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

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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 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.

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/UNICEF, 2017). 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/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, 1987, 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 socio-cultural 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 socio-cultural 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

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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).

2. Background

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, 2009), 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 (Cleaver 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; 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 et al., 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 et al., 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 et al., 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 socio-cultural 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, 1987; 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.

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/UNICEF, 2017). 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

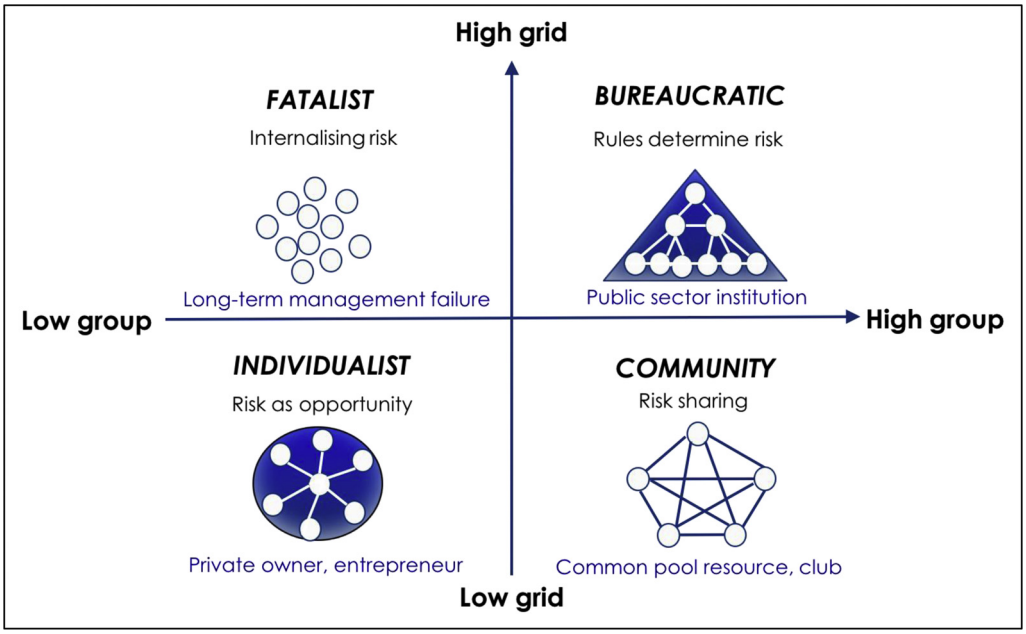

Fig. 1. Reframing cultural theory for waterpoint management.

operational and financial targets across these risk factors has become feasible through novel information systems (Thomson et al., 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 et al., 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 understand 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.

3. The framework of cultural theory

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 (Fig. 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 et al., 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.

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 et al., 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 et al., 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).

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.

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.

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 et al., 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.

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 et al., 2015). 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).

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 et al., 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 et al., 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 et al., 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.

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 Fig. 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 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, 2016). 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, 1995), 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.

4. Cultural theory of waterpoint management in coastal Kenya

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 audit in August 2013 had been broken for more than one year and are defined as fatalist here.

4.2. Risks and the four cultures

Key operational, financial, managerial and environmental risks facing waterpoint users in Kwale County are captured in Table 2. 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 audit. 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–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

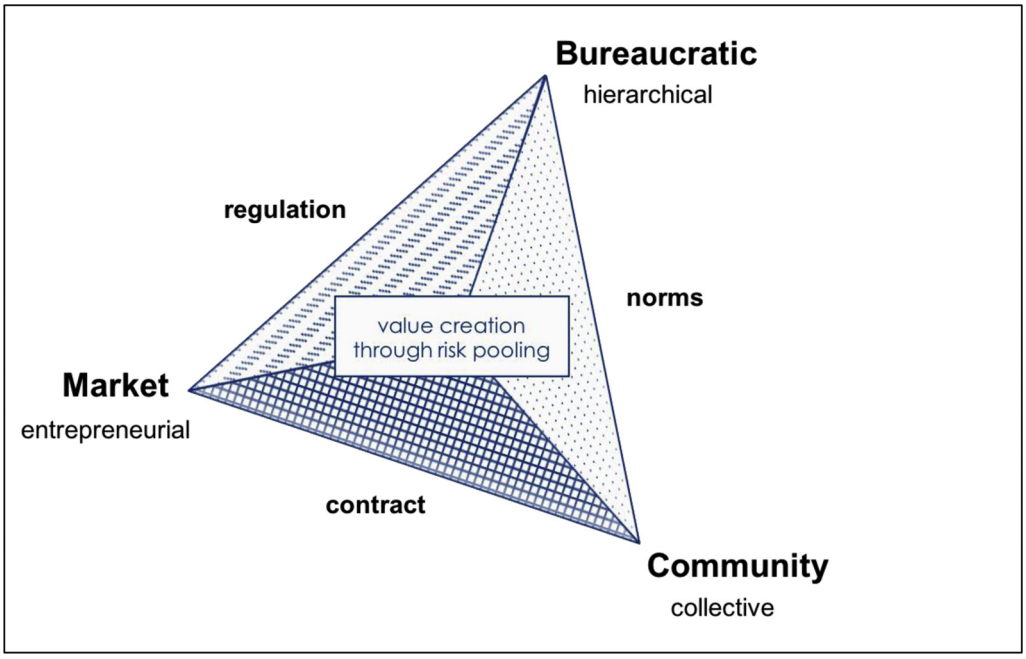

Fig. 2. A pluralist institutional network to recognise and promote cooperative management cultures.

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 audit 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 et al., 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 1). The large standard deviations suggest that within each culture there remains a wide variation in risk perception (Table 2), 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.

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 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

Table 1
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%

Table 2
Water risks applied to the four cultures.

Risk	Variable	Community			Individualist			Bureaucratic			Fatalist		
		n	Mean	SD	n	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.

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 1): 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.

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.

4.3. Addressing the risks through a professional maintenance service provider

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 et al., 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. 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 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 et al., 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.

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, 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; 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.

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Conflict of interest

The authors declare no competing interest exists.

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