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An ethnography of policy: water reuse policy in Kenya

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Abstract

Water scarcity and inadequate infrastructure for sanitation are two challenges that are emblematic to Kenya and other developing nations in Sub-Saharan Africa. Under such circumstances, water reuse has the potential to address these challenges but only under a favourable policy environment. In this paper, policy documents were considered as the ethnographic object to understand how people talk about water reuse in Kenya through policies, plans, regulations and guidelines. Using a general inductive approach to content analysis, the findings suggest that Kenya's policy on water reuse has progressed, especially in the recognition of the potential of reused water for addressing water scarcity, pollution, cleaner industrial production, food production, and climate change adaptation and mitigation. While many of the water reuse issues have been discussed under water and irrigation, environment and industrialization, other key sectors such as food and agriculture, housing, urban development and health remain silent on water reuse. Therefore, there is a need to take water reuse conversations beyond the water, environment, and industrialisation sectors if we are to address the water supply and wastewater management issues. Likewise, the study reminds us of the importance of foregrounding public perception and harmonized institutional arrangements in the success of water reuse in the country.

Keywords: Ethnography of policy; Kenya; Water policy; Water recycling; Water reuse

Introduction

Water scarcity and inadequate sanitation are problems occasioned by economic and industrial development, population growth and urbanization, as well as climate change. It has been said that global water demand is likely to surpass supply by more than 40% by 2030 and by more than 50% in the developing countries, especially in Sub-Saharan Africa (Chellaney, 2013). Worryingly, these Sub-Saharan countries have also been left behind in the development of sanitation services. This has caused the degradation of water quality because of the discharge of wastewater from domestic, industrial and agricultural sources (Nansubuga *et al.*, 2016).

A country is considered water-stressed if it has per capita water availability below 1,700 m^3 per year, but Kenya's situation is dire. It is among the water-scarce countries in the world with per capita

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availability below 1,000 m^3 per year (Jones, 2014). To make it worse, rapid population growth, economic development and urbanization in developing countries have made it difficult to address water scarcity and provide adequate sanitation services (Engel *et al.*, 2011; Jones, 2014). The consequences of this are many and none are good. For instance, because of the steady increase in wastewater production in a country with inadequate wastewater treatment facilities and systems that are prone to failure, it is common to see untreated or inadequately treated effluent directly discharged into river systems. This not only leads to the degradation of downstream ecosystems but also causes health problems and the destruction of riparian community livelihoods.

Considering these challenges in water supply and wastewater management, there is an urgent need for those of us in developing countries to move from current water management practices to sustainable ones such as water reuse. This is already being done in a few developing countries. For example, Jimenez & Asano (2008) observed that water scarcity, lack of sanitation services, the need for water for drought management and a high demand for agricultural water had driven water reuse in Namibia and South Africa; by contrast, only 44 cases of large-scale water reuse (mainly in agricultural farms and manufacturing industries) were found in Kenya (Jimenez & Asano, 2008). Despite having a lower per capita availability of water than Namibia and South Africa, Kenya recycles less water than the other two African nations.

Elsewhere, recycled water is often used for non-potable uses such as landscape irrigation, industrial cooling processes, general cleaning and toilet flushing. Levine & Asano (2004) observed that such uses of reused water have yielded considerable gains in reducing water supply and wastewater management problems in many countries. For example, Vigneswaran & Sundaravadivel (2004) found that water recycling in Australia reduced residential water consumption by 40–50%. This is a compelling endorsement of domestic water reuse for non-potable uses. In Europe and North America, wastewater management problems have also been alleviated by the reduction of wastewater production and water reuse initiatives in domestic, industrial and agricultural sectors (Seadon, 2010). These cases aptly demonstrate the viability of water reuse. But, this change from existing water and waste management practices to more efficient regimes like water reuse requires concerted efforts driven by public policy. It is through policy that stakeholders led by governments implement sustainable socioecological and technical transitions (Smith & Stirling, 2008). Public policy dictates the resources, processes, goals and strategies for these transitions.

The place of public policy in water reuse

But what is public policy? My own understanding of policy is informed by Birkland's (2014) view that it is a collection of public objectives and intentions and strategies – enforceable and non-enforceable. It connects actors with diverse interests and backgrounds to directly or indirectly shape societal practices (Wedel *et al.*, 2005). There are several justifications for having water reuse provisions in public policy. In relation to infrastructures and natural resources, policies – alongside public institutions – facilitate the establishment, maintenance, monitoring and enforcement of guidelines. These roles of policy are illustrated by the social-ecological systems model of Anderies *et al.* (2004), which explains the relationships between resources, users and infrastructures. More importantly, public policy justifies the inclusion of water reuse initiatives in budgetary allocation. This is critical for the uptake of water reuse given the high costs associated with the installation and operation of water recycling technologies. Thus, a policy environment that is keen to upscale water reuse would be expected to establish

coffers to fund public entities. This could also be combined with incentives to lower the costs for the private sector to recycle water. Thus, we cannot run away from public policy in our conversations about water reuse.

Besides the high costs, implementation of water reuse has also been slowed down by a negative perception of recycled water. This has been well documented in academic and industry literature. Leverenz *et al.* (2011), Friedler *et al.* (2006), Marks (2006) and many others have argued that the negative public perception is the biggest hurdle to water recycling. In their view, the term 'treated water' plays into the intuitive concept of 'contamination' or 'dirty' which makes recycled water less acceptable. This is what Po *et al.* (2003) calls the 'yuck' factor. These attitudes remind us of the importance of considering public perception in policy frameworks. So, public policy is important because it provides guidance and direction on how to address sociocultural issues related to water reuse as an intervention for the water and sanitation challenges. Therefore, we would expect to see policy instruments that encourage acceptance of water reuse (such as awareness creation and public involvement programmes) in Kenya's policy framework.

In this study, those instruments with which governments actualize societal aspirations are considered. These include non-enforceable instruments (such as sector policies, plans and strategies) and enforceable provisions (such as regulations, directives and guidelines). The central thesis is that a policy regime that supports water reuse would have enforceable and non-enforceable provisions related to water reuse.

Method

To date, few studies have been undertaken to understand how water reuse has been addressed by existing public policy in Kenya. With the exception of Onjala (2002), who specifically evaluated institutional frameworks on industrial water recycling in Kenya, previous research has been limited to covering developed countries such as China (Yi *et al.*, 2011), the USA (Angelakis & Gikas, 2014), Canada (Seadon, 2010) and Australia (Kayaalp, 1996). Apart from their abridged discussions on their methods, their findings also tell us very little about water recycling in developing countries. The research and methodological gaps have necessitated an evaluation of Kenya's policy on water reuse.

Taking an ethnography of policy approach, this paper seeks to understand the political, social and economic discussions around water reuse. This approach, proposed by Wedel *et al.* (2005), uses policy documents for ethnographic analysis. It is different from traditional ethnographies which involve interviews with informants, surveys, focus groups or participant observation. Using an ethnography of public policy, the paper seeks to understand the content and direction of conversations about water reuse in Kenya. The significance of understanding the policy discourse on water reuse is that it will illuminate societal aspirations and challenges, and guide us through the policy steps needed to fully embrace water reuse. By bringing policy deficiencies to light, it is hoped that this study will open a legislative and scholarly debate that will be of benefit to water reuse in Kenya and beyond.

In this study, government documents were obtained from Google and from the Kenya Law Reports (an online law and policy compendium, published by the National Council for Law Reporting (Kenya Law), 2018). First, international laws and policies were excluded (because the study was focused on Kenya) and then non-water related sectors were eliminated based on document titles and tables of contents. From an

initial sample of 164, 27 documents were selected for review based on full-text screening. A general inductive or grounded theory approach was employed, where codes were assigned as they emerged. Instead of a codebook, the coding was guided by the study objective which was to identify cases where water reuse was mentioned in the policy documents. According to Thomas (2006), an inductive approach is suitable for drawing key points from large volumes of text data to answer research questions. The coding was done in Dedoose, a computer-based coding application. Taking an exploratory approach to data analysis, the focus was on the themes and how often they came up in the documents. To maintain objectivity and consistency in the interpretation of the data, the reliability and validity of the codes were tested. Five former colleagues with knowledge of Kenya's environmental policy were asked to assign themes and subthemes to the excerpts obtained from the policy documents. Based on the team's responses, a Pearson's chi-square was performed to assess the hypothesis that there was no significant different in the themes. Themes with a p-value less than 0.05 ($p < 0.05$), meaning they were coded differently, were either reclassified or turned into new themes after discussions.

Results

In the analysis, 27 policy documents met the sampling criteria. They included policies, plans, acts of parliament and regulations. The sample documents were drawn from five water-related areas, namely: environment and natural resources; water and irrigation; food and agriculture; health; industrialization and manufacturing; and housing and urban development. A total of 44% of the policy documents were found to contain provisions related to water reuse in Kenya (see Appendix I, available with the online version of this paper).

These provisions fell under five major themes that met the 95% confidence level (detailed in Table 1). In relation to challenges to water reuse, the focus was on health risks and inadequate infrastructures. Moreover, the aspiration to reuse water in the country is noticeable. Under the water reuse goals, there are intentions to use recycled water in urban areas for climate change adaptation, cleaner

Table 1. Summary of themes and sub-themes related to water reuse in Kenya (*Source:* own data).

MAIN THEME	Subtheme
CHALLENGES TO WATER REUSE	Health risks
	Inadequate infrastructure
Water reuse goals	Urban reuse vision
	Reuse for climate change adaptation
	Reuse in agriculture and food production
	Reuse as a source of water supply
	Reuse as cleaner production
	Reuse as pollution reduction
WATER REUSE STRATEGIES	Promote reuse research and development
	Promote Public Private Partnerships (PPPs)
	Provide reuse incentives
	Promote reuse technologies
INSTITUTIONAL ARRANGEMENT	Objectives of authorities
WATER REUSE REGULATIONS	Reuse licenses and permits
	Reused water quality standards

production, pollution reduction and as a source of water supply. To achieve this, the water reuse strategies included: research and development, public–private partnerships (PPPs), incentives and the promotion of recycling technologies. To implement them, Kenya's policy framework has institutional arrangements and water reuse regulations (such as permits and water quality standards).

The water reuse policy environment

As shown in Figure 1, most of the water reuse provisions in Kenya fall under the environment and natural resources and water and irrigation sectors.

The National Environment Policy (NEP) (2013) and the National Water Policy (NWP) (1999) both recognize that the inadequate development of a reuse infrastructure and health risks are the biggest impediments to the uptake of water reuse in Kenya. The following selected excerpts illustrate the two challenges, as discussed in Kenya's sector documents:

'*Ensure safe water for all through prevention and minimization of health risks related to a water source, drinking water, recreational water, wastewater and water reuse*' (NEP, 2013: 42).

'*… sewerage systems and wastewater treatment plants experience inadequate operation and maintenance and low connection rate to sewers. Mixing industrial effluent and domestic sewage in mixed sewer systems often causes poor performance in pond treatment systems. Cases of pollution by wastewater emptying into storm sewers, soak-aways and cesspits designed for kitchen waste are common*' (NEP, 2013: 38).

'*There have been various technologies in use within the water sector. Some of these technologies have proved to be unsustainable in the long run. Many water supply and reuse schemes are currently non-operational while others are operating at a very low level. It is quite evident that among the*

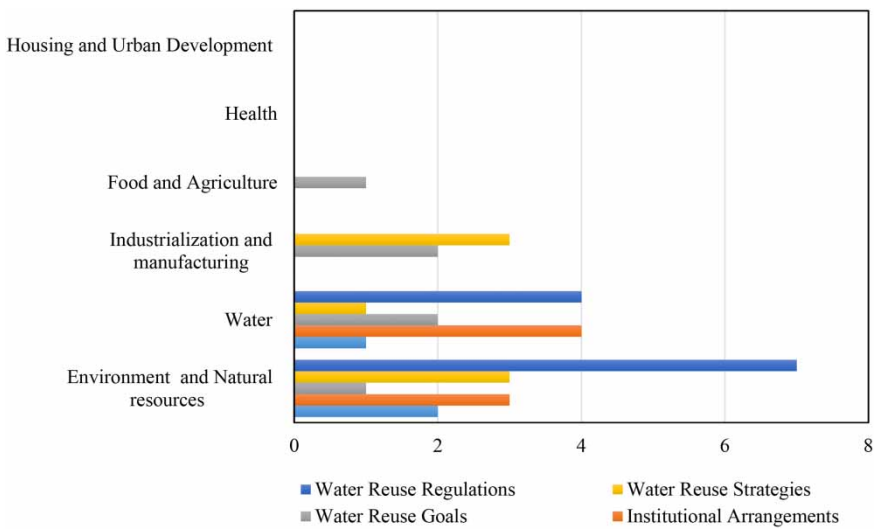

Fig. 1. Bar chart showing the distribution of water reuse provisions across sectors. The water and environment sectors had more provisions related to water reuse than health, agriculture, and industrialization and manufacturing (*Source:* own data).

reasons for this state of affairs is the choice of the wrong technology, which the beneficiaries or those charged with the responsibility of operating the water supplies do not understand' (NWP, 1999: 26).

From the general themes and sub-themes related to water reuse, Kenya's policy environment collectively appreciates the role of water reuse. The presence of statements relating to incentives, institutions, water quality regulations, research and development supports the view of Po *et al.* (2003) that integrated water reuse requires a policy framework that includes incentives, mandates, regulations and research.

Water reuse goals

The current public policy landscape in Kenya appreciates the role of water use in addressing water scarcity and wastewater management challenges, specifically as a source of water supply and as a pollution reduction mechanism. These goals have only been espoused by sector policies and plans and in the environment, food and agriculture, and the industrialization sectors (see Figure 2). For instance, the NWP (1999) sought to develop and promote domestic and industrial recycling of water to meet the current and future demand for water. The following excerpts illustrate the water reuse goals across different sectors:

'*In order to shield the country from increasingly frequent incidents of drought and food insecurity and to increase agricultural productivity, the Government will: (v.) promote water reuse, strategies for small-scale and where possible large-scale farming*' (National Food and Nutrition Security Policy, 2011: 21).

'*As the solution to this problem [water demand], identifying and developing adequate and appropriate water supply systems to meet the current and future industrial demands for water. Recycling of industrial water and individual supply systems for industry will be promoted*' (NWP, 1999: 29).

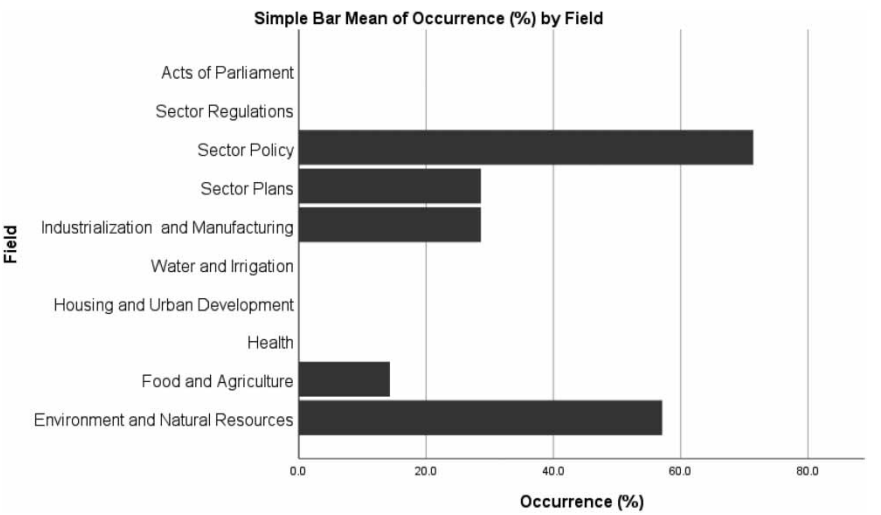

Fig. 2. Bar charts showing the distribution of water reuse goals across sectors (b) and types of documents (a). Provisions talking about water reuse goals were more prominent in sector policies and documents produced by the Ministry of Environment (*Source:* own data).

'The implementation of cleaner production programs [like water reuse] is an integral part of the policies that aim at increasing competitiveness and efficiency of firms as they assist in energy saving, water conservation, pollution control' (National Industrialization Policy Framework (NIPF), 2010: 17).

For pollution reduction, Kenya aims to reduce point sources of pollution by requiring all factories to incorporate wastewater treatment and recycling technologies in their operational designs. This is also supported by the NIPF (2010) which views water recycling as a cleaner production programme to reduce pollution. As shown in Figure 2, the health sector and housing sectors are silent on water reuse (0.0%) yet Kenya recognizes the health risks associated with water reuse and its potential as a water source.

Strategies to promote water reuse

These strategies were distributed across three sectors: environment and natural resources; industrialization; and water and irrigation. The majority appeared in sector policies (57.1%), followed by sector plans (28.6%). Only 14.3% were Acts of Parliament (see Figure 3). To achieve water reuse objectives, the NIPF (2010) proposed PPPs, promotion of technologies to support wastewater treatment (also supported by NEP, 2013). It also recommended incentives for the construction and fabrication of water recycling plants in the manufacturing industry. The Environmental Management Coordination Act (EMCA, 1999) and NEP (2013) call for tax rebates for industries that recycle water and private sector investors in water use technologies. Furthermore, research and development as a strategy is provided for by the Kenya Water Institute Act (KWIA) (2001) and the National Water Act (NWA) (2016). They both push for the acquisition and dissemination of knowledge to water stakeholders, especially on new water recycling technologies that promote increased water supply and improvement of sanitation. Here are three excerpts from the documents referencing water reuse strategies:

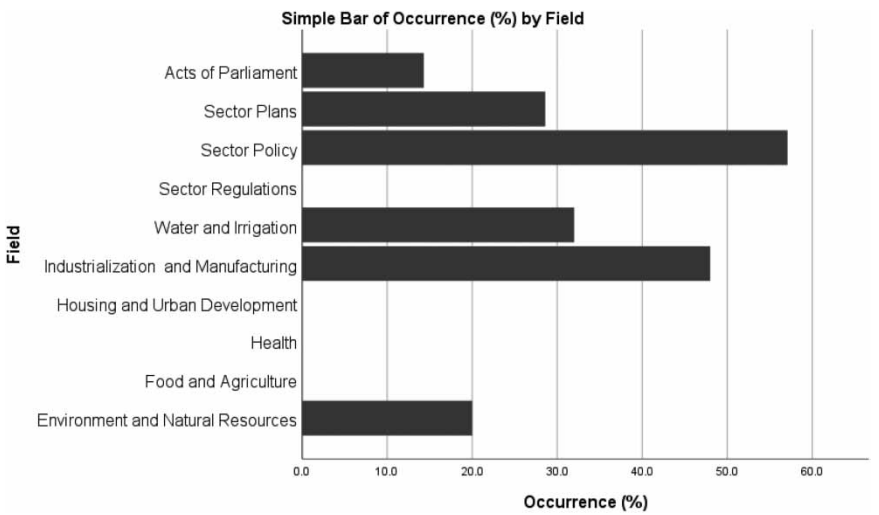

Fig. 3. Bar chart showing the distribution of water reuse strategies across sectors and documents. Most of the water reuse strategies were in sector policies and documents produced by the Ministry of Industrialization (*Source:* own data).

'*Promote products of nanotechnology, otherwise known as nanoparticles, that are already being used in most countries, … for water treatment*' (NIPF, 2010: 40).

'*On water and sanitation, the government will: (2) promote technologies for efficient and safe water use, especially with respect to wastewater use and recycling*' (NEP, 2013: 38).

'*[The Kenya Water Institute will]: provide training programmes, seminars, and workshops and produce publications aimed at maintaining standards in the water and sanitation sector; a forum for effective collaboration between the public and private sectors and other interested parties for the development of the water and sanitation [including water reuse]*' (KWIA, 2001: 6).

Despite the health risks associated with water reuse, the health sector and housing sectors also lack strategies to promote or ensure the safe use of recycled water. These two sectors recorded 0.0% on strategies for water reuse (see Figure 3).

Institutional arrangements for water reuse

The findings show that water reuse in Kenya is not handled by a single institution. As shown in Figure 4, the responsibilities are spread across different authorities. For instance, the National Environmental Management Authority (NEMA), established by the EMCA (1999), is tasked with recommending water use standards and giving restrictions on all types of water uses based on water quality. The Kenya water Institute (KWI) established under the Kenya Water Institute Act (KWIA, 2001) is tasked with research and development for water services and sanitation, including water reuse. Lastly, the National Water Authority established by the National Water Act (2002) is responsible for issuing permits to all water users, including to those who recycle water; it also has the power to determine appropriate purposes for different classes of water resources.

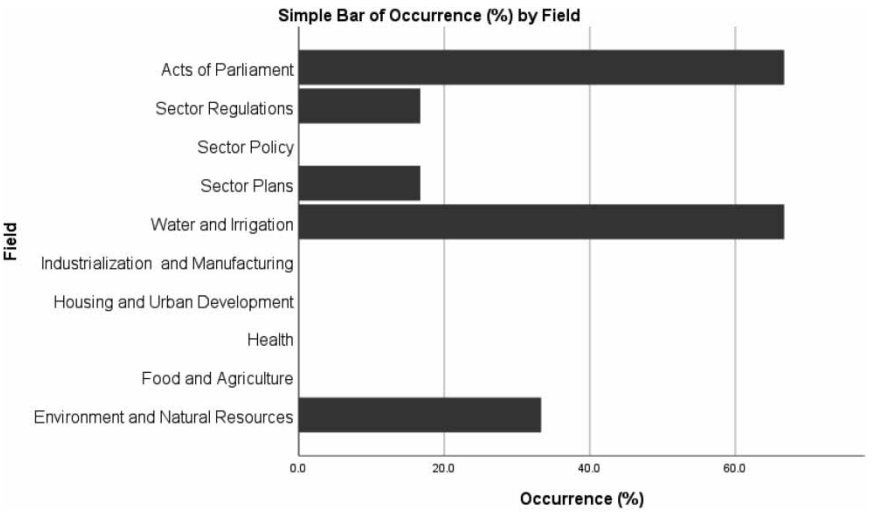

Fig. 4. Bar chart showing the distribution of institutional arrangements across sectors and documents. The majority of the provisions assigning water reuse responsibilities to institutions were contained in acts of parliament and in documents produced by the Ministry of Water and Irrigation (*Source:* own data).

Water reuse regulations

The findings also indicate that Kenya's water regulations that are related to water reuse are all carried under the water regulations (2006) implemented by NEMA and the National Water Authority (see Figure 2). Apart from prohibiting reuse of wastewater that does not meet the recommended quality standards, the regulations (in Schedule 8) dictate the microbial quality of wastewater that can be used for irrigation purposes. On permits and licenses, the NEP (2013) and EMCA (1999) both require all development projects including wastewater treatment and reuse plants to undertake Environmental Impact Assessments (EIA), and regular Environmental Audits (EA). Additionally, all water use and recycling projects require permits from the National Water Authority, as provided by the National Water Act.

Discussion

Water reuse provision in key sectors

The existence of water reuse goals, regulations, strategies and incentives as demonstrated by the findings challenge Onjala's (2002) view that Kenya's water policy only addresses issues related to effluent standards, licensing of water supply and disposal, and water privatization. Additionally, his observation that Kenya's regulatory framework tends to lean towards 'end pipe control' (meaning the focus is on regulating effluent discharge rather than on the minimization of wastewater production) is contradicted by the findings in this research. Instead, there is evidence that Kenya plans to use water reuse for several purposes, among them being for cleaner production, water supply and for food production. It could be that water recycling provisions in Kenya had not been formulated at the time of Onjala's study. Thus, this shows that Kenya has made significant progress especially in the statement of goals and strategies to promote water reuse.

However, most of the provisions are limited to the environment and water and irrigation sectors (See Figure 1). These two sectors recognize the challenges to water recycling, state reuse goals and strategies, assign mandates to institutions and have regulations that address the quality of water for reuse. However, it is disappointing that the domestic, industrial and agricultural sectors which are the biggest water consumers in Kenya do not adequately address water reuse. Additionally, the industrial sector – through the NIPF (2010) – talks about PPPs and the promotion of nanotechnology in wastewater treatment but does not have reuse regulations and institutional arrangements for implementation.

It is remarkable that the aspirations for water reuse in agriculture and food production are consistent with Jimenez & Asano's (2008) assertion that agriculture is the most important option for water reuse because of its high demand for water in the world. The National Food and Nutrition Security Policy (NFNSP) (2011) and the National Climate Change Action Plan (NCCAP) (2013–2020) also call for water reuse for small- and large-scale farming to mitigate drought (which causes food insecurity). These provisions are valuable because food production accounts for the largest water use – about 76% according to Jimenez & Asano (2008). Apart from the aspiration to reuse water for irrigation and food production, there are no strategies, institutional instruments or regulations in this sector. Furthermore, the housing and urban planning sector which controls the building and construction of housing and public infrastructure does not have any provisions for water reuse. Given the health risks posed by effluent mismanagement and concerns associated with water recycling, it would have

been expected that the health sector would contribute to regulations to protect public health. However, Figures 2–5 show that the health sector is completely silent on water reuse. This is despite the recognition that health risks are the among the biggest impediments to water recycling.

Kenya's water sector is evidently keen on promoting water use to address the water scarcity and pollution challenges related to wastewater. The NWP (1999) extensively discussed the challenge of inadequate infrastructure, and its goal was to promote water recycling as a source of water supply for domestic, industrial and agricultural sectors. Ideally, these policy objectives and strategies were to be actualized in midterm plans (Oner & Saritas, 2005). However, the National Water Strategy (NWS) for the years 2015–2020 lacks provisions that relate to water reuse. This shows that there is a disconnect between Kenya's water reuse policy, planning and implementation.

The absence of a focal institution

Institutional arrangements are needed to implement public infrastructure strategies (Anderies *et al.*, 2004). According to this research's findings the NWA, NEMA and the KWI share responsibilities for water reuse. For instance, the NWA grants permits, NEMA regulates water quality and grants permits after EIAs have been successfully carried out, and the KWI steers research and development. The policies evaluated did not assign mandates to any of these institutions to spearhead water reuse in the country. This leaves many responsibilities and strategies undesignated. For example, no agency has been given the role of reviewing the application and qualifications for incentives, or for public awareness campaigns to promote water reuse.

In the United States, the Environmental Protection Agency (US EPA) regulates and guides many aspects of wastewater treatment, water reuse and drinking water quality (Asano & Levine, 1996), unlike in Kenya, where no single institution has been tasked with overseeing water recycling activities.

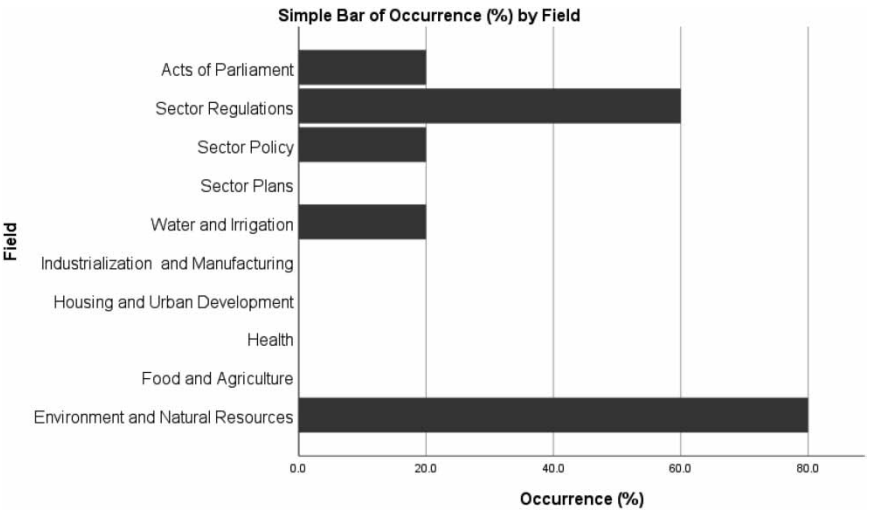

Fig. 5. Bar chart showing the distribution of water reuse regulations in sectors and documents. The majority of water reuse regulations were in the regulations sector and in documents produced by the Ministry of Environmental and Natural Resources (*Source:* own data).

Yet, water recycling programmes are more successful when implemented by coherent institutional regimes. As Rogers & Hall (2003) argued, a good policy framework should clearly define the mandate of established institutions for the effective uptake and administration of recycling infrastructures. Thus, Kenya urgently needs institutional arrangements for water reuse.

Inadequate quality guidelines on reused water

Schedule 8 of Kenya's 2006 water regulations, formulated by NEMA, stipulate the microbial quality of wastewater that can be used for irrigation purposes but there are no water quality provisions for reusing water for industrial, commercial and domestic purposes. Yet water treatment for reuse is seen as an option for pollution reduction in factories, and industries are required to incorporate wastewater treatment and recycling technologies in their operations. The NWP (1999) hopes to increase water reuse domestically. Likewise, the Environmental Management and Coordination Act (EMCA) (1999), the main legislation that established NEMA and water regulations, provides tax rebates for industries that recycle water. The failure to provide quality standards for domestic and industrial water recycling demonstrates that the existing regulations are inadequate. Therefore, there is a need to formulate guidelines for industrial and domestic sectors paying attention to the potential uses of recycled water.

Public perception of water reuse

As discussed above, scholars and professionals agree that negative public perception is the biggest hurdle to water reuse due to the 'yuck' factor and the association of reclaimed water with the concept of contamination. However, contrary to expectations, there was no mention and discussion of the challenge posed by the negative public perception of recycled water. This study has revealed that Kenya's policy framework on water reuse only recognizes health risks associated with water recycling and inadequate infrastructures as challenges to the uptake of water recycling. The failure to acknowledge the challenge posed by public perception means Kenya's policy is ill equipped to address the cultural issues around water reuse. For Kenya's policy, the starting point would be the consideration of the impact of public perception on water reuse. This would then inform the formulation of policy instruments that encourage the acceptance of water recycling, such as creating awareness and improving water management to build trust between users and utilities.

Conclusions

Certainly, Kenya's water reuse policy has progressively moved away from a focus on 'end pipe control' to a reduction of wastewater production, and this is seen in the consideration of wastewater as a resource for industrial and agricultural uses and as a source of water supply. To stimulate the uptake of water reuse, the existing provisions that are mainly in the environmental and water sectors need support from the high-water demand and wastewater producing sectors (especially domestic, agricultural and industrial). There is also a need to formulate provisions to address the water quality needs of all sectors and to ensure implementation plans match policy statements. Most importantly, a mandate to spearhead water reuse should be given to an institution that will regulate and coordinate multi-sector efforts. It is also important that policies take in to consideration emerging issues around water reuse,

especially the negative public perception and the many possibilities for potable and non-potable uses for recycled water. Since this study did not consider draft policy documents, it is possible that future studies could gain new insights into this topic and further studies in this area are therefore highly encouraged.

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