1988). In terms of the contrast between observed contract commitment and reported intent to contract, bureaucratic institutions have been more hesitant to commit to the maintenance service than community-managed user groups and individualists; yet households around bureaucratically managed waterpoints that have not yet committed to contract have the strongest intent to do so. This may be related to the fact that the committees of bureaucratic institutions may take more time to change their existing management arrangements than private owners who can alter their arrangements easily. Overall, at the end of 2016, more than half (53%) of the households belonging to user groups not yet contracted stated an intent to do so. Future research should enquire into the trajectory of contract commitment of each of the management cultures beyond the first year of service and what the limitations are to contract commitment in terms of internal power struggles as well as the role of local politicians.

6.5.3 Can the professional service provider address the risk factors?

Overall, those user groups that have signed the contract rely on the technical competence of the professional maintenance service provider to repair

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breakdowns within three days. Here we discuss whether the provider can address some of the specific risk factors that vary across the three active management cultures.

First, by contractually committing customers to monthly payments of a fixed amount (USD 10), the service provider appears to appeal to those community-managed groups that do collect regular payments. By administering those payments via the mobile phone, a new level of transparency is added that can increase trust in the financial transaction between the user group and service provider. Often, financial mismanagement by the treasurer has been cited as a major reason for system failure (Harvey and Reed, 2004; Whaley and Cleaver, 2017). When the assigned water-user committee member makes the mobile payment to the maintenance provider, ten messages are sent to other community members who have a level of oversight, which may strengthen trust.

Second, some of the affordability concerns of individualists with their current arrangement of having to cover the entire cost of repairs are likely addressed as the service is subsidised and does not require users to cover extreme spikes of repair costs. Moreover, the payment level is also below the average willingness-to-pay per household (Koehler, Thomson and Hope, 2015).

Third, while water quality issues are currently not addressed by the service provider, the concern of bureaucratic institutions in terms of distance to the next handpump is partially addressed. As the time of breakdown is reduced considerably, the number of water-fetching trips to a more distant source is reduced or entirely eliminated if water is stored for around two days. Community-managed groups may also consider this as a benefit (with prior average waterpoint breakdown times a third

higher than those of the individualist and 80% higher than those of the bureaucratic management cultures).

While, overall there was a slightly higher contract commitment by the community-managed culture in the first year of service, the analyses suggest there is no significant difference in the likelihood of any of the three in terms of intent to contract and commitment. The professional service provider appears to open up a “clumsy solution” (Verweij *et al.*, 2006; Thompson, 2013) – at least at the local level through alignment with the preferences and risk management practices of all three active management cultures. This study provides empirical evidence across 254 handpump groups that the maintenance service provider addresses some of the organisational, affordability and operational needs most important for community, individualist and bureaucratically-managed groups respectively. By catering to these varying needs of three different ways of organising rural waterpoints, it can be concluded, the entrepreneurial service provider has the potential to form part of a pluralist arrangement which could align with the wider risk-management framework enabled by Kenya’s devolution process and the Water Act 2016 (Republic of Kenya, 2016). It appears to have the capacity to integrate the three management cultures without forcing them to give up their own ways of organising and to align them with wider scales in the rural water sector through private sector support and government policy though the government has not provided any financial support so far. What further limits its scope is its dependence on subsidies and that the fatalists are currently not included in this approach as they refuse to actively organise – a prerequisite of committing to the contract of the professional service provider.

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It remains uncertain how such a pluralist arrangement can align with the devolution reform in Kenya's water sector as responsibilities are being renegotiated (Koehler, 2018; Mwihaki, 2018), creating new opportunities and constraints for community and bureaucratically managed waterpoints in particular. While county governments may start to engage more in service delivery for rural communities, thus redefining levels of accountability, schools, for example, remain under the national government mandate (except for early childhood education). Some of their uneven commitment may be related to their dependence on, often unreliable, budgetary allocations for infrastructure maintenance from the national government. This suggests that it is critical for a professional maintenance service provider to operate at the meso level between the local and the county levels to bridge the scales of engagement for a more coherent water service governance regime (Hood, Rothstein and Baldwin, 2001; Peters *et al.*, 2012). Whether entrepreneurs only engage from below and fill rural service gaps sporadically, or whether national and county governments start supporting such pluralist arrangements at a larger scale remains to be seen and is the decisive factor for long-term sustainability.

This leads to the main limitation of this study. The various data collection campaigns compiled into one large quantitative dataset allow valuable insights into the drivers of contract commitment across a large scale, some of the obstacles for intent to contract, as well as how the motivations behind commitment vary across management cultures. However, as a next step qualitative research is needed to provide deeper understanding of how those variations are manifested in the different management cultures, what the obstacles are to contract commitment, whether the pluralist arrangement is a solution for many or for few, and what the long-term

engagement of the government will be. Ethnographic research is needed beyond this study to explore how preferences are formed (and may change) collectively in real time. Due to the variation in preferences, one-size-fits-all solutions tend to have limited success in the rural water sector (Doe and Khan, 2004; Whaley and Cleaver, 2017).

Therefore, another important consideration are the legacy effects of previous interventions and the enabling environment they create (Thompson *et al.*, 2001). In Kwale, most waterpoints were installed by donors and development partners in the 1980s (Narayan-Parker, 1988). One of the key findings reported in 1988 was that all committees had selected women as treasurers and collected cash. Women on the committee still appear to be an indicator of good management, a positive legacy from this programme. However, already in 1988, regular payments and cost recovery in particular were identified as a motivational issue, besides being an economic factor. For example, they may be influenced by cognitive variables affecting risk perception (Weber and Hsee, 1998). A second success identified in 1988 was the approach of concentrating resources instead of dispersal over large geographic areas (Narayan-Parker, 1988). Here our findings demonstrate that close proximity of waterpoints can have a negative effect on commitment to contract. Clustering has also been identified as a factor in reduced willingness-to-pay for improved water services in Kitui County, Kenya (Koehler, Thomson and Hope, 2015).

Finally, in addition to the importance of progress towards providing “safe” water, free of microbial contamination, the identification of sites where water is perceived as potable, which is often linked to salinity levels, plays an important role

for the value of the water source and the decision to commit to a contract. In the same study site, a relationship between EC and user rejection or abandonment of the handpump on account of the poor taste of the water, was identified (Foster *et al.*, 2018). This underscores the importance of groundwater monitoring, particularly in coastal areas such as Kwale, where seawater intrusion is a threat (Tole, 1997). Thus, site selection and legacy effects from previous interventions linger unexpectedly, influencing future behaviours, and are likely to shape the success of pluralist arrangements. This insight should guide future policy design and monitoring of practice.

6.6 Conclusion

As professional maintenance services for rural water infrastructure are emerging across Central, East and Southern Africa which promise to increase value for rural water users, government and investors through performance-based contracts, it is important for policymakers and implementers alike to understand which factors trigger household water users and user groups to undertake such institutional change. Rather than providing blanket solutions, it is equally crucial to understand the variation in preferences and risk responses by different local institutions that may converge on the same action. Cultural theory of risk provides an alternative lens for analysis. This research demonstrates that the maintenance service arrangement operating in Kwale can be considered as pluralist, at least at the local level, as it appears to address operational needs of community-managed groups, issues of affordability faced especially by individualists, and operational concerns predominant

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among bureaucratic institutions. The professional service approach has the potential to be integrated into a wider governance regime connecting users with an entrepreneurial service provider relying on financial support from the private sector and donors. However, county government engagement has been reluctant to date, which leaves the question open whether the pluralist approach elaborated here can integrate with wider institutional change through devolution.

Due to its opt-in nature just over one in five user groups have committed to a contract in the first year of service with another half of the households intending to do so. This is in line with wider research suggesting that active institutional change tends to take time to become the new norm (Weber, 2010); however, further qualitative research is required to evaluate the barriers and opportunities of contract commitment as well as potential discrepancies between household intent and the final decision to commit to the contract subject to underlying power dynamics that the quantitative research was not able to capture here.

While the architecture of the institution (the maintenance service provider) can be designed, it is the uptake of the institution that could make it a “solution” – which cannot be designed, as the decision ultimately remains with the user. How uptake and payment behaviours will evolve over the years to come, whether a new path dependence for future generations of rural water services has been created once again in Kwale County, or whether the national and subnational governments decide to embark on a different pathway to make progress towards safely managed drinking water services is critical and an important avenue for future research.

Supplementary Information (Chapter 6)

Institutional pluralism and water user behaviour in rural Africa

Supplementary methods

Background information on data collection

The six data collection campaigns were conducted over the period 2013 until the end of 2016 and are briefly outlined in the “Methods” section (6.3). Here more background information is provided on the six campaigns and how the sampling took place. Ethical permission to conduct these campaigns was provided by the Central University Research Ethics Committee at the authors’ institution and research permission granted by the Government of Kenya’s National Council of Science and Technology, Kenya (NCST/RCD/17/013/132, September 2013). All interviews were voluntary with informed consent procedures observed in the local languages. Data have been anonymised and stored in encrypted files. The STATA code for analysing the data is available through [GitHub](#).

Waterpoint Mapping (WPM): A census of 571 waterpoints fitted (or formerly fitted) with Afridev handpumps was conducted in August 2013. Of these 571 pumps 337 were identified as functional and in use. The census captured technical, institutional, operational, financial, and geographical information through structured interviews.

Water Data Transmitters (WDT) were fitted to 300 selected Afridev handpumps. This type of WDT using a low-cost solid-state accelerometer to indicate changes in the movement of the handle can be fitted to the handle of any handpump (Thomson, Hope and Foster, 2012a). Thus, pump usage can be measured and volumetric abstraction estimated. Over a 12-month period from January to December 2014 hourly data were collected on observed handpump usage.

Household panel (HH panel): Three waves of a longitudinal household survey were conducted around the 571 waterpoints in Kwale County in October 2013 to January 2014, March to May 2015, and September to November 2016 (wave 1: n=3,349; wave 2: n=3,567; wave 3: n=3,542). Household respondents across a stratified random sample from the three sub-counties Matuga, Msambweni, and Lunga Lunga were interviewed. At each of the 571 handpumps, an average of six households were randomly selected. The household survey captured the following types of information: a) demographic, b) socio-economic, c) health, d) drinking water supplies, e) waterpoint management, and f) welfare and assets. All the households surveyed were geo-referenced. A pilot survey was conducted with 25 experienced enumerators recruited from communities spanning the study area, who administered the survey in local languages (Swahili, 54%; Digo, 43%; Duruma, 2%; other, 1%). Attrition was due to households moving away and non-responses or refusal to participate a second or third time, though the majority (97%) of the households were successfully re-sampled.

Water User Committee survey (WUC): A survey with representatives of water user committees at 531 handpumps was conducted in parallel with the first

household survey in 2013. Information on the physical, financial and organisational rules of handpump management was collected, which was used to determine the club good variable.

Marketing survey by community health volunteers (CHV): A marketing survey was conducted with all 300 handpump user groups to introduce them to the professional maintenance service model and the terms of the contract. Local community health volunteers from the communities were trained and administered the survey. This campaign took place in October to December 2015, and further targeted campaigns were administered in early 2016, when the maintenance service provider had already started its business operations.

Maintenance Service Provider business data (MSP): Data were collected on contracts signed by new customers as well as the performance and user payment behaviour over the period January until December 2016. This study focuses on the binary variable contract commitment (1/0).

Background information on variables

Club variable: Supplementary Table 6.3 demonstrates how the club variable was developed. The “club” idea was inspired by Buchanan’s theory of clubs (Buchanan, 1965), which is concerned with the highest attainable utility for the individual with respect to the optimum size of groups. A membership club limits the number of users and ensures an active management through adherence to the rules. This classification was developed by Koehler *et al.* (2015) for waterpoints in Kitui

County, Kenya. The requirement is to fulfil at least six out of ten rules, which have been classified as physical (lock, fence, pump attendant), financial (membership joining fee, non-member fee, regular payment, fines), and social (labour contributions, regular meetings, usage rules). Usage rules are the most common feature with 74 per cent of pumps adhering to them. For simplicity, all ten rules are weighted evenly, which is a simplification, but gives an idea of the number of rules set up by each group.

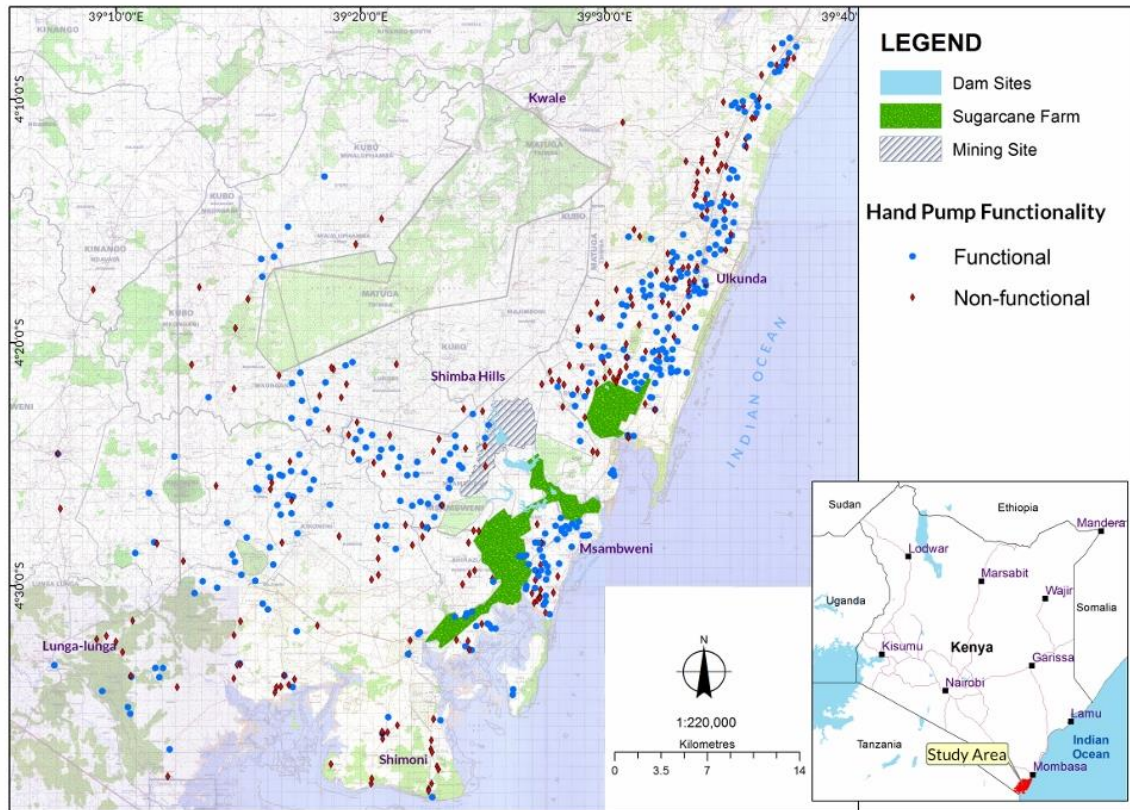
Multidimensional welfare index – poorest quintile variable: Katuva and Hope developed a welfare index which is used to compute the “*poorest quintile*” variable in this paper. For constructing a welfare index, the Principal Component Analysis (PCA) technique was applied (Filmer and Pritchett, 2001; Falkingham and Namazie, 2002; Vyas and Kumaranayake, 2006). They used a total of 29 indicators clustered into five groups: household composition, dwelling characteristics, asset ownership, sanitation and health, and drinking water (Supplementary Table 6.4). Households were assigned a score of ‘1’ if they met the criteria for an indicator, otherwise ‘0’. Households with missing data on at least one of the indicators were removed from the analysis. They then developed a multidimensional welfare index for the year 2014 based on all indicators; they label this welfare index the “multidimensional welfare index” (see Supplementary Table 6.4). This was done for years 2014 and 2015 using the same weights generated by the PCA with 2014 as the reference year. (Applying different weights for the year 2015 would have made the two years incomparable). Finally, they selected a subset of indicators likely to change over the short term as a result of local processes or events, choosing those with large factor scores from the PCA; eight “short term” indicators were identified. From these

Supplementary Information

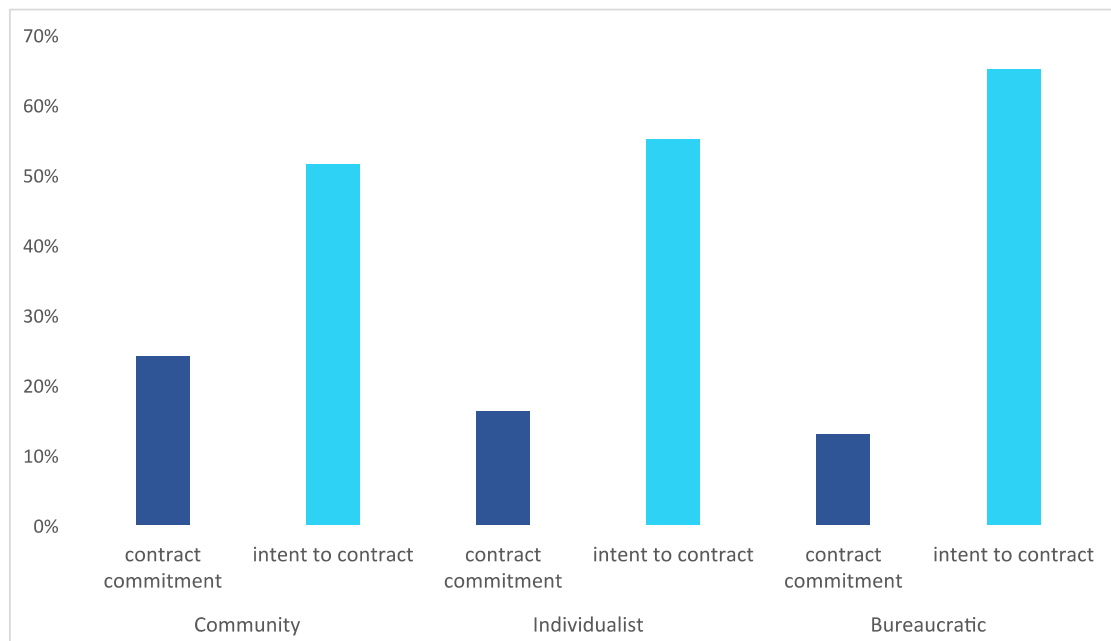
eight indicators they developed a welfare index for the years 2014 and 2015 using the same approach as above. They label this welfare index the “dynamic welfare index”. The “*poorest quintile*” variable comprises the bottom 20 per cent of the eight-variable dynamic welfare index.

Missing data variable: One handpump level model was run omitting all observations which had missing data as well as one with creating variables for missing data, which accumulated due to the appending of six datasets. The following variables were created for: a) “penalty for non-payment” (only 248 observations were recorded – the value ‘0’ was assigned to the remaining 23 observations); b) “regular payment”, “spare parts stored at handpump”, “alternative sources (all four)”, and “water available all year” (only 256 observations were recorded – the value ‘0’ was assigned to the same remaining 15 missing observations); c) “handpump age” (only 255 observations were recorded – the average value ‘21.69’ was assigned to the remaining 15 observations); and d) “handpump group size” (only 249 observations were recorded – the average value ‘44.12’ was assigned to the remaining 20 observations). Since the results were relatively stable, we opted for just one missing variable for “penalty for non-payment” in the final models presented in the paper.

Supplementary figures

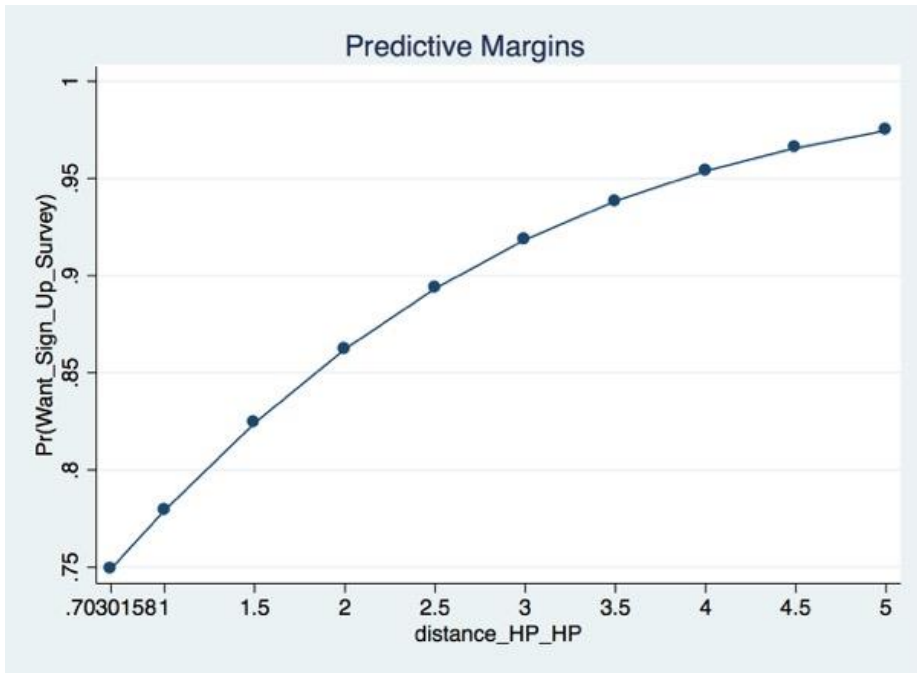


Supplementary Figure 6.1 Distribution and functionality of waterpoints fitted with Afridev handpumps in Kwale, Kenya (Foster and Hope, 2016)



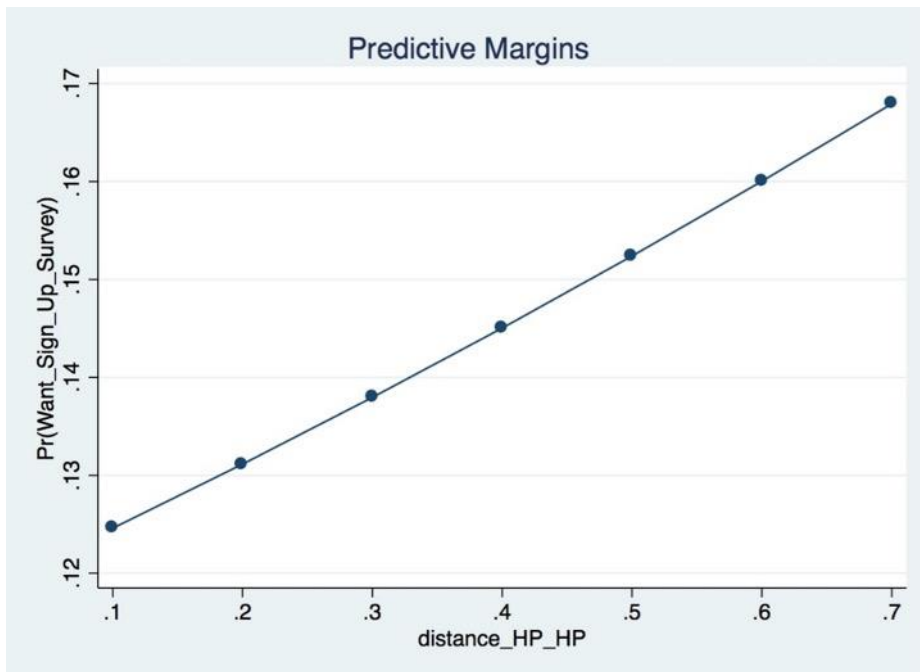
Supplementary Figure 6.2 Contract commitment within the first year in operation by user group versus household intent to contract within each management culture

Supplementary Information



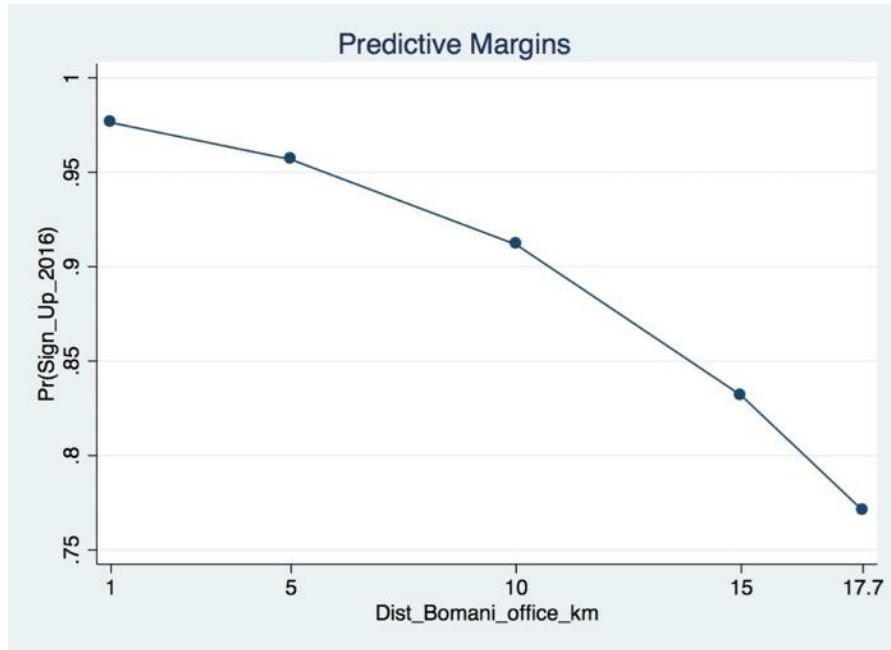
Supplementary Figure 6.3 Marginal effects for predicted probabilities for household intent to contract (y axis) under best-case scenario (Model 1)^a

^a Assuming a best-case scenario with regular payments at the handpump and charges as adequately priced, no support for free water for the vulnerable, the household using water for drinking water purposes, and a distance to the next handpump within a radius of 0.7 to 5 kilometres (also see Supplementary Table 6.7).



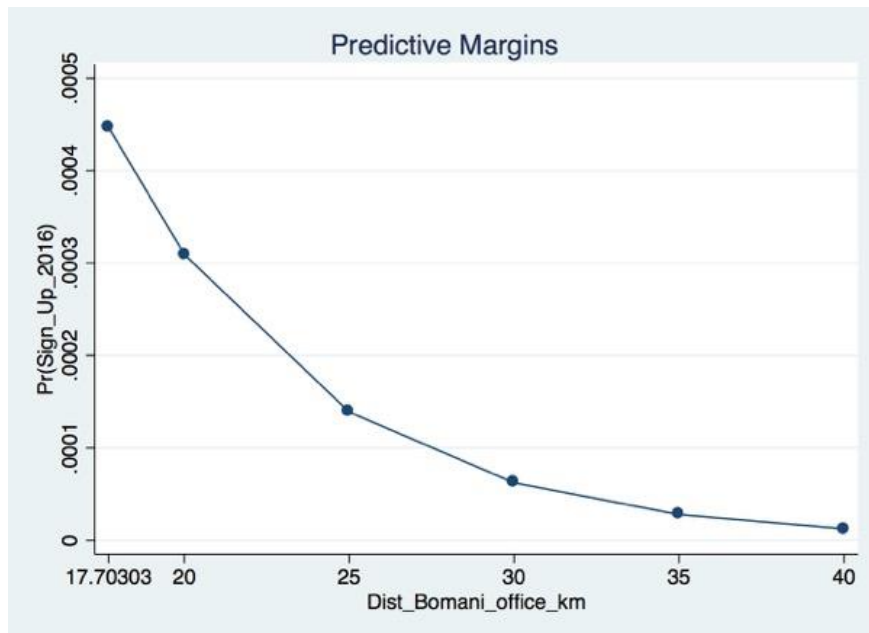
Supplementary Figure 6.4 Marginal effects for predicted probabilities for household intent to contract (y axis) under worst-case scenario (Model 1)^a

^a Assuming a worst-case scenario: no regular payments, concerns about water charge, support for free water for the vulnerable, handpump water not used for drinking, and distance to next handpump at 0.7 down to 0.1 kilometres (also see Supplementary Table 6.8).



Supplementary Figure 6.5 Marginal effects for predicted probabilities for user group contract commitment (y axis) under best-case scenario (Model 2)^a

^a Assuming a best-case scenario: the waterpoint user group is a club with women on the committee and regular payments, the water has low salinity and a pH over seven, the households grow crops, but the waterpoint is not situated in a coral area nor has spare parts stored close by and a distance to the maintenance service provider office of 17.7km down to 1km (also see Supplementary Table 6.9).



Supplementary Figure 6.6 Marginal effects for predicted probabilities for user group contract commitment (y axis) under worst-case scenario (Model 2)^a

^a Assuming a worst-case scenario: no club, no women on committee, no regular payments, high EC, low pH, household does not grow crops, spare parts are stored, the geology is coral and the distance to the maintenance service provider office between 17.7 and 40km (also see Supplementary Table 6.10).

Supplementary tables

Supplementary Table 6.1 Downtime days before entrepreneurial model

	N ^a	Total downtime days	Average downtime days
Community	201	7183	35.7
Institution	34	664	19.5
Private	29	694	23.9
n/a	84	863	10.3
Grand Total	348	9404	27.0

^a Waterpoint Mapping Survey: Data is from recall. Long-term non-functional handpumps have been excluded from this presentation.

Supplementary Table 6.2 Definition of variables in regression models

Category	Variable (Data source)	Description of the variables
Organisation	Community management (CHV)	Handpumps are managed by user committees, elected by the user group. They have varying rules and regulations for operations and maintenance and financial management.
	Private (CHV)	Handpumps are privately managed by the owner.
	Institution (CHV)	Handpumps are managed by institutions such as the management committees of schools, clinics, or religious institutions.
	Club with rules (WUC)	These user groups have at least six rules across the financial, operational and institutional categories.
	Rules made by majority decision (WUC)	Decisions on financial management and operation and maintenance are made by majority decision.
	Women in committee (HH panel)	The committee includes at least one woman.
	Exclusion for not observing rules (WUC)	Users who do not observe the rules of the group are excluded from using the handpump for an agreed period of time.
	Penalties for non-payment (WUC)	Penalties are imposed on users who do not abide by the financial regulations.
	Regular payments (HH panel)	Users make regular payments either on a monthly basis or on pay-per-jerrican basis.
	Spare parts stored at handpump (CHV)	User groups have spare parts stored locally for the case of pump breakdown, which can lead to a quick repair.
Socio-economic	Poorest quintile (HH panel)	Binary variable for users in the lowest welfare quintile of the welfare index.
	Subjective poor (HH panel)	Users were asked whether they consider themselves poor, average or well-off. This is a binary variable for those stating they are poor.
	Willingness-to-pay (HH panel)	Households were asked what their willingness-to-pay for the entrepreneurial model is before payments were introduced.
	Concern that water supply is costly (HH panel)	Binary variable whether household has concern about the affordability of the water charges.
	In favour of free water for the vulnerable (HH panel)	Binary variable whether the poorest, most vulnerable users in the user group should have free access and not pay the maintenance charges.

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Design	Distance to next handpump (WPM)	Distance in kilometres from users' main handpump to next handpump.
	Distance to maintenance service provider office	Distance in kilometres from users' main handpump to maintenance service provider office.
	Water concern reliability (HH panel)	Binary variable whether household has concern about the reliability of the water source.
	Low electric conductivity (EC) (HH panel)	Binary variable whether electric conductivity is below 1,500 μ S.
	High pH (HH panel)	Binary variable whether pH is above 7.
	Poor taste (HH panel)	Binary variable whether household considers taste of water as poor.
	Water concern safe to drink (HH panel)	Binary variable whether household has concern about the water quality.
	Geology coral (WPM)	Binary variable whether household lies in the densely populated coral strip along the coast.
	Handpump age (WPM)	Age of handpump in years since installation.
	Use	High volumetric use (WDT)
Handpump water for drinking (HH panel)		Binary variable whether handpump water is used for drinking purposes.
Handpump water for livestock (HH panel)		Binary variable whether handpump water is used for livestock purposes.
Household grows crops (HH panel)		Binary variable whether household grows crops.
Alternatives	Alternative source: handpump (HH panel)	Household uses another handpump as alternative source to handpump.
	Alternative source: open well (HH panel)	Household uses open well as alternative source to handpump.
	Alternative source: surface water (HH panel)	Household uses surface water (pond, river, stream) as alternative source to handpump.
	Alternative source: piped, tap (HH panel)	Household uses piped water as alternative source to handpump.
Performance	Free repair (MSP)	Binary variable whether handpump was repaired by professional maintenance service provider during a six-month free trial.
	Satisfied with maintenance provision (HH panel)	Binary variable whether household is satisfied with the maintenance provision.
	Missing data: penalty	Binary variable for ten missing observations for the penalty variable.

Legend: CHV – Marketing survey for maintenance service provider through Community Health Volunteers; WUC – Water User Committee survey; HH panel – Household survey 2013/14-2016; WPM – Waterpoint mapping survey; WDT – Water Data Transmitter measuring volumetric abstraction; MSP – Maintenance Service Provider data.

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Supplementary Table 6.3 Rules for handpump club – applied from Koehler *et al.* (2015) and updated for 532 handpumps in Kwale

Rule	Percent of pumps	Description
Physical excludability		
1. Lock	52%	Keys are only available to group members and are kept at a nearby house.
2. Fence	5%	Symbolic demarcation; fence helps keep livestock out.
3. Pump attendant	65%	Pump attendant is employed to keep the keys and collect money. Alternatively, group members rotate to fill the position.
Financial excludability		
4. Membership joining fee	13%	Membership joining fees since the installation of the pump are charged (payable in instalments).
5. Non-member fee	49%	Fee collected for single use by non-members and openness for new members to join.
6. Regular payment	33%	Monthly payments or on a pay-per-jerrican basis.
7. Fines	14%	Warranted for late fee payment or missing WUC or user group meetings.
Social excludability		
8. Labour contributions	61%	Contributions include fixing fences or labour on a community crop scheme.
9. Regular meetings	58%	Once a week/once a month, or only when the pump is broken.
10. Usage rules	74%	Rules include schedules and limits for pump use, especially during dry periods.

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Supplementary Table 6.4 Overall household PCA factor scores and summary statistics for variables, year 2014; n=3,229 (Katuva and Hope, forthcoming)

Variables		Multidimensional Welfare Index	Dynamic Welfare Index	Mean (<i>SD</i>)	Factor Score
Household composition	Highest level of education (Primary school)	X		0.55 (0.50)	-0.41
	Highest level of education (Secondary school)	X		0.33 (0.47)	0.39
	Outnumbered - more children under 15 to adults	X		0.28 (0.45)	-0.17
	At least one wage earner	X		0.10 (0.31)	0.17
Dwelling	Floor of main dwelling is improved (cement)	X	X	0.29 (0.45)	0.62
	Roof of main dwelling is improved (corrugated)	X	X	0.32 (0.47)	0.59
	Walls of main dwelling are improved (brick, blocks, cement)	X	X	0.41 (0.49)	0.56
	Walls of main dwelling are rendered	X		0.21 (0.41)	0.40
Asset ownership	Owens radio	X		0.71 (0.45)	0.44
	Owens bicycle	X		0.46 (0.50)	0.39
	Owens motorbike	X		0.11 (0.31)	0.33
	Owens mobile phone	X		0.84 (0.36)	0.40
	Owens cooking oil	X	X	0.45 (0.50)	0.52
	Owens sugar	X		0.60 (0.49)	0.51
	Owens flour	X	X	0.66 (0.47)	0.46
	Owens tea leaves	X	X	0.65 (0.48)	0.50
	Owens greater than 2 acres of land	X		0.42 (0.49)	0.16
	Owens large livestock (cattle or oxen)	X		0.20 (0.40)	0.13
	Uses wood to cook	X		0.95 (0.23)	-0.25
Sanitation and Health	Sanitation (pit with slab)	X	X	0.45 (0.50)	0.57
	Sanitation (bush/field)	X		0.45 (0.50)	-0.64
	Per cent of children under 5 years with diarrhoea in last week	X		0.05 (0.22)	-0.09
	Per cent of children 5-15 years with diarrhoea in last week	X		0.08 (0.28)	-0.08
	Owens soap	X	X	0.65 (0.48)	0.47
Drinking Water	Access to improved drinking water source in dry season	X		0.82 (0.39)	0.20
	Dry drinking water source is affordable, close, reliable or safe (3 or more)	X		0.14 (0.35)	0.20
	Access to improved drinking water source in wet season	X		0.83 (0.38)	0.21
	Wet drinking water source is affordable, close, reliable or safe (3 or more)	X		0.14 (0.35)	0.18
	Treat Water with Chlorine	X		0.14 (0.35)	0.12

Note: X marks the variables used in constructing the welfare indices

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Supplementary Table 6.5 Predictors of stated intent to contract at household level^a

a. Summary statistics

	N	Mean	SD
Club	1924	45.48	49.81
Rules made by majority decision	1919	17.72	38.19
Women on committee	1932	62.27	48.48
Exclusion for not observing rules	1919	9.59	29.45
Penalties for non-payment	1834	42.69	49.48
Regular payments	1827	49.70	50.01
Attendant collects fees	1919	46.43	49.89
Committee collecting fees	1909	47.67	49.96
Spare parts stored at handpump	1827	16.09	36.76
Low electric conductivity	1932	79.19	40.6
High pH	1932	29.35	45.55
Geology coral	1932	38.30	48.62
Group size	1805	44.32	44.13
Poorest quintile (%)	1932	19.77	39.84
Subjective poor (%)	1932	59.37	49.13
Richest quintile (%)	1932	19.93	39.96
Willingness-to-pay (USD) ^b	1896	5.80	9.65
Concern that water supply is costly (%)	1932	6.99	25.5
In favour of free water for vulnerable (%)	1899	83.64	21.64
Distance to next handpump (km)	1907	0.70	0.38
Distance to maintenance service provider office (km)	1932	17.16	10.18
Distance to major road (km)	1926	3.90	4.77
Handpump age (years)	1838	21.9	4.77
High volumetric use (%)	1932	52.33	49.96
Water available all year (%)	1827	86.92	33.73
Water concern reliability (%)	1932	15.58	36.28
Poor taste (%)	1932	6.21	24.14
Water concern safe to drink (%)	1932	9.06	28.71
Handpump water for drinking (%)	1827	58.57	49.27
Handpump water for livestock (%)	1827	11.77	32.23
Household grows crops (%)	1927	74.47	43.62
Household owns animals (%)	1928	34.75	47.63
Alternative source: handpump (%)	1827	20.91	40.68
Alternative source: open well (%)	1827	41.22	49.24
Alternative source: surface (river, stream, pond) (%)	1827	10.89	31.16
Alternative source: piped tap (%)	1827	18.36	38.79
Free repair (%)	1932	57.30	49.48
Satisfied with maintenance provision (%)	1932	70.45	45.64

b. Management variable

	N	Percent
Management – community	1461	75.62

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Management – private	257	13.3
Management – institution	214	11.08

^a Handpump level summaries are reported in the paper itself.

^b Conversion rate: 1 KES = 0.009677 (14 June 2017)

Supplementary Table 6.6 Multivariate linear probability models

	Model 1			Model 2		
CATEGORY	DV: Intent to contract			DV: Contract commitment		
Explanatory Variables	N=	R ² =	P-	N=	R ² =	P-
ORGANISATIONAL	Coef.	(robust SE) ^b	value	Coef.	(SE)	value
Management (w.r.t. community)						
Individualist	-0.046	(0.103)	0.660	0.015	(0.078)	0.852
Bureaucratic	0.032	(0.108)	0.770	0.023	(0.088)	0.791
Club	-0.025	(0.085)	0.767	0.080	(0.060)	0.182
Rules made by majority decision	-0.100	(0.993)	0.317	-0.014	(0.072)	0.852
Women on committee	0.061	(0.075)	0.417	0.108+	(0.059)	0.066
Exclusion for not observing rules	-0.190	(0.124)	0.126	0.062	(0.092)	0.501
Penalties for non-payment	-0.053	(0.050)	0.297	0.074	(0.058)	0.205
Regular payments	0.213*	(0.085)	0.013	0.111+	(0.061)	0.070
Spare parts stored at handpump	-0.070	(0.084)	0.405	-0.102	(0.069)	0.141
SOCIO-ECONOMIC						
Poorest quintile	0.031	(0.043)	0.464	0.154	(0.143)	0.280
Subjective poor	-0.032	(0.041)	0.434	0.056	(0.146)	0.699
Willingness-to-pay per month	3.11e-06	(9.65e-06)	0.747	-0.000	(0.00)	0.357
Concern that water supply is costly	-0.148**	(0.054)	0.007	0.046	(0.211)	0.826
In favour of free water for vulnerable	-0.122**	(0.044)	0.007	0.051	(0.142)	0.718
OPERATIONAL						
Distance to next handpump	0.086*	(0.036)	0.017	0.107	(0.094)	0.256
Distance to MSP office	0.009+	(0.005)	0.090	-0.014**	(0.004)	0.001
Concern that water is unreliable	0.042	(0.052)	0.421	0.198	(0.128)	0.125
Low electrical conductivity	0.058	(0.091)	0.520	0.137+	(0.070)	0.052
High pH	-0.031	(0.092)	0.735	0.111+	(0.066)	0.095
Taste is considered poor	0.126	(0.148)	0.395	0.017	(0.114)	0.883
Concern that water is unsafe to drink	-0.036	(0.059)	0.548	0.125	(0.171)	0.468
Geology coral	-0.030	(0.081)	0.707	-0.078	(0.067)	0.251
Handpump age	-0.004	(0.005)	0.394			
USE						
High volumetric use	0.016	(0.074)	0.829	0.061	(0.055)	0.273

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Handpump water for drinking	0.184*	(0.085)	0.032	-0.049	(0.064)	0.445
Handpump water for livestock	-0.239⁺	(0.134)	0.076	0.114	(0.094)	0.224
Household grows crops	-0.003	(0.042)	0.941	0.183	(0.113)	0.107
ALTERNATIVES						
Alternative source: handpump	-0.045	(0.136)	0.741	0.049	(0.105)	0.642
Alternative source: open well	0.040	(0.127)	0.755	0.033	(0.096)	0.732
Alternative source: surface water	0.075	(0.159)	0.638	-0.035	(0.118)	0.767
Alternative source: piped, tap	0.142	(0.148)	0.337	0.057	(0.111)	0.612
PERFORMANCE						
Free repair	0.008	(0.081)	0.924	0.083	(0.061)	0.174
Satisfied with maintenance provision	0.017	(0.038)	0.662	-0.011	(0.104)	0.917
Missing data: penalty	n/a	n/a		0.000	(0.113)	0.997
constant	0.193	(0.239)	0.419	-0.153	(0.245)	0.532

Significance: + P<0.1, * P<0.05, ** P<0.01, *** P<0.001

^a Model 1 at household level

^b Standard Error adjusted for 190 clusters along “handpump group”

^c Model 2 at handpump level

While Model 1 has more significant coefficients than Model 2 and is better at specifying the model with a line, overall the logistic regression models reported in the main paper appear to be more appropriate for the data.

Supplementary Table 6.7 Marginal effects for predicted probabilities for household intent to contract under best-case scenario (Model 1)^a

	Margin	Delta-method				
		Std. Err.	z	P>z	[95% Conf.	Interval]
at ^b						
0.7km	0.7492123	0.0588922	12.72	0.000	0.6337856	0.8646389
1km	0.7792399	0.0578629	13.47	0.000	0.6658308	0.892649
1.5km	0.8242058	0.0600878	13.72	0.000	0.7064359	0.9419756
2km	0.8621233	0.0624661	13.8	0.000	0.7396921	0.9845545
2.5km	0.8933321	0.0624437	14.31	0.000	0.7709447	1.01572
3km	0.9184688	0.0596884	15.39	0.000	0.8014816	1.035456
3.5km	0.9383314	0.0547979	17.12	0.000	0.8309295	1.045733
4km	0.953768	0.0486155	19.62	0.000	0.8584834	1.049053
4.5km	0.9655954	0.0419204	23.03	0.000	0.883433	1.047758
5km	0.9745502	0.0353086	27.6	0.000	0.9053466	1.043754

^a Assuming a best-case scenario with regular payments at the handpump and charges as adequately priced, no support for free water for the vulnerable, the household using water for drinking water purposes, and a distance to the next handpump within a radius of 700 metres to 5 kilometres.

^b Predicted probabilities for increasing distance to next handpump.

Supplementary Table 6.8 Marginal effects for predicted probabilities for household intent to contract under worst-case scenario (Model 1)^a

	Margin	Delta-method				
		Std. Err.	z	P>z	[95% Conf.	Interval]
at ^b						
0.7km	0.1681785	0.0470062	3.58	0.000	0.0760481	0.2603088
0.6km	0.1600228	0.0459969	3.48	0.001	0.0698706	0.2501751
0.5km	0.15239	0.0453023	3.36	0.001	0.0635992	0.2411808
0.4km	0.1450345	0.0448384	3.23	0.001	0.0571529	0.232916
0.3km	0.1379532	0.0445559	3.1	0.002	0.0506254	0.2252811
0.2km	0.1311426	0.044408	2.95	0.003	0.0441045	0.2181808
0.1km	0.1245986	0.0443525	2.81	0.005	0.0376693	0.211528

^a Assuming a worst-case scenario: no regular payments, concerns about water cost, support for free water for the vulnerable, handpump water not used for drinking, and distance to next handpump at 0.7 to 0.1 kilometres.

^b Predicted probabilities for decreasing distance to next handpump.

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Supplementary Table 6.9 Marginal effects for predicted probabilities for user group contract commitment under best-case scenario (Model 2)^a

	Delta-method				[95% Conf.	Interval]
	Margin	Std. Err.	z	P>z		
at ^b						
17.7km	0.7706522	0.11	7.08	0.000	0.5572734	0.984031
15km	0.8317984	0.09	9.44	0.000	0.6591039	1.004493
10km	0.9117022	0.06	16.23	0.000	0.8015914	1.021813
5km	0.956736	0.03	28.43	0.000	0.8907781	1.022694
1km	0.9763188	0.02	45.43	0.000	0.9341965	1.018441

^a Assuming a best-case scenario: the waterpoint user group is a club with women on the committee and regular payments, the water has low salinity and a pH over seven, the households grow crops, but the waterpoint is not situated in a coral area nor has spare parts stored close by and a distance to the maintenance service provider office of 17.7km down to 1km.

^b Predicted probabilities for decreasing distance to maintenance service provider office.

Supplementary Table 6.10 Marginal effects for predicted probabilities for user group contract commitment under worst-case scenario (Model 2)^a

	Delta-method				[95% Conf.	Interval]
	Margin	Std. Err.	z	P>z		
at ^b						
17.7km	0.0004	0.001	0.66	0.509	-0.00088	0.0017735
20km	0.0003	0.001	0.65	0.513	-0.0006166	0.0012351
25km	0.0001	0.000	0.63	0.525	-0.0002897	0.0005673
30km	0.0001	0.000	0.61	0.544	-0.000139	0.0002636
35km	0.0000	0.000	0.57	0.567	-0.0000677	0.0001236
40km	0.0000	0.000	0.54	0.592	-0.0000333	0.0000583

^a Assuming a worst-case scenario: no club, no women on committee, no regular payments, high EC, low pH, household does not grow crops, spare parts are stored, the geology is coral, and the distance to the maintenance service provider office ranges from 18 to 40km.

^b Predicted probabilities for increasing distance to maintenance service provider office.

7 The paradox of and progress
towards rural water sustainability in
Africa

The paradox of and progress towards rural water sustainability in Africa

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Abstract

The rural water sector has been exposed to processes of homogenisation that have led to the spread of technologies and voluntary institutional arrangements across large parts of sub-Saharan Africa. This paper proposes a reconceptualisation of rural water sector planning and investment by unpacking the theoretical and practical tensions between homogenisation towards a community, market or state solution, and pluralism, which dynamically realigns the three. First, we advance a framework combining institutional isomorphism and cultural theory to offer insights into the theoretical tension between homogenisation and pluralism, and the practical tension between the professionalisation of services and local diversity. We argue that coercive, normative and mimetic processes have led to the establishment of cultural regimes, while at times neglecting local pluralist institutions. This research makes the case for arrangements that combine the state, the market and communities through a realignment of isomorphic processes. Second, the framework is tested in Kenya, where two types of institutional change – legal and institutional reform through devolution, and professionalisation of rural water services – are aligned to potentially enable sector transformation. A survey involving all 47 county water ministries of the first devolved county governments and three case studies of professional service models across the country provide insights into the potential of pluralist arrangements to increase the sustainability of rural water services. The paper concludes with a reflection on how this new thinking might contribute to policy and practice to redefine approaches to advancing the sustainable development goal of universal water services in rural Africa.

Key words: Pluralism; Cultural theory; Institutional isomorphism; Rural water sustainability; Water policy; Kenya

7.1 Introduction

The halting progress towards rural water sustainability can be partly attributed to the need to balance universal drinking water services with financial sustainability. This paradox involves the latter often requiring institutional and financial regulations that, to be effective, may exclude the poorest, which will weaken or undermine the former. The tension is reflected in two different theoretic approaches, on which this paper draws: clumsy solutions that allow for institutional pluralism between the state, market, and community, and the countervailing processes of homogenisation. The framework proposed here provides a new perspective combining cultural theory of risk (Douglas, 1970, 1986, 1994, 1999; Wildavsky, 1987) and institutional isomorphism (DiMaggio and Powell, 1983). The theoretical contribution attempts to provide new insights and direction, given that the global Sustainable Development Goal (SDG) of safely managed drinking water services for all by 2030 (UN, 2015) is significantly more ambitious than the previous Millennium Development Goal (MDG) in terms of scale and scope of investment, infrastructure, and inclusivity, which requires institutional rethinking. While 147 countries met the less onerous MDG in 2015, the majority of those that missed the target are located in sub-Saharan Africa (UNICEF and WHO, 2015), as are the majority of people among the – globally – 844 million without basic drinking water (WHO and UNICEF, 2017a). The policy and practical implications of following the current trajectory are destined to lead to failure without radical and fresh approaches which recognise and embrace alternative constellations of state, market and community partnerships.

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Recent criticisms of the community management paradigm look towards the private sector to provide new impetus for progress towards servicing infrastructure sustainably (Koestler, 2009; Banerjee and Morella, 2011; Foster, 2012; Lockwood and Le Gouais, 2015; RWSN, 2017). We argue that neither the community, the state, or the market alone are likely to make sufficient progress towards *universal* water services, and we hypothesise that pluralist arrangements linking the three can be more flexibly adapted to local contexts while allowing for a certain degree of scale and professionalisation. The three principles inherent in the state, market, and community are identified here as enforcement, efficiency, and equity. Monitoring, contracts, and regulation are potential tools to achieve these principles. Whether and how these might all be met at the same time is discussed through examining a realignment and potential weakening of the forces of homogenisation characterised as coercive (formal rules), normative (professionalisation), and mimetic (standard responses to uncertainty due to information deficits). The viability of an institution may thus be defined as its capability to be sustained within its environment, despite a range of external pressures and internal tensions (6, 2003).

The theoretical paradox of combining pluralism and homogenisation provides a useful lens through which to reflect on the development of the rural water sector. Isomorphic processes generally tend to push for a dominant culture through coercive, normative and mimetic processes, which may be reinforced by existing structures and efforts to deal rationally with uncertainty and constraint (DiMaggio and Powell, 1983). DiMaggio and Powell (1983, p. 158) acknowledge this paradox and promote pluralism as “a guiding value in public policy deliberations”, advocating new forms of intersectoral coordination that will encourage diversification rather than

homogenisation. We therefore examine whether intersectoral realignment may lead to progress towards sustainable maintenance and sustainable finance in the rural water sector, drawing on three case studies of professional rural service models in Kenya.

The paper offers three contributions to the literature. First, we advance and evaluate the extent to which theory can reimagine pluralist institutional arrangements that, while recognised by current practice, are weakly conceptualised in a coherent and replicable framework. Second, we examine the theoretical approach in three rural water maintenance models in rural Kenya which provide different dimensions and interpretations of the theoretical framework. Third, we reflect on how this new thinking might contribute to policy and practice to redefine approaches to advancing the SDG of providing safely managed drinking water to everyone in rural Africa (UN, 2015).

7.2 Theoretical perspectives on institutional pluralism and homogenisation

7.2.1 Clumsy solutions in rural water

Cultural theory of risk, also known as the theory of plural rationality and the theory of sociocultural viability (Thompson, Ellis and Wildavsky, 1990; Douglas, 1994; 6, 2003; Verweij *et al.*, 2006; Thompson, 2013), can enhance our understanding of the four basic ways of organising to manage risks locally (hierarchist, egalitarian, individualist, and fatalist), as well as of a potential realignment to pool these risks in a dynamic relationship of the state, the market, and communities. Cultural theory

combines two strands of social theory – social regulation or structuration and collective representation – through its grid-group typology. It thus extends beyond the dualism of hierarchies and markets that is common in institutional theory (Dake and Thompson, 1993; Grendstad and Selle, 1995). Hierarchies institute inequality and set limits on competition; markets institute equality of opportunity (although not of condition) and promote competition. Cultural theory adds the following two kinds of social organisation: equality of condition without competition (egalitarianism), and inequality with competition (fatalism) (Dake and Thompson, 1993).

These four solidarities map onto rural water infrastructure managed by communities (egalitarian), schools, clinics or religious institutions (bureaucratic), or private owners (individualist), as well as fatalists with long-term broken infrastructure, who free-ride on other management arrangements or revert to unimproved sources (Koehler *et al.*, 2018). The fatalist solidarity has been the subject of examinations of micro-level water management (Therkildsen, 1988; Harvey and Reed, 2004); however, this paper focuses on the active management solidarities (hierarchist, egalitarian, and individualist) across multiple scales – from the national to the household level. We call the applicability of the same set of solidarities at different levels “vertical universality” (Grendstad and Selle, 1995, p. 20) – which we use as shorthand for patterns or alternative ways of organising that co-exist at each scale focused on by this research.

Vertical universality is especially powerful when cultural regimes develop – the complex of institutional geography, rules, practice, and animating ideas that are associated with the regulation and governance of a particular risk – that permeate

multiple scales (Hood, Rothstein and Baldwin, 2001), as they do in the case of rural water supply. Community management has been the dominant regime in the rural water sector for decades (Harvey and Reed, 2004; Whittington *et al.*, 2008) and a cultural bias – or “steady preference” in Douglas’ (1999) terms – has favoured community management, including the knowledge and behaviour that go with it. The dangers of strong monocultural regimes include a) the strengthening of fatalism through the tendency of rigid hierarchies to reinforce existing social structures and practices, which may be unequal (Mamdani, 1996); b) the possibility of leaving behind those who are less-entrepreneurial in an individualist-dominated environment; and c) the slow and sometimes difficult decision-making processes that characterise egalitarianism. These last may be antithetical to development due to their insistent demands for equality of condition, which tend to exacerbate conflict and redistribute resources in a potentially financially unsustainable way. It is widely recognised that a predominance of fatalism is likely to harm the system, while constructive interaction between hierarchy, individualism, and egalitarianism may be conducive to economic growth (Dake and Thompson, 1993; Rayner and Malone, 2000). In pursuit of a feasible solution this study predominantly focuses on these three constructive solidarities.

Finally, we ask, what does it take to change cultural regimes? This relates to the “clumsy” imperative towards pluralism. It is important to acknowledge that there is inherent instability within each culture as at each institutional level there are those in favour of tradition, those who open their institution up to opportunity and those who block opportunities for change in favour of turning back to more fundamental structures (Douglas, 1999). If the middle group becomes dominant, change may occur.

As imposing one culture on all is likely to lead to gridlock, so-called “clumsy solutions” are advocated by some cultural theorists (Verweij *et al.*, 2006; Thompson, 2013). They allow the ideal-type cultures to co-exist and combine their fundamentally different approaches to reality. Thus the hierarchical reliance on authority, the individualist confidence in entrepreneurship, and the egalitarian preference for collaboration may together shape a more flexible approach (Verweij *et al.*, 2006). The inherent instability of each archetype functions as the engine driving continual shifts in governance. However, the inherent instability – or even failure as regards community management being able to achieve greater sustainability at scale – does not seem to propel a wider realignment. We therefore argue that examining regime change by adding the perspective of institutional homogenisation can provide new insights into the tensions in theory and practice in the rural water sector.

7.2.2 Institutional homogenisation in the rural water sector

To distinguish between at least three ways in which pressures exist to conform to a single institutional model, the theory of institutional isomorphism is proposed. These pressures are often exerted in the name of efficiency but may act as a countervailing force to the clumsy arrangements described above. Within a certain hegemonic discourse (Rayner, 1995b), cultural regimes may be favoured, resourced, and mimicked in a process of “homogenisation” or “isomorphic change”, which leads to a decrease in variation and diversity. DiMaggio and Powell (1983, p. 149) define isomorphism as a “constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions”, and they

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suggest that the three mechanisms of institutional isomorphic change are: a) coercive isomorphism that can be attributed to political influence and contentious legitimacy; b) mimetic isomorphism originating in standard responses to uncertainty; and c) normative isomorphism related to professionalisation. DiMaggio and Powell (1983) emphasise that these are not always empirically distinct but tend to derive from different conditions and may lead to different outcomes. We apply this framework to the rural water sector and ask whether a paradigm shift can occur when all three processes have new impetus through legal, professional and contractual changes, as well as improved levels of information.

Coercive change occurs when formal and informal pressures are exerted on organisations by other organisations upon which they are dependent and by cultural expectations in the society within which they operate. Actors within the organisations may be prompted to do something they would not do of their own accord or refrain from doing something they would otherwise do. In their definition, DiMaggio and Powell (1983) suggest that these pressures involve not only mere force, they also include persuasion or the invitation to join an agreement. We use this broader definition when reflecting on “coercive” measures in the rural water sector. Typical forms of coercive organisational change are those that take place through direct responses to a common legal environment, a government mandate, and regulation (DiMaggio and Powell, 1983). In the rural water sector, community management has become the main paradigm after decades of colonial rule (Mamdani, 1996; Agrawal and Gibson, 1999). It is enshrined in water laws and policies across sub-Saharan Africa (Government of Ghana, 1998; Republic of Namibia, 2000; Republic of Kenya, 2002; Harvey, 2008; Government of Uganda, 2011). This is a legacy of the

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International Drinking Water Supply and Sanitation Decade, 1981 to 1990, which promoted community management (Arlosoroff *et al.*, 1987; Therkildsen, 1988; Carter, Tyrell and Howsam, 1999; Harvey and Reed, 2004; Whittington *et al.*, 2008) in order to empower communities through participation, collective decision-making, control and ownership (Briscoe and de Ferranti, 1988; DFID, 2002; Lockwood, 2004). Since it became the orthodoxy, donor funding and government practice have largely been conditioned to programmes embracing community management, thus making its coercive character even more pronounced, through apparently reflecting the priorities and interests of the poor (Hope, 2015).

However, tensions in community-driven development have also been highlighted, as the external actor often plays a direct role in setting equity criteria that do not necessarily conform to those of the community (Cleaver and Toner, 2006). Questions arise about the role of government in legitimising local authorities to translate the legislative framework into practice, especially as this often becomes a gateway for elites to impose their prioritised models of organisational structure and policy, which then go unquestioned for years to come (Katz, 1975). While devolution reforms in many developing countries weaken existing hierarchical structures, new coercive processes emerge, which create a changing legal and institutional environment as well as defining new interdependencies within the domains of the state, the market, and society.

The second process of isomorphic change is *normative*. The normative debate within communities, as well as the laws, conventions, and social values (Douglas, 1994) by which they are structured, has recently brought professionalisation

to the fore. In practice, normative change results essentially from professionalisation, which includes the knowledge, methods and skills applied by the members of a particular field (DiMaggio and Powell, 1983; Ashworth, Boyne and Delbridge, 2007). In the rural water sector, this mainly refers to the implementers, the engineers, who install infrastructure, and to locally trained mechanics who maintain the infrastructure. Harmonisation of professional conduct is therefore instrumental in developing the sector, be it through professional mechanics networks – as, for example, in Uganda (MWE *et al.*, 2012) – or through training community members to fix their own infrastructure. Either may take up a coercive paradigm and develop their own norms around it; hence there is a variation in community management practices. A result of this is that the operational side of the infrastructure may have been prioritised over institutional and equity considerations, which are critical for sustainability in the post-implementation phase.

Mimetic forces are pressures to copy or emulate other organisations' activities, systems, or structures. Especially under conditions of uncertainty – for example, when organisational technologies are poorly understood (March and Olsen, 1976), information is lacking, or goals are ambiguous – adopting practices used by others can enhance legitimacy (DiMaggio and Powell, 1983). For the rural water sector, uncertainty is especially high in the post-implementation phase, often leading to *mimetic* behaviour, for three reasons. First, waterpoints are rarely monitored and hence the time from breakdown to repair extends over several weeks on average (Foster, 2013; Banks and Furey, 2016). Second, payments are rarely deposited in a bank account, which limits financial accountability (Lockwood and Le Gouais, 2015). Third, there is no financial allocation from the state or donors for the post-

implementation phase. Hence, the attractiveness of mimicking the widely accepted community-managed rural water services has been powerful for state actors and donors, as the onus in respect of both operational and financial sustainability is on the community. Such mimetic processes lead to the ubiquity of certain kinds of structural arrangements without necessarily enhancing efficiency (Ashworth, Boyne and Delbridge, 2007). Mimetic behaviour can thus limit progress towards sustainable maintenance and finance.

Isomorphic processes, originally used in organisational analysis, are applied to the rural water sector here to explain the limited space for pluralism and the creation of certain cultural regimes, such as community management. We investigate under which circumstances space emerges for new, pluralist, models to take hold.

7.3 Institutional pluralism under processes of homogenisation

The framework advanced here tries to capture the tension of the clumsy imperative towards pluralism and the countervailing processes of homogenisation. Thus, linking these two theories provides novel insights, as one explains variability between state, market, and communities (Rayner, 1995a) and how these solidarities are linked, while the other highlights the processes that can create cultural regimes – and why it is hard to break out of them.

The framework (Figure 7.1) describes three modes by which the different ways of organising affect the whole system by capturing the three solidarities that can

be present from the household to the national levels – hierarchists, individualists, and egalitarians. Each has their own principles by which they try to make decisions (Rayner, 1995a): hierarchists try to promote a socially optimal approach that can be *enforced*; individualists are motivated by incentives in a strive towards *efficiency*; and egalitarians try to get a fairer deal by adhering to the principle of *equity*. The tools to reinforce these solidarities include regulation, contracts, and the professionalisation of services. Thus, in principle, the state, in regulating the market, may guarantee higher levels of equity for the community; the contracts between the market entity and the community, as customer, may be enforced by the state; and the norm of professionalisation embraced formally by the state and informally by the community may be realised through market-based approaches. These three tools are in line with the processes of homogenisation that institutional isomorphism proposes. Regulation can be a coercive tool that is used to ensure system maintenance, which tends to be key for hierarchists. Contracts help to reduce uncertainty and thus the need for mimetic behaviour, as long as they are enforced. However, egalitarians do not want the regulator or the market to have too much discretion. Professionalisation, mediated by the market, constitutes the normative process that leads to greater anticipated efficiency.

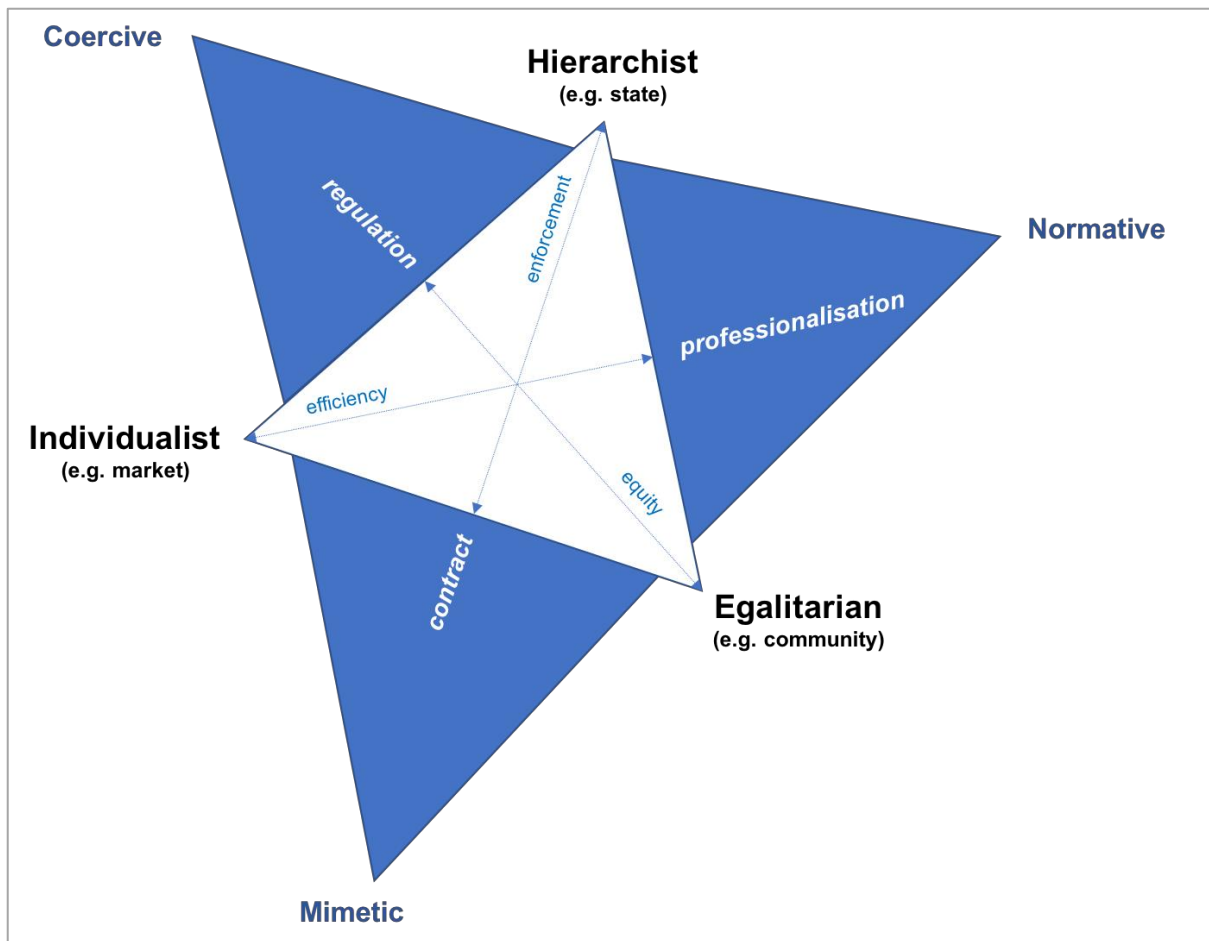


Figure 7.1 Institutional pluralism under processes of homogenisation

The framework of institutional pluralism, which represents a triangular pattern made up of alternative ways of organising (hierarchical, individualist, and egalitarian), is repeated across scales from the micro level of households (Gibson *et al.*, 2011), to communities, to subnational and national levels, and even to interactions between states – what Grendstad and Selle (1995, p. 20) call “vertical universality”. In that sense, our framework can be imagined as a fractal representing evolving symmetry across multiple levels of analysis. However, not all of the three solidarities will always be present, nor will the isomorphic processes be equally strong at each level. The point we propose here is that this framework can be applied to an

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examination of the processes at a single waterpoint, in a network of waterpoints, and up to the interactions of governments, donors and the private sector, all of which interact across multiple scales in the rural water sector and add to the complexity of achieving progress towards safe water for all.

Two examples illustrate the case. First, the proposition that the archetypical solidarities reappear in a self-similar way at each level, as represented by the metaphor of fractals, suggests that, for example, the values behind community management at the waterpoint level align closely with the non-profit sector. As the non-profit sector are the main implementers of the approach, especially in East Africa, along with donors and governments, this provides insights into the longevity of this paradigm. Promoting entrepreneurial approaches, the individualist solidarity through the market plays a stronger role in West Africa (Kleemeier and Narkevic, 2010; Foster, 2012; Van Houweling *et al.*, 2012). These cross-scale linkages can, therefore, provide insights into why risk responses become standardised through norm-setting, regulation, and contracts. Second, the lack of clarity regarding what community management actually entails (Agrawal and Gibson, 1999; Blaikie, 2006) means that, at the micro level, the four management cultures led by “communities”, “individualists”, “bureaucratic” organisations, and “fatalists” are often all clustered under the term “community management”. Failing to recognise this cultural diversity is one of the reasons why this approach has had limited success.

Considering the evidence for the underperformance of community management in many cases, as well as state (non)response, one could argue that these various pressures have led to “voluntary failure” (Salamon, 1987) as well as

“government failure” (Wolf, 1988). There are high hopes for the market to remedy these failures in the rural water sector (Koestler, 2009; RWSN, 2017). However, due to the market’s requirement for full cost recovery and growth, it is unlikely to be a solution on its own. Instead, we argue that if the isomorphic forces are weakened or realigned, new pluralist models of rural water services can emerge, characterised by varying degrees of state, market and community representation and a specific focus on long-term sustainability.

7.4 Promise and progress for rural water in Kenya

Understanding cultural regime change requires an assessment of a) the legal environment, b) the translation into implementation programmes by county governments, and c) the informal evolution of water management in response to uncertainty at the local level. These dimensions are empirically examined for Kenya’s rural water sector as a weakening of isomorphic forces in the country has recently allowed greater potential for pluralism. Coercive forces have become less prescriptive through new formal rules that allow for alternatives to community management; normative forces, promoted by a new subnational level of government mandated to deliver drinking water services, have seen new levels of professionalisation and performance-based management; and mimetic forces have been weakened through a reduction in uncertainty through improved information flows. Kenya is therefore a suitable case study for empirically testing the framework advanced above.

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To examine the changes in these three forces, we use a mixed methods approach. Prior to data collection, research permits and approvals were obtained from the Government of Kenya's National Council of Science and Technology and the Central University Research Ethics Committee at the lead author's institution.

First, we examined coercive changes through a legal document analysis of Kenya's 2010 Constitution (Government of Kenya, 2010), the Water Bill 2014 (Republic of Kenya, 2014), and its final formulation in the Water Act 2016 (Republic of Kenya, 2016). In particular, we examined the provisions made for rural areas not considered commercially viable.

Second, the lead author conducted surveys with members of all 47 county water ministries in two stages: a) surveys undertaken at the first summit of the members of the Water County Executive Committee (CEC), also referred to as water ministers, in Baringo on 30–31 October 2015, organised by the Water Sector Trust Fund, where 26 of the 47 counties were represented; and b) a further 21 surveys either in person or over the telephone in November and December 2015. Of the surveys, 72 per cent were carried out with the CEC members for water themselves. Some directed their Chief Officers (15 per cent) or Directors of Water Services (11 per cent) to respond.

Third, case studies were chosen in three counties across Kenya with varying geographies, climatic zones, and social and political dynamics. All are among the poorer counties, with Turkana leading, with 79 per cent of its population defined as poor, followed by Kitui and Kwale, with almost half of their populations defined as poor (KIHBS, 2018). Moreover, only around 42 per cent of the total Kenyan

population are within formal water service provision areas, and a mere 22 per cent are actually served (WASREB, 2015). The underlying data were collected through household surveys, service provider records and interviews with the managers of the maintenance service providers in Kitui and Kwale Counties, and interviews with a representative from the Catholic Diocese of Lodwar (CDL), Turkana County (see Supplementary Information).

7.4.1 Coercive changes

In line with DiMaggio and Powell's (1983) broad definition of coercive processes, which encompasses not only the obligation but also the invitation to abide by certain rules, we reflect here on changes in Kenya's legal environment. The right to water is defined in article 43 1(d) of Kenya's 2010 Constitution, which states that "every person has the right to clean and safe water in adequate quantities" (Government of Kenya, 2010). The constitution also mandates the 47 newly established counties to deliver services such as water and health (Government of Kenya, 2010). The counties' mandate is reflected in the Water Act 2016, gazetted in September 2016 (preceded by the Water Bill 2014), which more specifically defines the roles and obligations of national and county governments (Republic of Kenya, 2016). Regulation remains the mandate of the national government under the Water Services Regulatory Board (WASREB). Article 94 refers to rural areas not considered commercially viable, the 58 per cent of Kenya's population described above. In addition to community management, it provides for a) professional service provision under a contract, including through private sector actors, b) institutional coordination, including the role of subnational government and the national regulator, and c) new

investment and financing plans (Republic of Kenya, 2016). These constitute important changes to the prescriptive paradigm of community management and allow for a more flexible representation of the state, market, and civil society.

7.4.2 Normative changes

One aspect of professionalisation is the emphasis on education and legitimation. For example, some of the district water officers and mechanics are trained at institutions such as the Kenya Water Institute (2017). The second aspect is the growth and elaboration of professional networks across which new models diffuse rapidly (Lockwood and Le Gouais, 2015). Such professionalisation of services represents a change in the rural water sector across sub-Saharan Africa (Kleemeier and Narkevic, 2010; Moriarty *et al.*, 2013; Chowns, 2015). It involves what Lockwood and Le Gouais (2015, p. 2) call “a change in philosophy from volunteerism towards service provision”, as part of which communities become clients for management services rather than providers of the services themselves. This professionalisation further involves a separation of the service functions: communities may retain ultimate management and decision-making powers but they may contract out specific tasks or all of the operation and administration to entrepreneurs.

At the same time, a change in philosophy has to occur at the level of government mandated to deliver rural water services. Under Kenya’s 2010 Constitution, this task falls to county governments, who become an implementer of the coercive rules and, thus, play an important role in shaping the normative side of rural water provision. With the overall goals and functions defined, county governments are flexible in implementing the rules, including delegating

responsibilities. For the first county governments under the devolved system in Kenya, 47 per cent of the CEC members state that public provision is best placed to maintain drinking water supply infrastructure in the county for rural areas (compared to 81 per cent for urban areas). Twenty-six per cent opt for service provision with a private component (either as public private partnerships (PPPs) (17 per cent) or with private companies (9 per cent)), and 23 per cent opt for community management. This strongly suggests that a certain normative change is under way, as community management finds the lowest support for being the best mechanism to provide drinking water services even for rural areas.

We are particularly interested in under which circumstances PPPs or private companies are considered the best option (Table 7.1). Overall, it is striking that PPPs or private companies are considered the best option for those counties that have the lowest water coverage, and by far the lowest percentage of the population in service provision areas (28 per cent) – nearly half of the percentage for community management (51 per cent) and public provision (47 per cent). This is also reflected in the perceptions of county water ministers. According to them, the county governments who see PPPs and private companies as best placed to maintain drinking water supply infrastructure regard themselves as least able to fulfil water users' expectations in terms of providing water services. In contrast, they express the highest levels of responsibility for rural areas (Koehler, 2018) in terms of ensuring the human rights criteria of sufficient quantity (67 per cent), potable quality (64 per cent), and non-discrimination (83 per cent) – only affordability is higher for adherents of public provision (60 per cent) and physical access is higher for adherents of community management (90 per cent).

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Considerations regarding tariffs and subsidies are crucially important as the sustainability of rural water services hinges on this component. What is considered to be a fair tariff is very similar for those who regard community management and PPPs/private models as best placed (just over USD 0.02 per 20-litre jerrican), whereas it is double for public provision areas (USD 0.04). The more striking aspect is the consideration of subsidies. Different strands of thought in the rural water sector advocate anything between “water is free” and full cost recovery. While the idea of blended finance is taking hold in the sector (Hutton and Varughese, 2016; Fonseca and Pories, 2017), it remains unclear what form this would take on the ground. The findings here show that the mandated duty-bearers generally consider subsidies to be necessary. Full cost recovery appears most appealing to those in favour of community management (55 per cent). The highest subsidies (multiple options were ticked at a time) are expected by those in favour of PPPs and private companies – first and foremost from the county governments themselves (75 per cent), followed by donors (50 per cent) as well as the national government (42 per cent) and cross-subsidisation through better-off consumers (25 per cent). Expectations are a third to three times higher among them than among those in favour of public provision and community management. As part of this consideration, it is also noteworthy that the counties that support PPPs and private companies are the ones with the largest number of NGOs active in the water sector (seven on average). It appears that with professionalisation comes the realisation that some pluralist arrangement – at least with regard to financing rural water – is necessary.

Table 7.1 47 County water ministries' perception of the rural water sector disaggregated by preference for provision by state, market or community

<i>Category</i>	<i>best placed to provide drinking water services with respect to rural areas</i>	Public provision			PPP/private companies			Community management		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
Water coverage^a	Actual water coverage (WASREB) (%)	20	50.5	19.5	10	47.2	24.5	11	52.3	22.6
	% of county population in service areas (WASREB)	20	47.0	34.6	10	27.6	12.9	11	51.2	25.7
Capacity to fulfil water users' expectations for water services	Fulfil expectations completely (%)	22	13.6	35.1	12	8.3	28.9	11	18.2	40.5
	Fulfil expectations partially (%)	22	72.7	45.6	12	66.7	49.2	11	72.7	46.7
	Fulfil expectations insufficiently (%)	22	13.6	35.1	12	25.0	45.2	11	9.1	30.2
Responsibility for drinking water service delivery for rural areas	Sufficient quantity (%)	21	52.4	51.2	12	66.7	49.2	10	60.0	51.6
	Potable quality (%)	20	55.0	51.0	11	63.6	50.5	10	60.0	51.6
	Affordability (%)	20	60.0	50.3	12	58.3	51.5	10	40.0	51.6
	Physical access (%)	20	65.0	48.9	12	66.7	49.2	10	90.0	31.6
	Non-discrimination (%)	21	76.2	43.6	12	83.3	38.9	10	70.0	48.3
Tariff and provision level	Mean fair tariff (USD per 20l) ^b	22	0.04	0.03	12	0.02	0.01	11	0.02	0.01
	Mean fair provision level (l/c/day)	22	32.7	13.5	12	32.5	13.6	11	27.3	14.9
Subsidy (can be blended)	User full cost (%)	21	38.1	49.8	12	33.3	49.2	11	54.5	52.2
	Subsidy from national government (%)	22	13.6	35.1	12	41.7	51.5	11	18.2	40.5
	Subsidy from county government (%)	22	59.1	50.3	12	75.0	45.2	11	45.5	52.2
	Subsidy through better-off consumers (%)	22	4.6	21.32	12	25.0	45.23	11	9.1	30.2
	Subsidy through donors (%)	22	13.6	35.1	12	50.0	52.2	11	27.3	46.7

^a WASREB data (WASREB, 2015) from same year as CEC survey

^b Conversion rate: 1 USD = 101.103 KES (31 March 2018)

7.4.3 Mimetic changes

We argue that the high level of uncertainty in the rural water sector has traditionally led to an imitation of the same paradigm, community management, across sub-Saharan Africa and southeast Asia, notwithstanding cultural, institutional and geographical differences. The realignment of coercive and normative forces is accompanied by a weakening of mimetic forces. Africa's expanding mobile-phone

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network architecture provides new mechanisms to address the systemic information deficit that limits accountability and increases the risks associated with investments in and management of rural water supply (Hope, Foster and Thomson, 2012).

Improved levels of information allow approaches that are better tailored to both the operational and financial side of rural water management as the force for imitation is weakened. Thus, information access can alter the calculus of risk and responsibility (Hope, Foster and Thomson, 2012). We examine three professionalised models that draw on improved information. Two of them rely on mobile monitoring of the water infrastructure and mobile payments, which improve accountability and allow for performance-based contracts. The third relies on more traditional information chains—recently including mobile phones—through a network of local offices and payments in person. This model demonstrates that coordination (rather than technology alone) is key for networked approaches to service delivery.

The question here is whether better information can change behaviours at the user, service provider, local government and donor levels. Schemes relying predominantly on voluntary management arrangements are less accountable, and committee members often lack relevant skills. Without active support and monitoring, inadequate technical, financial and managerial capacities tend to develop, which frequently leads to system breakdown and service failure (Lockwood and Le Gouais, 2015). The shift from volunteerism requires concluding a contract between communities and professionalised service providers, which represents the missing link between the community and market dimensions.

7.5 Case studies of professional rural water service models in Kenya

7.5.1 Three professional models displaying pluralism

The theoretic tension between homogenisation and pluralism is also manifested in practice. We compare three models that are subject to homogenisation through professionalisation; what distinguishes them is that they have varying representations of the hierarchist, individualist and egalitarian components in their operational structure, management of payments, and subsidies (Table 7.2). They vary in how they strive for efficiency, equity, and enforcement, applying different tools to achieve these elements.

The first two models described below use performance-based contracts by which local companies guarantee that professional mechanics repair rural water infrastructure within three days. These are establishing the link between community and market solidarities. If a repair exceeds three days, communities receive a free month of service, thus building in a penalty for poor performance. This is supposed to improve both efficiency and enforcement. Customers are, in turn, expected to register through annual contracts and pay a monthly fee (USD 10 per user group) for the service, not the water (Page, 2005), using mobile payments, and they receive messages on payment and service performance. This can increase transparency and oversight as well as targeted support based on objective information (REACH, 2016b).

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In the first model, Kwale Handpump Services Ltd. (KHSL) maintains handpumps in two of Kwale's sub-counties. Since January 2016, 75 user groups around 300 handpumps have registered with KHSL. This model can be described as pluralist as it serves different cultures at the local level: community-managed waterpoints (75%), those owned by private individuals (14%), and those managed by bureaucratic institutions (11%), which can all retain their own management rules (Koehler *et al.*, 2018). The objective of reducing the downtime of serviced handpumps from 37 days on average to three days has largely been achieved. This is a sign of operational success by the professional service provider; however, only around 15 per cent of the local operating costs are covered by user payments in the first year of service (REACH, 2017a), which indicates that a pure market approach relying on full cost recovery is unlikely to be successful, at least in the short to medium term. To ensure equity as well as efficiency, a subsidy is required, which is described further below.

In the second example from Mwingi North, Kitui County, two out of five of around 70 handpump user groups have signed a contract with a service provider since 2015, committing them to making monthly payments. Miambani Ltd. also expanded its maintenance services to piped schemes, serving around 60,000 people by April 2018. The model links the normative component of professionalisation of rural water services to government involvement through devolved decision-makers. Like in Kwale, the aim of this model is to increase efficiency by linking different management cultures and different types of infrastructure under one professional service provider. Improved information flows also facilitate vertical oversight, representing the

hierarchical component, which is elaborated in terms of blended finance institutions in Section 7.5.2.

The third model has been operated by the CDL in Turkana County since the 1980s. Collaboration with government has increased since the establishment of the Turkana County Government under the devolution reform. While there are separate diocesan and county teams of mechanics, water infrastructure planning and maintenance are coordinated in a water, sanitation and hygiene (WASH) forum on a monthly basis. Currently, two pump maintenance units fix infrastructure in all six sub-counties within two to three days, each of them serving approximately 500 water sources, including handpumps, solar pumps, and piped schemes.

While mobile phones aid the communication to inform the CDL of a waterpoint breakdown, they are not a prerequisite for success. Rather, the network that the CDL has built across the county, split into four parts with 27 parishes and offices, has proven crucial. If water infrastructure breaks down, users report a failure at their local parish, who inform the main office in Lodwar to send the professional repair team. The charge of USD 35 per annum per waterpoint, independent of the number of repairs, is paid in cash or livestock but only covers around 10 per cent of the costs. Thus, this model also requires subsidies. While the county government, like for the other two cases, nominally supports the model, the first county government (2013—17) did not commit financially, including for agreed repairs for their own infrastructure. Instead the vital subsidies required to continue the services have been externally provided, predominantly by a Slovakian NGO since the early 1990s.

Table 7.2 Characteristics of three professional rural service models in Kenya

	KHSL (Kwale) <i>(since 2015)</i>	Miambani (Kitui) <i>(since 2014)</i>	CDL (Turkana) <i>(since 1980s)</i>
Management	Individualist	Individualist	Hierarchist
Monitoring	Mobile technology	Mobile technology	Network of 27 sub-offices
Maintenance	Professional mechanics (contractual guarantee: <3 days)	Professional mechanics (contractual guarantee: <3 days)	Professional mechanics (stated guarantee: 2-3 days)
User finance	Contract: insurance- based (USD 120/year)	Contract: insurance- based (USD 120/year)	Annual charge (USD 35/year)
Supporting finance	Private sector (individualist) – shift from donor	Donors (hierarchist)	NGO (egalitarian)

The common, homogenising theme across these three models is professionalisation; however, they vary in terms of representation across the three solidarities, depending on the local context. The variation relates to both the mode of service provision as well as oversight and financial support. In terms of monitoring, the key to such professional models is an information network – whether based on mobile technology or on a network of offices. When community management emerged as the dominant cultural regime in the rest of Kenya in the 1980s and 1990s, Turkana had already established a professional model, thus reducing the need to mimic an approach that may be less effective in a large and dry environment. Operationally, all three models operate on a reactive basis, with some preventative maintenance for reasons of cost-effectiveness. Financially, all three consider user payments as essential: two have formalised annual contracts; the CDL model issues receipts for the annual maintenance charge. It is important to highlight that all models are dependent on external financial support for substantially more than half of their

local operating costs, as the payment records of the three models demonstrate. The financial support is provided by different solidarities, which supports the models' pluralist nature.

7.5.2 Towards sustainable finance through pluralist arrangements

Given the financial unviability of services provided through user payments alone, there is a need for external organisations that are able and willing to underwrite the full cost of service provision. According to the “three Ts”, the *tariffs* paid by the users need to be subsidised through *transfers* (from donors) and *taxes* (through government budget allocations) (OECD, 2009). In Turkana, subsidies have been provided for several decades through the CDL and its own international fundraising mechanisms, such as the Slovakian NGO, which performs an oversight role through annual auditing of the water service maintenance accounts. At an operational level, the CDL also collaborates closely with the county government. The stability of the model is therefore based on the space between civil society and the state. For the Kitui and Kwale models, a Water Services Maintenance Trust Fund (REACH, 2017b) was established, which is legally registered and issues performance contracts to the maintenance service providers until such a time as it achieves optimal scale and financial sustainability. Two private companies have contributed to the Kwale trust fund since 2017, thus supporting KHSL's position close to the market solidarity.

One donor has contributed to the Kitui trust fund, while a UN partnership with the Kitui County Government further supports this model through rehabilitating non-functional schemes. This is why Miambani's position in the triangle (Figure 7.1)

would be closer to the civil society solidarity. In 2017, over eight non-functional piped schemes were rehabilitated and enrolled for the maintenance service. This continues to significantly increase the number of people with reliable access to water services. However, limited county government engagement and no financial contributions to date raise the question of how the rural water sector can be formalised to the extent that it aligns with legal provisions, not only in the water sector itself but also in relation to the finance departments and their regulations.

7.6 Discussion

Scale is a critical dimension of the sustainability of the rural water sector, as it facilitates more effective management and reduces costs (Lockwood, 2004). Thus, the strength of the presented framework is its capacity to demonstrate the vertical universality of the pluralist approach by balancing the three principles of efficiency, enforcement, and equity. Community management essentially embeds water supply in the scale just above the individual water user for reasons of increasing local participation, but also for reasons of complexity, as post-intervention support is difficult to organise and sustain centrally. A common means to allocate rural water services to the lowest level is through decentralisation reforms (Rondinelli, 1991; Agrawal and Ribot, 1999). Kenya is an interesting example: the current devolution reform has the potential to counter this trend and “recentralise” decentralising services at the county level through networking service provision for all waterpoints. Whether the gap between the formal and informal water institutions can be bridged by the conceptualisation and operationalisation of a cooperative network at the meso

level (Peters *et al.*, 2012) depends on its ability to integrate into the wider system of regulation and governance (Hood, Rothstein and Baldwin, 2001). To achieve the objective of leaving no one behind, this middle space must be embraced by linking different scales of organisation and sets of values, making use of professional and lay knowledge, including individual, community and state action. “Bricolage work” at these interfaces requires navigating between different interests to even out some of the discrepancies between regulation and practice (Cleaver and de Koning, 2015).

Scaling service provision to the meso level is aided by improved information flows and institutional coordination. The example of Turkana demonstrates that mobile technology is not a prerequisite for achieving pluralist professional service provision: the central aspect is the coordination of state, community and private actors. This flexibility can also make pluralism a challenging concept to operationalise. However, being less prescriptive than one single cultural regime, such as community management or private provision, it allows a better adaptation to the local context, which may be conducive to efficiency.

One major limitation is that despite providing a more flexible approach for linking state, market and community organisations, one culture of the grid-group typology (Douglas, 1999) is hidden in this framework, namely fatalists, whose infrastructure has effectively been abandoned. Previous research has shown that some fatalists demonstrate opportunistic behaviour by relying on organised user groups, and may thus indirectly benefit from the professionalisation of services (Koehler *et al.*, 2018). However, those who rely on unimproved sources may remain excluded. If the rehabilitation of a scheme is conditional on also joining a professional service

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provider for ongoing maintenance, more people might incrementally be integrated into service provision areas, especially if the question of subsidisation is effectively addressed.

This approach also provides new insights for the discussion on financing rural water. To meet SDG targets 6.1 and 6.2, an additional USD 114 billion of capital investments has to be allocated to the sector globally. Spending on operation and maintenance for the newly served, however, is likely to outweigh capital costs by 1.4 times for basic WASH, and 1.6 times for safely managed WASH services between 2015 and 2029 (Hutton and Varughese, 2016). Users in the three models are currently only covering a small proportion of the local costs, which suggests that user payments are unlikely to fill this gap. The long-term maintenance of water and sanitation infrastructure requires significantly higher investments and a strategically blended finance approach (Fonseca and Pories, 2017), for example through funds that pool finances from different public, private and civil society entities.

Such funds, like the Water Services Maintenance Trust Fund in the two counties in Kenya, are pluralist mechanisms capable of channelling contributions that are specifically ring-fenced for rural water infrastructure maintenance from: a) donors and (international) civil society organisations, such as the Slovakian NGO for Turkana; b) market actors, such as private companies, as in the example from Kwale County, Kenya, as well as local private actors; and c) government, both at the national and subnational levels. However, such funds also have to ensure that their long-term sustainability does not depend on specific financial allocations alone, such as fundraising campaigns by civil society organisations, the allocation of a national aid

budget, or the profit margins of private companies. It is essential that we realistically evaluate the fine balancing of financial contributions globally in making local solutions in remote places at least sustainable for the medium-term. A trust fund, representing a hierarchical institution, can oversee the transactions and ensure that financial allocations to professional service providers are based on their performance. It can be argued that while the rural water sector remains largely outside formal service provision areas, which prevents direct oversight by government regulators, such trust funds assume the role of *de-facto* regulators overseeing transactions and monitoring performance. Improved information helps to weaken mimetic forces, allowing service delivery to adapt to local needs and conditions, and can thus increase efficiency. If such funds succeed in improving accountability in the rural water sector, they may aid its transition through integration into formal regulation regimes along with the urban sector, which is heavily subsidised and performs weakly in Kenya (WASREB, 2015).

7.7 Conclusion

After government failure (Wolf, 1988) and voluntary failure (Salamon, 1987), the rural water sector is headed towards a more market-based solution to achieve progress towards the water SDG. To avoid inevitable market failure due to the large financing gap in the rural water sector, we argue for a pluralist approach that allows the community, individualist and hierarchist solidarities to co-exist. New impetus for a realignment of the solidarities has emerged through changes in coercive forces with the SDG agenda and new, less prescriptive legislation; in normative forces

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through a new drive towards professional service delivery; and through new levels of information available through better operational monitoring and financial flows, making it possible to create tailored responses. The framework advanced in this study provides an approach to examining the establishment and manifestation of cultural regimes, as well as assessing which forces lead to the homogenisation of approaches across diverging contexts. It also provides insights into the circumstances that can lead to regime changes in the rural water sector.

The devolution process in Kenya, a new push towards professionalisation of rural water services, and the spread of mobile technologies have provided a pathway for service delivery models at scale. These have the potential to link the formal and informal space of the water sector. However, the three Kenyan models presented here have not yet been streamlined into decision-making across all 47 counties. The framework advanced in this study may provide a conceptual instrument of how to think about aligning different solidarities in other counties and elsewhere to achieve professionalisation while recognising plurality. However, further practical guidance is needed for implementers to maximise the principles of efficiency, equity, and enforcement through tools such as contracts, performance monitoring, and regulation. Moreover, the financial sustainability of rural water services remains a major challenge. The case studies demonstrate that a *de-facto* regulator can take the hierarchical role of overseeing community-market interactions while the state is re-organising itself to integrate rural water services, including maintenance provision, into its mandate. Whether the realignment of forces will lead to a systemic change in Kenya and other sub-Saharan African countries remains to be demonstrated by future research.

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While it has been recognised that adaptive blending of different sources and flows of finance is necessary for financing rural water delivery, the role of isomorphic forces and cultural diversity is not adequately conceptualised or critiqued. Unproven assumptions are based on projecting down from global financial estimates rather than understanding the isomorphic and cultural processes which characterise the halting progress in Africa's rural water sector to date. We contend that reflection and reconceptualisation are required to avoid previous investment mistakes and to promote new thinking set in motion through the limits of current models and emerging approaches that are empirically documented through field experience.

Supplementary Information (Chapter 7)

The paradox of and progress towards rural water sustainability in Africa

Supplementary methods

This section aims to afford further insights into the background and data collected for the three case studies across Kenya, Kwale, Kitui and Turkana Counties (see Supplementary Figure 7.1). It also provides the full table of data referred to in the paper on the responses by the County Executive Members for Water (see Supplementary Table 7.1).

Ethical permission to conduct these campaigns was provided by the Central University Research Ethics Committee at the lead author's institution and research permission was granted by the Government of Kenya's National Council of Science and Technology (NCST/RCD/17/013/132, September 2013). Data have been anonymised and stored in encrypted files.

Background

The FundiFix model: professional maintenance service provision for waterpoints

FundiFix was established as a water services maintenance company in Kenya with two franchises in two Counties, Kitui (Miambani Ltd.) and Kwale (Kwale Handpump Services Ltd., KHSL). It focuses exclusively on the maintenance of existing water infrastructure for communities, schools, clinics and other rural facilities. It represents a pluralist institution by design encompassing four key components:

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professional services guaranteeing a reliable repair service by qualified technicians within three days of waterpoint breakdown; *smart monitoring* where regular data flows from mobile-enabled transmitters with data analytics support a rapid repair service (Thomson, Hope and Foster, 2012a); *sustainable finance* with regular pre-payments on a monthly basis; and *institutional coordination* through government and a Maintenance Services Trust Fund supporting business performance and extension (REACH, 2016b). The offices in Kitui and Kwale were set up in 2015 and the service was provided for free for one year to demonstrate the relative service improvement, a reduction in waterpoint downtimes from 27 and 37 days respectively (data from waterpoint mapping survey) to less than three days. From January 2016 customers were required to sign annual contracts and commit to monthly payments (USD 10 per user group). Supplementary Figure 7.1 provides an overview over the distribution of the communities around different types of infrastructure that signed up. By April 2018, 28 piped schemes and user groups at two out of five handpumps signed up in Kitui County, serving around 60,000 people, including around 12,000 children at 55 schools. In Kwale County, users at 75 handpumps signed the contract and users at 41 community handpumps and 9 school handpumps are currently paying, serving around 13,000 people, including 4,000 children.

The Catholic Diocese of Lodwar model

The model has been operated by the Catholic Diocese of Lodwar (CDL) in Turkana County since the 1980s. Currently, two pump maintenance units fix infrastructure in all six sub-counties within two to three days, each of them serving

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approximately 500 sources, including handpumps, solar pumps, and piped schemes (see Supplementary Figure 7.1). Mainly reactive maintenance of infrastructure is conducted, including some preventative measures in remote areas. The charge of USD 35 per annum per waterpoint independent of the number of repairs is paid in cash or livestock but only covers around 10 per cent of the costs.

Information on data collection

Water audit Kitui: The water audit survey was administered in July 2016 with a team of four local and technically-proficient enumerators. Piped water schemes in Mwingi North were identified and meetings pre-arranged with the management, assisted by local government staff. Information was collected on location (GPS coordinates, GSM signal), technical design and operation, maintenance history, water demand, water quality, monitoring systems, and financial management. Photos of documentation, meter reading records and of physical infrastructure complement the dataset. Water quality testing (pH, EC, TDS, temperature) was carried out with handheld meters. Forty-eight piped water schemes were documented with over 110,000 water users comprising 430 villages, 49 schools, eight clinics, one hospital, and 260,000 livestock. Assets include 124km of pipeline, 1,660m³ of water storage, 78 kiosks, 44 submersible pumps, and 17 solar systems (REACH, 2016a).

Waterpoint census Kwale: A census of 571 waterpoints fitted (or formerly fitted) with Afridev handpumps was conducted in August 2013. Of these 571 pumps 337

were identified as functional and in use. The census captured technical, institutional, operational, financial and geographical information through structured interviews.

Water Data Transmitters (WDT) were fitted to 300 selected Afridev handpumps. This type of WDT using a low-cost solid-state accelerometer to indicate changes in the movement of the handle can be fitted to the handle of any handpump (Thomson, Hope and Foster, 2012a). Thus, pump usage can be measured and volumetric abstraction estimated. These data are used for handpump monitoring by Miambani Ltd. and KHSL Ltd.

A **marketing survey** was conducted with all 300 handpump user groups to introduce them to the professional maintenance service model and the terms of the contract. Local community health volunteers from the communities were trained and administered the survey. This campaign took place in October to December 2015, and further targeted campaigns were administered in early 2016 when the maintenance service provider had already started its business operations.

Data from Miambani Ltd. and KHSL Ltd. were collected in an electronic database by the managers of the two companies on contracts signed by new customers as well the performance and user payment behaviour from the start of the professional service (2015). They are included in the analysis up to April 2018.

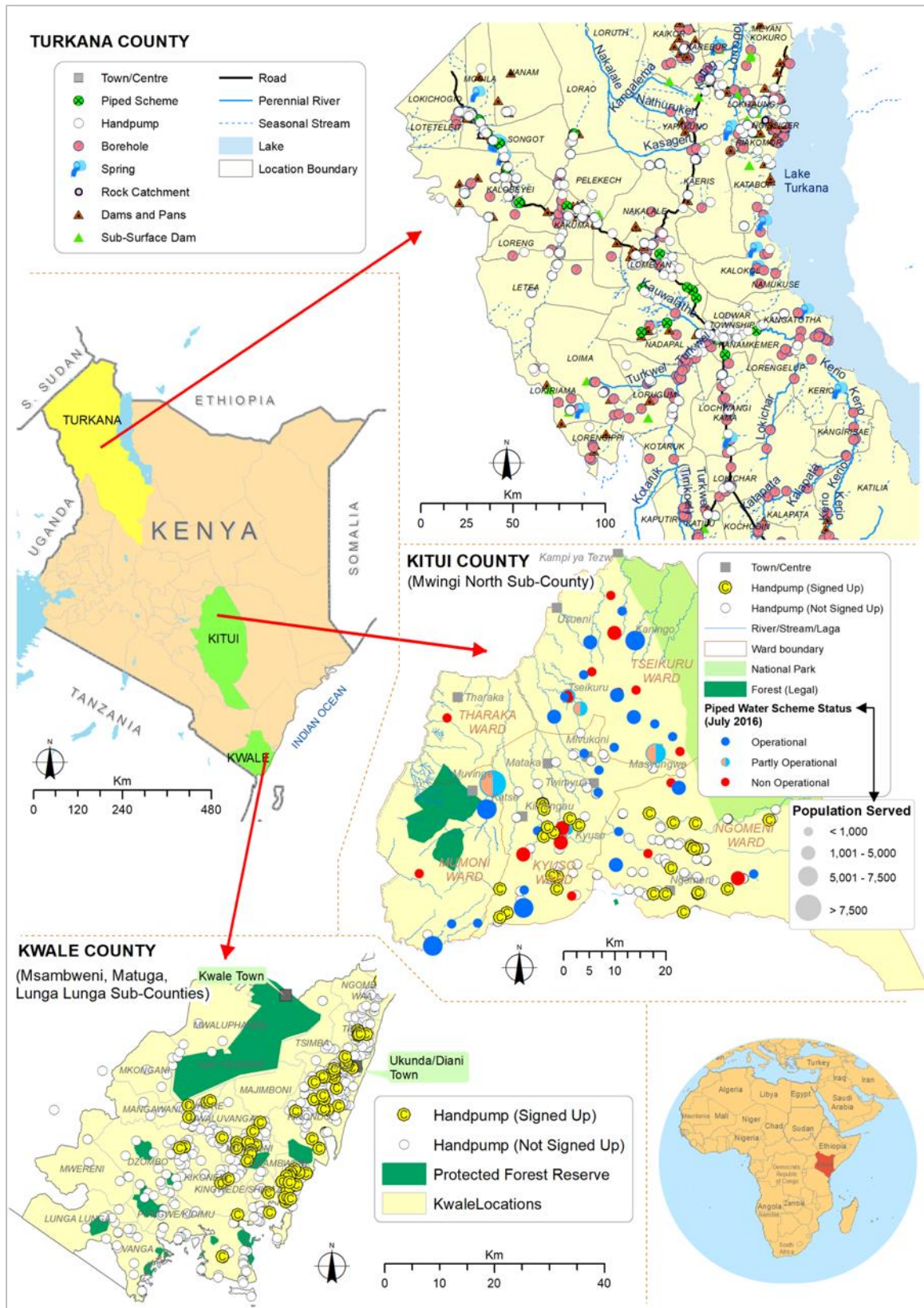
Data from CDL: The Catholic Diocese of Lodwar shared the data on infrastructure served and maintenance services conducted by the two pump maintenance units (see Supplementary Figure 7.1). Two interviews with a leading representative from CDL were conducted on 28 March and 4 April 2018, which provides the wider context on

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operations, their financial support mechanisms, as well as the relationship with the Turkana County Government.

Survey with all 47 county water ministries in Kenya: The data underpinning the information in Section 7.4.2 were collected through surveys with members of all 47 county water ministries in two stages: (a) through surveys conducted at the first summit of the members of the County Executive Committees (CEC) for Water in Baringo on 30–31 October 2015 organised by the Water Sector Trust Fund, where 26 of the 47 counties were represented; (b) the remaining 21 surveys were undertaken either in person or over the telephone in November and December 2015. Of the surveys, 72 per cent were conducted with the CEC members for water themselves. Some directed their Chief Officers (15 per cent) or Directors of Water Services (11 per cent) to respond. Representing the frontline bureaucrats in the county water ministries, these individuals were deemed best suited by the CEC members for water to respond to the question of perceived responsibility for the water service mandate, which is measured in terms of subjective statements. Supplementary Table 7.1 provides the full list of responses as reported in the paper.

Supplementary figure



Supplementary Figure 7.1 Three professional service provider models in Kenya

Supplementary table

The following table displays all data referred to in the main chapter (for abbreviated version, see Table 7.1).

Supplementary Table 7.1 47 County water ministries' perception of the rural water sector disaggregated by preference for provision by state, market or community

	<i>best placed to provide drinking water services</i>	Public provision			PPP/private companies			Community management		
<i>Category</i>	<i>with respect to rural areas</i>	n	Mean	SD	n	Mean	SD	n	Mean	SD
Tariff & provision level	Mean fair tariff (USD per 20l) ^a	22	0.04	0.03	12	0.02	0.01	11	0.02	0.01
	Mean fair provision level (l/c/day)	22	32.72	13.52	12	32.50	13.57	11	27.27	14.89
Responsibility for drinking water service delivery for rural areas	Sufficient quantity (%)	21	52.38	51.18	12	66.67	49.24	10	60.00	51.64
	Potable quality (%)	20	55.00	51.04	11	63.63	50.45	10	60.00	51.64
	Affordability (%)	20	60.00	50.26	12	58.33	51.49	10	40.00	51.64
	Physical access (%)	20	65.00	48.94	12	66.67	49.24	10	90.00	31.63
	Non-discrimination (%)	21	76.19	43.64	12	83.33	38.92	10	70.00	48.30
Satisfaction with state of drinking water (DW) provision in county	Satisfactory rural DW provision (%)	22	27.27	45.58	12	33.33	49.23	11	27.27	46.71
	Unsatisfactory rural DW provision (%)	22	54.55	50.96	12	41.67	51.49	11	63.63	50.45
	Very unsatisfactory rural DW provision (%)	22	18.18	39.48	12	25.00	45.23	11	9.09	30.15
Capacity to fulfil water users' expectations for water services	Fulfil expectations completely (%)	22	13.64	35.13	12	8.33	28.87	11	18.18	40.45
	Fulfil expectations partially (%)	22	72.72	45.58	12	66.67	49.24	11	72.72	46.71
	Fulfil expectations insufficiently (%)	22	13.64	35.13	12	25.00	45.23	11	9.09	30.15
Mapping of existing drinking water supply infrastructure	Completely mapped rural water infrastructure (CG) (%)	22	13.64	35.13	12	0.00	0.00	11	0.00	0.00
	acceptable level of mapping (%)	22	40.91	50.32	12	8.33	28.87	11	18.18	40.45
	partial mapping (%)	22	36.36	49.24	12	8.33	38.92	11	81.81	40.45
	none mapped (%)	22	9.09	29.42	12	0.00	0.00	11	0.00	0.00
Quality of information on water coverage in county	information very satisfactory (%)	22	18.18	39.48	12	8.33	28.87	11	0.00	0.00
	information satisfactory (%)	22	54.55	50.96	12	58.33	51.49	11	36.36	50.45
	information unsatisfactory (%)	22	27.27	45.58	12	25.00	45.23	11	54.54	52.22
	information very	22	0.00	0.00	12	16.67	38.92	11	9.09	30.15

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	unsatisfactory (%)									
Current monitoring of functionality of water supply infrastructure	monitor functionality urban only (%)	22	13.63	35.13	12	8.33	28.87	11	0.00	0.00
	monitor functionality rural only (%)	22	4.55	21.32	12	0.00	0.00	11	0.00	0.00
	monitor functionality urban & rural (%)	22	72.72	45.58	12	91.67	28.87	11	81.81	40.45
	monitor functionality neither (%)	22	9.09	29.42	12	0.00	0.00	11	18.18	40.45
Reasons for not monitoring	not monitoring - insufficient budget (%)	22	13.64	35.12	12	8.33	28.87	11	18.18	40.45
	not monitoring - no need (%)	22	0.00	0.00	12	0.00	0.00	11	0.00	0.00
	not monitoring - plan in future (%)	22	13.64	35.13	12	0.00	0.00	11	9.09	30.15
NGOs	NGOs in county (number)	18	5.39	4.09	9	7.00	5.83	10	4.10	5.97
	CG coordinates NGOs (%)	20	45.00	51.04	11	81.81	40.45	10	30.00	48.30
	NGO plays a role in public participation (%)	17	70.59	46.97	11	90.91	30.15	9	33.33	50.00
Subsidy	user full cost	21	38.10	49.76	12	33.33	49.24	11	54.54	52.22
	Subsidy from national government	22	13.64	35.13	12	41.67	51.49	11	18.18	40.45
	subsidy from county government	22	59.09	50.32	12	75.00	45.23	11	45.45	52.22
	subsidy through better-off consumers	22	4.55	21.32	12	25.00	45.23	11	9.09	30.15
	subsidy through donors	22	13.64	35.13	12	50.00	52.22	11	27.27	46.71
Water coverage^b	Actual water coverage (WASREB) (%)	20	50.50	19.47	10	47.20	24.46	11	52.27	22.64
	% of county population in service areas (WASREB)	20	46.95	34.55	10	27.60	12.85	11	51.18	25.66

^a Conversion rate: 1 USD = 101.103 KES (31 March 2018)

^b WASREB data (WASREB, 2015) from same year as CEC survey

8 Conclusion

8.1 Theoretical and empirical contributions

I started this thesis by reflecting on the opportune moment of studying institutional change in Kenya's water sector. Existing paradigms and existing institutions are in the process of being transformed, allowing for innovation as well as new strategies for risk mitigation at all levels from rural water users to national legislation including the 2016 Water Act. This research not only examines the current dynamism in the practice of rural water service delivery but also makes theoretical contributions by applying the dynamic approach of pluralism through the lens of cultural theory of risk. Its strength lies in capturing this dynamism by identifying at least three ways of organising through the state, market and community solidarities. Examining institutional viability and change by adding a risk perspective has afforded new knowledge through a) modelling incentives and constraints for uptake of institutional change by devolved policymakers and water users; and b) making a theoretical and empirical case to consider pluralist institutional arrangements enabling risks and responsibilities to be re-conceptualised and re-allocated between the three solidarities – state, market, and communities – to create value for rural water users. This thesis therefore provides a theoretical underpinning to the understanding of institutional arrangements in the rural water sector and also the potential to directly influence rural water services. In this concluding chapter, I reflect on the wider implications and linkages across the four empirical chapters that respond to the overarching research question, namely how water institutions transform to manage water risks and deliver sustainable water services to the rural poor.

Conclusion

Managing transitions to improved systems of governance, potentially through decentralisation, requires addressing failures in authority, legitimacy, and service delivery (Stewart and Brown, 2010). The research presented here has uncovered deviations in accounts of responsibility for the water service mandate by the decision-makers in the first county governments due to varying sociopolitical risks (Chapter 4), which may affect their authority. What legitimises rural water service delivery institutions varies. It depends on risk perceptions and values held by the rural water users determining the management approach on the one hand (Chapters 5 and 6), and on wider uptake in law, by governments, and professional organisations on the other hand (Chapter 7).

Overall, this thesis affords new empirical and theoretical insights into the impact of devolution on the water sector as well as into the concurrent process of professionalisation of rural water services. In what ways the two types of institutional change are interlinked, to what extent they have been taken up at government and user levels, and how much potential they have to improve the sustainability of rural water services has been examined across all 47 Kenyan counties, with in-depth analysis for Kwale County and additional case studies from Kitui and Turkana Counties. Instead of repeating the findings of each chapter, I discuss three areas of new knowledge that have emerged across the chapters. These reflect on the three main gaps in the literature (Chapter 2), and appear pertinent to understanding the evolution of institutions in general and specifically in mitigating water-related risks.

- 1. Processes of homogenisation shape institutional responses to risks both in terms of the creation and persistence of regimes and resistance to change.*

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For the rural water sector this implies that shifts from a cultural regime like community management towards professionalisation are subject not only to formal changes in rules and regulations but also to changes in informal norms and water user behaviours. The contribution of the regime perspective is a) to enhance the understanding of how institutions are created and persist and b) to ascertain the role of the meso level in mediating between formal and informal responses to risk.

2. *Pluralist institutional arrangements can pool risks of active management cultures, yet the stoics are left behind.*

This thesis suggests how prescriptive policy can be advanced beyond either public, private or community management in rural water services towards more flexible, pluralist arrangements. The potential outcomes include efficiency gains in local operational and financial management of water infrastructure maintenance – as well as allowing the space for blended finance approaches at the government and donor levels. However, the legitimacy of the approach is contingent on uptake by rural water users, which appears to be influenced by their perceptions and experiences of a variety of institutional, environmental, financial and operational risks. The identification of two fatalist groups – opportunists that can indirectly be served by the pluralist service arrangement and stoics that appear to be left behind – adds a new facet to cultural theory, and constitutes a policy challenge that needs to be addressed.

Conclusion

- 3. Devolution represents a natural institutional experiment permitting investigation of how institutional change can realign risk management in the rural water sector.*

Devolution provides a policy window for institutional change in the water sector in Kenya and allows a realignment of how sociopolitical and sociocultural risks are managed – by changing the level of government responsible for the delivery of these services and by relying on institutional innovation in addressing new challenges such as target 6.1 of the SDGs. It thus provides room for many different approaches to emerge. Whether the two types of institutional change examined here (devolution and professionalisation of services through pluralist arrangements) can be fully aligned and even integrated, depends on the interplay of individual, collective and public choices in navigating different institutional preferences for managing risk. The level of integration will be a decisive factor in whether pluralism can translate its promises into reality.

The three themes of institutional persistence and regime change, pluralism, and devolution as a natural institutional experiment, are explored throughout the thesis and are discussed in more detail in Sections 8.1.1 to 8.1.3. I then reflect on my role in researching institutions and institutional change while it was occurring. This concluding chapter also highlights the contribution the thesis makes to policy and practice. Finally, having discussed the limitations of this research in Chapter 3 (Section 3.6), I close with some avenues for future research.

8.1.1 On regime creation, persistence and institutional change

Processes of homogenisation (through coercive, normative and mimetic processes) – described in Chapter 7 – will likely shape longer-term developments both in terms of regime persistence and resistance to change. According to the definition in this thesis, regimes may develop when actors at each level apply a largely overlapping understanding of an acceptable management arrangement with the distinct levels reinforcing each other with varying levels of stability. The rural water sector demonstrates a tendency to establish such regimes around a single solidarity – the community or the state or the market. Community-based management, propagated by international donor agencies since the 1980s, has been the dominant regime in the rural water sector for several decades (Arlosoroff *et al.*, 1987; McCommon, Warner and Yohalem, 1990; Agrawal and Gibson, 1999; Carter, Tyrell and Howsam, 1999; Blaikie, 2006). It can be argued that the regime prevailing at any one time follows the funding preferences of donors, government and non-governmental organisations, which often leaves the major risks of reliable water services with those least able to cope. Prescriptive ways of managing risk may often not suit local arrangements. In effect, community management has become a default rather than an active choice when new infrastructure was installed, which has created path dependence (Campbell, 2010). In fact, this thesis demonstrates that the prescriptive term “community management” as applied by implementers (government and civil society alike) at higher levels in the governance regime entails a variety of forms of organising at the local level that include individualist, bureaucratic and community solidarities as well as fatalist forms of managing rural water infrastructure.

Conclusion

Such sweeping use of the term highlights the questions of how such regimes are established and whether they are sustainable.

Acknowledging the potential of government failure (Wolf, 1988) and voluntary failure (Salamon, 1987) resulting from slow progress towards universal water services, the hope of the rural water sector appears to be set on the market to solve the SDG challenge of providing everyone with safely managed water by 2030 (RWSN, 2017). To avoid an anticipated market failure due to the large financing gap in the rural water sector, this thesis argues that, for progress towards the SDG target, the three solidarities need to be aligned, with community–managed groups receiving maintenance support through private or public service providers overseen by an institution that can coordinate and release financial support based on sector performance. The main question that arises here is whether such a dynamic approach to distributing risk can overcome some of the challenges of monocultural regimes through the professionalisation of pluralist arrangements and gain acceptance. This depends on at least two responses: the level of uptake by policymakers and by water users. For the latter, the number of contract commitments over time (Chapter 6) will determine whether professionalisation becomes the new normal or whether the community management regime persists. Some communities appear to fare well with this type of management – however, in other cases, where the transaction costs of service delivery are high, a shift towards pluralism may be more plausible. The uptake by policymakers can – to an extent – be steered by voters to prioritise service delivery and thus potentially affect public choices (politics-as-exchange – Chapter 4). However, it appears that political games between the county water departments, members of county assemblies as well as national stakeholders are liable to impede direct pathways

of accountability. Legitimacy will ultimately be determined by whether county governments subscribe to the pluralist approach of providing their population with maintenance services for their water infrastructure either by contracting professional service providers or by ring-fencing funds for the maintenance of rural water infrastructure in county water budgets.

Thus, in such a governance regime the meso level – situated between the county government and user level – becomes more important as a space to mediate between formal and informal institutions (Hood, Rothstein and Baldwin, 2001; Peters *et al.*, 2012). Current legislation establishes that water service providers can only operate in areas deemed “commercially viable” (Republic of Kenya, 2016), which excludes most rural settings. The professionalisation of rural water services through maintenance providers opens up an opportunity to operate at scale and thus meet the formal water service sector at the meso level. While the term “commercially viable” is misleading, as most formal service providers, including those in urban areas, tend to require financial support (Whittington *et al.*, 2012; WASREB, 2015), professional service providers in rural areas are dependent on blended finance mechanisms between community users, the state, donors, and private entities, thus allowing financial risks to be pooled. A pluralist governance regime differs from the focus on just one solidarity by allowing financial, operational and institutional risks to be redistributed to where they are best managed within a framework of varying regulations. While this is theoretically plausible, the challenges of operationalising a pluralist arrangement not only at a sub-county level but at county or national scale are considerable.

8.1.2 Risk-pooling under pluralism and its limits

The bargain of the pluralist choice may be described as any arrangement that allows the different solidarities within the rural water sector to co-exist while offering an opportunity to pool their risks. Therefore, the clumsy solution proposed here extends cultural theory to cooperation as a flexible approach which goes beyond compromise. Pluralism concerns the *effectiveness* of addressing a major, often messy, social problem, namely the need to improve rural water services, and the *legitimacy* of this process (Verweij *et al.*, 2006). These two propositions are discussed with respect to the theoretical and practical viability of pluralism in the rural water sector.

First, pluralist arrangements are derived from “clumsy solutions” in the cultural theory literature, which have been argued to be inherently inefficient and potentially struggle with feasibility (Verweij *et al.*, 2006; Ney and Verweij, 2015), as they attempt to align conflicting ways of organising. They usually involve the different solidarities in difficult negotiations. However, I contend that institutional arrangements at a level combining multiple waterpoints in a network can, at least partially, reduce operational and financial inefficiencies by pooling finances and operating at scale (Chapter 5). Such a network has the potential of connecting user and county levels and thus may form part of wider institutional transformations through decentralisation, linking public, collective and individual choices (Figure 8.1). The active waterpoint cultures would not have to change their own organisation but can be nested within a larger system that addresses their operational and financial risks. In fact, the integration of the three “E’s” – *enforcement* through the hierarchists’ promotion of a socially optimal approach, increased *efficiency* through the individualists’

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motivation by incentives, and enhanced *equity* through the egalitarians' attempt to get a fair deal (Chapter 7) – has the potential to establish a balance that enables sector progress. Hence, instead of bringing the solidarities into conflict or forcing them into a compromise, risk is potentially reduced through cooperation between the active management cultures, the service provider and, ideally, the county government. As community management (risk-sharing) has been the predominant norm for decades, institutional change to allow for professionalisation can only take place if the norms both in county governments and in the communities change towards such pluralist arrangements (risk-pooling).

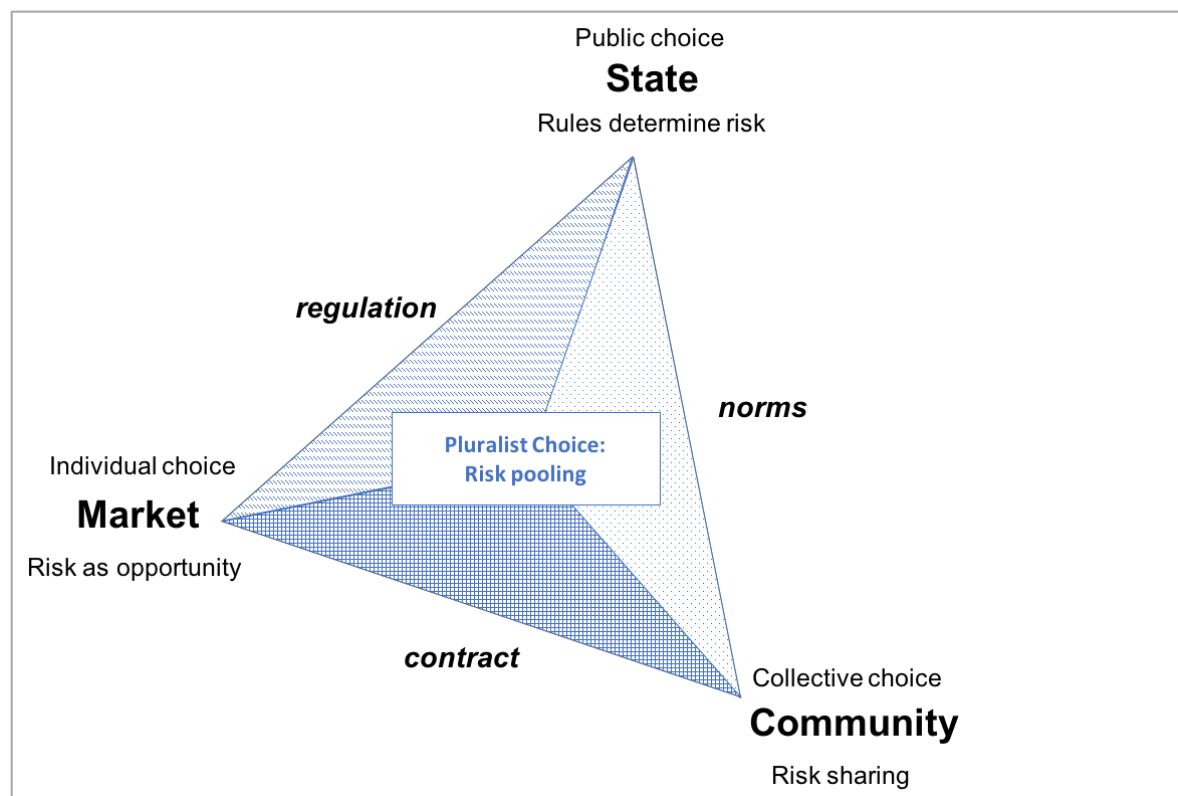


Figure 8.1 Thesis framework

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The second proposition concerns the legitimacy of the process of arriving at a pluralist arrangement. Legitimation through household users, user groups, and the various levels of government eventually determines whether pluralism is an alternative pathway towards achieving universality. That said, the legitimacy of the approach cannot be maintained without examining whether it is truly pluralist or is dominated by one of the solidarities. The findings in Chapters 5 and 7 demonstrate that the professional service models in Kwale and Kitui Counties clearly do have components of an entrepreneurial approach through contracts and monthly payments, but also of the egalitarian and bureaucratic cultures through their financial support mechanisms. Chapter 6 further confirms that the management cultures do not differ significantly in levels of sign-up to the professional service, thus supporting the pluralist nature of the arrangement: it appears to be an option for all active management cultures. Just over one in five user groups committed to contract the maintenance service provider in Kwale County in the first year of the service (Chapter 6). One may argue that the effectiveness of this clumsy solution is limited due to slow uptake; however, given that the contract commitment requires an active choice by the user groups, sign-up rates are expected to pick up over time (Weber, 2010).

Meanwhile, it is important to recognise that this approach, in its current form, is not a pathway to universal services, not least due to the fact that it requires an active choice. One unintended outcome may be that the stoics, one of the two fatalist types, are excluded from the pluralist arrangement under a professional service provider, unless specific provisions are made to admit them. The water users here defined as stoic internalise their risks – they do not manage their own waterpoints to keep them functional and have to draw water from alternative, often unimproved,

sources to survive. Even if their waterpoints were rehabilitated, these users would need to organise to regularly contribute to the maintenance model. However, I argue in Chapter 5 that the opportunists – the second fatalist type who use improved water sources at a further distance and tend to free-ride off other management arrangements – can indirectly be counted as being served by this pluralist arrangement. Teasing out these two types of fatalism is a theoretical contribution, and a major policy challenge that needs to be addressed. Environmental factors around water quality, especially salinity, also play a role in infrastructure abandonment, yet it was beyond the scope of this thesis to examine the dynamics within the stoic culture to fully understand the obstacles for choosing improved service arrangements.

As described above, the pluralist arrangement leaves a gap for those users that fail or refuse to organise. How to overcome this obstacle remains a serious challenge requiring some targeted research into alternative measures, for example social policy and protection programmes. Thus, the approach constitutes a fragile solution, which aims to achieve SDG target 6.1 while raising the important question whether all people can be reached and whether it is feasible to integrate all waterpoints. This reflects the tension between the universality claim of the SDGs and the particularities of local decision-making.

8.1.3 Devolution as a natural institutional experiment?

It is certainly too early to measure the long-term impact, limitations, and success of Kenya's devolution reform. This thesis has engaged with the process of devolution in the water sector, the uptake of the mandate by the devolved county governments and the space it has provided for different management approaches

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dealing with varying sociocultural and political risks. While the formal institutions have been changed by the stroke of a pen (North, 1990), the resulting process at the meso and local levels unfolds as a natural institutional experiment with a variety of different responses – facilitated or obstructed by prevailing cultural values (Denzau and North, 1994).

The Constitution of 2010 – in many ways a response to the failure of authority to deal with political risks (that led to violence after the 2007 election) – started Kenya’s devolution process and the establishment of the county governments in 2013, changing the institutional landscape of the entire country. It also led to changes in the water sector through the 2016 Water Act (Republic of Kenya, 2016). The findings suggest that the new legal mandate gives rise to different forms of uptake of responsibility for water services across the 47 county governments (Chapter 4). While formal rules determine acceptable levels of drinking water risks – as is the case for the human right to water defining levels of water quantity, quality, affordability, physical access, and non-discrimination – perceptions of political and socioclimatic risks are critical for the institutional choices governments make when implementing their mandate. Successful risk mitigation and improvement of service delivery is expected to enhance the chance of political support by the electorate.

Yet the findings from our panel study in Kwale demonstrate that, while the main reason for supporting devolution was faster access to services, water featuring as the highest concern, improvements triggered by the county government’s activities were mainly perceived in the education, infrastructure and health sectors from 2013 to 2016 by the interviewed residents (Koehler, 2017). Further discrepancies between

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county government and user perceptions of which risks play a role can be seen by comparing findings from Chapters 4 and 6. While affordability of drinking water featured as the least accepted criterion by the 47 county governments for both urban and rural areas (Chapter 4), one of the limiting factors for the respondents at waterpoints in Kwale that had not yet signed up for the new maintenance service was the perception that water was already costly under their current arrangement before making a contract commitment (Chapter 6). The variability of risks and values as well as legacy effects of other informal arrangements may slow down the uptake of the professional service model, especially as the signing of a contract represents an active opt-in arrangement. This represents an individual or collective choice at the local level as opposed to public choice decision-making on devolution, which steers sector development from above. One of the negative implications of devolution may be the widening of regional disparities, which could occur if public choices in terms of service delivery diverge across the 47 counties.

These are examples which suggest that varying risk perceptions and management approaches require realignment under the processes of institutional change. It is likely that the ability of the devolved governments to respond to existing and emerging rural water service models, such as the professional ones discussed in Chapter 7, will determine how citizens evaluate the devolution reform in the longer term. Devolution thus constitutes a natural institutional experiment that allows tracking the diversity of approaches which will inevitably emerge. It is associated with high hopes for improved service delivery, the potential for enhanced accountability between policymakers and water users, as well as the remaining question whether the legitimacy of new pluralist arrangements can be increased and sustained.

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The human rights agenda postulates universal rights and demands their universal enforcement. This doctoral research affords insights into the potential of institutional change but also into institutional tensions between universalism, public choices in policymaking, and institutional pluralism. Policymakers often act within constraints which cause them to adopt solutions that are considered to serve the majority of their electorate (Cheeseman, Lynch and Willis, 2014; Cornell and D'Arcy, 2014; Harding and Stasavage, 2014). Local water users find themselves in a plethora of institutional arrangements that neither fulfil the universalist demands of the human rights agenda nor effectively provide solutions for the majority that are based on utilitarian policies (Blaikie, 2006; Cleaver, 2012). Whether the gap between formal and informal water institutions, between universal claims and challenging local institutional conditions can be bridged depends on the restructuring of the rural water sector in a way that allows the formation of an effective cooperative network at the meso level while advancing the sustainable development agenda and implementing a system of regulation and governance that allows for variability in local institutional arrangements.

8.2 Reflections on researching institutions and institutional change

Being an observer and agent perturbing the system (Cassell, 2002) has been particularly intriguing while undertaking this research, warranting some further reflection on the conflicts, insights, and limitations this has produced. As discussed in Chapter 3, one key conflict is that by partaking in the process of institutional change,

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I was no longer an entirely objective observer; my research has been geared towards understanding expectations and acceptance of rural water service delivery models, including the financial component of the level and modality of user payments as well as the drivers of and barriers to uptake by household users and user groups. By conducting both qualitative and quantitative field campaigns, I was able to provide insights into adaptations of the model design. For example, the user charge for the professional maintenance service provider was set below the average stated willingness-to-pay level in the field campaigns – in order to facilitate an inclusive service. The findings of Chapter 6 do not reveal any barriers for the poorest user groups to commit to the contract (though the intent to do so may be influenced by the experience of charges prior to the offer by the professional service provider). Such insights were only possible by being in close contact with the local maintenance service provider team. Another example is that, in the third round of the household survey (2016), we were able to capture data on household experience with the maintenance service and compare households which had and had not signed up to the maintenance service to identify drivers of and barriers to uptake of the pluralist arrangement (Chapter 6). A key limitation is that this approach involves experimentation with existing local institutions. As existing institutions – whether community-managed, privately or bureaucratically managed – can retain their own forms of management, the perturbation is not expected to override existing forms of local management at the waterpoint; however, I acknowledge that the longer-term effects of this approach are yet to be seen.

This discussion is pertinent to the question as to whether clumsy solutions can be designed. I argue that, while one component, the professional maintenance

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service provider, can be designed, it is the acceptance of the pluralist arrangement that can make it a “solution”. This cannot be designed as the decision ultimately rests with the user. How uptake and payment behaviours will evolve over time, whether a new path dependence for future forms of rural water services has been generated again or whether Kwale County Government chooses a different path is critical and an important avenue for future research as discussed in Section 8.4. While the limitations of this thesis have been explored in detail in Chapter 3, it is worth highlighting again that the timing of the thesis can be considered both a strength and a weakness: it is possible that the professional maintenance service was introduced too early as county governments were pre-occupied with building their ministries rather than improving services. Moreover, the long timeframe for institutional change may stand in contrast to the short-termism of political cycles.

8.3 Contribution to policy and practice

8.3.1 Water Act 2016

Due to its timing, this thesis research includes observation of the emergence of Kenya’s new Water Act (Republic of Kenya, 2016) and was even able to add a small impulse to it in the domain of rural service delivery in a wider consultation process. The contribution of the project lies in observing and monitoring institutional change as it is occurring, thus providing insights which would be less readily available in its aftermath.

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Working closely with policymakers at the national and county levels in Kenya has opened up opportunities for this research to actively and interactively engage with policy processes by providing evidence and putting forward some recommendations. Specifically, evidence empirically corroborating the need for new approaches to rural water service delivery was taken up in the consultation process on Kenya's Water Act 2016. For the last several decades, the prevailing paradigm in water services for areas outside formal service provision has been community management. Now, Article 94 in Kenya's 2016 Water Act integrates the less prescriptive and more widely applicable idea of a pluralist arrangement. The article is concerned with "special provisions with respect to rural areas not commercially viable" and considers a) professional service provision under a contract, also through private actors, b) institutional coordination, including the role of subnational governments and the national regulator, and c) new investment and financing plans (Republic of Kenya, 2016).

This research has also contributed to discussions on developing a prototype county water services bill, which laid the basis for the water legislation being developed in the 47 counties. The recommendation here supports endeavours to adopt a coordinated approach to prevent counties from deepening regional disparities with regard to water provision. The research on novel models for maintenance service delivery of rural water infrastructure is part of a wider debate amongst United Nations institutions, donors, national governments, and civil society organisations on how, and indeed if, progress towards universal water services can be achieved (WHO and UNICEF, 2015; RWSN, 2017). Effectively using large datasets and supporting governments in re-positioning themselves to embrace novel approaches to service

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delivery in an era of improved information availability highlight the long-term policy objectives which this work might assist. Overall, the empirical, theoretical and policy contributions (Figure 8.2) of this thesis are laid out as a set of recommendations outlined below.

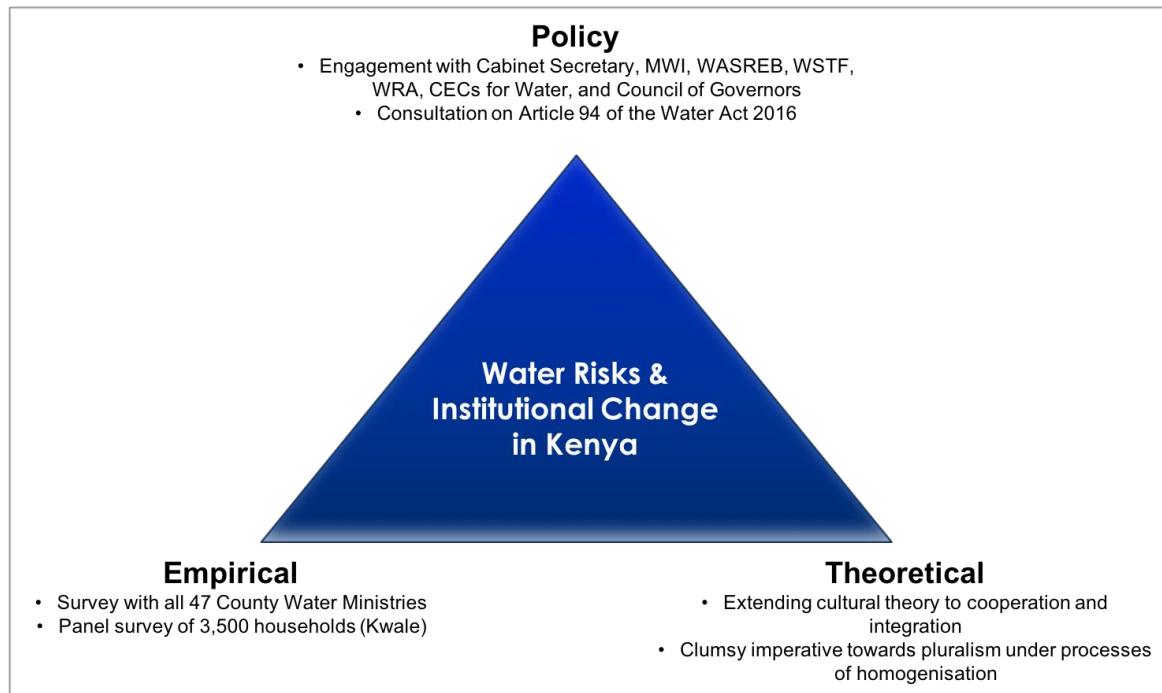


Figure 8.2 DPhil thesis contributions

8.3.2 Recommendations

Recognising that strategies adopted in the rural water sector vary in terms of existing evidence base, feasibility, and scalability, I propose five recommendations for policymakers and practitioners to facilitate progress towards more sustainable rural water services in Kenya and beyond. The empirical findings of the research provide rationales for these recommendations. However, it is important to acknowledge that they echo proposals and arguments that have been advanced and detailed elsewhere

(Thompson *et al.*, 2001; Harvey and Reed, 2004, 2006; Cleaver, 2012; Foster, 2013; Moriarty *et al.*, 2013; Hope, 2015; Lockwood and Le Gouais, 2015).

Recommendation 1: *Promote community and private sector delivery of water services with government oversight and regulation for areas not considered commercially viable.* This form of pluralist approach which links the state, market, and communities has been captured in Article 94 of the 2016 Water Act but needs to be translated into practice in rural areas where the three have often been separated. Operationally and financially combining them may therefore provide more flexible approaches to the challenge posed by SDG target 6.1. This is therefore a recommendation for the development of strategies by governments and other implementers alike.

Referring to the growing privatisation of water and environmental health service provision in East Africa which started as early as the 1980s, Thompson *et al.* (2001) point to the increasing role of the voluntary sector, but also the continued significance of the state – and of foreign donors. This thesis has provided further theoretical and empirical evidence on how such arrangements may be translated into policy and practice – and also highlighted the challenges that pluralism entails, especially with regard to institutional coordination with a variation of coercive, mimetic and normative forces that need alignment for pluralist arrangements to emerge. Such coordination is particularly challenging as one, two or all three of the solidarities may be weak, thus creating more room for fatalist approaches and potential failure.

The discussion above also demonstrates that not all combinations of state, market, and voluntary institutions are necessarily pluralist in the sense of this study or

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provide higher levels of efficiency. Cooperation in and regulation as well as oversight of such arrangements are not straightforward. Pluralism cannot be seen as a panacea as it requires a careful untangling of complex institutional relationships that reveal different value propositions. Only if users and governments see added value in dynamic arrangements, large-scale uptake may occur, thus potentially effecting institutional change.

Recommendation 2: *Encourage adequate financial allocations for rural water maintenance and the regular payment of maintenance charges.* A robust finding across the different empirical chapters (Chapters 4 and 6) is that, perhaps unsurprisingly, sustainable finance for rural water maintenance plays a, if not the, major role in leading to effective institutional change. Especially in those areas not considered commercially viable, blended finance mechanisms are required, as user payments are unlikely to cover the full cost of maintenance services, even if pooled at scale (Chapter 7). Consequently, the policy objective of full cost-recovery through user payments is unlikely to achieve anticipated results and may even slow down progress in the rural water sector (Harvey, 2007; Foster, 2013; Whittington, Sadoff and Allaire, 2013; Foster and Hope, 2016; Fonseca and Pories, 2017).

This recommendation is directed at policymakers at national and subnational levels to ensure that water budgets not only account for infrastructure provision but also contain ring-fenced allocations for professional maintenance support. There are multiple ways in which such budget allocations can contribute to sector progress – either by employing government mechanics, by sub-contracting professional service providers, or by allocating a budget proportion to ring-fenced

maintenance funds for rural water infrastructure. Chapter 4 suggests that the strongest effect on Kenya's devolved decision-makers to accept higher levels of responsibility for promoting the core criteria of the human right to water is the allocation of higher county water budgets. Acceptance of their mandate is a precondition for successful implementation, which may then allow progress towards sufficient, safe, affordable, and equitable rural water services.

Recommendation 3: *Recognise the crucial role of creating an enabling environment when new infrastructure is built.* This recommendation is directed at practitioners implementing rural water schemes and thus playing a role in creating an enabling environment at the local level that will, at least partially, determine the success or failure of future, often unrelated interventions. The results in Chapter 6 suggest that environmental and financial conditions where infrastructure is installed, from low salinity levels through to the effective administering of user payments, are critical components of behaviour change in transition towards a professional service model. The legacy effects of past interventions, such as the institutional arrangements of how water user committees and their payment arrangements are set up, will likely shape future uptake of institutional change.

Recommendation 4: *Test and rigorously evaluate professional rural water management models.* Professionalised rural water service approaches are increasingly gaining ground in sub-Saharan Africa (Lockwood and Le Gouais, 2015; RWSN, 2017); however, their effectiveness in sustainably improving rural water services and advancing the water SDG has not been rigorously captured to date. In this thesis, I have made a start in collecting and providing evidence in parts of Kenya. As yet, there

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is little evidence on the ways in which existing models deal with their reliance on blended finance through institutional arrangements in terms of how financing is best apportioned between the private, voluntary and state sectors (which may vary in different contexts). It is important to continue collecting evidence to enable comparison at scale in order to understand the different ways in which pluralism can manifest itself. The framework proposed here may provide criteria for evaluating these new institutional relationships.

Recommendation 5: *Harness the natural institutional experiment of the devolution reform to collect, examine and provide evidence of different emerging models of service delivery and their performance.* Linking sectoral change with wider institutional change, devolution in Kenya's case, may represent a policy window to engage with often newly appointed decision-makers who may be open to evidence suggesting new policies and strategies that take advantage of the latest developments in their respective sectors. For example, in the process of this research I provided empirical evidence for decision-makers in policy briefs and shared them with the Governors of my main research sites, Kwale and Kitui Counties, as well as at the Third Annual Devolution Conference organised by the Council of Governors (see Appendix 7). The dynamism of the devolution reform and the inherent lack of data on its performance opened up an opportunity to engage in the process itself rather than just observe it. Overall, devolution provides a unique natural institutional experiment and over time change across the 47 counties will become apparent. Different water service models are likely to emerge, flourish, or fail and will provide further evidence to test the sociopolitical risk model advanced in Chapter 4. The findings demonstrate the delicate balance of improving service delivery, while increasing levels of accountability and the legitimacy of the process.

There is an important caveat to these recommendations. A complex challenge like rural water sustainability does not present a case for simple solutions, as history demonstrates. Pluralism by nature requires a complex alignment of different elements to the particularities of varying local contexts rather than a one-size-fits-all approach.

8.4 Avenues for further research

The analyses and findings of this thesis generate a number of future research questions. Five avenues of further research are suggested in some detail below.

First, an important avenue for further research is to examine the evolution of the professional service provider model. This research examines the first year of its operations. Yet, it is important to document whether it establishes itself as a significant solution to rural water maintenance in Kwale in the longer term or whether users return to their previous ways of organising and managing water risks independently. Furthermore, in addition to examining contract commitment it is important to evaluate whether contracts are honoured – both in terms of the evolution of user payment behaviour and in terms of the performance of the maintenance service provider.

Second, the financial sustainability of pluralist arrangements requires special emphasis. Given that user payments are unstable (Foster and Hope, 2016, 2017) and only cover up to a third of the local costs in the study sites of this thesis, and globally

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only one third of the USD 114 billion needed for safely managed drinking water in terms of capital expenditure is currently being spent (Hutton and Varughese, 2016), further research needs to be conducted into which blend of legal, institutional and financial arrangements can make service delivery viable. This is hypothesised to vary across countries and regions. The need for such blended finance mechanisms is exacerbated by the fact that spending on operation and maintenance for the newly served from 2015 to 2029 is likely to outweigh capital costs by 1.4 times for basic WASH services, and 1.6 times for safely managed WASH services globally by 2029 (Hutton and Varughese, 2016).

Third, what happens to the stoics, the water users who fail to manage their waterpoints and use unimproved sources? This is an important question for further progress towards achieving universal water services – and there is no apparent answer. The thesis argues that this group is unlikely to be captured in new pluralist models unless they adopt at least opportunism. Therefore, it is important that specific programmes of research are designed to understand how targeted social protection programmes can be drawn up for this minority group.

Fourth, how can the informal and formal sectors be linked? The meso level emerges as a space between the devolved county level and the water users where formal water institutions through county water ministries and informal water institutions through maintenance service providers meet. Further research should be conducted into ways in which the blurring of the formal and informal institutions can be integrated into wider governance regimes.

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Fifth, what are the implications of Kenya's institutional transformation for other countries, particularly in sub-Saharan Africa and South East Asia? The cultural theory framework advanced in this thesis may provide a tool for analysis of institutional transformation in the rural water sector. Models are emerging across Central, East and Southern Africa offering professionalised service delivery that claim to create value for rural water users, government, and the private sector through performance-based contracts. More recently, financial instruments to pool risk at scale, including trust funds, have been established in Kenya and Ghana underpinned by mobile data to incubate local entrepreneurs delivering preventative and reactive maintenance for water users in communities, schools, and clinics. The scale, urgency and need of the global challenge is underlined by 2.1 billion people lacking safely managed drinking water services and 844 million people without basic drinking water services in the baseline data for the SDGs (targets 6.1 and 1.4), the largest share living in rural areas of Africa (WHO and UNICEF, 2017a).

* * *

To conclude, recognising that resources are governed at a variety of scales with a dynamic relationship between the local and the global is essential for managing drinking water risks sustainably. This research demonstrates how pluralist arrangements can be conceptualised, operationalised and aligned with wider institutional change through Kenya's devolution reform. It thus provides an opportunity to better understand how global goals, such as safely managed and equitable water services, may be pursued while integrating local institutions into a coherent governance regime.

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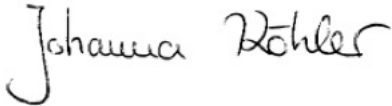
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Appendices

Appendix 1: Declaration of Authorship

I, Johanna Karolina Louise Koehler, hereby declare that this thesis is my own work, except where otherwise stated.

Signed: 

Date: 6 September 2018

Place: Oxford

Co-author agreements

Detailed contribution of co-authors for paper 2 (chapter 5)

Title: A cultural theory of drinking water risks, values and institutional change

First author: Johanna Koehler (School of Geography and the Environment (SoGE) and Smith School of Enterprise and the Environment (SSEE), University of Oxford)

Co-authors:

Steve Rayner (Institute for Science, Innovation and Society, University of Oxford)

- Feedback for the development of the theoretic framework
- Provided overall edits and comments for the paper

Jacob Katuva (SoGE, SSEE)

- Provided comments for the paper

Patrick Thomson (SoGE, SSEE)

- Provided overall edits and comments for the paper

Rob Hope (SoGE, SSEE)

- Feedback for the development of the paper design
- Provided substantial edits and comments for the paper

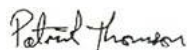
We confirm that Johanna Koehler led the paper design and methodology, analysed the data, drafted the paper and managed the submission and revision process – with our contributions as specified above.



Steve Rayner, 23 June 2018



Jacob Katuva, 23 June 2018



Patrick Thomson, 22 June 2018



Rob Hope, 21 June 2018

Detailed contribution of co-authors for paper 3 (chapter 6)

Title: Institutional pluralism and water user behaviour in rural Africa

First author: Johanna Koehler (School of Geography and the Environment (SoGE) and Smith School of Enterprise and the Environment (SSEE), University of Oxford)

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Rob Hope (SoGE, SSEE)

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Patrick Thomson, 22 June 2018



Susanna Goodall, 25 June 2018



Jacob Katuva, 23 June 2018



Rob Hope, 21 June 2018

Detailed contribution of co-authors for paper 4 (chapter 7)

Title: The paradox of and progress towards rural water sustainability in Africa

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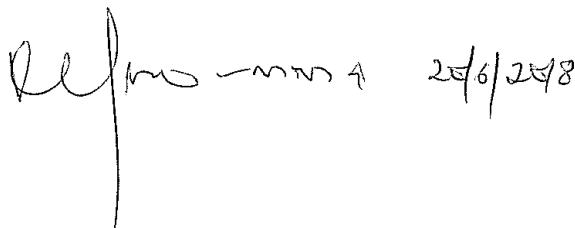
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Andrew Trevett



Jacob Katuva, 23 June 2018



Patrick Thomson, 22 June 2018



Rob Hope, 21 June 2018

Appendix 2: Additional paper

“Pump-Priming Payments for Sustainable Water Services in Rural Africa”

Johanna Koehler^{*a}, Patrick Thomson^a, Robert Hope^a

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Note: This article is included in the Appendix for the following reasons: it provides insights into a) the early stages of the design and development of the pluralist arrangement through qualitative research in Kitui County¹, and thus complements the quantitative approach through surveys in Kwale County presented as the core of this thesis research, and b) it examines the institutional factors that were selected for the institutional variables (“handpump clubs”) in Chapters 5 and 6.

¹ Half of the field research for this article was conducted during my MSc thesis research (2012-13), the second half was conducted during my time as Research Assistant at the Smith School of Enterprise and the Environment in 2013-14. I finalised the article in the first year of my DPhil degree.



Pump-Priming Payments for Sustainable Water Services in Rural Africa

JOHANNA KOEHLER, PATRICK THOMSON and ROBERT HOPE*
University of Oxford, UK

Summary. — Locally managed handpumps provide water services to around 200 million people in rural Africa. Handpump failures often result in extended service disruption leading to high but avoidable financial, health, and development costs. Using unique observational data from monitoring handpump usage in rural Kenya, we evaluate how dramatic improvements in maintenance services influence payment preferences across institutional, operational, and geographic factors. Public goods theory is applied to examine new institutional forms of handpump management. Results reveal steps to enhance rural water supply sustainability by pooling maintenance and financial risks at scale supported by advances in monitoring and payment technologies.

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Key words — drinking water security, handpumps, public goods, payment behavior, Africa, Kenya

1. INTRODUCTION

An enduring puzzle in achieving progress toward universal and reliable water service delivery in Africa is overcoming barriers to sustainable water user payments for community-managed handpumps (Harvey & Reed, 2004). The nonfunctioning of one third of the handpumps in rural Africa (RWSN, 2009) has resulted in an uncertain return on the USD 1.2–1.5 billion of infrastructure investments in the last two decades (Baumann, 2009). Increasing water service coverage has failed to translate into a guarantee of reliable service delivery (Hope & Rouse, 2013; Therkildsen, 1988; Thompson *et al.*, 2001). The long repair times that contribute to high handpump failure rates in rural Africa are essentially associated with weak payment systems (Foster, 2013; Harvey, 2007; RWSN, 2009). Community management of water services has been widely identified as a dominant but failing model in rural water service delivery in Africa (Bannerjee & Morella, 2011; Hope, 2014) with growing evidence that improved payment systems promote handpump sustainability (Foster, 2013). Increasing opportunities to exploit the new, inclusive, and low-cost mobile infrastructure offer new but untested approaches to accelerate and maintain reliable water services for the 273 million rural Africans without improved water coverage (Hope, Foster, & Thomson, 2012; WHO/UNICEF, 2014). The policy implications are relevant to the post-2015 debate on the Sustainable Development Goals (SDGs) and may increase momentum for universal and sustainable water services within the framework of the Human Right to Water and Sanitation (UNGA, 2010).

In this paper, three major barriers to achieving regular rural water user payments to promote financial sustainability are identified and empirically examined. First, *institutional barriers* indicate that the organizational structure of the user group influences the regular collection of user fees from all handpump users. Second, due to *geographic barriers*, handpump density in certain areas can negatively impact payment behavior. Third, *operational barriers* frequently cause handpumps to remain unrepaired for an extended period, discouraging users from paying, as the source is considered unreliable. This constitutes a vicious cycle with the risk of long-term failure in service delivery.

The paper makes novel contributions to the literature by (a) drawing on unique hourly data on observed handpump usage

over a 12-month period, (b) relating water use estimates to current and future payment preferences, and (c) applying public goods theory to community water management structures to examine new approaches to overcome financial sustainability barriers. In conclusion, an output-based payment framework is outlined as a potentially replicable approach to support the Government of Kenya's and the global drive to universal and reliable water services.

2. CONTEXT

(a) *The rural water challenge*

Since the latter years of the Decade of International Drinking Water Supply and Sanitation, 1981–90, community management of rural water supply has been advocated by international organizations, governmental and nongovernmental alike (Briscoe & de Ferranti, 1988; Carter, Tyrell, & Howsam, 1999; Churchill *et al.*, 1987; Harvey & Reed, 2004; Jiménez & Pérez-Foguet, 2010; Therkildsen, 1988; Whittington *et al.*, 2008). The empowerment of communities is based on the principles of participation, decision-making, control, ownership, and cost-sharing (Briscoe & de Ferranti, 1988; Lockwood, 2004). However, despite the positive characteristics of community management, operations and maintenance have barely improved (Blaikie, 2006; Lockwood, 2004). Failure is largely blamed on poor planning and service delivery (Carter, Harvey, & Casey, 2010; Carter *et al.*, 1999;

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The World Bank Water Demand Research Team, 1993), limited community financing (Carter *et al.*, 2010; Harvey, 2007; Harvey & Reed, 2004; Skinner, 2009) and shortcomings in the institutional design of management models (Sara & Katz, 2010; Whittington *et al.*, 2008). Consequently, rural water supplies are in danger of falling into a spiral of decline in the post-construction phase (Rouse, 2013). Adoption of simplified infrastructure asset management principles can increase cost-effectiveness and reduce interruptions in service (Boulenouar & Schweitzer, 2015). While maintaining the community-based model, new approaches are therefore required which acknowledge the communities' inability to maintain their water supply without support in the long term (Harvey & Reed, 2004; Lockwood, 2004).

(b) *Deconstructing the rural water challenge*

(i) *Institutional choices*

Institutions, "the humanly devised constraints that structure political, economic and social interaction" (North, 1991, p. 97), evolve over time and are adapted to specific human needs. This study focuses on those institutions that have been created for the management of groundwater resources, and specifically for managing handpumps in rural areas. Due to its delineation of management systems along the lines of rivalry of consumption and exclusion, the theory of public goods, building on Samuelson (1964), is chosen for analyzing the institutional design at community level. Two versions of the theory are applied – Ostrom's (1990) understanding of common pool resources (CPRs) and Buchanan's (1965) definition of club goods. While the nonexcludable and rivalrous CPR is a "natural or man-made resource system that is sufficiently large as to make it costly... to exclude potential beneficiaries from obtaining benefits from its use" (Ostrom, 1990, p. 30), the excludable and nonrivalrous club good determines a membership margin at "the size of the most desirable cost and consumption arrangement" (Buchanan, 1965, p. 2). Ostrom (1990) defines principles for robust common pool resource institutions, requiring clear institutional rules and solution mechanisms. Buchanan's (1965) criteria for the management of club goods expand on the public-private spectrum and emphasize consumption/ownership/membership arrangements. Consumption-sharing models, tariffs, and membership levels are determined by the local communities according to their particular requirements to prevent "congestion".

If adapted to handpump management, the institutional design is a response to varying group preferences with implications for payment behavior: Some groups prefer higher payments at household level to be able to limit abstraction levels by reducing the number of users (with the tendency of organizing themselves as "handpump clubs" with a more exclusive membership); others prefer lower individual payments but with higher membership numbers to ensure that enough money is available to pay for maintenance bills (acting more as common pool resource groups). Agrawal and Gibson suggest that communities must be examined "by focusing on the multiple interests and actors within communities, on how these actors influence decision-making, and on the internal and external institutions that shape the decision-making process" (1999, p. 629). It is beyond the scope of this research to analyze these aspects, as the focus is on the group's collaborative decision-making on willingness-to-pay. However, it is acknowledged that the institutional structure of user groups may change in response to internal power relations or external factors, such as population growth or increasing aridity. The latter may reinforce a potential tendency toward excludability,

which some groups pursue to counteract congestion and over-abstraction. Only by understanding the institutional design of rural user groups can payment models be adapted to local needs.

(ii) *Geographic challenges and infrastructure decisions*

A problem specific to sub-Saharan Africa is that low population density encourages broad spatial distribution between handpumps and the clustering of systems around existing infrastructure (Harvey & Reed, 2004). This implies high opportunity costs for users, often women, who have to walk long distances to the next-best pump alternative when their usual pump breaks (Van Houweling, Hall, Diop, Davis, & Seiss, 2012). As the most urgent demand tends to occur in areas of widely scattered pumps, geography appears to have an important impact on payment behavior. Another geographical aspect is the distance of handpumps to spare parts outlets, which impacts the reliability of service delivery (Harvey & Reed, 2006). Similarly, Foster (2013) found that distance from the district/county capital city is significantly associated with nonfunctionality of handpumps in a study covering 25,000 pumps across three countries in sub-Saharan Africa.

(iii) *Demand and service level*

Since the Dublin Principles of 1992 (ICWE, 1992), the demand-responsive approach has provided the template for most rural water supply services. It focuses on both financial and managerial sustainability through participatory planning, informed choices, community management, and cost recovery or cost-sharing arrangements (Sara & Katz, 2010). It involves households in the choice of technological and institutional arrangements, while requiring them to pay for the service (Whittington *et al.*, 2008). According to this approach, communities rather than donors or governments make informed choices about the preferred service level, which is reflected in their willingness-to-pay. They also decide on service delivery mechanisms, operation and maintenance of services as well as the management of and accounting for funds and the degree to which the private sector is involved (Deverill, Bibby, Wedgwood, & Smout, 2001; Lockwood, 2004; The World Bank Water Demand Research Team, 1993). To best serve the users' preferences, economic and social constraints are considered in the user group's institutional design. These comprise informal constraints, including sanctions, taboos and codes of conduct, as well as formal rules (North, 1991), including property rights.

However, in practice the success of the demand-responsive approach can be thwarted through lack of acceptability, feasibility, or the limited capacity of communities to sustain the chosen option (Harvey & Reed, 2004; Skinner, 2003). The failure of communities to speedily repair their handpumps results in longer term nonfunctionality causing discontent among water users, who then look for alternatives and refrain from paying fees – a process that leads to a downward spiral in water services (Cross & Morel, 2005). To counter such a downward development, supra-communal management options should be considered for rural water services recognizing the critical importance of the interface between a community-based model and the local community it is meant to serve (Blaikie, 2006). Bannerjee and Morella (2011) demonstrate that central, regional, or local governments play a dominant role in all aspects of energy, road, and water infrastructure provision across Africa. However, it is only in the area of providing and maintaining water services where local communities are given a leading role – precisely the area

where Bannerjee and Morella (2011) identify most challenges. Alternatives such as private rural water service providers are promoted by Kleemeier and Narkevic (2010), who argue for private firms or individuals to receive long-term government-let contracts to design, build or rehabilitate, operate, and maintain water supplies within a defined geographical area.

3. STUDY SITE AND METHODOLOGY

(a) Study site

The study site comprises the Kyuso District, Kenya, (38° 10'E, 0° 35'S; 660–880 m elevation; 2,446 km²) located 267 km east of Nairobi with a population of 26,848 households (Government of Kenya, 2009). The population is almost entirely rural (99%) with 62% living in absolute poverty – one of the highest rates in Kenya (KIHBS, 2006). Frequent droughts exacerbate the area's poverty by adversely affecting the farmers' major source of income from crop yields and livestock (Office of the Prime Minister, 2009). The mean annual temperature ranges between 26 °C and 34 °C. The bi-modal rainfall pattern, with long rains from March to May and short, heavier rains from October to December, drives handpump usage patterns with pumps more heavily used in the dry season. An estimated 70% of households rely on unimproved sources, such as ponds and rivers (Office of the Prime Minister, 2009), which have negative health implications. Of the remainder, 30% use wells or boreholes, which include 66 Afridev handpumps installed over the last 20 years (see Figure 1).

As part of Oxford University's "Smart Handpumps Project" these 66 pumps have been equipped with mobile-enabled transmitters reporting hourly pump usage to a central server via SMS (Thomson, Hope, & Foster, 2012a). About half the pumps are "actively managed" and send data automatically to the server. The others are "silent" with usage data being recorded for later analysis, while disruptions are monitored by users through crowd-sourcing (Thomson, Hope, & Foster, 2012b). Following water user committee (WUC) approval, robust stickers were attached to the silent pumps, providing contact information for users to call in case of breakdowns. When a handpump failure is noted, a mechanic is dispatched immediately to assess and fix the problem. Consistent with Marks and Davis' (2012) finding that reliable and regular access to the water source (a piped system in their case) significantly enhances community members' sense of ownership, this service was provided for free on the assumption that a good service had to be demonstrated in order to establish the maintenance model was viable and build trust that a faster repair service was feasible. This study examines the willingness-to-pay preferences of rural water users after experiencing the service for a 1-year trial period. The automated monitoring technology provides unprecedented information on handpump usage thus creating the basis for institutional and financial progress in rural water supply.

During 2013, the year of the study, handpumps broke two times per year on average; however, the range was between zero and 11, which led to a high variation in repair cost ranging from USD 54 to USD 649 per pump per year with an average repair cost of USD 62 (Oxford/RFL, 2014).

The unpredictability of pump failures and the variation in cost indicate that pooling payments across the District may afford the users higher security against water risks. Therefore, a supra-communal management structure was proposed by

the "Smart Handpumps Project" to explore a mobile payment platform that could build on high (73%) use of mobile money services in Kyuso District (Oxford/RFL, 2014). In such a scheme all members would contribute monthly cash payments to be deposited into a designated mobile payments (M-PESA) account by the water user committee treasurer. SMS messages would subsequently inform users that their fees have been received and deposited into the account, thus creating greater transparency and accountability for the user group. If pooled, even costly repairs can be covered following an insurance-based approach.

During handpump downtimes in the dry season, 77% of households report using a nonpump alternative drinking water source, whereas 64% use such sources during the wet season, which may cause seasonal shifts in pump revenue. Two major alternative sources in the area are Kiambere water pipeline and Ngomeni rock catchment, which provide piped water through kiosks (USD 0.02/20 liters) for people living in the limited service area.

(b) Methodology

(i) Sampling framework and hypotheses

Four factors are hypothesized to be major influences on demand for a certain service level of rural water supply: handpump service reliability, handpump density, water use, and water quality. The first three factors form the basis of the sampling framework and the analysis in this paper. Water quality is not examined here but is a goal of further research in the site. The institutional framework depicts an organization of users whose preferences determine payment level and mode in order to achieve a certain service level supply (Figure 2). The institutional design of the water user group is a key factor in achieving regular rural water user payments as it constitutes a link between the individual user and the supra-communal management structure in terms of personal involvement in the user group and willingness-to-pay.

The following four hypotheses are tested in this study to analyze the barriers to rural water user payments.

(1) Institutional design and management

The institutional design of the user group – with a tendency to either a "handpump club" or a common pool resource group – is, *inter alia*, an expression of its preferences, and it influences payment behavior. Therefore applying public goods theory to communal management of handpumps provides a useful framework of analysis. Buchanan's theory of clubs (1965) is concerned with the highest attainable utility for the individual with respect to the optimum size of groups. Too large a number of handpump users may implicate long queuing for water or cause over-abstraction, which represents a form of congestion in Buchanan's terminology, as the consumption of the sustainable quantity of the good may be exceeded. Some user groups are therefore expected to opt for an institutional design with higher levels of excludability, although this requires higher payment levels by individual users. Thus, user groups are characterized by different levels of physical, financial, and social excludability. Hence, we hypothesize that the institutional design of the user group affects willingness-to-pay levels (H_1).

As water abstraction levels are an expression of demand – with higher levels being more likely to lead to "congestion" – this study suggests that the organizational structure of the user group and the associated willingness-to-pay are linked to handpump usage. It is tested whether handpump user groups with a high water demand are prone to opt for more exclusive management arrangements (H_2).

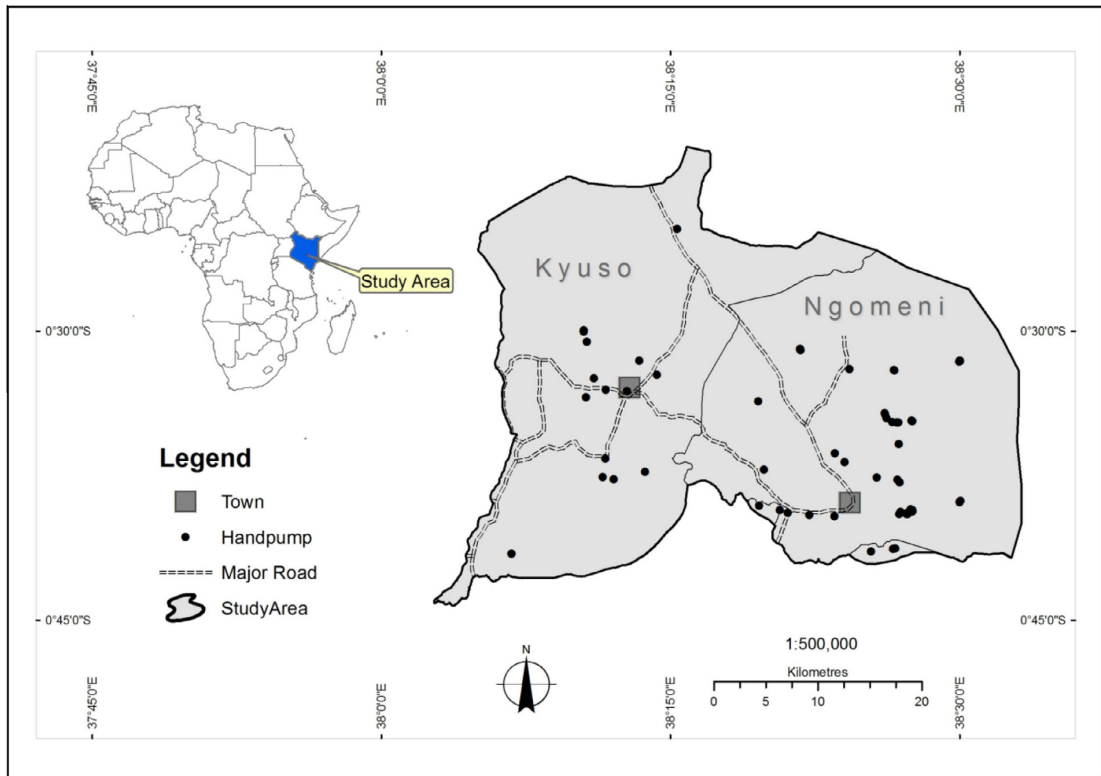


Figure 1. Map of study area.

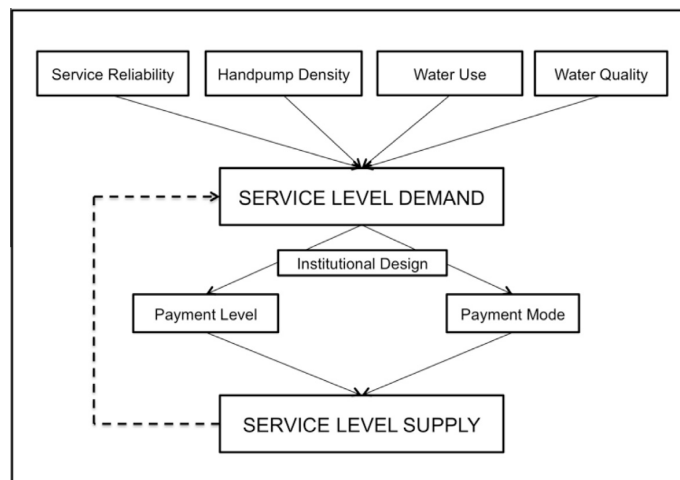


Figure 2. Framework of analysis.

(2) Handpump density

A household's willingness-to-pay depends on existing alternatives (The World Bank Water Demand Research Team, 1993), as people attribute a high value to the time spent on collecting water (Whittington, Mu, & Roche, 1990). Briscoe (1996) argues that opportunity costs are substantially higher, all other things being equal, in arid, high-demand areas. Moreover, he points out that the existence of opportunity costs can

give rise to conflicts among users, unless institutional mechanisms exist which recognize these costs. The influence of existing alternative handpump sources on willingness-to-pay is therefore tested with the third hypothesis: Payment levels are related to handpump density; higher payments occur at more isolated pumps (H₃).

Thus, the sampling framework included three classes of handpump density: single pumps, pairs, and clusters. Single

pumps have no alternative pump closer than 1.5 km; pairs have one alternative pump closer than 1.5 km and at times share management arrangements; clusters have three or more pumps within a radius of 1.5 km. This definition was derived from two pumps with the longest distance between them (1.3 km) but shared management.

(3) Maintenance service reliability

According to Narayan, “a service can be considered reliable when it has a high probability of being available in the quality, quantity, and at the time required. Since attaining reliability has a financial cost, the standard acceptable to users will vary depending on the particular context” (1993, p. 33). Thus reliability of the maintenance service and financial sustainability are interdependent (The World Bank Water Demand Research Team, 1993). This insight leads to the fourth hypothesis that payments are contingent on service delivery (H₄).

(ii) Ethics statement

Ethical permission was granted from Oxford University’s Central University Research Ethics Committee and the National Council of Science and Technology, Kenya, based on the following consent procedure. All respondents were adults (over 18 years of age) who provided oral consent to voluntarily participate. Oral consent is the local, socio-cultural norm and accepted practice. At the beginning of each focus group discussion (FGD), the following criteria were confirmed: (a) the respondents’ membership of the handpump user group, (b) summary of the project purpose with government support, (c) project contact name and mobile number, (d) voluntary exercise, and (e) anonymity.

(iii) Data collection

Data collection comprised three linked components led by Oxford University’s Smart Handpumps Project: (1) a baseline survey in 2012, (2) handpump monitoring using mobile transmitters (January to December 2013), (3) focus group discussions in June/July and November/December 2013. Oxford/RFL (2014) provides details on the first two components which are briefly discussed here to contextualize the findings from the third component, which affords new knowledge and insights linking water use with payment behaviors.

(1) Baseline survey

In July 2012, after training and piloting the instrument, a team of five experienced enumerators (four women, one man) administered a revised baseline survey in either the local language Kikamba (54%) or Kiswahili (46%), according to the respondent’s preference. A random sample (32%) of the universe of handpumps was selected and interviews were conducted with any person who drew water for their household on the day of sampling ($n = 118$) (Hope, 2014; Oxford/RFL, 2014). The majority of sampled respondents were female (64%) with an average age of 41 years. The informants represented households with an average of 5.3 members.

Before the handpump maintenance trial started in January 2013, 56% of users paid for water in some way with the majority of payments (80%) coordinated by the water user committee. Payment for water has traditionally been collected as monthly fees (31.5%), when the pumps break (26.6%), per 20-liter jerrycan (19.3%), as membership fees (16.7%) or by livestock usage (8.9%) (Oxford/RFL, 2014). However, only 24% of users had sufficient funds saved when the pump broke. For the other groups, on average 18 days were required to raise funds, with a range of 1–180 days. The average time from pump breakage to repair was 27 days (Oxford/RFL, 2014).

(2) Handpump monitoring

As described above, the water data transmitters installed in all 66 handpumps either send or record hourly information on handpump usage and associated volumetric use (Thomson *et al.*, 2012a), depending on which arm of the study they are in. These data are used for correlation with willingness-to-pay levels and institutional design.

(3) Focus group discussions

To inclusively and reflexively explore community preferences to institutional barriers and opportunities, focus group discussions (FGD) were administered by two Kikamba native speakers supported by the lead author. A total of 63 field days were spent in 66 handpump communities in the periods June/July and November/December 2013. Enumerators co-developed, piloted, and refined the discussion framework subject to the composition (gender, size, location) of the focus groups. In doing so, they adhered to a structured process of (a) pre-planning discussion purpose and delivery (lead and rapporteur), (b) community liaison to timetable the meeting, (c) community discussion, and (d) debrief and write-up on the same day (see Table 1).

In the first phase 32 of the 66 handpumps were systematically sampled according to the following criteria: density category, experience of service and level of usage. In round two the remaining 34 handpumps were sampled. Follow-up focus groups were conducted at the community pumps. In the first round groups were divided by gender. This methodology was chosen because women might be reluctant to state their own preferences in the presence of men (The World Bank Water Demand Research Team, 1993). The follow-up was conducted in mixed groups because groups had met in the interim to discuss the proposals. Participants ranged in age from 20 to 80 years and represented both users with and without mobile phones. FGD methods included mapping the water user community with alternative sources, a seasonal calendar, and a timeline on handpump maintenance (Narayanamy, 2009).

A group willingness-to-pay activity was designed to identify how much each water user group would be willing to pay for a continuation of the existing maintenance service at the conclusion of the free maintenance trial in December 2013. No maintenance service standard was guaranteed as the aim was to understand individual community preferences based on their experience of the service. Community experiences varied from no maintenance response, as 30% of handpumps did not fail in 2013, through to communities having had their handpump repaired on at least one occasion. A willingness-to-pay design was chosen as a means to initiate community debate on payments collectively. Without rehearsing the extensive literature critiquing willingness-to-pay studies conducted with individuals (Hensher, Shore, & Train, 2005; Merrett, 2002) or collectively (Wiser, 2007), well-established biases (strategic, protest vote, anchor) and limitations (temporal invariance, intra-household dynamics, social dynamics, computation) are acknowledged. Davis’ study (2004) on the effects of the mode of data elicitation on results obtained in demand-assessment research demonstrates that the explanatory power is highest in a combination of focus groups and subsequent self-administered questionnaires, which she attributes largely to additional time for contemplation. We acknowledge this finding, however, as in our case group decision-making was the objective for a standard payment level per user group, we replaced the questionnaires by follow-up focus groups leaving time for each group to reach

Table 1. *Composition of focus groups and number of interviewees*

Handpump user group	Total number of participants/interviewees	Number of female participants	Number of male participants
Total (users)	1692	639	291
Median	15	8	4
Mean	26	10	5
Min	1	1	0
Max	157	41	20

Table 2. *Factors of excludability*

Exclusion type	Percent of pumps (%)	Description
Physical excludability		
1. Lock	77	Keys are only available to group members and are kept at a nearby house
2. Fence	59	Symbolic demarcation; Fence helps keep livestock out
3. Pump attendant	14	Pump attendant is employed to keep the keys and collect money. Alternatively, group members rotate to fill the position
Financial excludability		
4. Membership joining fee	29	Membership joining fees since the installation of the pump are charged (payable in installments) (average USD 35)
5. Nonmember fee	46	Fee collected for single use by nonmembers (usually USD 0.06/20 liters)
6. Regular payment	23	Monthly and weekly options are used (average USD 0.98/month)
7. Fines	52	Warranted for late fee payment or missing WUC or user group meetings (between USD 0.06/offence and USD 1.15/offence)
Social excludability		
8. Labor contributions	64	Contributions include fixing fences or labor on a community crop scheme
9. Regular meetings	53	33% meet once a week, 18% once a month, 9% twice a month and 6% only when the pump is broken; the remainder with infrequency or not at all
10. Usage rules	74	Rules include schedules and limits for pump use, especially during dry periods

consensus. Thus, we selected a flexible and comprehensible approach whose results were to inform the wider institutional analysis; however, we do not claim nor wish to advance the methodology. The research team did not suggest minimum payment nor did it prescribe a payment system (from equality to a sole benefactor) but supported the group discussion with a view to engage quieter members actively but respectfully in an inclusive discussion.

The members of the water user committee attending focus group discussions were interviewed separately regarding the current management of their committee, thus informing the discussion on excludability. Additional interviews with user group members provided insight into relevant group dynamics.

Both qualitative and quantitative methods were used to analyze the data gathered in focus group discussions and interviews with 639 participants in June/July and November/December 2013 as well as the 2012 baseline survey. Data were analyzed in three steps: firstly, the quantitative willingness-to-pay was analyzed according to the themes developed in the sampling framework. The statistical program SPSS, version 22, was used for the statistical tests. Secondly, focus group transcripts were coded according to themes, which added narrative to the quantitative findings (Miles & Huberman, 1994). The analysis of excludability through a ranking system determined management types as common pool resources, club goods, or privately managed pumps.

4. INSTITUTIONAL DESIGN AND RURAL WATER USER PAYMENTS

(a) *Levels of excludability of handpump user groups*

The institutional design of handpump user groups may constitute a major obstacle to securing regular rural water user payments. To test the hypothesis that the level of excludability in the institutional design has an impact on willingness-to-pay (H_1), the data were classified into three different categories of excludability – physical, financial, and social (Table 2). Pumps may combine several types, thereby further increasing their exclusivity. By counting the number of exclusion types in place at each pump (assuming all exclusion types are equal, which is a simplification), a value for exclusivity was determined for each, which allowed for their division into two groups: more exclusive pumps (exclusivity levels six to ten) and less exclusive pumps (exclusivity levels up to five). Drawing on public goods theory, these two levels of exclusivity show a tendency toward the institutional type of club goods (Buchanan, 1965) or common pool resources (Ostrom, 1990) respectively. The water user committee plays an important role in administering rules and regulations that define the exclusivity of the group. Purely private pumps, which are the property of and are managed by a single household, constitute the third category.

The average membership size of exclusive groups (27 members) is 43% smaller than that of more inclusive groups (47

members). As one member usually represents a household (average 5.3 people), the difference is over 100 people.

Buchanan's (1965) delineation of the highest attainable utility for the individual within clubs is reflected in several user groups' endeavor to maintain an optimum size. Excludability is meant to prevent queuing, wear on the pump, over-abstraction, and potential rationing of the resource (occurring at 28% of the pumps in the dry months). While experiencing long, time-consuming queues, pumps with more than 100 members can offer lower membership fees. This implies that there is a trade-off between an individual's benefits, especially in the dry season, and their cost over the whole year. When one pump (MIS-059) became too congested, users increased the fee to USD 1.15 per month in 2007, which paid for an attendant to enforce excludability. This led to a reduction in group size by 40% as people sought alternative sources.

(b) *Effects of excludability on rural water user payments*

The application of public goods theory to the institutional design of user groups reveals that the more exclusive handpump clubs show a 43% higher average willingness-to-pay per member per month (USD 1.03) than more inclusive groups classified as common pool resource groups (USD 0.72). The finding is significant ($t = 2.12$; $df = 57$; $p < 0.05$), which supports hypothesis H₁ that a more exclusive form of management is related to higher user payment levels (see Figure 3 and Table 3).

Excludability is a response to water supply risks and trade-offs between sustainable abstraction, aquifer variability, handpump reliability and varying social demands. It is there-

fore an important feature of the institutional design of certain handpump groups. Too small or too large a membership limits group stability as demand can become insufficient or excessive (Carley, 1991). Through restricting membership, the good becomes less rivalrous. At the point of equilibrium between benefit and cost, an individual's preferences are best met, which contributes to the group's stability and the handpump's sustainability.

Hence, the institutional design of the user group determines the operationalization of water user committee-administered payments. More exclusive groups tend to impose tighter financial regulations to generate the required revenue for the pump. They do not only achieve this through higher membership fees, which correspond with club members' 43% higher willingness-to-pay for a more reliable water source, but also through nonmembership fees, joining fees and fines. Abstraction quantity and geographical distribution influence the decision-making process. On the other hand, some pump groups charge a lower fee while having more members to achieve the same overall revenue. Finally, some households prefer to own their pumps – 16% of the pumps studied are privately managed. These owners demonstrate a high willingness-to-pay. "I will pay whatever it takes to ensure [the pump] is repaired" (pump NGO-065, June 22, 2013). This is usually achieved by selling livestock. The implication of this finding is that studies regarding pump ownership should acknowledge the different institutional designs and the formation of handpump clubs. Although in their research on sense of ownership Marks and Davis (2012) refer to forms of participation during water supply planning and construction, we

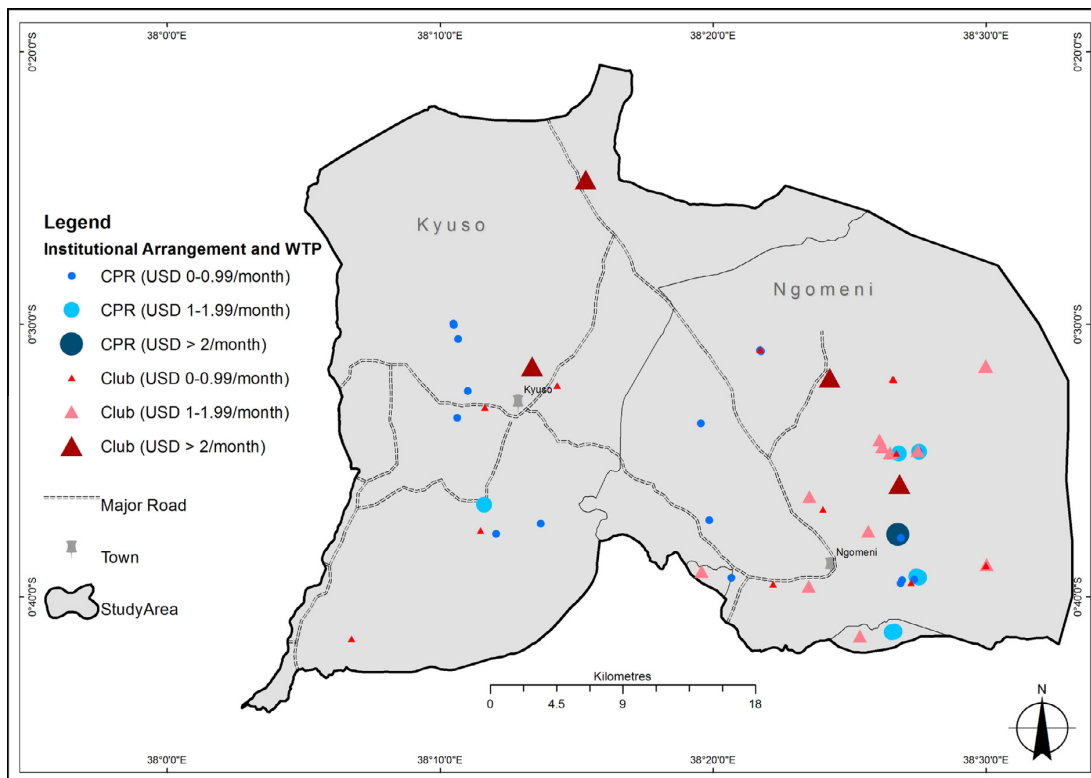


Figure 3. Institutional arrangement and willingness-to-pay (household/month) as agreed by each handpump user group.

Table 3. *Factors influencing willingness-to-pay levels at user household and user group levels*

Treatment category		Household willingness-to-pay per month (USD)	Group willingness-to-pay per month (USD)
		Mean (st.dev)	Mean (st.dev)
Management	CPR ($n = 26$)	0.72 (0.47)	22.52 (34.43)
	Club ($n = 32$)	1.03 (0.69)	23.80 (29.18)
	Private ($n = 8$)	1.20 (1.91)	1.43 (2.05)
Handpump density*	Single ($n = 18$)	1.12 (0.78)	40.79 (51.04)
	Pair ($n = 14$)	0.79 (0.49)	22.03 (6.75)
	Cluster ($n = 27$)	0.76 (0.52)	11.28 (7.90)
Use*	Domestic ($n = 7$)	0.61 (0.40)	35.76 (56.31)
	Productive ($n = 8$)	1.58 (1.10)	48.69 (54.19)
	Both uses ($n = 44$)	0.79 (0.41)	16.08 (10.03)
Estimated quantity*	Low ($n = 10$)	1.15 (0.63)	31.65 (47.76)
	Medium ($n = 28$)	0.91 (0.75)	15.09 (13.13)
	High ($n = 13$)	0.66 (0.30)	36.91 (44.25)
Serviced*	Yes ($n = 41$)	0.92 (0.68)	24.98 (36.74)
	No ($n = 18$)	0.79 (0.47)	17.95 (12.17)

* Only considering community pumps (CPRs and clubs; $n = 59$), excluding private pumps.

found the same factors to be relevant in the post-construction phase. User group decisions on stricter enforcement mechanisms – from membership joining fees, regular payments, and labor contributions through to higher household contributions to maintenance costs in case of impending congestion – also strengthen the sense of ownership among group members, which links the club good approach to the sense-of-ownership discussion. Whereas Marks and Davis (2012) emphasize the intensity of individual factors, we draw on a number of measures reinforcing each other to make an aggregate impact.

This study suggests a distinction between membership clubs and common pool resource groups, the consequences of which have yet to be considered. While membership clubs may have a positive impact on the financial sustainability of handpumps, exclusion may have repercussions for the communities. The benefits of CPR management models must therefore not be disregarded. Ostrom (1990) demonstrates that if self-organizing principles are adopted, an institution may be relatively robust. This applies to common pool resources as well as club goods; however, the lower excludability of CPR groups may help to reduce the potential for community conflict, which exclusion might provoke. While no such conflicts were observed in the communities, it is acknowledged that handpump clubs can exacerbate financial and social inequality – through wealth, kinship, or other factors. These potential social repercussions as well as the implications for the Human Right to Water and Sanitation (UNGA, 2010), require further investigation. At the same time progressive realization of universal drinking water services requires financial sustainability. Handpumps managed as club goods contribute to progressing, and critically maintaining, universal services consistent with property rights regimes for piped water systems in urban Africa, such as kiosks, which are not open access but provide the poor with a lower cost and generally safer water supply than other alternatives (Kjellén & McGranhan, 2006).

(c) Institutional design and handpump usage

The handpump user groups that have a tighter organizational structure appear to be those with a higher demand for

water. Club handpumps have a 57% higher usage level than CPR handpumps. Figure 4 shows the increasing usage levels with increasing exclusivity levels (sixfold increase). This suggests that club handpumps need a more exclusive management structure in order to prevent over-abstraction and queuing at sources where demand is relatively high (H_2). The user group safeguards the desired degree of exclusiveness primarily through adaptation of payment levels.

Not only the abstraction quantity per user group but also the intended use is relevant. Productively used water shows high willingness-to-pay levels (USD 1.58 per user per month versus USD 0.61 per user per month for domestic-use pumps), supporting the water-pays-for-water hypothesis, which implies that using water for income-generating activities has a greater perceived value than purely domestic uses. Pumps with both productive and domestic use have 2.3 times the weekly mean output compared to solely domestic-use pumps (900 liters per day versus 400 liters per day). The productive use of water also confounds estimates of demand based on population data and assumptions on personal use patterns. Having objective handpump usage data enables the spatial mapping of demand for water (see Figure 5). Given the reality of limited resources and inevitable trade-offs, this information can provide an objective basis for investments in water infrastructure, be that the installation of more handpumps or determining the best place to upgrade to a powered pump and tank or the transition to a piped water scheme.

When willingness-to-pay is compared to measured usage, the following pattern emerges: high-use pumps, above 36,000 liters per month (75th percentile and above), have the highest mean group willingness-to-pay of USD 37 per month; low-use pumps, with abstractions below 6,000 liters per month (25th percentile), show a willingness-to-pay of USD 32 per group; medium-use pumps, between 6,000 and 36,000 liters per month (up to 75th percentile), have the lowest willingness-to-pay per user group at USD 15 per month. This relationship is nonmonotonic, and thus cannot simply be explained by looking at the demand for water at a pump in isolation. The geographical distribution of pumps, in particular a pump's location in relationship to other pumps must be considered.

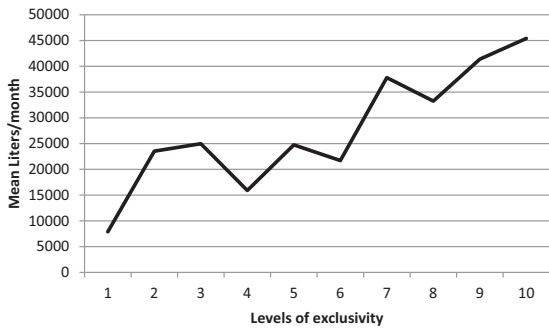


Figure 4. Abstraction versus exclusivity.

5. HANDPUMP DENSITY AND RURAL WATER USER PAYMENTS

Geographic factors also influence rural water user payments. Population density does not generally vary across all three groups; however the geographic distribution of pumps does. The existence of alternative sources is likely to reduce the willingness of users to pay for operation and maintenance of a certain pump since they can easily switch to another one. Thus handpump density has implications for operational management and investment planning. In Kyuso there are 17 single pumps, eight pairs, and four clusters (eight pumps on average per cluster) according to definition (see Section 3(b)).

The research has shown that isolation of pumps influences the institutional design of user groups. The average group size

for single pumps is 43 household members, for pairs 32 household members and for clusters 27 household members. Considering community handpumps, the willingness-to-pay level of households at single pumps is 42% higher than that of pairs; moreover, it is 47% higher for singles than for clusters. This tendency is consolidated at group level. At user group level singles have an 85% higher willingness-to-pay than pairs, and a 2.6 times higher willingness-to-pay than clusters. The relationship is significant ($F = 5.355; df = 2; p < 0.01$), which supports the hypothesis that payments are related to handpump density (H_3). This also explains why medium-use pumps (between 6,000 and 36,000 liters per month) showed a lower willingness-to-pay at the group level than high-use or low-use pumps. In Kyuso, medium-use pumps are disproportionately those in clusters.

Considering opportunity cost, users generally tend to prefer paying higher fees to walking greater distances to alternative handpumps (Hulton, 2012; Sorenson, Morsink, Abril, & Campos, 2011). This fact is highlighted by Narayan (1993), who shows that the presence of alternatives is the major cause for pump users not to invest in a well as they lack incentives. Thus handpump clustering is at best inefficient, and at worst a counter-productive planning decision (see Figure 6).

6. SERVICE DELIVERY AND RURAL WATER USER PAYMENTS

Poor service levels appear to be the most important barrier to sustaining water user payments. Increased reliability, enabled through mobile monitoring, constitutes a critical component of demand as it affects other preferences. For this pur-

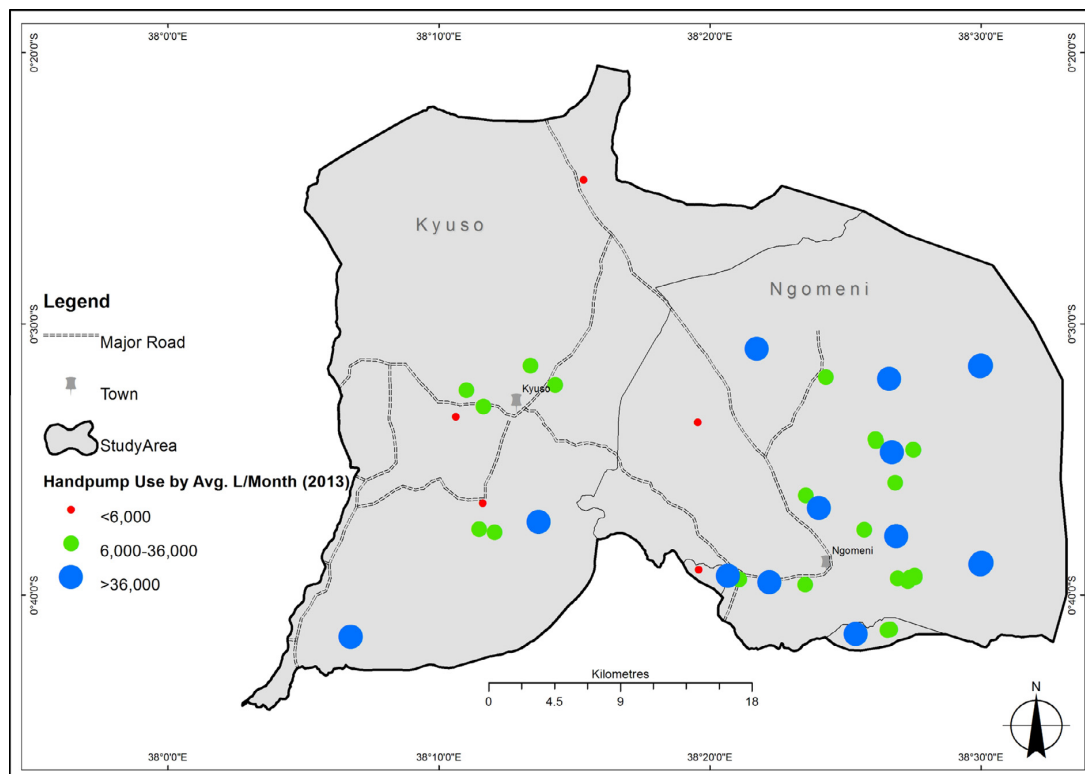


Figure 5. Handpump usage by average liters per month, 2013.

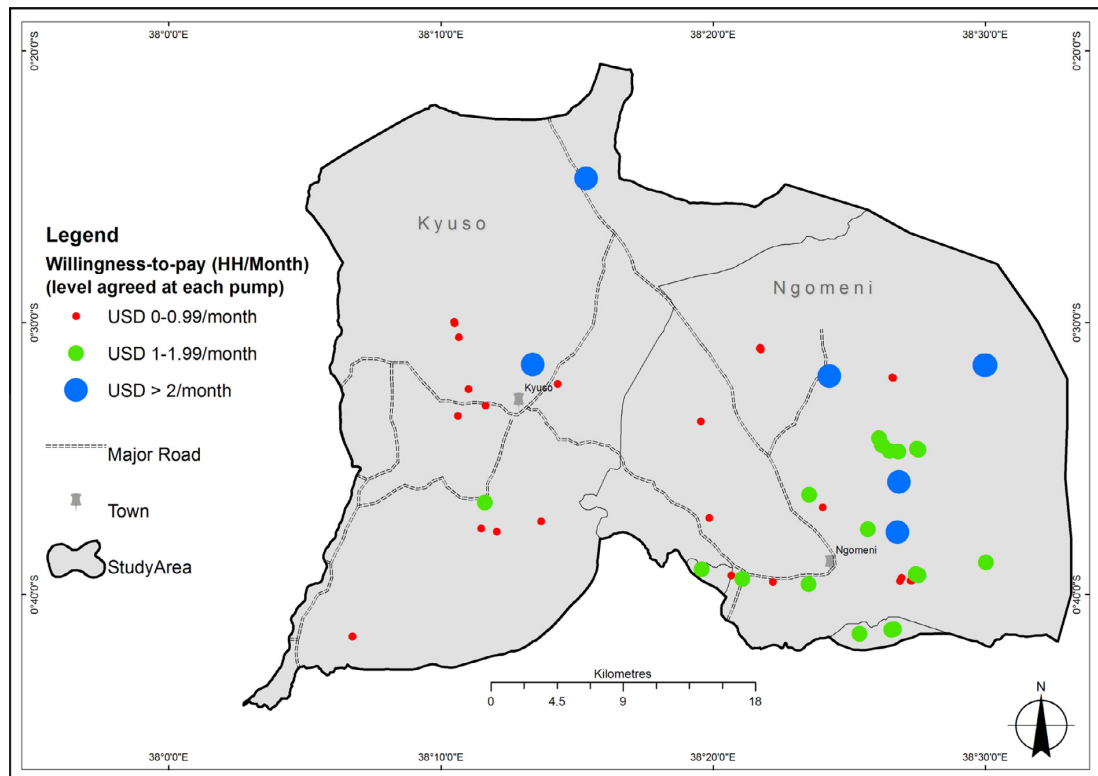


Figure 6. Willingness-to-pay (household/month) as agreed by each handpump user group.

pose, monthly payment levels per household of the time before the service started were compared with willingness-to-pay levels after the users had experienced the service ($n = 46$) – including those private pumps that would join the payment model. The increase is fivefold from USD 0.2 to USD 1 per household per month (Table 4). This can be related to the fact that the new level of service produced a tenfold decrease in handpump downtime from 27 to 2.6 days on average over the 1-year study period (Oxford/RFL, 2014), which represents an order of magnitude improvement found to be critical in the baseline survey (Hope, 2014). Moreover, the number of handpump groups intending to contribute monthly – rather than making post-breakdown payments – increased threefold (Table 4).

The findings suggest that payments are contingent on service delivery, thus supporting hypothesis H_4 . The aspects of service delivery that were most valued by the water users were the speed of service (77%), the quality of the service (54%), and the knowledge that the service is guaranteed (31%). The focus group participants also endorsed mobile payments as an acceptable payment mode, especially as mobile payments are already used for remittances by at least one member in each focus group. The average willingness-to-pay for a mobile-enabled service at all 66 pumps is USD 0.92 per household; the average monthly group willingness-to-pay is USD 21 per month across all pumps. Of the sample of 66 handpumps, 70% required at least one repair in 2013, with 63% of broken handpumps requiring more than one repair. The average cost of each repair was USD 62 (Oxford/RFL, 2014). If the stated willingness-to-pay of all pump user groups reflected the actual future payment collected, this would raise sufficient revenue to

have covered all repair costs in 2013; however, if communities chose not to pool revenue, 43% of communities would not have met their individual costs (Oxford/RFL, 2014). Equal monthly payments and equal cost-sharing are therefore deemed universally important. With the given level of acceptance and use of mobile phones in Kyuso, a mobile-enabled service delivery model is socially acceptable and familiar as well as practical and efficient.

The benefit of higher revenues can lead to a cycle of improved pump maintenance triggering higher returns for users (Figure 7). The spiral of decline and discontent among users leading to nonpayment and long-term pump nonfunctionality can be reversed through an effective maintenance system that facilitates demand for higher service levels (The World Bank Water Demand Research Team, 1993), which is expressed by greater willingness-to-pay. Translating this willingness-to-pay into actual payments requires strong institutions with enforcement mechanisms. Madrigal, Alpizar, and Schlüter (2011) point to the significance of a set of working rules enforced by the local communities. At the same time, satisfying user preferences reinforces institutional stability (Olson, 1965; Ostrom, 2010). Even beyond willingness-to-pay, a study by Ali, Fjeldstad, and Sjørusen (2014) finds that satisfaction with public service provision supports a tax-compliant attitude among Kenyans and other sub-Saharan Africans, which may indicate that willingness-to-pay will eventually translate into payments recognizing the new service level. Altogether, the measures discussed above have profound implications for the operational and institutional challenges of community management of handpumps.

Table 4. Service delivery and willingness-to-pay

Handpumps repaired under new model (n = 46)	Before treatment		After treatment		Mean household monthly payment (st.dev)	Increase in pre-paying handpumps	Increase in payment level
	% handpumps pre-paying	% handpumps to pre-pay	Yes	No			
	29%	91%	9%	9%	USD 0.2 (0.49)	318%	500%
					USD 1 (0.99)		

7. OPERATIONALIZING AND INSTITUTIONALIZING RURAL WATER SERVICES AND USER PAYMENTS

(a) Harnessing mobile technology for monitoring and payment

Mobile monitoring and mobile payments have the potential to improve traditional payment systems with benefits for both service provider and water user. For the former, it provides an effective monitoring system that “would be alert to all credible problems and notify maintenance responses in a timely and constant manner” (Thomson *et al.*, 2012b, p. 283), thus not only enabling fast repairs but also contractual oversight. For the latter, benefits include a more transparent financial system and a higher level of water security through regular repairs (Hutchings *et al.*, 2012). While mobile monitoring facilitates a hitherto impossible alignment of service delivery with user level demand through monitoring functionality and abstraction, mobile payments facilitate direct financial flows back to the maintenance service provider (Figure 7). Mobile technology could therefore act as a conduit for reliable information and financial flows, thus achieving the central objective of strengthening handpump sustainability while increasing financial transparency and security. The service provider may achieve a better understanding of the financial capacity of water user groups while users can monitor their management committees through feedback loops, which would counter potential mismanagement of handpump finances. Without strict group level enforcement measures, the entire group may lose interest in fee collection (Harvey & Reed, 2004).

Mobile technology is not a panacea for Kenya’s and other countries’ rural water supply problems. There are numerous obstacles impeding the successful delivery of a mobile-enabled service, including the lack of signal and electricity for recharging mobile phones, together with operational problems of crowd-sourcing. However, these technical challenges are surmountable with coverage and subscription levels continuously increasing. Technology is an enabler that creates the opportunity for novel management models, which were not previously possible; yet it will not train and equip mechanics, enforce agreed payment levels, or conduct a spare parts inventory check. Overall, success is contingent upon the willingness of the people to participate. “Getting the human side of things right... [is] much harder than making the technology work” (Daraja, 2012). Nevertheless, this study has shown that, by aligning rural water supply systems to the service level demand formed through socio-economic preferences and translated into the institutional design of user groups, the financial sustainability of community handpumps may be improved. Mobile technology is a useful tool for aligning supply and demand – but only if the institutional structure at the community and supra-communal level are sufficiently robust to nurture and exploit its full potential.

(b) Developing an output-based payment framework

Overcoming the barriers to rural water user payments is an essential step in the global drive toward achieving the water targets of the sustainable development agenda. An output-based payment model represents a new framework for donor and government behavior in Kenya and other African countries (Figure 8) within the wider initiatives on result-based payment approaches (DFID, 2014; Hope, 2014). The cycle of improved service delivery presented above constitutes the first building block at the sub-national level where finances flow from communities whose payments are clustered to a performance-based maintenance service provider, who in

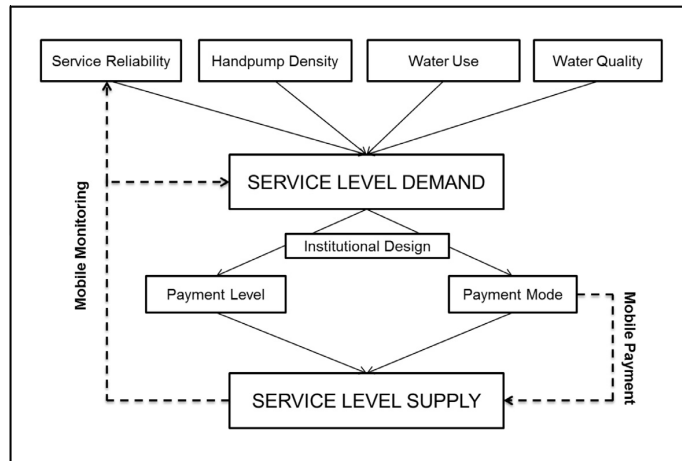


Figure 7. Cycle of improved service delivery.

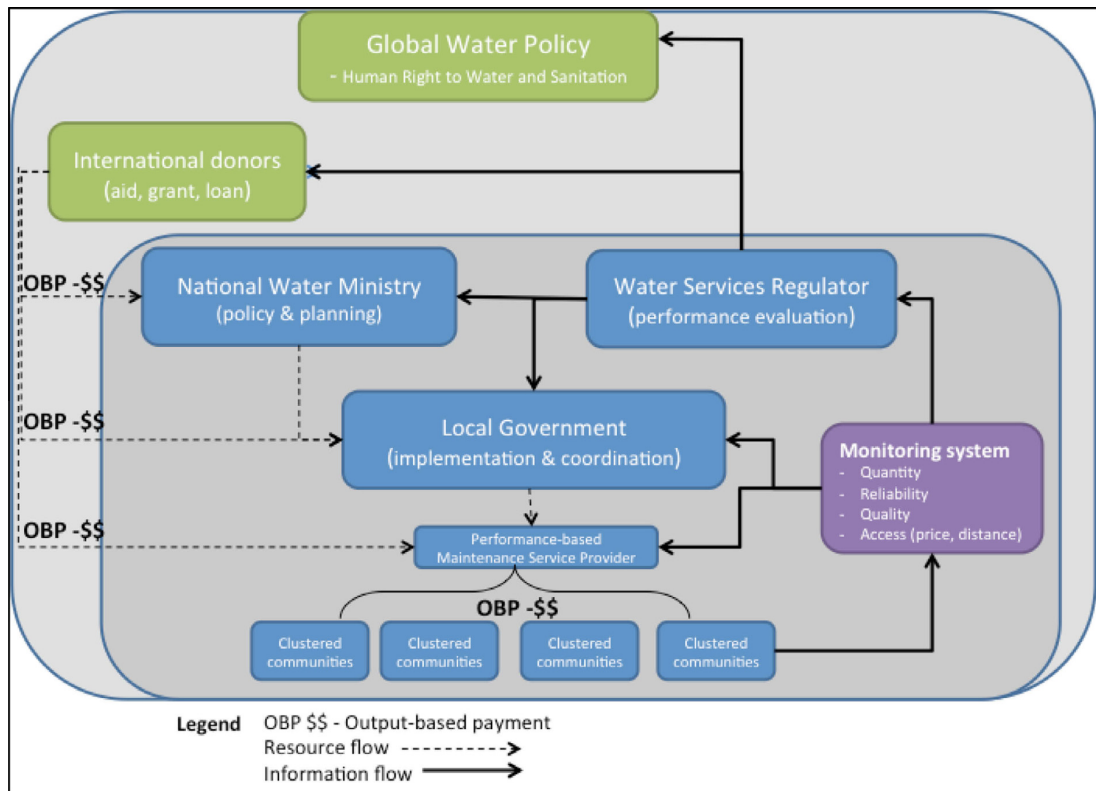


Figure 8. An output-based payment model of rural water services (Oxford/RFL, 2014).

turn is monitored and regulated by local and national governments. The national rural water regulation system documents existing and new investments by environmental, technical, and operational indicators, thus providing a valuable resource for monitoring and regulating investment behavior and outcomes at scale. The sub-national level can provide regular information on performance and user payments, lending itself to the

model of a results-based financing mechanism that supports the provision of basic public services. This can be facilitated by delegating the delivery of outputs, such as a functioning maintenance service, to a third party in exchange for the payment of a subsidy upon delivery of specific outputs. It can thus address a potential funding gap between the cost of service delivery and the beneficiaries' ability and willingness to pay

the full amount of user fees for the service (GPOBA, 2014; IDA, 2009). Hence this system can continuously inform national government goals and priorities while supporting global water policy approaches.

8. STUDY LIMITATIONS

Five limitations are identified in this study. First, the study site is in one District in rural Kenya with a unique hydro-climatic, geological, social, and political landscape; no claim is made to generalize the findings though there is confidence in internal validity. Second, the free maintenance service may have biased upwardly informant responses, particularly on payment levels, toward the end of the study given the successful performance of the technology. As noted, there are significant methodological concerns with willingness-to-pay studies (see e.g. Davis, 2004). Aware of the issues, we have attempted to be conservative in the estimates and associated implications. We could not address all the broader scope socio-cultural factors affecting willingness-to-pay of users. Third, insufficient resources were available to conduct analysis of environmental variation (hydrogeology, recharge, water quality) or technical components (installation quality, depth of well), which may confound some of the results. Future work aims to include natural and human-related contamination to understand the extent to which this key variable affects water payment behaviors. Fourth, the research team worked closely with but independently from the Government of Kenya District Water Office and staff. While government support was instrumental in the research, we acknowledge such collaboration may have affected community behavior despite enforcing strict ethical and human informant measures on confidentiality and anonymity. Fifth, the data on handpump usage are presented as an estimated value for volumetric abstraction over a given period. This is based on calibrations of handle movements against observed flow prior to the start of the study (Thomson *et al.*, 2012a). The same calibration coefficients were used for all pumps throughout the study, so slight differences in pump dynamics between pumps and across time will not have been captured. We acknowledge the associated inaccuracies in this approach, but highlight the novel insights this technique allows in understanding factors contributing to sustainable rural water service delivery.

9. CONCLUSION

This study identifies three major findings to prime rural water user payments in Africa. First, a reliable and fast maintenance service is key to sustaining rural water user payments. Second, these payments are subject to demand, which is related to the spatial distribution of handpumps. Hence, clustering should be avoided for financially sustainable services and new handpump installations determined by verifiable metrics. Third, the management of community handpumps takes several forms along the public-private spectrum. Almost half

of the handpumps self-organize in clubs and choose a semi-privatized model with a higher payment structure.

The empirical findings suggest that there are two linked and potentially competing arguments: First, sustainable water services require new approaches to tackle the widely documented failure beyond infrastructure construction and the associated limitations of current monitoring practices. Second, the universal water access argument requires approaches that are sustainable. Historically, the latter has been applied at the expense of the former with major waste of resources (Baumann, 2009). We provide new insights to advance theory on improving sustainable water services for the rural poor through the club good model. However, the legacy and limited accountability of external interventions by donors and government can undermine the model as illustrated by clustering handpumps, which may neither be cost-effective nor deliver sustainable services. If sustainability is not achieved through the efforts of functioning institutions, the human right to safe drinking water is generally infringed, not only for those who do not have access yet. Acknowledging the requirement of progressive realization is therefore realistic as well as beneficial to a growing number of sub-Saharan Africans, if steps are taken by communities and governments alike toward the full realization of the human right, using the “maximum available resources” and “ensuring that the right can be realized for present and future generations” (UNGA, 2013).

Understanding operational, geographic, and institutional barriers of rural water user payments contributes to developing an innovative, output-based payment model for rural water services in Africa. The real test will be if users support the introduction of a new payment system, which acknowledges the higher value for money that the new maintenance service system creates. This research indicates that such reforms are supported by the communities if reliable services are delivered. The findings offer pathways toward the suggested water targets of the post-2015 sustainable development agenda promoting, *inter alia*, universal and sustainable access to safe drinking water and raising service standards, as well as robust and effective water governance with more effective institutions and administrative systems (UN Water, 2014). It demonstrates the need for continuous monitoring of rural water services, as well as suggesting strategies for achieving this. Water service performance data are key to defining a baseline and measuring progress toward sustainable services at the local level, for operationalizing a maintenance service provider model at the supra-communal level and testing an output-based payment model at the national and international levels. The Government of Kenya’s Water Services Regulatory Board (WASREB) acknowledges the importance of such performance data “enabling WASREB to ensure that satisfactory performance levels are achieved and maintained, and enhancing transparency and accountability within the rural sector” (WASREB, 2014, p. 79). Thus, the data can support and monitor national policy goals that promote progress toward universal access and more reliable improved water services for the rural poor.

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Appendix 3: County water ministry survey questionnaire

NB: This survey was conducted with representatives from all 47 County Water Ministries in the first devolved County Governments in October-December 2015.

County Water Ministry Survey Questionnaire: CEC Members for Water

This questionnaire will provide critical data for WSTF to support County Governments to guide effective responses to devolution of the water sector in Kenya. Participation is voluntary, all data will be anonymised and remain strictly confidential. Data will be analysed and a report prepared in collaboration with WSTF.

Please identify your County: _____

What is your position? _____

Since when have you had this position? _____

BUDGET

1. Please rank from 1 (high) to 7 (low) what portion of the budget your County has allocated to the following sectors in FY 2015/16:

- a) Health _____
- b) Education _____
- c) Drinking water _____
- d) Electricity _____
- e) Sanitation _____
- f) Transportation & roads _____
- g) Security & crime _____

2. Approximately, how much of the total County budget has your County allocated to the water sector in FY 2015/16?

If known, what was the total County budget? KES _____ | % of total budget allocated to water:

If known, what was the water sector budget? KES _____ | _____

3. Please rank the following areas in terms of priority of investment from 1 to 8 (1 top priority):

- a) Development of water service infrastructure _____
- b) Water infrastructure mapping _____
- c) Water infrastructure monitoring _____
- d) Maintenance provision _____
- e) Water service institutions _____
- f) Water resources development _____
- g) Water conservation _____
- h) County Water Ministry administration _____

4. How was the water sector budget distributed along the following categories in FY 2015/16?

Water Services Infrastructure: <25% 25-50% 51-75% > 75%

Water Services Operation and Maintenance: <25% 25-50% 51-75% > 75%

Water Resources Management: <25% 25-50% 51-75% > 75%

LEGISLATION

5. Do you have a County Water Act in your County that has passed through the County Assembly? Yes No
- a. If **Yes**, was there a process of public participation in the making of the County Water Act?
 Yes No
- i. If **Yes**, what was the format of public participation?
 Frequency of meetings: _____
 Average number of communities involved per Ward: _____
- b. If **No**, do you have a Water Bill pending in the County Assembly?
 Yes No
6. Given a choice, which type of legislation would you prefer for the water sector of your County? *(please tick ONE)*
- Omnibus law** (one law including all responsibilities assigned to county governments in Fourth Schedule: water and sanitation services, aspects of water resources management, etc.)
- Multiple laws** (separating responsibilities: e.g. dedicated water services law, etc.)
7. Who is responsible for regulating county water services? *(Please tick ONE only)*
- National Government (WASREB)
- County Government
- Other *(please specify)*: _____

SERVICE PROVISION

8. Today, is the County Government responsible for drinking water service delivery across the criteria below?
****Please tick urban AND rural for each category*

	Urban		Rural	
	Yes	No	Yes	No
Sufficient quantity				
Potable quality				
Affordability				
Physical access				
Non-discrimination				

9. How satisfactory is drinking water provision in your County?
- a. Urban: very satisfactory satisfactory unsatisfactory very unsatisfactory
- b. Rural: very satisfactory satisfactory unsatisfactory very unsatisfactory
10. Does the County government have the capacity to fulfil water users' expectations in terms of providing water services in your County?
- a. Urban: completely partially insufficiently
- b. Rural: completely partially insufficiently

11. To what extent has the County mapped existing drinking water supply infrastructure?
- a. Urban: complete acceptable partial none
- b. Rural: complete acceptable partial none
12. How do you consider the quality of information on water coverage in your County for identifying and prioritising investments?
- a. Urban: very satisfactory satisfactory unsatisfactory very unsatisfactory
- b. Rural: very satisfactory satisfactory unsatisfactory very unsatisfactory
13. Does your office monitor functionality of water supply infrastructure?
- Yes, Urban & Rural; Yes, Urban only; Yes, Rural only; Neither
- a. If **Yes**, when was the last monitoring exercise?
- o For urban, year: _____
- o For rural, year: _____
- b. If **Neither**, what are the reasons for not monitoring? *(Please tick ALL that apply)*
- o Insufficient budget
- o No need for monitoring
- o Plan to in the near future
- o Other *(please specify)*
-

14. Who would be best placed to maintain drinking water supply infrastructure in your County?
****Please tick ONE only for urban and ONE only for rural*

	Urban	Rural
Public provision, e.g. County Government or WSPs		
Public-private partnership (PPP)		
Private companies		
Community		
Other <i>(please specify)</i>		

15. Which of the following options would best work for your County? *(Please tick ONE only)*
- A **one utility** model for the whole county (both urban and rural)
- A **two utilities** model (one for urban, one for rural)
- several utilities** (that obtain a water services provision licence and provide water services within a defined geographical area in the County)
16. If you plan for only one county Water Service Provider (WSP), do you expect this one county WSP to be responsible for managing all the community schemes?
- Yes No
17. Which role do you see for Water Services Boards in the future? *(Please tick ALL that apply)*
- infrastructure development in the county
- managing cross-County water infrastructure
- regulating WSPs
- managing Water Service Providers
- no role
- Other *(please specify)*
-

18. How many NGOs are currently active in the water sector in your County? _____

- a. Does the County Government coordinate their activities? Yes No
 b. Do they play a significant role in public participation? Yes No

TARIFF SETTING

19. Who is responsible for setting drinking water supply tariffs?

- Ministry of Water and Irrigation
 WASREB
 County Government
 Other (*please specify*) _____

20. What role should water users have in tariff-setting?

- no role
 consultation/informed
 agree tariffs before formalising
 Other (*please specify*) _____

21. What do you consider a fair drinking water tariff? (*Please tick one for urban AND one for rural*)

URBAN (per m ³)	RURAL (per 20 litres)
<input type="checkbox"/> 50 KES	<input type="checkbox"/> 1 KES
<input type="checkbox"/> 100 KES	<input type="checkbox"/> 2 KES
<input type="checkbox"/> 200 KES	<input type="checkbox"/> 4 KES
<input type="checkbox"/> 250 KES	<input type="checkbox"/> 5 KES
<input type="checkbox"/> 500 KES	<input type="checkbox"/> 10 KES
<input type="checkbox"/> > 500 KES	<input type="checkbox"/> > 10 KES

22. Is it the policy of your County that every consumer should pay the full cost of water provision? Yes No

a. If **No**, who should subsidise the cost? (*Please tick ALL that apply*)

- National Government County Government better-off consumers Donors
 Other (*specify*) _____

23. What level of service provision of potable water per person do you think is appropriate in your County?

- Urban: 10 litres/day 20 litres/day 40 litres/day 50 litres or more/day
 Rural: 10 litres/day 20 litres/day 40 litres/day 50 litres or more/day

WATER RESOURCES

24. Which of the following aspects is your County government responsible for? *(Please tick ALL that apply)*

- Water resources regulation
 - Catchment and soil conservation
 - Storm water drainage
 - issuing abstraction permits
 - collecting water abstraction fees
 - none
 - other *(please specify)*
-

25. If you have a County Water Bill/Act, does it provide for a levy for financing catchment conservation? Yes No

26. How many Water Resources User Associations (WRUAs) are in your County? _____

27. Do you involve your local WRUAs in decision-making on devolved aspects of water resources management? Yes No

28. Does your County Government currently finance WRUA activities? Yes No

THANK YOU for your participation – a report will be shared by January 2016.

Contact details:

Name:

Email address:

Phone number:

Appendix 4: Kwale household survey questionnaire

NB: This survey questionnaire is the basis for the panel study in Kwale County, Kenya (2013-2016). The most recent survey (2016) is presented here as it provides an additional section on the maintenance service examined in this thesis. The survey is designed to capture information for multiple projects seeking to answer different questions, including on welfare dynamics and health. This thesis draws on questions regarding the management and maintenance of waterpoints as well as governance and devolution. While only a small selection of the questions were chosen for analysis in this thesis, the entire survey is presented for reasons of completeness. The following information was recorded on tablet devices by enumerators using the software doforms. The questionnaire has an in-built logic skipping certain sections based on previous responses; thus, the format presented here is repetitive. The survey instrument was provided in Swabili on doforms – English translations are given below.

Main household survey (2016)

Unique ID
Mwandishi [name of enumerator]
Tarehe [Date]
Nambari ya handpump (bomba la maji) [Handpump ID]
Kijiji [location/town/village]
Je bomba linafanya kazi? [Functionality status of handpump]
✓ Ndio, linafanya kazi [yes, it works]
✓ Halifanyi kazi (chini ya mwaka moja) [it does not work for less than one year]
✓ Halifanyi kazi (zaidi ya mwaka moja) [it does not work for more than one year]
Name of 2015 respondent at this handpump / Previous respondent
Wave 1/2 previous respondents / Names 2015/ 2014
Nambari ya nyumba [household number]
Majina ya wengine wanoishi kwa numba hii [Names of other household members]

Introduction

“Habari ya asubuhi/jioni, ninafanya utafiti kuhusu handpumps hapa Kwale nikiwa na ruhusa kutoka Wizara ya Maji na Baraza la kitaifa la Sayansi na Teknolojia (National Council of Science and Technology). Jina langu ni _____ na mimi ni miongoni mwa watafiti wanaoongozwa na xxx.” *Good morning/ afternoon. I am conducting a study on handpumps in Kwale with support from the Ministry of Water and the National Council of Science and Technology. My name is _____ and I am part of a research team led by Rural Focus Ltd, I would like to ask you about your handpump to help the Government of Kenya improve water service delivery.*

“Maelezo uliyotupa wakati huo yanasaidia sana kuimarisha usambazaji wa maji Kwale. Kwa mfano, mradi wa kurekebisha bomba za maji (hand pumps) kwa haraka umeanzishwa na unasaidia jamii nyingi. Tumerudi tena ili tupate maelezo zaidi kwa ajili ya kuimarisha mabadiliko na mda wa kurekebisha bomba za maji zikiharibika. Tunashukuru sana kwa usaidizi na mda wako.” *The information you provided last time has been very helpful in strengthening Kwale water supply. For example, a handpump repair project has recently been developed and supports many communities. We have come back for more information for enhancing the change and timing of fixing the handpumps. We are very thankful for your support and time.*

“Zoezi hili litachukua takriban dakika 30 na litatoa habari muhimu.” *The survey should take around 30 minutes and will provide important information.*

“Maelezo utakayonipa yatakuwa ya siri na hakuna yeyote atakaye jua majibu yako. Maarifa haya yatapelekwa kwa Wizara ya maji ama unaweza nipigia simu kujua matokeo kwa hii namba xxxxxxxxx.”
All the information will be strictly confidential and remain anonymous. The data will be shared with the Ministry of Water or you can contact me for the results on (cell) xxxxxxxxxxxx.

“Kushiriki kwa hili zoezi ni kujitolea na kama kuna maswali hautataka kujibu nitayaruka ama pia unaweza simamisha zoezi zima wakati utataka lakini natumai utashiriki katika hili zoezi kwa sababu maoni yako ni ya muhimu mno.” *Participation in this survey is voluntary, and if we should come to any question you don't want to answer, just let me know and I will go on to the next question, or you can stop the interview at any time. However, we hope that you will participate in this survey since your views are important.*

Je, kuna mhusika mwenye umri zaidi ya miaka 18?

Kama la, umshukuru na uende kwa mwingine *Is there a respondent present at the household who is over 18 years?* [*If 'no', end interview and thank him/her and move to the next household*]

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ La [*no*] - Unavailable today (follow-up required)
- ✓ La [*no*] - Household moved closeby
- ✓ La [*no*] - Household permanently moved away

Conditional: if household moved closeby

Umeipata nyumba mpya (mahali alipo hamia)? *Found new location of household?*

- ✓ Ndio [*yes*]
- ✓ Ndio [*yes*] – but unavailable today
- ✓ La [*no*]

Chagua nyumba mpya iliyo karibu na utafute mhusika kwa hiyo nyumba.
If no, select a new household to interview in the vicinity.

Conditional: if household permanently moved away

Sababu ya familia kuhama? *Reason family has moved away?*

- ✓ Alipata kazi mahali pengine [*respondent found work elsewhere*]
- ✓ Alifiwa [*respondent died*]
- ✓ Nyumba iliharibika [*the house was damaged*]
- ✓ Shida za kijamii [*social problems*]
- ✓ Nyingenizo [*other*]
- ✓ Sijui [*don't know*]

Chagua nyumba mpya iliyo karibu na utafute mhusika kwa hiyo nyumba.
Select a new household to interview in the vicinity.

Je mhusika amekubali kushiriki? *Has the respondent agreed to participate?*

Kama la, umshukuru na uende kwa mwingine [*If not, thank them and go to another household*]

- ✓ Ndio [*yes*]
- ✓ La [*no*]

Conditional: if respondent not willing to participate

Chagua nyumba mpya iliyo karibu na utafute mhusika kwa hiyo nyumba.
Select a new household to interview in the vicinity.

Je mhusika alishiriki katika utafiti wa hapo awali (2015)?

Is the respondent the same respondent as last time (2015)?

- ✓ Ndio [*yes*]
- ✓ La [*no*] - but same respondent as 2014

- ✓ La [no] - but an adult from the same household
- ✓ La [no] - it is a new household

About the Respondent

"Sasa ningependa kukuuliza maswali machache"

"Now I'm going to ask a few questions about you"

Hakikisha majina kamili ya mhusika?

Confirm respondent's name? ____

Jinsia ya mhusika

Respondent's gender

- ✓ Mume [male]
- ✓ Mke [female]

Umri wa mhusika

Respondent's age in years ____

IT APPEARS THE RESPONDENT IS BELOW 18. IS THIS CORRECT?

Yes - Skip to end of survey

No - Age was incorrectly entered (return to previous question)

Umefikia kiwango gani cha elimu?

Level of education you have reached?

- ✓ Hakuna [none]
- ✓ Chekechea [kindergarten]
- ✓ Shule ya msingi [primary school]
- ✓ Chuo cha Ufundi [technical college]
- ✓ Shule ya upili [high school]
- ✓ Chuo cha mafunzo [college training]
- ✓ Chuo kikuu [university]
- ✓ Hajui [don't know]
- ✓ NR [no response]

Conditional: if primary school

Ulifikia darasa la ngapi? Highest primary school class completed?____

Conditional: if secondary school

Ulifikia kidato cha ngapi? Highest secondary school class completed?____

What is your main religion?

- ✓ Mkristo [Christian]
- ✓ Mwislamu [Muslim]
- ✓ Hana dini [No religion]
- ✓ Ingine [other]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi? Specify if other____

Major Household Concerns

"Iwapo Serikali ya kaunti ingependa kusaidia kijiji hiki, ni mambo yapi matatu muhimu ambayo familia yako ingependekeza yafanywe". *Suppose that the government could help your village with just THREE of these issues. Which would YOUR FAMILY choose?*

Usimuelekeze mbusika. Chagua majibu 3 (Do NOT prompt. Tick only THREE)

___ Concern 1 options:

- Afya na huduma za afya [health and health care]
- Usafi (vyoo na upitishaji wa maji machafu) [sanitation]
- Usafiri na barabara [transport and roads]
- Usalama na uhalifu [security and crime]
- Huduma za umeme [electrical services]
- Kazi na ukosefu wa ajira [work and unemployment]
- Elimu [education]
- Usaidizi wa kilimo [agricultural support]
- Huduma za usamabazaji wa maji [water supply services]
- Nyenginezo [other]
- NR [no response]

___ Concern 2

___ Concern 3

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. *Specify if other* ___

Ni shirika gani la serikali linahusika na kushughulikia suala hili? *What level of government is involved in dealing with this issue?*

___ Concern 1 options:

- Serikali kuu [central government]
- Serikali ya Kaunti [county government]
- Serikali kuu na Kaunti [central and county governments]
- Nyenginezo [other]
- Sijui [don't know]
- NR [no response]

___ Concern 2

___ Concern 3

Je, unadhani kampuni ya Base na/ama KISCOL inachangia katika kuleta maendeleo kwa Kaunti? *Do you think Base and/or KISCOL contributes to development in the County?*

Chagua yote yatakayotajwa. *Tick ALL that apply.*

	Base	KISCOL	Neither	Sijui [DK]	NR
Afya na huduma za afya <i>Health and health services</i>					
Usafi (vyoo na upitishaji wa maji machafu na mazingira) <i>Sanitation</i>					
Usambazaji / upatikanaji wa maji <i>Water supply</i>					
Stima <i>Electricity</i>					
Barabara <i>Roads</i>					
Shule <i>Schools</i>					
Kazi <i>Jobs</i>					
Chakula <i>Food</i>					

Nyenginezo					
Other					

Kama ni nyenginezo, tafadhali fafana kwenya nafasi. Specify if other___

Taja mambo matatu ambayo Serikali ya Kaunti imeimarisha tangu kuchaguliwa. Name three things that the County government has strengthened since devolution.

___Response 1 options:

- Usimamizi wa maji, mito, visima and chemichemi [*water management, rivers, wells and fisheries*]
- Usambazaji / upatikanaji wa maji kwa wanavijiji (bomba za maji) [*water supply/ access to villagers (water pipelines)*]
- Ujenzi na usambazaji wa kliniki na huduma za afya katika vijiji [*construction and distribution of clinics and health care in the villages*]
- Miundombinu ya shule [*school infrastructure*]
- Ubora wa elimu [*quality of education*]
- Kuleta kazi [*employment*]
- Miundombinu ya barabara [*road infrastructure*]
- Nyenginezo [*other*]
- Hamna [*none*]
- Sijui [*don't know*]
- NR [*no response*]

___Response 2

___Response 3

Ni mambo gani yanakukera kuhusu hali ya usambazaji wa maji. What are your main water concerns?

Usimuelekeze mhusika. Chagua yote yatakayotajwa. (Do NOT prompt. Tick ALL that apply).

- ✓ Maji yanasambaziwa mbali sana [*Water source is too far away*]
- ✓ Maji hayatoshi kwa matumizi ya nyumbani [*insufficient water for domestic use*]
- ✓ Maji hayatoshi kwa kilimo [*insufficient water for agricultural use*]
- ✓ Maji hayatoshi kwa mifugo [*insufficient water for livestock*]
- ✓ Usambazaji wa maji ni ghali [*water supply is too expensive*]
- ✓ Maji si salama kwa kunywa [*water is not safe to drink*]
- ✓ Hakuna mahali pa kuhifadhi maji nyumbani [*Insufficient water storage in the home*]
- ✓ Usambazaji wa maji hautegemeeki [*water supply is intermittent*]
- ✓ Maji ni ya msimu [*water is seasonal*]
- ✓ Mlolongo wa kupata maji ni mrefu sana [*Queue for water is too long*]
- ✓ No concern
- ✓ Nyenginezo [*other*]
- ✓ NR [*no response*]

Conditional: if other

Mambo mengine yanayokera kuhusu usambazaji wa maji? Other concern relating to water supply___

About the Household Members

"Ningependa kukuuliza kuhusu watu wengine wanaoishi katika nyumba yako"

"Now I'm going to ask you about other members of your household"

Je, ni watu wengine wangapi wanaoishi katika nyumba yako? *What is the number of other people in your household?* (Mhusika asiwe katika idadi ya wanaoishi katika hiyo nyumba. Jumlisha wote wanaokula ama wanaolala kwa hiyo nyumba).___

"Tuanze na yule mkubwa ki umri"

"Let's start with the oldest member of your household"

Jina la kwanza? *First Name*___

Jinsia? *Gender?*

- ✓ *Male*
- ✓ *Female*

Umri wake? *Age in Years*___

Conditional: if <24

Je amehudhuria shule mwaka jana 2015? *Did they attend school last year (2015)?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if >15

Anafanya kazi gani? *Job status?*

- ✓ Amejiriwa [*full-time wage*]
- ✓ Kibarua [*part-time wage*]
- ✓ Amejijiri mwenyewe [*self-employed*]
- ✓ Anasoma [*studying*]
- ✓ Hana kazi [*no income*]
- ✓ Zinginezo [*other*]
- ✓ NR [*no response*]

Conditional: if >4

Amefikia kiwango gani cha elimu? *What level of education have they reached?*

- ✓ Hakuna [*none*]
- ✓ Chekechea [*kindergarten*]
- ✓ Shule ya msingi [*primary school*]
- ✓ Chuo cha Ufundi [*technical college*]
- ✓ Shule ya upili [*high school*]
- ✓ Chuo cha mafunzo [*college training*]
- ✓ Chuo kikuu [*university*]
- ✓ Hajui [*don't know*]
- ✓ NR [*no response*]

Conditional: if primary school

Ulifikia darasa la ngapi? *Highest primary school class completed?*___

Conditional: if secondary school

Ulifikia kidato cha ngapi? *Highest secondary school class completed?*_____

Conditional: if <15

Sasa nitakuuliza kuhusu hali yake ya afya (1)

"Now I'm going to ask you about the health of [NAME]"

Je, amewahi kuharisha ndani ya wiki mbili zilizopita (Kuwa na choo chepesi (kuhara) mara tatu au zaidi kwa siku)? *Has he/she had diarrhea in the last 2 weeks (loose stool three or more times a day)?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if yes

Je, kulikuwa na damu kwenye kinyesi? *Blood in stools?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, amewahi kuwa na ugonjwa wa kisonono/kichocho ndani ya mwezi uliopita? *Has he/she had schistosomiasis or blood in urine in the last month?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, amewahi kuwa na ugonjwa wa kukohoa ndani ya wiki mbili zilizopita? *Has he/she ever had a cough in the last 2 weeks?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if yes

Alipokuwa na ugonjwa wa kukohoa je, alikuwa akipumua karaka kuliko au kupata ugumu wa kupumua? *Did he/she breathe faster than usual with short, rapid breaths or have difficulty breathing?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, ana ugonjwa wowote wa ngozi? *Does he/she have any skin infections?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Ndani ya kipindi cha wiki mbili zilizopita je alikuwa na madhara katika macho yake? *Has he/she had any eye infections in the last 2 weeks?*

- ✓ Ndio [yes]
- ✓ La [no]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Je, ameugua malaria mwaka uliopita? *Has he/she had malaria in the last 12 months?*

- ✓ Ndio [yes]
- ✓ La [no]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Are there other household members? If so, now ask about the next oldest person in the household. *[Same questions are repeated for each household member]*

Income and Employment

Sasa ningependa kukuuliza maswali kuhusu kuajiriwa au mapato yako.

"Now I'm going to ask you about your income/employment"

Je, unafanya kazi gani? *What kind of job are you doing?*

- ✓ Ameajiriwa [full-time wage]
- ✓ Kibarua [part-time wage]
- ✓ Amejijiri mwenyewe [self-employed]
- ✓ Anasoma [studying]
- ✓ Hana kazi [no income]
- ✓ Zinginezo [doesn't know]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi? *Specify if other*_____

Conditional: if self-employed or does not work

Mhusika anajipatia mapato kwa nija gani? *What work?*

- ✓ Ukulima [farming]
- ✓ Uvuvi [fishing]
- ✓ Biashara ndogo ndogo [small business]
- ✓ Nyenginezo [other]
- ✓ NR [no response]

Conditional: if self-employed

Je, alipata au kupokea malipo au fedha kwa siku, kwa wiki au kwa mwezi?

Did you receive money or get paid per day, per week or per month?

- ✓ Kwa siku [per day]
- ✓ Kwa wiki [per week]
- ✓ Kwa mwezi [per month]
- ✓ Nyenginezo [Other]
- ✓ NR [no response]
- ✓ Sijui [don't know]

Conditional: if per day/week/month

Fedha alizopokea au kulipwa kwa siku? *Money received or paid per day/week/month?*___

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi? *Specify if 'other'?*___

Conditional: if other

Fedha alizopokea au kulipwa kama ni nyinginezo? *Payment per other time period?*___

Health

Je, watu katika nyumba yako wakiwa wogonjwa huenda kliniki aghalabu mara ngapi?

How often do members of your household go to a medical facility when they are sick?

- ✓ Kawaida [*common*]
- ✓ Mara kwa mara [*regularly*]
- ✓ Si sana [*not common*]
- ✓ Wakati wamezidiwa sana [*rare*]
- ✓ Hawaendi kliniki/hospitali [*do not go to clinic / hospital*]
- ✓ Wanaendelea na matibabu [*undergoing treatment*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Ni kliniki/hospitali gani wao huenda? *Which medical facility do they go to?*___

Kuna nyakati ambazo afya ya watu wazima na watoto zaidi ya miaka 5 katika familia yako hudhoofika kwa sababu ya magonjwa yafuatayo? *Are there times when the health of adults and children over 5 years in your family is weakened due to the following diseases?*

	Malaria	Diarrhea	Respiratory problems	Skin/eye disease	Schistosomiasis
Msimu wa mvua <i>Wet season</i>					
Msimu wa kiangazi <i>Dry season</i>					
Mwisho wa kiangazi <i>End of dry season</i>					
Wakati bomba la maji limeharibika <i>When HP breaks</i>					
Nyinginezo <i>Other time</i>					

Kuna nyakati ambazo afya ya watoto chini ya miaka 5 katika familia yako hudhoofika kwa sababu ya magonjwa? *Are there times when the health of children under 5 years of age in your family is weakened due to the following diseases?*

	Malaria	Diarrhea	Respiratory problems	Skin/eye disease	Schistosomiasis
Msimu wa mvua <i>Wet season</i>					
Msimu wa kiangazi <i>Dry season</i>					
Mwisho wa kiangazi <i>End of dry season</i>					
Wakati bomba la maji limeharibika <i>When HP breaks</i>					
Nyinginezo <i>Other time</i>					

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi? Specify if other_____

Ni mabadiliko gani mazuri yamechangia kuboresha afya yako katika mda wa miezi 12 iliyopita?

What has changed positively to improve your family's health in the last 12 months? Tick ALL that apply.

- ✓ Hakuna mabadiliko [*no change*]
- ✓ Mafunzo katika elimu ya afya [*training/ education about health*]
- ✓ Kuongezeka kwa fedha ninazopata [*increased earnings*]
- ✓ Umbali wa kliniki kupungua [*shorter distance to a clinic*]
- ✓ Kuboreka kwa huduma za kliniki [*improved clinical services*]
- ✓ Kuboreka kwa upatikanaji wa vifaa vya usafi [*improved access to sanitary facilities*]
- ✓ Kuboreka kwa upatikanaji wa maji ya matumizi nyumbani [*improved access to water for household use*]
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if training/ education about health

Nani aliwaelimisha juu ya fya? Who provided the education/training on health practices?

- ✓ Serikali kuu [*central government*]
- ✓ Serikali ya Kaunti [*county government*]
- ✓ Shirika lisilo la Kiserikali [*NGO*]
- ✓ Jamaa wa vijijini [*local people*]
- ✓ Nyinginezo [*other*]
- ✓ DK [*don't know*]
- ✓ NR [*no response*]

Conditional: if shorter distance to a clinic or improved clinical services

Nani alichangia katika ujenzi/uboreshaji wa kliniki? Who funded the building/improvement of the clinic?

- ✓ Serikali [*government*]
- ✓ Base Titanium
- ✓ KISCOL
- ✓ Nyinginezo [*other*]
- ✓ NR [*no response*]

Conditional: if improved clinical services

Ni sababu gani zimechangia kuimarika kwa kliniki? Which factors contribute to improved clinic conditions? Tick all that apply.

- ✓ Daktari na wauguzi kuongezeka [*increase in number of doctors and nurses*]
- ✓ Dawa kuongezeka [*increase in access to medication*]
- ✓ Mda wa kingojea kutibiwa kliniki umepungua [*waiting times for treatment have decreased*]
- ✓ Nyinginezo [*other*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi? Specify if other_____

Conditional: if improved access to water

Nini iliboresha upatikanaji wa maji? *What improved your water supply access?* Tick all that apply.

- ✓ Bomba la maji kuwa karibu [*water tap is now available*]
- ✓ Urekebishaji wa bomba la maji uko haraka [*fast repair of pipeline*]
- ✓ Upatikanaji wa maji safi katika sehemu zingine mpya [*new access to clean water*]
- ✓ Fundifix Kwale / Kwale Handpump Services Ltd. [*maintenance service*]
- ✓ Nyinginezo [*other*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi? *Specify if other* _____

Ni changa moto gani za ki afya nyumba yako hupata? *What health-related challenges does your household face?* Tick ALL that apply

- ✓ Kliniki ziko mbali [*clinics are far away*]
- ✓ Bei ya matibabu iko juu [*price of treatment*]
- ✓ Bei ya dawa iko ghali sana [*price of medication*]
- ✓ Huduma za kliniki zimedhoofika [*worsened clinical services*]
- ✓ hamna [*none*]
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi? *Specify if other* _____

Household Assets

Je, nyumba yako ina vitu vifuatavyo? *Does your home have the following items?*

	Ndio [<i>yes</i>]	La [<i>no</i>]	NR [<i>no response</i>]
Umeme [<i>electricity connection</i>]			
Sola [<i>solar panel</i>]			
Televisheni / Runinga [<i>television</i>]			
Kompyuta / Tarakilishi [<i>computer</i>]			
Radio [<i>radio</i>]			
Baiskeli [<i>bicycle</i>]			
Pikipiki [<i>motorcycle</i>]			
Dhow [<i>dhow</i>]			
Simu ya mkononi / rununu [<i>mobile phone</i>]			

Je, nyumba yako ina vitu na vyakula vifuatavyo? *Does your home have the following food items?*

	Ndio [<i>yes</i>]	La [<i>no</i>]	NR [<i>no response</i>]
Mafuta ya kupikia [<i>cooking oil</i>]			
Sukari [<i>sugar</i>]			
Unga [<i>flour</i>]			
Majani chai [<i>tea leaves</i>]			
Sabuni [<i>soap</i>]			

Conditional: if have mobile phone

Je, kuna mtu yeyote wa nyumba hii amewahi tuma au kupokesa pesa kutumia simu ya mkononi kwa mwaka uliopita? *Has anyone in the household sent or received money by mobile phone for the past year?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if have cooking oil

Unatumia nini kupikia? *Type of fuel used for cooking?*

- ✓ Umeme [*electricity*]
- ✓ Gesi [*gas*]
- ✓ Mafuta ya taa [*kerosene*]
- ✓ Makaa [*charcoal*]
- ✓ Kuni [*wood*]
- ✓ Nyasi [*grass*]
- ✓ Mahunzi (Maguguta) [*agricultural crop, e.g. maize*]
- ✓ Mavi ya ngombe [*cattle dung*]
- ✓ Hatupiki [*not used*]
- ✓ Nyinginezo [*other*]
- ✓ NR [*no response*]

Mnatumia choo cha aina gani? *Type of toilet facility used?*

- ✓ Choo cha kusukuma kwa kupitia bomba [*Flush to piped sewer system*]
- ✓ Choo cha kusukuma kwa kupitia tangi [*Flush to septic tank*]
- ✓ Choo cha kusukuma hadi kwenye shimo [*Flush to pit latrine*]
- ✓ Shimo la choo lenye hewa nzuri [*VIP latrine*]
- ✓ Choo cha shimo kilichojengewa [*Pit latrine with slab*]
- ✓ Choo cha ndoo [*Bucket toilet*]
- ✓ Choo cha kuhifadhi mbolea [*Composting toilet*]
- ✓ Choo kando kando ya maji [*Hanging toilets/latrines*]
- ✓ Hakuna choo/ Choo cha msituni/uwanjani [*No toilet, use bush*]
- ✓ Nyinginezo [*other*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi? *Specify if other*_____

Je, mnatumia hiki choo pamoja na watu wengine? *Share toilet with other households?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if share toilet

Kama ndio, mbali na nyumba yako, ni ngapi zingine zinatamia choo hiki? *How many other households share the facility?*_____

Je, mnamiliki ardhi ya nyumba hii? *Does the household own the land on which the dwelling sits?*

- ✓ Tunamiliki [*owns it*]
- ✓ Tumekodi ardhi [*pays rent*]
- ✓ Hatukukodi-tumepewa kwa ridhaa [*does not pay rent with consent of owner*]
- ✓ Hatukukodi-ni maskwata [*does not pay rent – squatting*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Mnamiliki hekari ngapi za shamba? *How many acres of land are owned by the household?*_____

Kuna yeyote anaelima? *Does the household grow any crops?*

- ✓ Ndio, mimea hukuzwa kwa ajili ya matumizi ya nyumbani [*yes, crops are grown for home use*]
- ✓ Ndio, mimea hukuzwa kwa ajili ya kuuza [*yes, crops are grown for sale*]
- ✓ Ndio, mimea hukuzwa kwa ajili ya matumizi ya nyumbani na pia kuuza [*yes, crops are grown for home use and sale*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if crops are grown for sale

Je mnakuza miwa kwa ajili ya KISCOL? *Does household grow sugarcane for KISCOL?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if yes

Ni hekari ngapi zilizopandwa miwa kwa ajili ya KISCOL? *How many acres of your farming land are under sugarcane for KISCOL?*_____

Je, mnamiliki mifugo wa aina yoyote? *Does the household own any kind of livestock/herd?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if yes

Mna ng'ombe wa kienyeji wangapi? *Number of indigenous cattle?*_____

Conditional: if yes

Mna ng'ombe wa maziwa wangapi? *Number of dairy cows?*_____

Conditional: if yes

Mna ng'ombe wa kulima wangapi? *Number of oxen?*_____

Conditional: if yes

Kuku wangapi? *Number of poultry?*_____

Wealth and Expenditure

Sasa ningependa kujua kiwango cha pesa nyumba yako inatumia kwa vitu kadha wa kadha.

"Now I would like to know how much money you spend on different things"

Matumizi ya nyumbani kwa wiki/mwezi uliopita. Kama hakuna matumizi, andika 0 (sufuri).

Spending on home use per week/month. If no expenditure, write 0.

Kitu [item]	Kiasi cha pesa [Amount Kshs]	Per day/week/month
Chakula [food]		
Usafiri [transport]		
Matibabu / Dawa [health / medicine]		
Karo ya Shule [school fees]		
Maji [water]		
Matumizi kwa umeme na nguvu ya kupikia (kuni, makaa n.k) [energy]		
Matumizi kwa simu [mobile phone]		

Kwa ujumla, utasema familia yako ni tajiri, inajiweza au ni maskini? Does household think they are well-off, average or not well-off in terms of assets and income?

- ✓ Tajiri [well-off]
- ✓ Inajiweza [average]
- ✓ Maskini [not well-off]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Je hali ya maisha ya nyumba yako ni bora Zaidi, hamna mabadiliko mbaya zaidi ikilinganishwa na mwaka jana? Does household think they are better-off, the same or worse-off than last year?

- ✓ Better-off
- ✓ Same
- ✓ Worse-off

Conditional: if better-off or worse-off

"Sasa ningependa tuzumzie kuhusu sababu ya kuboreka au kudhoofika kwa familia yako tukilinganisha na mwaka jana. Ni sababu gani mabadiliko hayo yametokea?" *"Now I would like to know about the cause of the improvement or worsening of your household compared to last year. What is the reason for this change?"*

Je, kumekuwa na kifo, magonjwa, au watoto kuzaliwa? Have there been deaths, diseases or births?

	Male adult	Female adult	Male child	Female child	No change
Vifo [Deaths]					
Ugonjwa mkuu [Serious illness]					
Watoto kuzaliwa [Births]					

Je, nyumba yako ina kiasi cha mali sawa na ya mwaka jana? Does your house have the same amount of assets as last year?

	More	Less	No Change
Shamba [land]			
Mifugo [livestock]			
Uvuvi [fishing]			

Biashara ya usafiri [<i>transport</i>]			
Ukulima [<i>farming</i>]			

Je, kuna mabadiliko yoyote makubwa katika mapato au matumizi ya nyumbani kulingana na mwaka jana? *Is there any major change in income or home use compared to last year?*

	More	Less	No Change
Pesa kutoka kwa wanafamilia [<i>remittances</i>]			
Pesa kutoka kwa serikali/shirika lisilo la kiserikali [<i>cash transfers</i>]			
Mabadiliko katika ajira [<i>change in employment</i>]			
Malipo ya shule [<i>school fees</i>]			
Bei ya chakula [<i>food prices</i>]			

Je, kumekua na mabadiliko yoyote kwa huduma nyumba yako hupokea? *Has there been any change in the services your home receives?*

	Better	Worse	No Change
Huduma ya maji ya kunywa [<i>drinking water services</i>]			
Huduma ya afya [<i>health services</i>]			
Huduma ya elimu [<i>education services</i>]			
Huduma ya usafi wa vyoo [<i>sanitation services</i>]			
Huduma ya usafiri wa barabara [<i>road/transport</i>]			
Huduma ya umeme/stima [<i>energy services</i>]			
Huduma za ulinzi [<i>political stability/security</i>]			

Mabadiliko mengine amabayo hatujayazungumzia? *Specify any other changes.*_____

Water Sources

"Sasa nitakuuliza njia unazotumia kupata maji ya KUNYWA."

"Now I will ask you about how you get drinking water."

Wakati wa kiangazi, mnapata maji ya kunywa wapi? *In the DRY season, what is the MAIN source of water your household uses for DRINKING?*

- ✓ Reference handpump
- ✓ Handpump nyengine [*other handpump*]
- ✓ Mashine ya kupamp maji (ya umma) [*public submersible pump*]
- ✓ Mashine ya kupamp maji (ya binafsi) [*private submersible pump*]
- ✓ Kisima kilichofunikwa (cha umma) [*public protected well*]
- ✓ Kisima kilichofunikwa (cha binafsi) [*private protected well*]
- ✓ Kisima kilichowazi (cha umma) [*public unprotected well*]
- ✓ Kisima kilichowazi (cha binafsi) [*private unprotected well*]
- ✓ Maji ya ardhini (mito, ziwa, kidimbwi, mito midogo, kishimo) [*surface water (rivers, lakes, dams, streams)*]
- ✓ Maji ya mfereji nyumbani [*piped to yard dwelling*]
- ✓ Maji ya mfereji kwa jirani [*piped to neighbour's yard*]
- ✓ Mfereji wa umma [*public tap/kiosk*]
- ✓ Gari la maji [*truck vendor*]
- ✓ Mkokoteni/baiskeli iliyo na madebe/ mitungi [*bicycle vendor*]
- ✓ Maji ya mvua [*rainwater collection*]
- ✓ Maji ya chupa [*bottled water*]
- ✓ Nyenginezo [*other*]

Conditional: if surface water

Ni mto gani unaotumia? *Which river to you use?*

- ✓ Mkurumudzi
- ✓ Ramisi
- ✓ N'Gade
- ✓ Pongwe Kidimu
- ✓ Mwena
- ✓ Mwakwembe
- ✓ Nyinginezo [*other*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. *Specify if other*_____

Ni sababu gani zinazofanya uchague kupata maji ya kunywa kwa njia hiyo wakati wa kiangazi? *What factors make you choose to use this source in the dry season?*

Usimuelekeze mhusika. Chagua yote yatakayotajwa. *Do not prompt. Tick ALL that apply.*

- ✓ lko karibu na nyumba [*it is near the house*]
- ✓ Ladha ya maji [*the taste of the water*]
- ✓ Harufu ya maji [*the smell of the water*]
- ✓ Rangi ya maji [*the colour of the water*]
- ✓ Usalama wa kunywa [*safety of water*]
- ✓ Yananulika kwa bei nafuu [*it is affordable*]
- ✓ Ni bure [*it's free*]
- ✓ Yanategemeeka [*it is reliable*]
- ✓ Ndio njia ya pekee [*it's the only source available*]
- ✓ Nyenginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other._____

Conditional: if any source other than reference handpump

Wakati wa kiangazi, maji haya ni salama kwa kunywa? Is water source safe to drink in dry season?

- ✓ Ndio [yes]
- ✓ La [no]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if any source other than reference handpump

Unalipa pesa ngapi kutumia maji haya wakati wa kiangazi? How much do you pay to use this main drinking water source in the DRY season?

Kiasi cha pesa (Amount Kshs)	Jinsi ya malipo (Frequency)

Wakati wa masika, mnapata maji ya kunywa wapi? In the WET season, what is the MAIN source of water your household uses for DRINKING?

- ✓ Reference handpump
- ✓ Handpump nyengine [other handpump]
- ✓ Mashine ya kupamp maji (ya umma) [public submersible pump]
- ✓ Mashine ya kupamp maji (ya binafsi) [private submersible pump]
- ✓ Kisima kilichofunikwa (cha umma) [public protected well]
- ✓ Kisima kilichofunikwa (cha binafsi) [private protected well]
- ✓ Kisima kilichowazi (cha umma) [public unprotected well]
- ✓ Kisima kilichowazi (cha binafsi) [private unprotected well]
- ✓ Maji ya ardhini (mito, ziwa, kidimbwi, mito midogo, kishimo) [surface water (rivers, lakes, dams, streams)]
- ✓ Maji ya mfereji nyumbani [piped to yard dwelling]
- ✓ Maji ya mfereji kwa jirani [piped to neighbour's yard]
- ✓ Mfereji wa umma [public tap/ kiosk]
- ✓ Gari la maji [truck vendor]
- ✓ Mkokoteni/baiskeli iliyo na madebe/ mitungi [bicycle vendor]
- ✓ Maji ya mvua [rainwater collection]
- ✓ Maji ya chupa [bottled water]
- ✓ Nyenginezo [other]

Conditional: if surface water

Ni mto gani unaotumia? Which river to you use?

- ✓ Mkurumudzi
- ✓ Ramisi
- ✓ N'Gade
- ✓ Pongwe Kidimu
- ✓ Mwena
- ✓ Mwakwembe
- ✓ Nyinginezo [other]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other._____

Ni sababu gani zinazofanya uchague kupata maji ya kunywa kwa njia hiyo wakati wa masika? What factors make you choose to use this source in the dry season?

- ✓ lko karibu na nyumba [it is near the house]
- ✓ Ladha ya maji [the taste of the water]

- ✓ Harufu ya maji [*the smell of the water*]
- ✓ Rangi ya maji [*the colour of the water*]
- ✓ Usalama wa kunywa [*safety of water*]
- ✓ Yananulika kwa bei nafuu [*it is affordable*]
- ✓ Ni bure [*it's free*]
- ✓ Yanategemeeka [*it is reliable*]
- ✓ Ndio njia ya pekee [*it's the only source available*]
- ✓ Nyenginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. Specify if other. ___

Conditional: if any source other than reference handpump

Wakati wa masika, maji haya ni salama kwa kunywa? Is water source safe to drink in dry season?

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if any source other than reference handpump

Unalipa pesa ngapi kutumia maji haya wakati wa masika? How much do you pay to use this main drinking water source in the WET season?

Kiasi cha pesa (Amount Kshs)	Jinsi ya malipo (Frequency)

Kwa mwaka uliopita, ni njia gani mbadala munayotumia kupata maji ya kunywa wakati wa kiangazi na wakati wa masika? For the past year, what alternative water sources did you use for drinking water during the dry season and/or wet season?

	Dry season	Wet season
Handpump nyengine [<i>other handpump</i>]		
Mashine ya kupamp maji (ya umma) [<i>Submersible pump (public)</i>]		
Mashine ya kupamp maji (ya binafsi) [<i>Submersible pump (private)</i>]		
Kisima kilichofunikwa (cha umma) [<i>Protected well (public)</i>]		
Kisima kilichofunikwa (cha binafsi) [<i>Protected well (private)</i>]		
Kisima kilichowazi (cha umma) [<i>Unprotected well (public)</i>]		
Kisima kilichowazi (cha binafsi) [<i>Unprotected well (private)</i>]		
Maji ya ardhini (mito, ziwa, kidimbwi, mito midogo, kishimo) [<i>Surface water</i>]		
Maji ya mfereji nyumbani [<i>Piped to yard/ dwelling</i>]		
Maji ya mfereji kwa jirani [<i>Piped to neighbour's yard/ dwelling</i>]		
Mfereji wa umma [<i>Public tap / kiosk</i>]		
Gari la maji [<i>Tanker truck</i>]		
Mkokoteni/baiskeli iliyo na madebe/ mitungi [<i>cart/ bicycle vendor</i>]		
Maji ya mvua [<i>Rainwater collection</i>]		
Maji ya chupa [<i>Bottled water</i>]		
Nyenginezo [<i>other</i>]		

Conditional: if surface water

Ni mto gani unaotumia? Which river to you use?

- ✓ Mkurumudzi
- ✓ Ramisi
- ✓ N'Gade

- ✓ Pongwe Kidimu
- ✓ Mweni
- ✓ Mwakwembe
- ✓ Nyenginezo [other]

Conditional: if other

Kama ni nyenginezo, tafadhali fafana kwenye nafasi. Specify if other.____

Je, huwa mnatibu maji kabla ya kunywa? Does household treat water before drinking?

- ✓ La [no]
- ✓ Ndio - wakati wa kiangazi [yes – during the dry season]
- ✓ Ndio - wakati wa masika [yes – during the wet season]
- ✓ Ndio - nyakati zote [yes – always]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if yes

Ni nija gani mnayotumia kuyatibu maji ya kunywa? Methods used to treat drinking water? Tick all that apply.

- ✓ Kuchemsha [boiling]
- ✓ Kuongeza dawa [adding bleach or chlorine]
- ✓ Kuchuja na nguo [filter with cloth]
- ✓ Kutumia kichungio cha maji [use water filter]
- ✓ Kutumia miale ya jua [solar disinfection]
- ✓ Kuyaacha yatulie [let it stand and settle]
- ✓ Nyenginezo [other]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if boiling

Je, unatumia nija gani kuchemsha maji ya kunywa? What fuel do you use to boil water for drinking?

- ✓ Umeme [electricity]
- ✓ Gesi [natural gas]
- ✓ Mafuta ya taa [kerosene]
- ✓ Makaa [charcoal]
- ✓ Kuni [wood]
- ✓ Nyasi [grass]
- ✓ Mahunzi (Maguguta) [agricultural crop]
- ✓ Mavi ya ngombe [animal dung]
- ✓ Nyenginezo [other]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafana kwenye nafasi. Specify if other.____

Je, mbali na kunywa, una matumizi yapi mengine ya maji kutoka kwenye handpump? Other than drinking, do you use the handpump water for other uses?

	Dry season	Wet season	NR
Kupika, kufua na kuonga [cooking, washing, bathing]			
Kunyunyizia mimea [irrigation]			
Kunywisha mifugo [livestock watering]			

Nani mwenye bomba la maji? Who owns the reference handpump?

Usimuelekeze mhusika. Do NOT prompt.

- ✓ Nyumba fulani [*a private household*]
- ✓ Kikundi cha maji pamoja na kamitii [*water committee*]
- ✓ Jamii ya kijiji [*village community*]
- ✓ Shirika la kidini [*religious organization*]
- ✓ Shule [*school*]
- ✓ Kliniki [*clinic*]
- ✓ Chifu [*chief*]
- ✓ Serikali ya Kaunti [*County government*]
- ✓ Serikali kuu/Wizara/WRMA [*Central Government / Ministry / WRMA*]
- ✓ Coast Water Services Board
- ✓ KWAWASCO
- ✓ Shiriki lisilo la Kiserikali [*NGO*]
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. Specify if other. ____

Nani mwenye shamba lenye bomba la maji? Who owns the land where the reference handpump is located?

Usimuelekeze mhusika. Do NOT prompt.

- ✓ Nyumba fulani [*a private household*]
- ✓ Kikundi cha maji pamoja na kamitii [*water committee*]
- ✓ Jamii ya kijiji [*village community*]
- ✓ Shirika la kidini [*religious organization*]
- ✓ Shule [*school*]
- ✓ Kliniki [*clinic*]
- ✓ Chifu [*chief*]
- ✓ Serikali ya Kaunti [*County government*]
- ✓ Serikali kuu/Wizara/WRMA [*Central Government / Ministry / WRMA*]
- ✓ Coast Water Services Board
- ✓ KWAWASCO
- ✓ Shiriki lisilo la Kiserikali [*NGO*]
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. Specify if other. ____

Nani mwenye maji yanayopigwa kutoka kwa bomba la maji? Who owns the water drawn from the reference handpump?

Usimuelekeze mhusika. Do NOT prompt.

- ✓ Nyumba fulani [*a private household*]
- ✓ Kikundi cha maji pamoja na kamitii [*water committee*]
- ✓ Jamii ya kijiji [*village community*]
- ✓ Shirika la kidini [*religious organization*]
- ✓ Shule [*school*]
- ✓ Kliniki [*clinic*]
- ✓ Chifu [*chief*]
- ✓ Serikali ya Kaunti [*County government*]
- ✓ Serikali kuu/Wizara/WRMA [*Central Government / Ministry / WRMA*]
- ✓ Coast Water Services Board
- ✓ KWAWASCO

- ✓ Shiriki lisilo la Kiserikali [NGO]
- ✓ Nyinginezo [other]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other.____

Nani anasimamia na kudumisha bomba la maji? Who manages and maintains your drinking water supply infrastructure?

- ✓ Mtu binafsi kutoka kwa kaya [individuals from the household]
- ✓ Kamitii ya bomba la maji [water committee]
- ✓ Kampuni ya kibinafsi (Fundifix, Kwale Handpump Services Ltd.) [private company]
- ✓ Serikali ya Kaunti [County government]
- ✓ Nyinginezo [other]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other.____

Kwa maoni yako, ni nani unadhani anafaa kudumisha shina la maji ya kunywa? Who do you think would be best placed to maintain your drinking water supply infrastructure?

- ✓ Serikali ya kaunti/huduma za uma/kampuni ya kutoa huduma ya maji [the County government / service provider]
- ✓ Kampuni za kibinafsi [private companies]
- ✓ Wana vijiji [the villagers]
- ✓ Nyinginezo [other]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other.____

Unadhani sahihi ni msimu wa kiangazi au wa mvua. Right now, would you consider this to be dry season or wet season?

- ✓ Msimu wa kiangazi [dry season]
- ✓ Msimu wa mvua [wet season]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Reference Handpump

NB: The 2015 survey included an additional section on willingness-to-pay for the maintenance service. A year on, the willingness-to-pay questions were replaced with questions on the performance of the maintenance service after the service had been in operation for close to a year (see next section).

NOTE: All the following questions relate to the reference handpump.

Ni nani anayechukua malipo ya huduma ya handpump? *Who usually collects the handpump user fees from your household?*

- ✓ Mwekahazina wa kamati ya maji [*water committee treasurer*]
- ✓ Mhudumu wa handpump [*handpump attendant/caretaker*]
- ✓ Mwanakamati mwengine [*other water committee member*]
- ✓ Mmiliki wa handpump [*owner of the handpump*]
- ✓ Nyenginezo [*other*]
- ✓ Sijui [*don't know*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. *Specify if other.*_____

Je, wakati umeitishwa pesa kwa ajili ya handpump, huwa unalipa? *When requested, how often do you contribute user fees for handpump repairs?*

- ✓ Kila wakati [*always*]
- ✓ Mara kwa mara [*often*]
- ✓ Mara moja moja [*sometimes*]
- ✓ Kwa nadra [*rarely*]
- ✓ Silipi [*never*]
- ✓ Sijui [*don't know*]

Je, unaamini kuwa wale wenye maisha magumu katika jamii wanafaa kupewa maji bila kulipia katika handpump? *Do you think that the most vulnerable households (old, poor etc.) of your community should have free access to water at the handpump?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, kuna amri/kanuni katika handpump hii inayo waruhusu msilipie maji wakati wa Ramadhan? *Is there a specific rule that you do not have to pay handpump user fees during Ramadhan?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, handpump imerekebishwa kwa mwaka mmoja uliopita? *Has handpump been repaired in the last 12 months?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if yes

Mara ya mwisho iliporekebishwa, ilikaa siku ngapi bila kuhudumu? *Last time handpump was repaired, for how many days was it broken?*_____

Conditional: if yes

Malichanga pesa ngapi kwa ajili ya urekebishaji wa handpump? How much money did your household contribute for these repairs? If no contribution enter '0'. ____

Nani alirekebisha hand pump? Who carried out the repairs?

- ✓ Mmoja wa jamii ya Kijiji [*someone from the village*]
- ✓ FundiFix/Kwale Handpump Services Ltd. (Idd Mwaropia, Okoti Omayo)
- ✓ Mafundi wengine kutoka inje [*other technicians*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]
- ✓ Nyenginezo [*other*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafana kwenye nafasi. Specify if other. ____

Je, umeridhika na mpangilio unaotumika kwa urekebishaji wa handpump? Currently how satisfied are you with the handpump repair arrangements?

- ✓ Nimeridhika sana [*very satisfied*]
- ✓ Nimeridhika [*satisfied*]
- ✓ Naona kawaida [*neither satisfied nor dissatisfied*]
- ✓ Sijaridhika [*dissatisfied*]
- ✓ Sijaridhika kabisa [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if satisfied

Mbona umeridhika? Why are you satisfied?

Chagua yote yatakayotajwa. Tick all that apply.

- ✓ Urekebishaji unafanyika haraka [*repair is quick*]
- ✓ Handpump haiharibiki kila wakati [*handpump is not often damaged*]
- ✓ Maekebisho sio ghali [*not expensive*]
- ✓ Nyenginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafana kwenye nafasi. Specify if other. ____

Conditional: if dissatisfied

Mbona umeridhika? Why are you dissatisfied?

Chagua yote yatakayotajwa. Tick all that apply.

- ✓ Urekebishaji unafanyika polepole [*repair is slow*]
- ✓ Handpump inaharibika mara kwa mara [*handpump is often damaged*]
- ✓ Maekebisho ni ghali [*expensive*]
- ✓ Nyenginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafana kwenye nafasi. Specify if other. ____

Je, ungependa handpump irekebishwe? *Would you like the handpump to be repaired?*

- ✓ Ndio [*yes*]
- ✓ Sijiali [*don't care*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if yes or don't care

Nyumba yako iko tayari kulipia pesa kiasi gani kwa ajili ya marekebisho ya handpump? *How much would you be willing to contribute to have the handpump repaired? (Kshs)_____*

Maintenance Service

Tumekua tukizungumzia kuhusu jamii yako na udumishaji wa hand pump. Jamii nyingi hazipendezwi na mda unaochukua kurekebisha hand pump zikiharibika. Kuimarisha matumizi ya hand pump, kampuni ya kibinafsi iliyosajiliwa imeajiri mafundi kutoka kwa jamii za huku ili kurekebisha hand pump zikiharibika kwa njia iliyo ya haraka na ya kiasili. huduma hii imekuwa ikiendelea huku Kwale na kila handpump imekuwa ikilipa shilingi 1000/- kila mwezi ili kupokea huduma hizi za kiasili, sasa tungependa kuona jamii nyingi zaidi zikijisajilisha ili kuboresha huduma ya maji katika kaya zao.

We have been talking about your community and the maintenance of handpumps. Many communities are not pleased with the time it takes to repair hand pumps when they break down. To improve handpump repair services, a registered company has hired technicians from the community to fix the handpumps quickly and reliably. This service has been running in Kwale and user groups at handpumps have been paying Kshs 1000 per month to receive these services. We would like to understand whether there is wider demand by households for these maintenance services.

Je, unaafahamu kuhusu huduma hii ya udumishaji wa handpump (Fundifix/KHSL)? *Are you aware of this handpump maintenance service company?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if yes

Ulijuaje kuhusu mradi huu? *How did you hear of the company?*

Usimuelekeze mhusika. *Do not prompt.*

- ✓ Walirekebisha hand pump katika jamii yangu [*they fixed the handpump in my community*]
- ✓ Walirekebisha hand pump katika jamii jirani [*they fixed the handpump in neighboring communities*]
- ✓ Walirekebisha hand pump katika jamii ya mbali [*they fixed the handpump in a distant community*]
- ✓ Nawajua Idd, Okoti na/au Banje [*I know Idd, Okoti or Banje*]
- ✓ Kusikia [*word of mouth*]
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafana kwenye nafasi. *Specify if other.*_____

Je, mmesajilisha bomba lenyu la maji na kampuni ya huduma ya urekebishaji ya FundiFix?
Has your handpump registered for the FundiFix/KHSL maintenance service?

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if yes

Je, umeridhika kiwango gani na huduma ya FundiFix/KHSL? *How satisfied are you with the FundiFix/KHSL maintenance service?*

- ✓ Nimeridhika sana [*very satisfied*]
- ✓ Nimeridhika [*satisfied*]
- ✓ Sijaridhika [*dissatisfied*]
- ✓ Sijaridhika hata kidogo [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ No response

Conditional: if no or don't know

Je, mngpenda kujisajilisha katika mradi huu wa urekebishaji wa haraka wa Handpump na wenye manufaa katika uimarishaji wa huduma ya maji?
Would you like to sign up for Fundifix Kwale/KHSL?

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ No response

Water Storage

Familia yako inahifadhi maji ya kunywa? *Does household store drinking water in the house?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if yes

Unahifadhi kiasi cha maji yanayotosha matumizi ya siku ngapi wakati wa msimu wa kiangazi? *How many days' worth of water do you store at home in the dry season?*___

Conditional: if yes

Unahifadhi kiasi cha maji yanayotosha matumizi ya siku ngapi wakati wa msimu wa mvua? *How many days' worth of water do you store at home in the wet season?*___

Water Resources Management

Ni nani ana jukumu la kutunza na kusimamia maji kwenye mito, visima na chemichemi?

Who is responsible for managing water in rivers, wells and springs?

Usimuelekeze mhusika. *Do NOT prompt.*

- ✓ Mzee wa kijiji [*Village chairman*]
- ✓ Kamati ya maji [*water user committee*]
- ✓ Water Resources Management Authority (WRMA)
- ✓ Water Resources Users Association (WRUA)
- ✓ Serikali ya kaunti [*County government*]
- ✓ Chifu [*chief*]
- ✓ KWAWASCO
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. Specify if other.____

Ni mashirika au tahasisi gani yanafuata watumizi wa maji sehemu hii? (serikali, shirika la kibinafsi, shirika lisilo la kiserikali) **Which institutions (government, private, NGO) benefit water users in this area?**

Usimuelekeze muhusika, Jaza zaidi ya majo. *Do NOT prompt. Tick ALL that apply.*

- ✓ Kamati ya chama cha watumizi wa maji [*Water Resources User Association*]
- ✓ Chama cha watumizi wa maji [*Water Supply Association*]
- ✓ Wizara ya maji ya Kaunti [*County Water Ministry*]
- ✓ Baraza la Kaunti [*County Council*]
- ✓ Kwale Handpump Services Limited
- ✓ KWAWASCO
- ✓ Shirika kuu la kiserikali la kudhibitisha usmbazaji wa maji [*central government agency with water supply mandate*]
- ✓ Shirika kuu la kiserikali lenye mamlaka ya Kumudu 'RasiliMaji' [*central government agency with rural development mandate*]
- ✓ Wizara ya maji, mazingira, na rasilimali [*Ministry of Water and Irrigation*]
- ✓ Shirika kuu la kiserikali la mazingira [*central governmental organization with environment mandate*]
- ✓ South Coast Development Agency
- ✓ Base Titanium Ltd
- ✓ KISCOL
- ✓ Team & Team International
- ✓ Rural Focus Limited
- ✓ World Wildlife Fund
- ✓ Nyenginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. Specify if other.____

Je, unadhani mito/visima/chemichemi zimedumishwa vizuri na Serikali ya Kaunti iliyo chaguliwa kulingana na hoja zifuatazo? *Do you think the rivers/wells are well cared for by the County Government according to the following points?*

	Negative change	No change	Positive change	DK
Ubora wa maji [<i>water quality</i>]				
Wingi wa maji [<i>water quantity</i>]				
Jamii ya vijiji kuhusika katika kumudu mito [<i>greater community participation</i>]				
Rasilimali kuongezeka na kupatikana kwa matumizi ya 'Chama cha watumizi wa maji' [<i>more resources for WRUA (Water Resources User Association)</i>]				
Jamii za vijiji kujua Zaidi kuhusu kumudu mito [<i>more awareness raising for communities</i>]				
Nyinginezo [<i>other</i>]				

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. *Specify if other.*____

Je, unajua chama cha watumizi wa maji (WRUA) kinafanya nini? *Do you know what the Water Resources User Association (WRUA) does?*

To confirm, ask respondent to explain what they believe the local WRUA does.

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if yes

Je, unajua mwanachama yeyote wa WRUA? *Do you know any members of the local WRUA?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if yes

Umwahi kuhudhuria mkutano wa WRUA? *Have you ever attended a WRUA meeting?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Conditional: if yes

Umeridhika na utendakazi wa WRUA? *Are you satisfied with the performance of the WRUA?*

- ✓ Nimeridhika sana [*very satisfied*]
- ✓ Nimeridhika [*satisfied*]
- ✓ Naona kawaida [*neither satisfied nor dissatisfied*]
- ✓ Sijaridhika [*dissatisfied*]
- ✓ Sijaridhika kabisa [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Kwa maoni yako, ni nani mtumizi mkuu wa maji sehemu hii? *Who would you identify as the major water users in the area?* Usimuelekeze mhusika. *Do NOT prompt. Tick all that apply.*

- ✓ Base Titanium Ltd (Kampuni ya madini)
- ✓ KISCOL

- ✓ Utalii/mahoteli [*tourism/hotel*]
- ✓ Miji mikuu [*big cities*]
- ✓ Jamii za vijijini [*rural communities*]
- ✓ Mashule [*schools*]
- ✓ Kliniki/Hospitali [*clinic / hospital*]
- ✓ Misikiti / Mekanisa [*mosques/churches*]
- ✓ Mazingira [*environment*]
- ✓ Nyenginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. Specify if other. ____

Una wasiwasi wowote kuhusu matumizi ya maji sehemu hii? Do you have any major concerns about water use in the area?

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if yes

Ni hoja/mada gani tatu kuu zinakutia wasiwasi kuhusu matumizi ya maji sehemu hii? What three main topics about water do you worry about?

Usimuelekeze mhusika. [*Do not prompt.*]

____ *Concern 1 options:*

- Kuchafuka wa maji [*water contamination*]
- Upungufu wa maji/shina kukauka [*water shortage*]
- Mafuriko [*floods*]
- Watu kutolipa ada/karo [*people do not pay fees*]
- Ufisadi [*corruption*]
- Hatari ya kuharibu mazingira [*dangers of environmental degradation*]
- Matumizi haramu [*illegal use*]
- Nyenginezo [*other*]
- Sijui [*don't know*]
- NR [*no response*]

____ *Concern 2*

____ *Concern 3*

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. Specify if other. ____

Conditional: if yes

Kati ya hizi, ni gani KUU zaidi? Of these concerns, which is your greatest concern?

- ✓ Kuchafuka wa maji [*water contamination*]
- ✓ Upungufu wa maji/shina kukauka [*water shortage*]
- ✓ Mafuriko [*floods*]
- ✓ Watu kutolipa ada/karo [*people do not pay fees*]
- ✓ Ufisadi [*corruption*]
- ✓ Hatari ya kuharibu mazingira [*dangers of environmental degradation*]
- ✓ Matumizi haramu [*illegal use*]
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]

✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other.____

Conditional: if yes

**Ni nani anayechangia kwa hoja/mada hii inayokutia wasiwasi mkuu?
Who do you think is responsible for causing the problem about which you are most concerned?**

Usimeulekeze mhusika. Do NOT prompt.

- ✓ Watu binafsi [individuals]
- ✓ Jamii za vijiji [village communities]
- ✓ Shirika za kidini [religious organisations]
- ✓ Kampuni [company]
- ✓ Serikali [government]
- ✓ Nyinginezo [other]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other.____

Conditional: if village communities

Ni jamii gani unadhani zinahusika? Which community do you think is responsible?

- ✓ Jamii yetu [our community]
- ✓ Jamii jirani [neighbouring community]
- ✓ Nyinginezo [other]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other.____

Conditional: if company

Ni kampuni gani unadhani inahusika? Which company do you think is responsible?

- ✓ Base Titanium Ltd. (Kampuni ya madini)
- ✓ KISCOL
- ✓ Nyinginezo [other]
- ✓ Sijui [don't know]
- ✓ NR [no response]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other.____

Conditional: if government

Ni Serikali gani inahusika? Which level of government do you think is responsible?

- ✓ Serikali ya Kaunti [County government]
- ✓ Serikali kuu [national government]

- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafanua kwenye nafasi. Specify if other.____

Governance

Kwa ujumla, uliridhika kiwango gani na utelekezaji wa katiba ya Kenya 2010? Overall, how satisfied are you so far with the implementation of the Kenya Constitution 2010?

- ✓ Nimeridhika sana [*very satisfied*]
- ✓ Nimeridhika [*satisfied*]
- ✓ Naona kawaida [*neither satisfied nor dissatisfied*]
- ✓ Sijaridhika [*dissatisfied*]
- ✓ Sijaridhika kabisa [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, unapendelea ugatuzi? Do you support devolution (i.e. having county governments in Kenya)?

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if yes

Kwa nini unapenda ugatuzi? Why do you support devolution? Tick ALL that apply.

- ✓ Unaleta rasilimali na kugawa kwa usawa vijijini [*equitable distribution of resources at the village*]
- ✓ Unaleta huduma ya haraka na karibu kwa watu [*faster access to services*]
- ✓ Unaleta kazi nyingi kwa watu [*job creation*]
- ✓ Unaleta amani katika vijiji [*it brings peace and cohesion*]
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafanua kwenye nafasi. Specify if other.____

Conditional: if no

Kwa nini haufurahii ugatuzi? Why do you NOT support devolution?

Tick ALL that apply.

- ✓ Ni ghali sana [*devolution is expensive*]
- ✓ Una siasa nyingi [*too much politics*]
- ✓ Unaleta mgawanyiko katika nchi na kuharibu amani na umoja wan chi [*it creates division in the country*]
- ✓ Unaongeza ushuru [*increases tariffs*]
- ✓ Unaleta utumizi mbaya wa uongozi/rasilimali/ufisadi [*it brings misuse of leadership/resources/corruption*]
- ✓ Uongozi mbaya [*poor leadership*]

- ✓ Huduma mbaya [*poor service delivery*]
- ✓ Kutotekelezwa kwa katiba [*non-implementation of the constitution*]
- ✓ Kukosa elimu juu ya ugatuzi/hatujui vile ugatuzi unafanya kazi [*not being sensitised about devolution/we do not know how devolution works*]
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. Specify if other._____

Je, unaridhika na ugatuzi katika idara ya maji? How satisfied are you with devolution in the water sector?

- ✓ Nimeridhika sana [*very satisfied*]
- ✓ Nimeridhika [*satisfied*]
- ✓ Naona kawaida [*neither satisfied nor dissatisfied*]
- ✓ Sijaridhika [*dissatisfied*]
- ✓ Sijaridhika kabisa [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, kwa maoni yako, hoja zifuatazo zinatimizwa katika huduma ya usambazaji wa maji ya kunywa? In your opinion, are the following criteria being fulfilled in drinking water services?

maji ya kutosha | sufficient quantity

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

maji safi | potable quality

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

maji kwa bei nafuu | water you can afford

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

maji yako karibu na unaweza kuyafikia kwa urahisi (chini ya dakika 30 kwenda na kurudi) | Physical access to functioning drinking water source (within 30 minutes roundtrip)

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

hakuna ubaguzi wa nani anateka maji na udumishaji wa bomba la maji (watu wote waka na haki ya kuteka maji? wake/waume, Watoto/Watu wazima, kabila tofauti, waislamu/wakiristo) | Non-discrimination in the collection and management of drinking water

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ NR [*no response*]

Je, unaridhika na ugatuzi katika idara ya afya? *How satisfied are you with devolution in the health sector?*

- ✓ Nimeridhika sana [*very satisfied*]
- ✓ Nimeridhika [*satisfied*]
- ✓ Naona kawaida [*neither satisfied nor dissatisfied*]
- ✓ Sijaridhika [*dissatisfied*]
- ✓ Sijaridhika kabisa [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, unaridhika na ugatuzi katika idara ya mashamba? *How satisfied are you with devolution in the lands sector?*

- ✓ Nimeridhika sana [*very satisfied*]
- ✓ Nimeridhika [*satisfied*]
- ✓ Naona kawaida [*neither satisfied nor dissatisfied*]
- ✓ Sijaridhika [*dissatisfied*]
- ✓ Sijaridhika kabisa [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, unaridhika na mafanikio ya Serikali ya Kaunti ya Kwale tangu mwaka 2013? *Are you satisfied with the achievements of the Kwale County Government since 2013?*

- ✓ Kuridhika sana [*very satisfied*]
- ✓ Kuridhika [*satisfied*]
- ✓ Kutoridhika [*dissatisfied*]
- ✓ Kutoridhika sana [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je unatarajia serikali ya kaunti iwapunguzie gharama ya usambazaji wa huduma ya maji ya kunywa? *Do you expect the County Government to subsidise drinking water service provision?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, serikali ya kaunti imerekebisha bomba la maji ya kunywa au shina la maji ya kunywa wakati wowote mwak uliopita? *Has the County Government repaired your drinking water service supply in the last year?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, ulikuwa ukiridhiswa na huduma ya IEBC (Independent Electorate and Boundaries commission)? *Have you been satisfied with the services of the IEBC (Independent Electoral and Boundaries Commission)?*

- ✓ Kuridhika sana [*very satisfied*]
- ✓ Kuridhika [*satisfied*]
- ✓ Kutoridhika [*dissatisfied*]
- ✓ Kutoridhika sana [*very dissatisfied*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, Utapiga kura mwaka 2017 katika uchaguzi mkuu? *Are you going to vote in the 2017 general elections?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]

Chama chako cha kisiasa ni kipi? *Which political party do you feel closest to, if any?*

- ✓ Amani Coalition
- ✓ CORD supporters
- ✓ Jubilee supporters
- ✓ None
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. *Specify if other.*____

Je, kuna yeyote kwa nyumba yako anahudhuria mikutano ya kisiasa ya huku vijijini. *Does any member of your household attend local political meetings?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if yes

Ni mara ngapi amehudhuria mikutano hiyo kati ya miezi 12 iliyopita? *How many times has this member attended local political meetings in the last 12 months?*____

Ni nani wanagombea kiti cha ugavana kaunti ya Kwale mwaka wa 2017? *Who are campaigning for the Governor's seat for the 2017 elections in Kwale?*

DON'T PROMPT. Select all that apply.

- ✓ Mvurya
- ✓ Sonko
- ✓ Mwakwere
- ✓ Dori
- ✓ Dena
- ✓ Boi Juma
- ✓ Chidzuga
- ✓ Mwachai
- ✓ Nyinginezo [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. *Specify if other.*____

Kuna Uwezekano gani utampigia kura Gavana wako wa sasa? *How likely are you to vote for your current Governor?*

- ✓ Uwezekano mkubwa sana [*very likely*]
- ✓ Kuna uwezekano [*likely*]
- ✓ Hakuna uwezekano [*unlikely*]
- ✓ Hakuna uwezekano sana [*very unlikely*]
- ✓ Sitaki kusema [*I do not want to say*]

- ✓ Simjui Gavana wangu [*I do not know my governor*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Kuna Uwezekano gani utampigia kura MCA wako wa sasa? *How likely are you to vote for your current MCA?*

- ✓ Uwezekano mkubwa sana [*very likely*]
- ✓ Kuna uwezekano [*likely*]
- ✓ Hakuna uwezekano [*unlikely*]
- ✓ Hakuna uwezekano sana [*very unlikely*]
- ✓ Wanapendelea kutosema [*prefer not to say*]
- ✓ Simjui MCA wangu [*I do not know my MCA*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Ni huduma gani katika wadi yako ambazo zimeboreshwa tangu 2013? *Which services in your ward have improved since 2013?*

- ✓ Afya [*health*]
- ✓ Kilimo [*agriculture*]
- ✓ Huduma ya maji ya kunywa barabara [*water services*]
- ✓ elimu [*education*]
- ✓ umeme [*electricity*]
- ✓ ajira/kazi [*employment/work*]
- ✓ hakuna [*nothing*]
- ✓ nyinginezo - specify [*other*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. *Specify if other.*____

Ni nani aliye boresha huduma hizo? *Who improved those services?*

- ✓ MCA
- ✓ Governor's office
- ✓ County Ministries
- ✓ County Women Representative
- ✓ County Government
- ✓ National Government
- ✓ NGOs
- ✓ Base
- ✓ KISCOL
- ✓ GDF
- ✓ Other private companies
- ✓ Other - specify
- ✓ Sijui
- ✓ NR

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. *Specify if other.*____

Je, umewahi kuhusika au kuulizwa kutoa maoni yako kwa ajili ya utengenezaji wa mswada(sheria) wa huduma za maji ya kaunti wa kwale? *Have you been engaged in the public engagement process in the making of the Kwale County Water Services Bill?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Je, ushawai kuhusishwa katika uamuzi wa bei ya maji ya kunywa katika bomba la maji mnalolitumia? *Have you ever been consulted about water-tariff setting for your drinking water source?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]
- ✓ Sijui [*don't know*]
- ✓ NR [*no response*]

Conditional: if yes

Kama jawabu ni ndio, nani alikuhusisha? *Who consulted you for tariff-setting?*

- ✓ Serikali ya Kaunti [*County government*]
- ✓ KWAWASCO
- ✓ Kampuni ya kibinafsi [*private company*]
- ✓ Wana vijiji/Kamitii ya maji [*village water committees*]
- ✓ Nyinginezo [*other*]
- ✓ NR [*no response*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafania kwenye nafasi. *Specify if other.*____

Mobile Survey

Habari tunayokusanya leo itasaidia serikali ya kaunti na mashirika mengine kupanga mikakati ya kuimarisha huduma za maji na uendelevu wa kaunti kwa ujumla. Iii tueze kuona mabadiliko yanayotoea kwa ajili ya mikakati hiyo, tutanzisha kukusanya habari kupitia kwa simu. Wenyeji wa kaunti watakua wakipigiwa simu na kuulizwa maswali machache, hii haitachukua mda zaidi ya dakika kumi na tano. Baada ya mazungumzo hayo kwa kupitia njia ya simu, utapokea 'airtime' ikiwa utapeana ujumbe ulio sahihi. *The information we collect today will help the County Government and other organisations arrange strategies to strengthen water services. We would like to continue collecting such important information via mobile phone surveys. Enumerators would call up and ask a few questions. This would not take longer than fifteen minutes.*

Introduction to mobile survey.

Je, ungependa kushiriki katika utafiti huu kwa nia ya simu? *Would you like to participate in this mobile phone survey?*

- ✓ Ndio [*yes*]
- ✓ La [*no*]

Conditional: if yes

Tafadhali nisaaidie na nambari yako ya simu. Pia ningependa unisaaidie na nambari za simu za wengine wanaoishi katika nyumba yako ambao tunaweza kuwahoji ikiwa hautapatikana kwa nu va simu. *Please tell me your phone number. I would also like to know the phone numbers of others living in your home that we can ask if you are not available for phone calls.*

Name	Relationship	Mobile #1	Mobile #2
	✓ Respondent		
	✓ Mother		
	✓ Father		
	✓ Husband		
	✓ Wife		
	✓ Uncle		
	✓ Aunt		
	✓ Other adult child		
	✓ Other		

Note to enumerator: Please try calling the current respondent's numbers to ensure that you noted them correctly. Thank respondent for providing the phone numbers and share FundiFix Kwale hotline number: (+254) 0719723000 with him/her in case there are any follow-up questions.

About the Dwelling

Vifaa husika kwa ajili ya sakafu. *MAIN MATERIAL OF FLOOR (record observation)*

- ✓ Mchanga [*earth/sand*]
- ✓ Mavi ya ng'ombe [*dung*]
- ✓ Mbao [*wood planks*]
- ✓ Bamboo [*palm/ bamboo*]
- ✓ Mbao zilizopakwa rangi [*painted wood*]
- ✓ Vinyl or asphalt strips [*vinyl or asphalt strips*]
- ✓ Vigae [*ceramic tiles*]
- ✓ Simiti [*cement*]
- ✓ Mpira [*carpet*]
- ✓ Nyenginezo [*other*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. *Specify if other.*_____

Vifaa husika vya paa. *MAIN MATERIAL OF ROOF - Record observation*

- ✓ Makuti [*thatch/grass*]
- ✓ Mabati [*corrugated iron*]
- ✓ Vikebe, Matope [*tin cans*]
- ✓ Mavi ya ng'ombe [*dung/mud*]
- ✓ Asbestos [*asbestos sheet*]
- ✓ Zege [*concrete*]
- ✓ Vigae [*tiles*]
- ✓ Nyenginezo [*other*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. *Specify if other.*_____

Vifaa husika vya ukuta. *MAIN MATERIAL OF WALLS - Record observation*

- ✓ Mawe na udongo [*stone with mud*]
- ✓ Mawe na simiti [*stones with lime cement*]
- ✓ Matofali ya zege [*concrete bricks*]
- ✓ Mbao na udongo [*wood with mud*]
- ✓ Mabati [*corrugated iron*]
- ✓ Mbao za mtumba [*wooden boards*]
- ✓ Makuti [*thatch/ grass*]
- ✓ Simiti [*cement*]
- ✓ Vipande vya miti [*cane, palm trunks*]
- ✓ Matofali [*bricks*]
- ✓ Matofali ya udongo [*clay bricks*]
- ✓ Plaiwudi [*plywood*]
- ✓ Cardboard
- ✓ Fito [*wood planks, shingles*]
- ✓ Takataka [*dirt*]
- ✓ Hakuna kuta [*no walls*]
- ✓ Nyenginezo [*other*]

Conditional: if other

Kama ni nyenginezo, tafadhali fafaua kwenye nafasi. *Specify if other.*_____

Conditional: if stone and clay, stone and stems, concrete bricks, wood and clay, bricks, clay bricks

Are the walls rendered?

- ✓ Rendered
- ✓ Unrendered

Chukua picha ya nyumba | *take a picture of a house*

Only take photo if existing photo is inadequate or dwelling has changed since first photo was taken.

GPS ya nyumba [GPS of Dwelling]

Will automatically save when within 5m accuracy. To override accuracy threshold, press 'OK'.

End

Huu ni mwisho wa mahojiano, asante sana kwa kunipa muda wako, tabasamu, jibu maswali yoyote utakayoulizwa ni mhusika na uondoke ili kukamilisha maswali. Kazi nzuri! *This is the end of the interview, thank you very much for giving me your time, smile, ... Good work!*

Onyesha jinsi mhusika alivyoelewa maswali? *How well was interview understood?*

- ✓ Ufahamu mzuri [*good understanding*]
- ✓ ufahamu wastani [*average understanding*]
- ✓ ufahamu mbaya [*bad understanding*]

Kwa maoni ya mwandishi, unadhani kwamba majibu uliyopewa na mhusika ni ya kweli na hakika? *In the opinion of the enumerator, do you think the majority of answers given by the respondent are true and correct?*

- ✓ Nakubali sana [*strongly agree*]
- ✓ Nakubali [*agree*]
- ✓ Tashwishi juu ya baadhi ya maswali - (ELEZEA kupitia njia ya sauti) [*Concerns*]

Je, mahojiano yalikuwa kwa lugha gani? *What was the main language that the interview was conducted in?*

- ✓ Swahili
- ✓ Digo
- ✓ Duruma
- ✓ Kamba
- ✓ English
- ✓ Other

Conditional: if respondent over 18 is not available today (follow-up required)

Phone number of respondent or household member?_____

Save as incomplete and record this with the Team Leader.

**If you would like to add any other comments about the interview, please include them here.
Time end.**

Appendix 5: Survey questionnaire (2014) with water user committee representatives

Enumerator name: _____ Team Code: _____

Water Quality Testing

Handpump Code: _____

Date: _____ Time: _____: _____ AM/PM

Survey for handpump users/WUC members

Please make the following observations and ask the following questions to individuals gathering around the handpump.

- Good morning/afternoon, I am taking water samples and conducting a survey on handpumps in Kwale with support from the Ministry of Water. My name is ___ and I am part of a research team led by Rural Focus Ltd, Kenya.
- I would like to ask you about your handpump to help the Government of Kenya improve water service delivery.
- The survey should take around 5 minutes and will provide important information.
- All the information will be strictly confidential and remain anonymous.
- The data will be given to the Minister of Water.

Are you willing to participate? Yes No

Community name: _____

Respondent name: _____

Role: Chair ; Treasurer ; Secretary ; Other

PHYSICAL CHARACTERISTICS	
OBSERVATIONS <i>Please make these observations before asking the first questions (starting at 5).</i>	
1. Is there a secure fence with closed (closable) gate around the handpump?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2. Is the concrete skirting around the handpump in good condition (no cracks or obvious ingressions)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3. Is there a pit latrine within eyesight (<=50m)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
4. Is the handpump locked?	Yes <input type="checkbox"/> No <input type="checkbox"/>

QUESTIONS for handpump user													
5. If the handpump is locked, for how many hours per day is it locked on average?	_____ hours per day												
6. Is there a clearly defined member group of the handpump?	Yes <input type="checkbox"/> No <input type="checkbox"/>												
7. Does the handpump have an attendant/caretaker?	Yes <input type="checkbox"/> No <input type="checkbox"/>												
8. Does the handpump attendant collect fees from all users?	Yes <input type="checkbox"/> No <input type="checkbox"/>												
9. Is the attendant paid?	Yes <input type="checkbox"/> No <input type="checkbox"/>												
10. If yes, how much per month or other metric (% fees, seasonal, other)?	_____												
11. How many hours per day/night is the pump manned by an attendant/caretaker?	_____												
FINANCIAL CHARACTERISTICS													
12. When the handpump was installed did members:	<table border="1"> <thead> <tr> <th></th> <th>YES</th> <th>NO</th> </tr> </thead> <tbody> <tr> <td>a) Contribute labour</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>b) Contribute land</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>c) Pay a membership fee</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>		YES	NO	a) Contribute labour	<input type="checkbox"/>	<input type="checkbox"/>	b) Contribute land	<input type="checkbox"/>	<input type="checkbox"/>	c) Pay a membership fee	<input type="checkbox"/>	<input type="checkbox"/>
		YES	NO										
	a) Contribute labour	<input type="checkbox"/>	<input type="checkbox"/>										
	b) Contribute land	<input type="checkbox"/>	<input type="checkbox"/>										
c) Pay a membership fee	<input type="checkbox"/>	<input type="checkbox"/>											
If c) is yes, how much is the fee?													
KES _____													
13. If a new member wanted to join today, could they join?	Yes <input type="checkbox"/> No <input type="checkbox"/> <i>If no, go to 13.</i>												
14. How much would they have to pay to join the user group?	KES _____												
15. Are there fines for not paying regular water fees?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, how much?												
	KES _____												
INSTITUTIONAL CHARACTERISTICS													
16. Are there rules for handpump use?	Yes <input type="checkbox"/> No <input type="checkbox"/>												
If yes, what are the rules:													
a. Attend meetings	Yes <input type="checkbox"/> No <input type="checkbox"/>												
b. Contribute labour to minor repairs (fence repairs, help fundi, etc.)	Yes <input type="checkbox"/> No <input type="checkbox"/>												
c. Keep animals away from handpump	Yes <input type="checkbox"/> No <input type="checkbox"/>												
d. Allow those with lower income or vulnerable persons (old, disabled, female-headed households)	Yes <input type="checkbox"/> No <input type="checkbox"/>												

to pay less (or nothing) for water use?	
e. Other	Please specify _____
17. Have any members been excluded from using the handpump for not observing the rules?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, please list which rules were broken _____
18. How are the rules made?	<input type="checkbox"/> By full consensus <input type="checkbox"/> Majority decision <input type="checkbox"/> Water User Committee decides <input type="checkbox"/> Chairman decides <input type="checkbox"/> Other, please specify _____

Comments/Observations:

Appendix 6: List of interviews

Consent to participate in research

Introduction and purpose

My name is Johanna Koehler. I am a PhD researcher at the University of Oxford working with Associate Professor Dr Robert Hope in the School of Geography and the Environment. I would like to invite you to take part in my research study, which concerns decentralisation and its impact on the Kenyan water sector.

Procedures

The interview should last about 45-60mins. With your permission, I will audiotape and take notes during the interview. The recording is to accurately capture the information you provide, and will be used for transcription purposes only. If you choose not to be audiotaped, I will take notes instead. If you do not wish to continue, you can stop the interview at any time. I expect to conduct only one interview; however, follow-ups may be needed for added clarification. If so, I will contact you by mail/phone to request this.

Confidentiality

Your study data will be handled confidentially. If results of this study are published or presented, individual names and other personally identifiable information will not be used *unless you give explicit permission for this below.*

Rights

Participation in research is completely voluntary. You are free to decline to take part in the project. You can decline to answer any questions and are free to stop taking part in the project at any time.

Questions

If you have any questions about this research, please feel free to contact me. I can be reached at +254700305279 or Johanna.Koehler@ouce.ox.ac.uk.

CONSENT

If you wish to participate in this study, please sign and date below.

Participant's Name (*please print*)

Participant's Signature

Date

If you agree to allow your name or other identifying information to be included in all final reports, publications, and/or presentations resulting from this research, please sign and date below.

Participant's Signature

Date

Policy and practice interviews and interactions

NB: Many conversations over the four years have provided important information and are used for contextual understanding in the thesis (not all of which are listed here). Names of interviewees were removed in the following tables. The selection of policy briefs listed in the next section provided useful entry points to some of the high-ranking officials to share findings from the ongoing research.

Interviews in Nairobi

Date & Place	Sector	Interviewee	Association
03/03/2016, 07/03/2017, Nairobi	Government Ministry	Cabinet Secretary	Ministry of Water and Irrigation (MWI)
20/04/2015, Nairobi	Government Ministry	Director	Water Storage, Ministry of Water and Irrigation (MWI)
20/04/2015, Nairobi	Government Ministry	Senior staff (former Director)	Water Resources Directorate, MWI
20/04/2015, Nairobi	Government Agency	CEO	Water Resources Management Authority (WRMA)
21/04/2015, Nairobi	Government Ministry	Director	Water Resources, MWI
21/04/2015, Nairobi	Government Agency	WRUA Liaison	WRMA (now WRA)
22/04/2015, Nairobi	Government Agency	Technical lead	WRMA (now WRA)
22/04/2015, Nairobi	Government Agency	CEO	Water Services Regulatory Board (WASREB)
22/04/2015, Nairobi	Government Agency	Legal Officer	WASREB
22/04/2015, Nairobi	Academia/ Legal advisory	Professor/ environmental law	School of Law, University of Nairobi
23/04/2015, Nairobi	Government	Director	Water Services Regulation
23/04/2015, Nairobi	Government Ministry	Director	Water Services, MWI
23/04/2015, Nairobi	Government Agency	Groundwater Lead	WRMA (now WRA)
23/04/2015, Nairobi	Government Agency	WRUA Liaison	WRMA (now WRA)
24/04/2015, Nairobi	Development Agency	Water Sector Reform team	GIZ
24/04/2015, Nairobi	Judicative	Chairman	Water Appeal Board (now Water Tribunal)
24/04/2015, Nairobi	Government Agency	Chief Legal Officer	WRMA (now WRA)

Interviews in Mombasa

Date & Place	Sector	Interviewee	Association
07/04/2015, Mombasa	Government Agency	Director	WRMA Regional Office (now WRA)
07/04/2015, Mombasa	WRMA	Groundwater Officer	WRMA Regional Office (now WRA)
07/04/2015, Mombasa	Government Agency	CEO	Coast Water Services Board (CWSB)
07/04/2015, Mombasa	Government Agency	Planning Division	Coast Water Services Board (CWSB)

Interviews with representatives from Kwale County

Date & Place	Sector	Interviewee	Association
08/04/2015, Kwale Town	County Government	Governor	Kwale County Government
08/04/2015, Kwale Town	County Government	County Secretary	Kwale County Government
09/04/2015, Kwale Town 22/04/2016, Meru	County Government	CEC Member Water	County Water Department
09/04/2015, Kwale Town	County Government	Chief Officer	County Water Department
09/04/2015, Kwale Town	County Government	Director, Water Services	County Water Department
09/04/2015, Kwale Town	Water Service Provider	Interim CEO	KWAWASCO
09/04/2015, Kwale Town	Water Service Provider	Board Member	KWAWASCO
10/04/2015, Kwale Town	County Legislative	Member of County Assembly	Kwale County Assembly, Water Committee
10/04/2015, 20/09/2016, Bomani	Private	Manager	Kwale Handpumps Services Ltd.
10/04/2015, 20/09/2016, Bomani	Private	Mechanic	Kwale Handpumps Services Ltd.
10/04/2015, 20/09/2016, Bomani	Private	Mechanic	Kwale Handpumps Services Ltd.

Interviews with representatives from Kitui County

Date & Place	Sector	Interviewee	Association
10/12/2014, Kyuso	Private	Manager	Miambani Ltd.
20/06/2013, 05/12/2015, Kyuso	Private	Mechanic	Miambani Ltd.
22/01/2016, Mwingi	County Government	CEC Member for Water	Kitui County Government
05/10/2015, Nairobi; 02/03/2016, Kitui; 22/04/2016, Meru	County Government	Governor	Kitui County Government

Interviews with representatives from Turkana County

Date & Place	Sector	Interviewee	Association
28/08/2016, Stockholm	County Government	Interim CEC Member for Water	Turkana County Government
28/03/2018, (phone)	NGO	Lead	Catholic Diocese of Lodwar
04/04/2018, (phone)	NGO	Lead	Catholic Diocese of Lodwar

Appendix 7: Policy briefs



Water Policy Choices in Kenya's 47 Counties Policy Brief, February 2016

Objectives

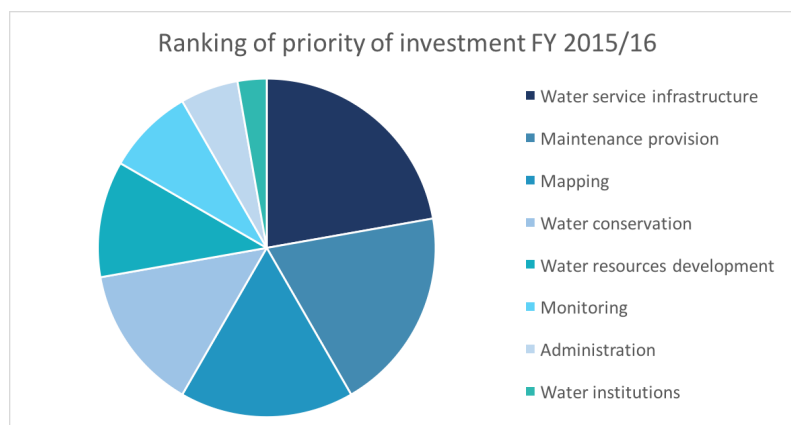
Kenya's 2010 constitution introduced the devolution of water services to the county level. In 2013, 47 county governments with affiliated county water ministries were established. The three-year transition period towards a devolved system is now coming to an end. We take stock of the water policy choices of the newly appointed county water ministers and their staff. Drawing on unique insights from surveying all 47 county water ministries, we examine the political economy of devolution and what factors impact responsibilities and policy choices of county governments across new legislation and water service provision arrangements in urban and rural areas.

Methodology

This research evaluates a unique dataset covering responses of all 47 county water ministries (100%) in Kenya, and participant observation at the first summit of Kenya's county water ministers in October 2015 organised by the Water Services Trust Fund, at which the framework for a prototype County Water Bill was developed as basis for future water policy. Preliminary descriptive findings are reported here on policy choices around questions of budget allocation, legislation, regulation, responsibilities, service provision arrangements as well as tariffs and subsidies.

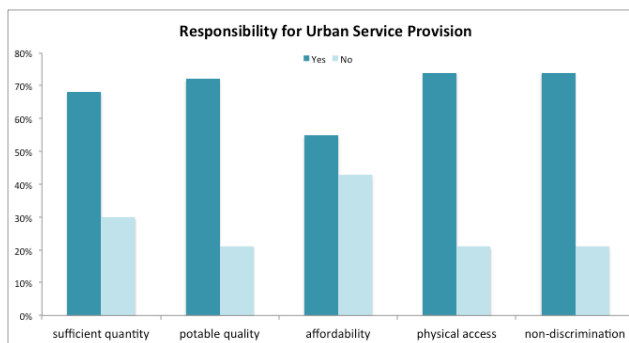
Key Findings

- Budget:** Across all counties the water budget ranks fourth after health, transport and education. The majority of counties spend more than 75% of their water budget on developing water service infrastructure.

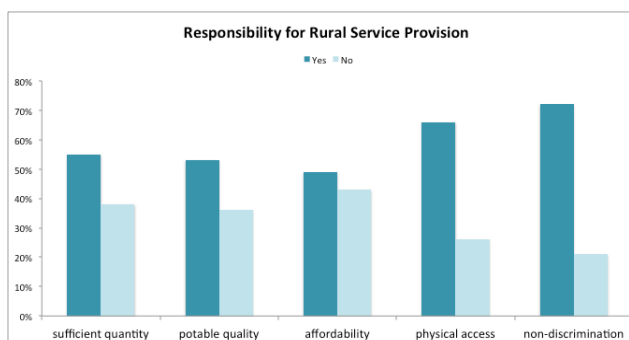


- Legislation:** Six counties (12.8%) currently have a County Water Act. At the end of 2015, 21 counties (44.7%) had a County Water Bill pending in the County Assembly. 36.2% prefer an omnibus law that encompasses all aspects of the county water mandate and 61.7% prefer multiple laws that separate the different responsibilities between water service delivery, sanitation services and water resources management.
- Regulation:** 80.9% consider the national government (WASREB) responsible for regulation while 7% consider it a shared function with county governments and the rest attribute it to county governments.

4. Responsibilities: Overall, there is a high sense of responsibility for urban service provision. The most clearly defined responsibilities for both urban and rural areas are physical access and non-discrimination. The criterion of affordability is the most contested one across both urban and rural areas. While sufficient quantity and potable quality are around the 70% mark for urban areas, just around 55% of the counties consider them applicable for rural areas.



5. Satisfaction with Drinking Water Provision: Overall, there are higher dissatisfaction levels with rural than with urban drinking water provision. 70% consider it unsatisfactory or very unsatisfactory compared to 53% considering urban drinking provision (very) satisfactory. The majority of counties believe they can only partially (64% for urban and 70% for rural) fulfil water users' expectations at this point in time.



6. Service Provision Arrangements: 72% of the counties opted for two (38%) or several (34%) utilities as the best service provision arrangement for their county. Public provision is the preferred choice for both urban (81%) and rural areas (51%) with 28% still considering community management as the best arrangement for rural service provision. Private sector involvement through either PPPs or fully private companies is preferred by 28% of the counties for both urban and rural areas.

7. Tariffs and Subsidies: The average fair tariff for rural water provision (KES/m³) was defined 29% higher than for urban water users, whereas a fair provision level was defined 12 litres per capita per day lower for the rural population. 40% of the counties state that users should pay the full cost of water provision. Of those counties supporting subsidies, the majority (57%) state that county governments should pay for the subsidy, followed by donors (26%) and the national government (23%).

KES	fair urban tariff (per m3)	fair rural tariff (per m3)	Urban DW provision (litres/capita/day)	Rural DW provision (litres/capita/day)
Min	50	50	10	10
Mean	116	150	43	31
Median	50	100	50	20
Max	>500	>500	50	50

More Information and Acknowledgements

Johanna Koehler, Doctoral Researcher, School of Geography and the Environment, University of Oxford, Email: Johanna.Koehler@ouce.ox.ac.uk.

We would like to thank the Water Services Trust Fund, especially the CEO, Ismail Shaiye, and Isaac Kega, for the opportunity to conduct this survey at the Baringo Meeting in October 2015. We also would like to thank all County Governments for participating in this research.



Unlocking the Potential of Groundwater for the Poor



Household Responses to Decentralisation

Objectives

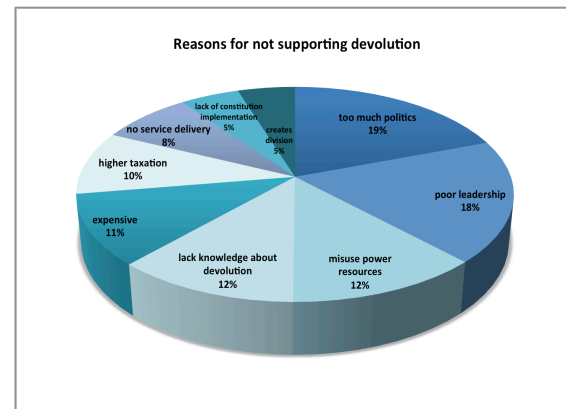
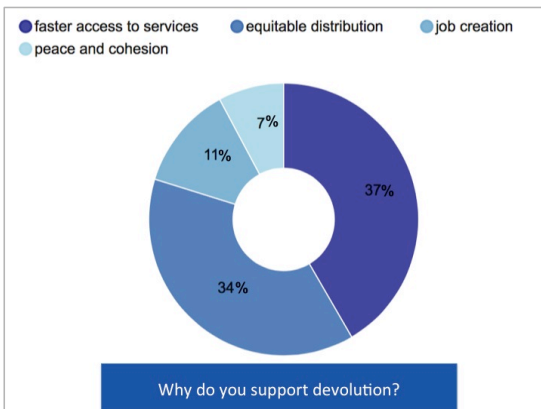
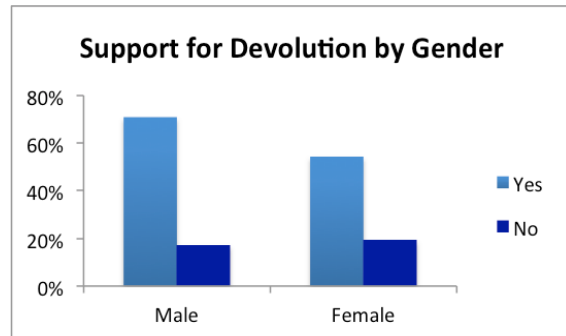
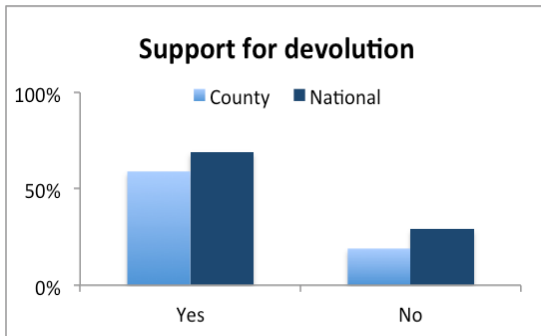
Decentralisation has been a frequent policy choice across sub-Saharan Africa as it is expected to lead to greater transparency and more equitable development impacts. What are the decentralisation preferences and responses of Kwale's rural water users? This research investigates how Kwale's water users respond to Kenya's recent decentralisation reform introduced by the 2010 constitution. Here we present findings on a) support for devolution, b) major household concerns, and c) household perceptions on improvements by the County Government since its election in 2013.

Methodology

Two waves of a longitudinal household survey were conducted in Kwale County in October 2013 to January 2014 and March to May 2015 (wave 1: n=3,349; wave 2: n=3,567). A team of 23 enumerators was trained, the instrument was piloted and rolled out over a two-month period. The sampling strategy was developed around 532 handpumps with a random sample of 3 to 10 households per handpump. An additional 242 households were interviewed in wave 2 around areas that had received development support from local stakeholders. This is a preliminary analysis.

Key Findings

1. Devolution is supported by the majority of the households interviewed (60%) in Kwale (n=3,516), with slightly higher support by the male population (71%).





Unlocking the Potential of Groundwater for the Poor



Research jointly supported by the ESRC and DFID

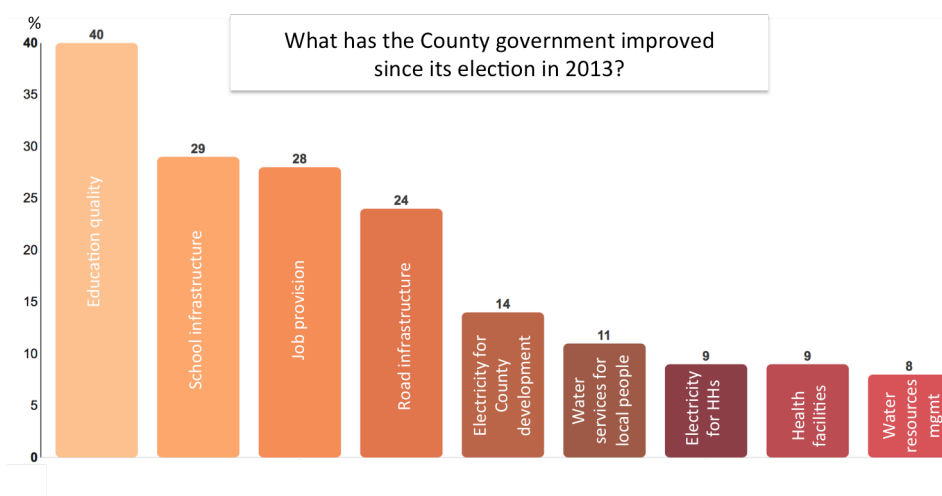
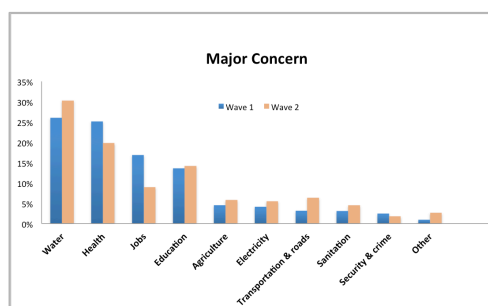
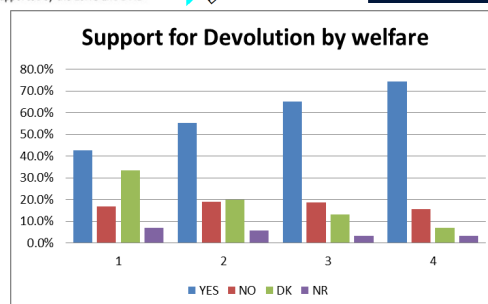


2. The main reason for supporting devolution is the expectation that it will lead to faster access to services (37%), both in the water and health sectors, followed by the expectation of a more equitable distribution of resources (34%). The main reason for households not supporting devolution is 'too much politics' (19%).

3. Welfare appears to be one determinant for supporting devolution with a 30% difference between the poorest quarter the wealthiest quarter.

4. Concerns around water are predominant in both waves, however, these increased by 4% in wave 2, whereas water as a major concern decreased by 6% and jobs by almost 8% in wave 2. The highest second concern is jobs (23%) in wave 1 and education (17%) in wave 2.

5. Households interviewed saw largest improvements by the County government in terms of education quality (40%) and school infrastructure (29%).



More information

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Unlocking the Potential of Groundwater for the Poor



Research jointly supported by the ESRC and DFID



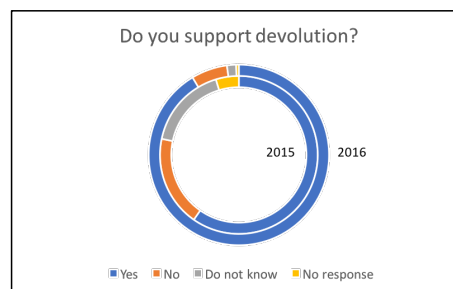
How has devolution fared in its first term? Responses from Kwale County at the end of the transition period Policy Brief, February 2017

Objectives

The first electoral term in Kenya's newly decentralised system is coming to an end. The second round of elections at national and county levels is approaching fast, which presents a good opportunity to evaluate perceptions of respondents across a large household survey study in Kwale County. This research investigates how Kwale's water users respond to Kenya's decentralisation reform introduced by the 2010 Constitution and how they perceive the performance of the first County Government. Here we present findings on a) support for devolution, b) likely voting behaviour in the 2017 elections, c) satisfaction with the performance of Kwale County Government, and d) perceptions of improvements in water and health services provision.

Methodology

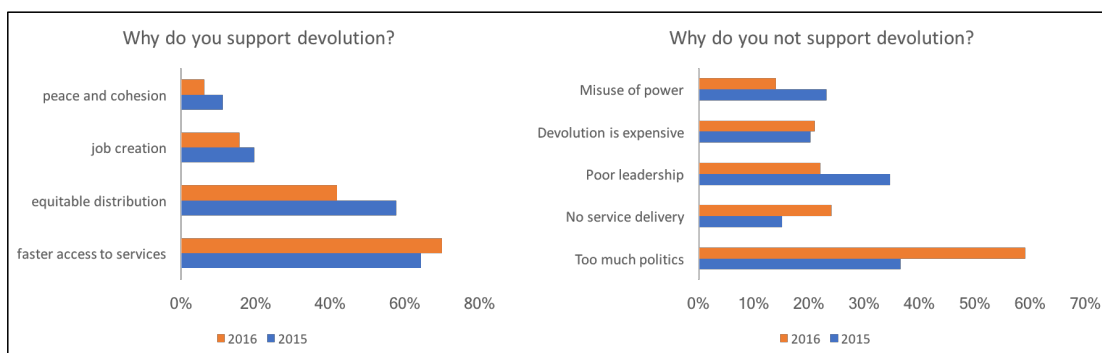
Three waves of a longitudinal household survey were conducted in Kwale County in October 2013 to January 2014, March to May 2015 and September to November 2016 (wave 1: n=3,349; wave 2: n=3,567; wave 3: n=3,542). A team of 25 enumerators was trained, the instrument was piloted and rolled out over a three-month period. Household respondents across a stratified random sample from the three sub-counties Matuga, Msambweni and Lunga Lunga were interviewed.



Key Findings

Do you support devolution?

At the end of the transition period, there is strong support for the devolution process among the Kwale respondents. Satisfaction with the 2010 Constitution increased by 28% in 2016 (69%) compared to 2015 (41%). Moreover, overall support for the devolution process lies at 91% compared to 60% in 2015.



Are you going to vote in the 2017 elections?

93% of respondents state that they will vote in the 2017 elections. The main reasons for those who will vote are that they have the right to vote (70%), followed by the belief that voting brings change (44%). Those who declared not to vote stated that they do not like politics (14%) as their primary reason, followed by the belief that voting does not change anything (13%).



Unlocking the Potential of Groundwater for the Poor



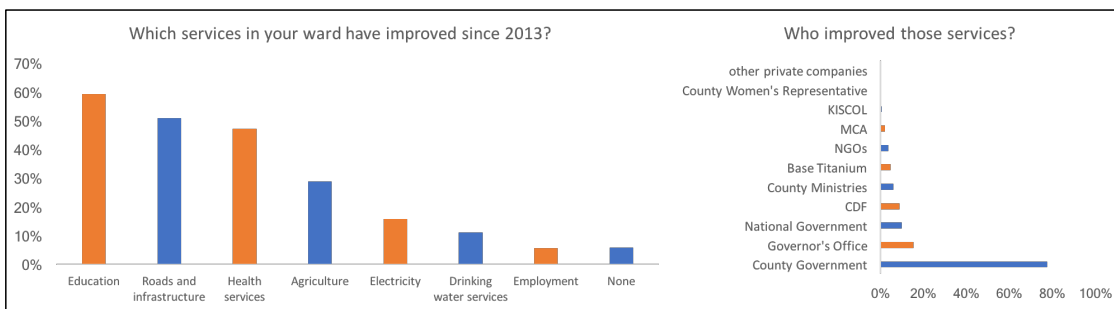
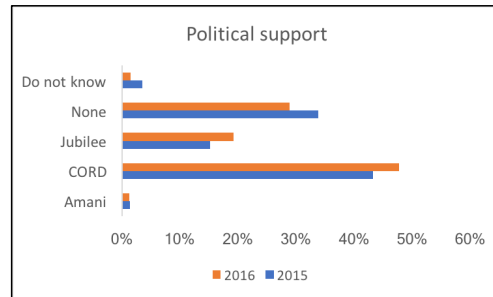
Research jointly supported by the ESRC and DFID



How satisfied are you with the performance of Kwale County Government?

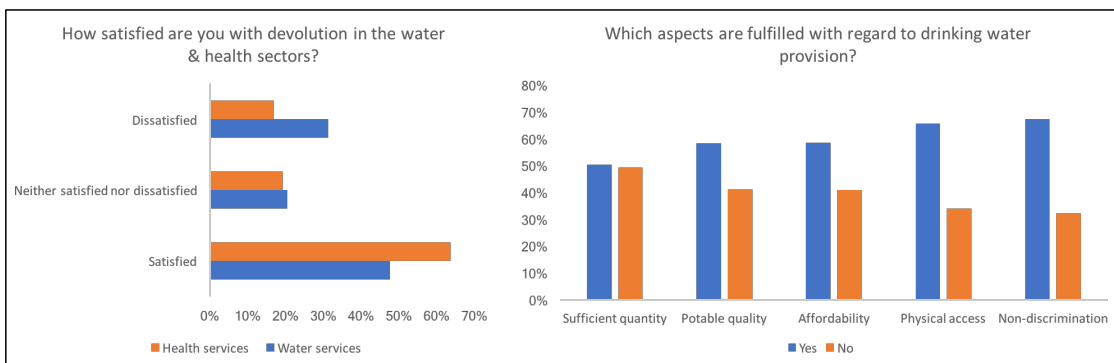
89% of the respondents are either very satisfied or satisfied with the performance of Kwale County Government. 78% of the respondents are likely to vote for the current Governor, and 43% are likely to vote for the current Member of County Assembly. Both CORD and Jubilee increased their support base since 2015.

Highest improvement across the wards since the election of the County Government in 2013 was perceived in the education sector (59%), followed by roads and infrastructure (51%) and health services (47%). Drinking water services are lagging behind with only 11% acknowledging that these services have improved in their ward since 2013. The County Government (77%) was by far seen as the main institution responsible for these improvements.



How does the water sector fare?

Of the two major devolved service functions, there is higher satisfaction with health service provision (64%) compared to a 48% satisfaction rate with water service provision. 85% expect the County Government to subsidise drinking water services. Only 12% stated that the County Government engaged in the repair of drinking water supplies in their area. Only half of the respondents stated that sufficient quantity was provided with regard to drinking water provision, followed by potable quality and affordability at 59% each, physical access (66%) and non-discrimination (67%).



More Information

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