PROGRAM ON WATER GOVERNANCE

EDGES

Framing a Community's Entitlement to Water access in Accra, Ghana: A complex reality

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1. INTRODUCTION

Over the past decades, access to potable water in Ghana has improved substantially based on indicators such as those highlighted in the Millennium Development Goals (MDG) progress report and other national level data (GSS, 2013; WHO/UNICEF, 2012). Even before the MDG target date of 2015, a significant increase in access to improved drinking water was recorded countrywide; moving from 53% in 1990 to 86% in 2010. In urban areas, access to improved drinking water increased from 84% to 91% over the same period (WHO/UNICEF, 2012). The WHO/UNICEF Joint Monitoring Programme for Water-supply and Sanitation (JMP) defines improved drinking water sources to include piped water in homes, yards, or neighbour's houses, rainwater, and covered boreholes and wells (WHO/UNICEF, 2012). In light of these numbers, in 2012 Ghana declared success in meeting the MDG for water in advance of the deadline, even as the sanitation goal remained out of reach.

Many concerns have been raised about WHO/UNICEF's definition of improved water access which emphasizes particular water sources as more healthful and reliable, including a strong focus on piped water as paradigmatic of what constitutes an 'improved source'. Recent works have challenged these understandings; particularly the suggestion that 'improved sources' will necessarily contribute to well-being and healthful outcomes (Mahama et al., 2014; Songsore, 2008)[1]. In Accra, studies have called for greater attention to be paid to the specific pathways

[1] Mahama et al. (2014) redefine the WHO definition of improved water sources as 'those with little likelihood of contamination with faecal matter and other pollutants' (p. 323). Using this definition and with a sample of 1500 respondents distributed across migrants and indigenous communities across Accra, those authors found that only 4.4% (piped water in dwelling 3.3 and bottled water 1.1) of the respondents had access to improved drinking water compared to 39.6% using the WHO definition. Moreover, the study found that 88.7% of respondents had access to improved water for domestic uses compared to 98.3% using the WHO's definition. The study suggested that using the WHO definition was invalid for low-income localities in Accra.

through which access is negotiated (Mahama et al., 2014; Morinville, 2012; Songsore, 2009) to better understand implications and outcomes for water quality, affordability, health, and equity concerns (Mahama et al., 2014; Songsore, 2008). If we take these broader studies seriously regarding the diverse pathways and modalities of water access, we can appreciate the possibility that extending and improving access need not rely entirely on infrastructural improvements, but might also involve social and institutional considerations, as well as efforts to work with existing modalities of access to improve water quality, reliability, and affordability. In this sense, needed improvements might be realized by recognizing existing modes of access, and working with those structures and opportunities, which would likely include, but not be limited to, municipal piped infrastructure (cf. Bakker, 2003). In Accra, specifically, it has been noted that the piped water network is often erratic and unreliable, leading residents to engage in diverse coping strategies such as shared connections, informal resale and vending, or illegal tapping of pipelines (Ainuson, 2010; Peloso and Morinville, 2014; Songsore, 2008). In addition to the ways that unreliable infrastructure leads residents to engage in a range of informal connections and relationships to ensure access, other studies further suggest that the ways in which the poor access water affects the quality of water, also complicating the very definition of what 'access' might mean (Mahama et al., 2014; Songsore, 2008). For instance, Songsore (2008, p. 8) suggests that "given the widespread practice of unhygienic water handling and storage in deprived low-income areas, it is not enough to focus on bringing "water to the tap"; what is happening "between the tap and the mouth" is also critical in determining health outcomes". Mahama et al. (2014) also suggest that beyond the focus on improving the quantity of water supply, policies to address water access should consider what users themselves consider to be good or bad sources of water and the factors that constrain or enhance access to good quality water in line with those

understandings. Our work in Accra confirms that residents access and store water in multiple ways, and that these practices are often well beyond the scope of existing efforts to ensure water quality, or to regulate price, posing a direct challenge to the regulatory capacity and oversight functions of the GWCL[2], PURC[3], or even local water boards.

Building on the above studies, we argue that it is important to understand and recognize that in low-income communities in Accra where water is insecure, modes of access vary significantly and thus, each community's coping strategies are different—with a diverse patchwork of access mediated by varied conditions and relationships, including infrastructures, socio-economic dynamics, as well as socio-cultural norms and community values. As large bodies of work in political ecology, and environmental justice have emphasized 'civil society is an arena for social contestation where power struggles often affect which groups control which resources' (Amin, 1996). As such, it becomes imperative to understand the precise pathways through which community members negotiate and command access—the crux of an entitlements approach, as described in further detail below. In this study, we compare two communities with distinct social, demographic, and historical features to better understand the diverse pathways of access. We then consider how these specific modes of access might also condition differentiated vulnerabilities in the face of current (or future) conditions.

Entitlements are generally defined as bundles of ownership rights, endowments and or assets; economic and social, that specific individuals, or households, draw on to enable "sufficient

[2] Ghana Water Company Limited (GWCL) is the main water utility company and is responsible for the planning, development and maintenance of water supply systems in urban communities in Ghana.
[3] The mandate of the Public Utilities Regulatory Commission (PURC) is to set tariffs and quality standards for the operation of public utilities including water in Ghana.

access to resources" (Sen, 1981). For this analysis, we evaluate community entitlements to water by focusing on how endowments (at the community level) can constrain or enhance functioning and capabilities for secure water access. We aim to characterize, in a broad sense, "things that people have acquired such as land, labour, knowledge, rights…. that when.... combined with institutional arrangements, determine people's entitlements" (Mehta, 2006). The analysis is organized around four interdependent categories of endowments important for our study sites, as revealed by our mixed method approach in both communities: socio-cultural factors, socio-economic factors, community water assets/ water infrastructure, as well as values and knowledge. While we are not able to analyze these factors in a comprehensive sense, and there are undoubtedly other elements important for a broad understanding of entitlements, we find that these dimensions are helpful to enrich our understanding of water access and vulnerabilities in these contexts. Our analysis of **socio-cultural factors** include cultural/ethnic homogeneity and household/compound water practices including water sharing; **socio-economic factors** include income levels, size of family and land ownership; for **community location and water infrastructure**, we analyze patterns of water availability and location in relation to piped water network; for **community values** our analysis considers the role of local leadership in addressing local water problems including having shared a understanding of the state of water access with residents (i.e., alignment between knowledges). Analyzing these factors from a 200-household survey, we ask, how do differentiated water entitlements and community endowments condition diverse pathways of water access, and linked vulnerabilities, in two distinct relatively impoverished sites of Accra (Madina and Ga Mashie)? Insights from this study provide an important foundation from which to consider future policies aimed precisely to extend secure

and affordable access, or to mitigate against vulnerabilities that might be anticipated with ongoing or future water scarcities (Gosling and Arnell, 2016).

Following this introduction, the next section (1.2) explores the determinants of water access in our two study sites. Here we also detail what an entitlements approach to water involves, drawing on key contributions from the literature. In section 2, we provide an overview of the methods for data collection and analysis. In section 3, we detail results of the study. In section 4, we specifically discuss the comparative element of the work, highlighting what can be learned by comparing two different communities in terms of key entitlements, and associated vulnerabilities.

1.2 What determines access to water in low-income communities? A review

In many developing countries, governments' responses to urban water provision challenges have relied heavily on technical expertise, often focused on increased capital investment, including efficiency improvements through Public-Private Partnerships (PPP), and similar efforts (Ainuson, 2010). While there has been a de-emphasis on funding infrastructure for water provision from lending agencies such as the World Bank in the past decades (Bakker, 2003), instead of pushing PPPs and other mechanisms that might fund these efforts through other means, there has nonetheless been a long-term focus on large scale infrastructure, including reservoir building, and piped water systems in response to the urban water crisis, often dominated by engineers and other technical 'experts' (Baker, 2015). The specific situation in urban Accra involved a recent privatization effort with the entity AVRL (Aqua Vitens Rand Limited, 2006-2011) required as part of loan conditions from the World Bank and IMF (Harris, 2013), as well as more recent PPP arrangements that have recently brought desalination and

other infrastructure onboard to provide water to some of Ghana's underserved communities, including Teshie (Andoh-Appiah, 2015).

At the global level, the MDGs, the International Decade for Water and Sanitation, and the recent policy emphasis on the Human Right to Water and Sanitation, have all contributed to the push for increased piped water access. To this point, it is estimated that almost two-thirds of total official development assistance (ODA) for drinking water and sanitation globally is targeted at the development of large piped water systems (WHO, 2010). However, in many developing contexts, piped water systems have not only been criticized for failing to provide water for those in greatest need (WHO, 2010; McGranahan and Satterthwaite, 2006) but are also seen as tied to western ideas of development and the modern city (Kaika, 2005; Kaika and Swyngedouw, 2000) that may be ill-suited to the conditions in some developing or Southern contexts (cf. Lawhon and Patel, 2013). Indeed, the argument has been made that goals such as those laid out by the MDGs might often encourage improvements and extensions to be made in middle and higher income areas, precisely where there is the 'lowest hanging fruit' to improve overall numbers for purposes of the targets, rather than extensions of service and infrastructure in communities where it might be most needed. Further to this, linked goals such as efficiency improvements, full-cost recovery and reductions in non-revenue water may not be as feasible in low-income areas, making them less attractive for ongoing investment.

These issues notwithstanding, in many developing countries where common health issues are linked to limited and poor water quality and access (Songsore, 2008), extending piped water systems have been shown to be more secure, and less costly, in comparison with reliance on

vendors, purchasing bottled water, and other modes of access (Stoler et al., 2012; Crow, 2001). Considerable evidence related to the importance of water quality for health outcomes (Songsore, 2008; Boadi and Kuitunen, 2005; Bartlett, 2003), lends forceful suggestion to the importance for municipal piped infrastructure for broad senses of public health and well-being. In Ghana, studies by Songsore (2008), and Boadi and Kuitunen (2005) have documented a strong and consistent association between unsafe water and hygiene, and infant and child mortality arising from diarrhoeal diseases. All told, formal piped water access is generally considered to be the gold standard—improving access, reducing vulnerability, and resulting in improved health outcomes.

However, given that improvements in piped water supply do not necessarily benefit those in greatest need (McGranahan and Satterthwaite, 2006), there have been calls to highlight equity in access as paramount, replacing a singular focus on merely extending infrastructural access (Loftus, 2015; Perreault, 2014; Anand, 2013). Work in this vein has shifted attention towards a range of social and institutional dimensions of access, including approaches that highlight the role of entitlements and human capabilities building on the earlier innovations of Amartya Sen (e.g. Goldin, 2013). Sen's (1981) work introduced these concepts through focus on how particular groups or individuals gain access and control over food in times of crisis. As Sen described, with a "commodity bundle" of ownership rights and endowments an individual will be able to acquire sufficient resources, even in times of relative scarcity. The key then, more in line with an equity focus, is to differentiate which people are not able to maintain secure access, given differential entitlements. With this understanding, it became clear that the root causes of

famine were not limited to 'food availability decline' but rather the outcome of entitlement failures. With this approach, a more nuanced understanding of 'access' comes into view, particularly one that links water insecurity to various endowments (e.g. things acquired, such as land, or a capacity that enables one to acquire access to resources, such as labour, knowledge, familial networks, or customary rights).

The initial approach offered by Sen has been revised with later contributions, moving beyond a focus on individual entitlements to collective action (Frediani, 2009), the influence of social structures (Ibrahim, 2006), as well as reducing market failures to achieve greater freedoms that might lead to new endowments (Stewart, 2005). Miltin (2013) distinguishes between endowments that are individual (e.g. financial inheritance) and those that are social (affecting all of those within a group) such as the levels of inequality in society, or cultural attributes that influence access to entitlements (rituals such as tithing or making contributions to the poor). In sum, an entitlements approach to resource scarcity clarifies that changes in overall supply and availability may not be sufficient indicators of better access.

In the case of water, entitlement theory has been recognized as a useful approach to understand the complex institutional arrangements that shape water access and insecurity (Mehta, 2014, 2006; Wutich and Brewis, 2014; Anand, 2013, 2001). However, Wutich and Brewis (2014) suggest that only a handful of scholars have applied the entitlement approach to understand water insecurity. Among them, Mehta (2014) combines the entitlement theory and the capability approach to understand water insecurity, particularly from an equity perspective. According to Mehta (2014) an entitlement approach enables us to focus on the structural and institutional arrangements (such as property right systems, paying for water through billing systems etc...)

that often result in exclusions for the poor and perpetuation of water-related inequalities. The capabilities approach on the other hand addresses the link between water and well-being. Per the entitlement approach, to understand scarcity, we need to move beyond having physical access to water to include factors such as quality and cost of water that can affect one's entitlements and endowments. In sum, entitlement theory broadens our understanding that scarcity is as much about socially regulated access, institutional rules, and patterns of service provision that exclude the poor as it is about the dominant understanding of scarcity that often focuses on the overall availability due to seasonal variation and other aspects related to the physical conditions of water (ibid).

Applying these insights to our case, we see that some groups in the population may suffer from lack of water even when there is no decline in water availability in the region (cf. Anand, 2001, 23, shifting the question from 'whether there is enough water' to why 'some people are not getting enough water'). Taken together, entitlement approaches to water security focus on entitlements as a product of both individual and social endowments, and of complex negotiations that people employ in the absence of clear procedures or established rights to water (Wutich and Ragsdale, 2008). Before proceeding, it is worth noting that an entitlements approach is also generally consistent with the large body of work from political ecology, and newer work on justice and equity, which carefully considers histories, discourses, or social-cultural attributes that condition uneven resource access (Loftus, 2015). However, an entitlements approach also invites careful assessment of particular attributes or characteristics that might enable and maintain entitlements, rather than broadly assessing the inequity dimensions or histories of (in) access.

In this paper, we broaden the understanding of water access in low income communities in Accra through an entitlements analysis that assesses various characteristics that might be important. As such, we bridge work on equity, political ecology, and environmental justice, with other approaches that have quantitatively analyzed factors that affect access (for examples of such 'determinants of access' studies for Accra, see Mahama et al., 2014; Songsore and McGranahan, 1993). Doing so adds interesting elements to the broader debates related to water security, providing detail as to how water security is maintained, even when water is little available, or how water insecurity can be produced, even when there might be sufficient water overall in a system. Mapping water entitlements and assets together (grouped as 'endowments'), and comparing two sites in Accra (an indigenous community--Ga Mashie and a migrant community--Madina), we evaluate endowments across the sites and consider how these variable endowments might relate to water insecurity and vulnerability.

2. METHODOLOGY

2.1 Description of study sites

Two communities were chosen for data collection—Ga Mashie and Madina (see Map 1and 2).

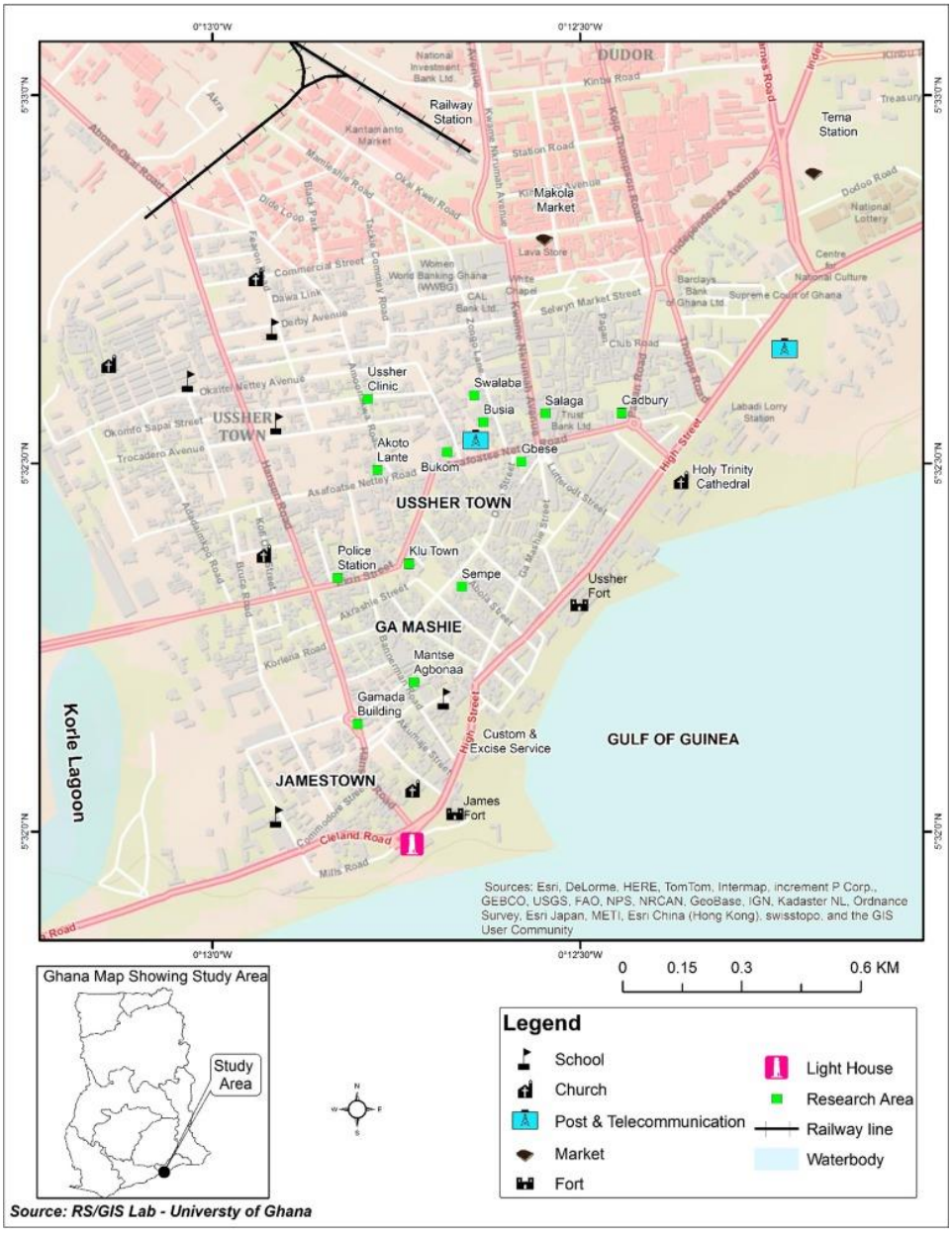
Ga Mashie

Ga Mashie is an indigenous community in Accra and one of the initial localities in the city to have gained access to piped water infrastructure and social services. The area covers an area of about 100 hectares along Ghana's southwest coast (Mahama et al., 2014), shown in Map 1. Ga

Mashie is principally inhabited by the Ga, of the Ga-Adangbe people (GAMADA, 2008; Razzu, 2005). Our survey results show that in Ga Mashie more than two-thirds of respondents identified themselves as belonging to the Ga indigenous ethnic group (See Table 1). Historically, the community's strategic location on the coast of Accra made it a commercial and industrial centre. Several strategic events such as the building of a harbour along the eastern coast, and the transfer of the capital of Ghana from Cape Coast to Accra in 1877 (Mahama et al., 2014; Dapaah, 2011) had an important impact on the community by boosting the local economy including the role of indigenous artisanal fishers (Parker, 2000). Importantly these events also enhanced the importance of local Ga chiefs who acted as brokers between Europeans and Ghanaians during the colonial period. During this time, considerable attention was given to the physical growth of Accra as well as the development of major infrastructure (Quarcoopome, 1993), including piped water, although it largely benefitted merchants and colonial administrators (GAMADA, 2005).

Following these earlier investments, Ga Mashie experienced a number of significant events that led to the collapse of the local economy and which continues to negatively impact the community. Among them, the growth of Accra resulted in growing pressure on existing infrastructure, the destabilization of the power of local authorities, and an outbreak of the bubonic plague in 1908 which led the colonial government to demolish many homes, further destabilizing the community and resulting in crowding (GAMADA, 2008; Razzu, 2005). Wealthy community members also left Ga Mashie at this time, seeking refuge in other areas of the city (GAMADA, 2008). At present, while Ga Mashie does not face direct problems with public service provision, there are considerable challenges with management (Paller, 2012) (see Dapaah (2011) and Quarcoopome (1993) for discussion of other community challenges). In

2010, Ga Mashie's population stood at 175,000 up from 61, 558 in 1984 (GSS, 2013), with the rising population attributable both to natural growth and in-migration (Quartey-Papafio, 2006).



Map 1. Map of Ga Mashie. The green points on the map show the sampling sites. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)
Source: RS/GIS Lab, Department of Geography and Resource Development, University of Ghana. March

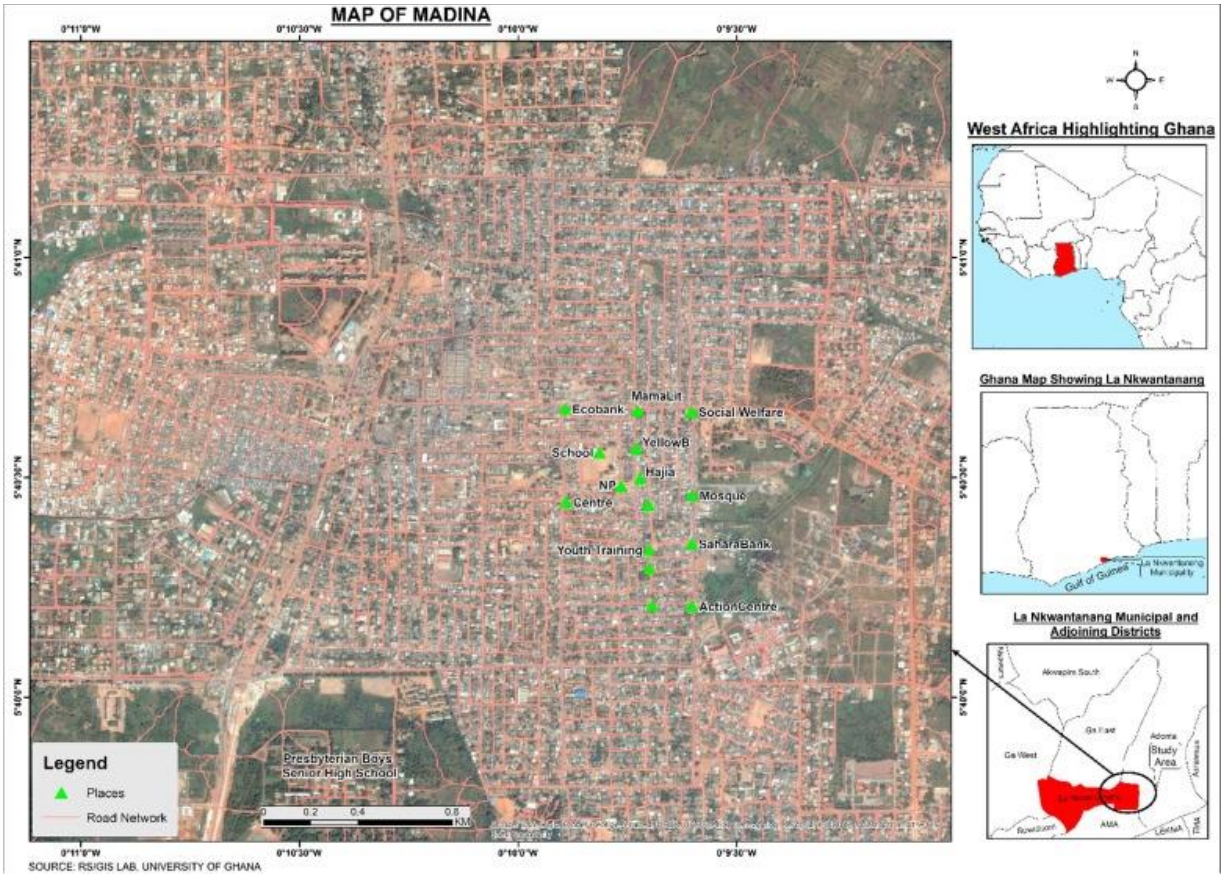
19th, 2014; reprinted with permission.

Madina

Madina, (Map 2) is a relatively new community that emerged on the landscape of Accra after Ghana's independence in 1957, founded largely by Muslims migrants who were evicted from the center of Accra (Gough et al., 2003). The name Madina signifies a place of refuge for Muslim migrants, as there is also an obvious reference to the city in Saudi Arabia where the prophet Mohammed is buried (Badru and Sackey, 2013). Currently, Madina is recognised as the tenth largest settlement in Ghana, comprised of diverse ethnic neighbourhoods, with many residents regularly commuting to central Accra (Ardayfio-Schandorf et al., 2012). The 2010 Population and Housing Census showed that almost all of Ghana's ethnic groups are present in Madina, although Akans seem to have a slight majority over Gas, Ewes, Dangbes and Gurs (GSS, 2013) largely consistent with our survey respondents, Table 1). In 2010, Madina's population stood at 145,356 up from 28,364 in 1984 (GSS, 2013).

Madina is inadequately serviced in terms of water supply, waste management and sanitation (Agyei et al., 2011). Without connections to the city's main water supply lines, water is sourced through several pathways, primarily through secondary vending (vendors who redirect piped water provided by the GWCL to other parts of the city) (Gough et al., 2003). Madina represents a neighbourhood in transition, and can be considered as representing those communities found throughout the city without piped water infrastructure. The comparison between Ga Mashie and Madina allows us to consider everyday access and linked vulnerabilities in relation to differnet characteristics of both communities, to evaluate how entitlements link to infrastructure, as well as varied social and demographic characteristics (e.g. a diverse population for Madina, as

compared to the relatively homogenous indigenous population in Ga Mashie).



Map 2. Map of Madina. The green points on the map show the sampling site. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.) Source: RS/GIS Lab, Department of Geography and Resource Development, University of Ghana. May 31st, 2014; reprinted with permission.

2.2 Field data collection

Primary data was collected through a mixed-method approach (Creswell, 2009), involving a household survey, in-depth interviews and focus group meetings. The survey was conducted in 200 households divided proportionally between the two sampled communities; Madina and Ga Mashie, based on simple proportional representation of the population sizes (120 households sampled in Ga Mashie, 80 in Madina). We used a stratified sampling technique to select the respondents (Twumasi, 2001). Within each community, we undertook a transect walk to identify

boundaries and sub-localities. We then divided each community into clusters to enable all sub-localities in the communities to be fairly represented. A GPS was used to record the location of each cluster and this was input in the map of the study area (See Maps 1 and 2). We then selected every 3rd household on a street within each cluster until all the streets within a cluster were covered. The interviewed respondents were household heads or household members with knowledge of household water needs. In each household, before interviewing, we asked who oversaw water decisions including how and where to access water. In Ga Mashie, we found that more females (and boys) than male adults were involved in water fetching so we sampled more females (Table 1). As a result, we interviewed more female respondents (60.8%) relative to males (39.2%). In Madina, we found that both men and women were often involved in the search for water so we interviewed who was available at the time of our survey, resulting in only a slight skew towards female respondents (53.8%) relative to male respondents (46.3%). We asked questions related to the sources of water supply, determinants of water access at the household and community level, household water demand management strategies in times of water scarcity, levels of trust between community leaders and citizens, and so forth.[4]

The second sampling approach involved selecting respondents for in-depth interviews, drawing on purposive sampling (Silverman, 2013). Selection of informants was based on their social/leadership role in the community, participation in water management committees and existing informal networks important for water management. In each community, we conducted three in-depth interviews; with one opinion leader, an assembly member and a local traditional

[4] The full survey instrument is available on our project website, www.xxx.xx (redacted for anonymity)

leader. We also conducted two focus group discussions in each community, one involving adult males and one female-only group, with participants between the ages of 18 and 35 years. These methods together give us a basis from which to examine differentiated water entitlements, and the potential points of connection to differentiated vulnerabilities to water scarcities in the two communities, to which we now turn.

3. RESULTS AND DISCUSSION

3.1 Demographic background of respondents

Table 1 provides a summary description of the socio-demographic characteristics of respondents in the two study communities. These include gender composition, age, ethnic origin, housing types, and educational attainment.

Table 1 Socio-demographic characteristics of study communities

	Community	
	Ga Mashie (N=120)	**Madina (N=80)**
Gender of Respondents (%)		
Male	39.2	46.3
Female	60.8	53.8
Average age		
Mean	38.80	35.33
Minimum	18.00	18.00
Maximum	76.00	65.00
Size of Household		
Mean	4.68	6.26
Minimum	1.00	1.00
Maximum	40.00	33.00
Ethic origin (%)		
Ga-Adangbe	78.3	16.3
Mole-Dagbani	1.7	10.0
Ewe	3.3	22.5
Akan	13.3	42.5
Foreigner	.8	3.8
Others	2.5	5.0
Level of education (%)		
None	13.3	8.8
Non-Formal Educ.	1.7	0.0
Primary	10.0	3.8
Junior Secondary School	41.7	23.8
Senior Secondary School	26.7	30.0
Comm/Voc/Technical	5.0	11.3
Post-secondary education	0.8	12.5
Housing types		
Compound	87.5	57.5
Detached	1.7	11.3
semi-detached	5.8	16.3
Apartment	4.2	13.8
Others	0.8	1.3

3.2 A portrait of water access routes in Ga Mashie and Madina

Figure 1 shows differences in our selected indicators for 'water entitlements' (the water sources that residents have ownership or command over) between Madina and Ga Mashie. One similarity in terms of water access is the high dependence on commercial water vending services as opposed to residents who depend on private water sources (owned and solely used by a household such as private water tank). On the other hand, a key difference in water access between the two communities is that in Ga Mashie more residents have access to water through the city's supply system - 20% and 13.3% for in-house and in-yard connections respectively, while in Madina none of the respondents reported access to piped water (Figure 1). Yet in Ga Mashie, the percentage of the respondents with direct access to piped water (33.3 %) is considerably lower than the overall estimates of piped water access in Accra which stands at 64.4% (GSS, 2012). The low reported use of in-house and in-yard connection in Ga Mashie, and none reported in Madina, shows that access to the piped infrastructure in both communities is poor, even as we also question the degree to which infrastructure relates to water access (let alone quality, affordability, or other considerations).

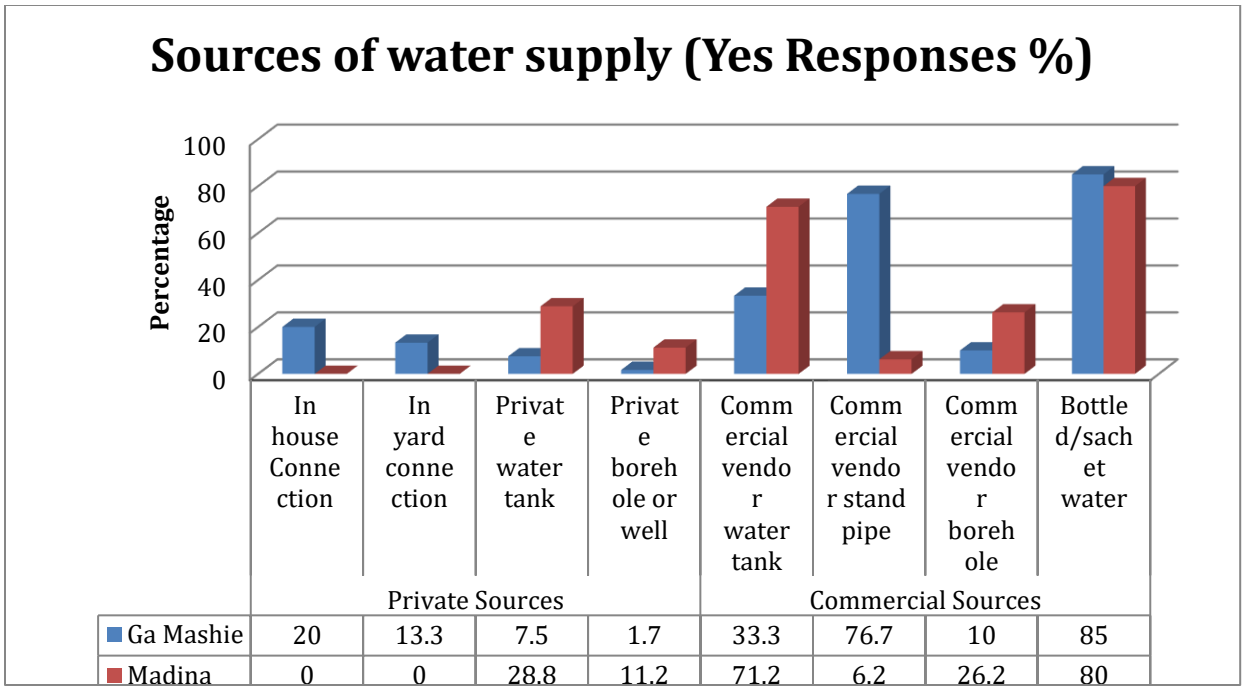


Figure 1 Differences in water provision and access between Ga Mashie and Madina. (Source: Fieldwork, 2013).

In Madina, commercial vendor water tanks, private water tanks and commercial vendor boreholes remain the dominant modes of water access (Figure 1). Reported use of sachet water was as high in both communities, 80% and 85%, in Madina and Ga Mashie, respectively (as a supplemental source—only 1.5% indicated sachet water as a primary source (Morinville, 2012; Stoler et al., 2012).

Given the considerable focus in the literature, and in indicators of access of the type cited in the introduction, we might expect that given that Ga Mashie has formal piped water[5], access to water there might be better as compared to Madina which is physically isolated from the city centre with few to no piped water connections. We might also expect, following from this, that not only

[5] Evidenced both by the ~30% with in-yard and in home connections, as well as the strong reliance on commercial vendor standpipes which are connected to the municipal system.

would Ga Mashie have better water access but might also be less vulnerable in times of stress. However, in the next section, we show that an entitlement approach provides a more complicated portrait of water access and linked vulnerabilities. These results are salient both given potential future water scarcities, and also given present conditions —94.2 percent of respondents in Ga Mashie, and 72.5 percent of respondents in Madina suggested that they experience interruptions in water supply on a weekly basis[6] in part due to a rationing schedule of the GWCL that was in effect until recently.

3.2 The role of entitlements and of endowments in water access between Madina and Ga Mashie.

Table 2 highlights a suite of entitlement factors, including individual endowments (either in the form of things acquired, such as land, or a capacity that enables them to acquire, such knowledge and certain rights) and social endowments (ability to command additional water sources through a variety of access routes such as belonging to a household, an ethnic group or community) which when combined with institutional arrangements, determine entitlements. These factors are categorized according to different themes, including socio-cultural, socio-economic, institutional, and location and infrastructural factors, which are listed together with associated indicators. We also highlight statistical statements (hypotheses and conclusions) based on the literature in relation to entitlement factors that we test in our study.

Table 2: An entitlement matrix showing determinants of water access

Bundle of Community	Hypothesized effects on water	Conclusions based on this

[6] Due to population growth and mismanagement in urban water supply, demand for water far exceeds the water production capabilities of the existing water treatment plants. This is a situation that changed only very recently, with new supply from a desalinisation plant (interviews, 2015). Until this time, the GWCL implemented a water rationing program for distributing water within the city. Estimates show that, 75% of Accra lacks 24-hour water access while another 10% has no access at all. The rationing programme varies geographically and socioeconomically by neighbourhood in Accra (see also Stoler et al., 2012).

Entitlement and/ Endowment	access based on literature and prior expectations before undertaking fieldwork	study
1. Community location and Infrastructure		
1.1 Availability of GWCL network	Neighbourhoods located in areas of the city with extensive piped network have better water access (Ainuson, 2010; Mahama et al., 2014).	Availability and connection of a community to GWCL does not necessarily enhance water access in a daily sense, given unreliable supply, and especially in times of shortage.
2. Socio-economic		
2.1 Income	High purchasing power will give better water access (Mahama et al., 2014; Stoler et al., 2012; Stoler et al., 2013).	Focus group participants in both communities considered incomes as the most significant determinant of water access.
2.2 Ownership of land/house	Land/house ownership enable the development of alternative water access schemes such as borehole and rainwater harvesting	In Madina, many house owners have built boreholes that serve both household needs and commercial purpose although this was less possible in Ga Mashie because of salinization of underground water as a result of nearness to the sea. In the focus group in both communities, participants intimated that house owners control rainwater collection where appropriate.
3. Socio-cultural		
3.1 Cultural/ethnic homogeneity	A neighbourhood with high ethnic homogeneity likely has better access to water (Bowles and Gintis, 2002) such as dependence of familiar networks through sharing and collective action to address water problems	High ethnic homogeneity does not readily translate into better water access. Evidence of water sharing exists in both communities

4. Community values		
4.1 Local leadership	Community leaders with a shared understanding of the status of water access with citizens can help drive intervention options that can enhance water in access	In Madina local leaders have a shared understanding of status of water access with citizens and lead in efforts to address water access. In Ga Mashie local leaders do not share the same understanding of water access with citizens and there is very little leadership drive in relation to water.

In the sections that follow, we make extensive reference to Table 2 to show the complexities in entitlements to water access, coping strategies and their relationship to potential community vulnerabilities. For instance, for infrastructure and socio-cultural homogeneity, we might expect that Ga Mashie is better off compared to Madina. However, the entitlements analysis allows us to see that in some ways, Ga Mashie may be even more vulnerable in times of water stress. The approach highlights that access in both communities is complex, in relation to the suite of variables and indicators listed.

3.2.1 Entitlements related to piped water infrastructure and its effects on community water access

As noted above, and in Figure 1, a key difference between the sites is that water vending dominates water access, particularly in Madina. Both male and female participants in the Madina focus group discussion suggested they can get water within reasonable distance from either a commercial borehole or commercial water tank.

> *"Those who sell borehole water and piped water from tanks are many. I can get water from many houses around here who sell water, particularly from the borehole. The borehole water is always available- they don't dry up compared to those who sell pipe water which will be closed sometimes" (female focus group participant in her thirties).*

While Ga Mashie technically has piped water infrastructure, the majority of our survey respondents (60.8%) nonetheless access their water from commercial vendors (Figure 1), a percentage similar to that of Madina (58.8%) (Figure 2). This reliance, despite the physical presence of the network, is linked to several factors, among them poverty, crowding, and inability to pay water bills. Echoing what many participants at a female focus group had said

about inability for most homes to connect to pipes in Ga Mashie, one participant, in her mid-thirties, stated:

> *"Like my sister said, the taps are for individuals who charge people at the tap side but we will need public taps where we can go to fetch water when we are not able to go to people's homes. Formerly, there used to be taps in most homes and also public pipes at the chief's gate, the park and other places. All those ones have been disconnected and few people with the means have done it in the homes. Not everyone will be able to put taps in their homes too. And when the taps stop flowing, people without taps are left in a pitiful situation. So, they should come and put up public taps for us. So, that we can be a bit comfortable."*

This insight relates directly to an entitlement understanding that resource access is as much a function of social and economic factors as much as it might be from the strict availability of resources (or in this case, infrastructure), meaning that people can lack secure access even when there is an abundance of the resource, resulting in a collapse in their means of commanding access to the resource (Leach et al., 1999; Sen, 1981). Although both communities rely on vendors, with implications for cost and ease of access (as discussed further in section 3.3), we observe that Madina has a well-developed water vending system compared to Ga Mashie where water vending is controlled by few people. Apart from infrastructure, what other factors mediate everyday water access in these communities?

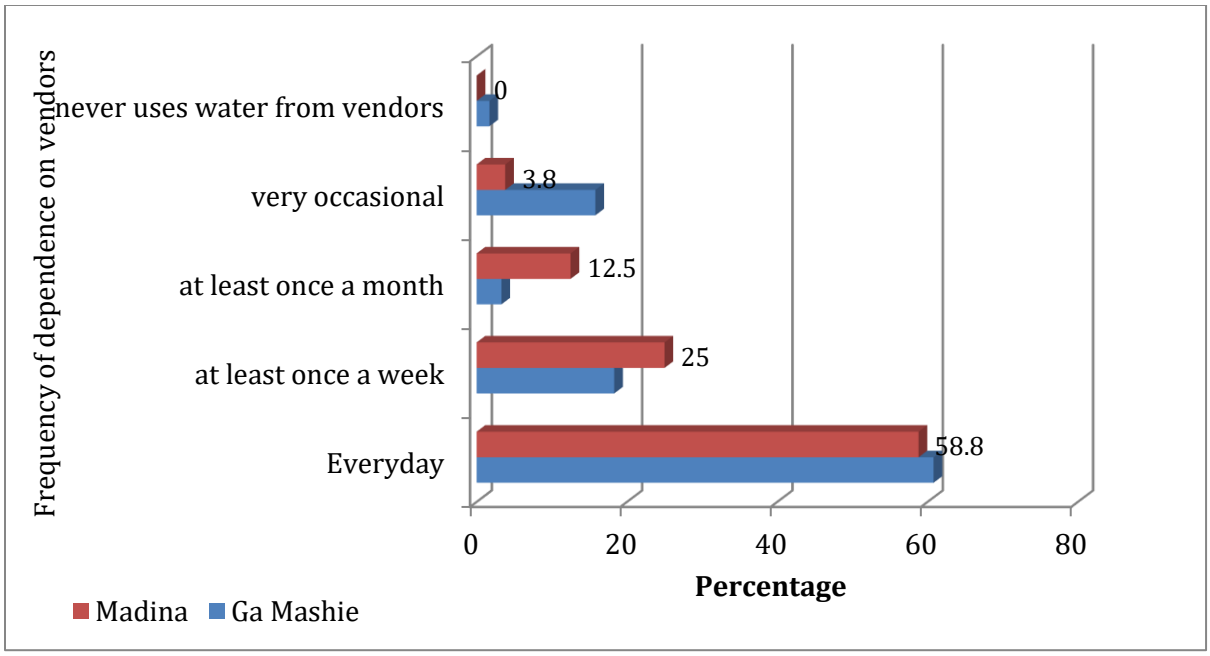


Figure 2 Frequency of dependence on vendors. (Source: Fieldwork, 2013).

3.2.2 Entitlements related to socio-economic variables and effects on community water access

The socio-economic factors we evaluated include income and ownership of land/house (Table 2)—both factors that were highlighted by participants in our focus groups, in interviews with community leaders, and also in the literature as important to securing water access (WHO/UNICEF, 2012), particularly in times of water stress (Stoler et al., 2012).

Given the considerable reliance on vending in Madina, with no direct access to piped water, there is a well-developed vending network. For instance, an Assembly man in Madina said:

> *My sister (referring to the researcher), you know Madina is home to a lot of tenants and traders… and they cannot buy water in bulk from the water tanker people. So, those who have money to invest in water vending helps the people a lot, a lot. People can easily walk to the next house to buy water as and when they need it- especially the borehole*

water is cheap.

Since a majority of residents in Madina are tenants (as revealed by our survey as well as other studies e.g.,(Ardayfio-Schandorf et al., 2012; GSS, 2012)) compared to Ga Mashie where majority of residents live in family houses, lack of ownership does appear to constrain access to water. Below are examples of the different ways that landlords influence water access, highlighting the importance of land and home ownership to water security.

> *Those with the land can dig a borehole but tenants cannot. The landlord can give his land to construct a well and sell to tenants. In my house, the landlord always has more water because he chooses to reserve some water for himself in case of shortage (Women's Focus group, Madina).*

> *Although the well is cheap, sometimes when there is shortage of piped water, the landlord can increase the price of the well water. This affects us a lot (Women's Focus group, Madina).*

In Madina, ownership of land/house has a clear impact on water access. House or landowners are the primary vendors of commercial tanker water, are able to invest in boreholes, and also control rainwater harvesting. Because of the informal nature of water vending, their activities, particularly pricing and quality are not under the radar of the regulator, PURC. The role of income and ownership of house/land in water access in Ga Mashie plays out in quite different ways. While focus group participants in Ga Mashie felt the same way as those in Madina in that ownership of land/house confers better water access, they also highlighted some key differences—notably, in Ga Mashie home ownership may also mean piped water access (thus access to water provided directly by GWCL, at what effectively are the lowest rates in the city).

However, in Ga Mashie, there is less of an opportunity to construct and use borehole water because of proximity of the community to the sea, posing risks of saltwater intrusion (in addition to space constraints). Echoing the insights offered by the community leader, focus group discussions also revealed that while many households have a physical connection to the city's network, they have been disconnected because of inability to pay monthly bills. People preferred to buy water daily, which is more flexible than the current billing system (section 3.3 provides further discussion on why most residents in Ga Mashie preferred communal vending standpipes). This, coupled with the high reliance on vendors, means that income is a key factor in determining entitlements. Speaking to the reliance on vendors, one local leader expressed that some people prefer to buy water from vendors rather than accessing water in their homes:

> *Every household had it (piped connection) but they were not paying the monthly bills and the accumulation (indebtedness) was too much so they (GWCL) will cut you off. In the compounds, who controls the water, who invests in the connection to the house is the problem. Just like electricity, the more people consume, the more expensive it becomes so you have problems of sharing among the members…if one household consumes less while the other households consume more, how do you share the cost?" … So, in most compound houses there were conflicts on water management so they disconnect and they buy outside….so people prefer buying from vendors so they have their peace.*

Here we see that while in theory direct piped access is possible, difficulties with sharing of bills or monitoring usage adds layers of complexity, leading people to resort to daily vendor access (a pattern that exists in Ga Mashie, where ironically the poor pay more for water on a per unit basis because they cannot afford the accumulated water bills, among other reasons). Another female focus group discussant in Ga Mashie also noted that infrastructure doesn't necessarily translate

into entitlements and secure access.

> *If everyone has a tap in his or her house it's the best. But it looks like the houses here are not for individuals. They are family houses and family issues are troublesome. Maybe I will say I will fix the tap, another will say I am her sister so I won't pay when I fetch. Me too I am not government and they will bring me a bill and I have to do it and sell. Someone will say she is selling the water. ... Or maybe when I am going for the monthly contributions for the bill, it will turn into a fight and they will close the tap… There are houses where their pipes have been closed because of money problems because this one will say she is my auntie so I won't pay. So, it's mostly monetary problems.*

These quotes highlight the importance of water governance (including specific management and payment regimes), beyond issues of merely extending piped infrastructure to impoverished and vulnerable communities. As such, the issues related to variable access, and entitlements, may be as much about the 'soft side' of water (payment schemes, subsidies, management practices) than the engineering/infrastructural side. In this case, if residents cannot pay and connect in terms that are flexible, the existence of water infrastructure will not translate into improved access. This insight is readily apparent with an entitlements approach, highlighting diverse modes of acquiring resources (Anand, 2013), and extending well beyond JMP's emphasis (which is translated by most national agencies as the mere presence of physical infrastructure), to include social considerations, pricing mechanisms, trust, or other elements that condition how the infrastructure is used, or not, as well as other means that residents might use to secure access.

3.2.3 The role of socio-cultural entitlements in water accessibility

In reference to the study communities, socio-cultural entitlements related to water access are evident in various forms and are largely related to the history and kinship relations (See Table 2 -

2.1 and 2.2). The hypothesis was that a community with greater cultural homogeneity will have better water access than a culturally (ethnically) heterogeneous community, largely due to a sense that one can engage kin networks to secure water access in times of scarcity. In this vein, high degrees of ethnic homogeneity could be linked to community networks, collective action and mutual support (Bowles and Gintis, 2002). Based on this premise, we might expect Ga Mashie to have stronger entitlements and coping strategies as compared with Madina. However, this result is not born out, as high cultural homogeneity in Ga Mashie does not necessarily translate into secure access.

To get at some of these socio-cultural dimensions, we examined the extent of water sharing in both communities by asking whether respondents share water within households or with their neighbours. The findings show that water sharing either at the communal, compound / household level was not exclusive to Ga Mashie, although in all instances, more respondents in Ga Mashie reported sharing water than Madina (Table 3). However, the difference in the extent of water sharing between the two communities is not significant.

Table 3. Forms of Household/Communal Water Sharing

	COMMUNITY	
	Ga Mashie (%) (N=120)	Madina (%) (N=80)
Do households share water in this compound?	54.2	36.2
Can you borrow water from your neighbour when you do not have water	42.0	27.8
Are you and your household able to rely on other households when you need water	45.8	42.5

In both communities, among those who reported sharing, this was either with relatives, neighbours, or both. In Ga Mashie since households live in compound houses, most forms of water sharing largely occur among relatives in extended family settings within the same compound. In Madina, most residents live in rented housing units either in compound / single unit houses with other families from different ethnic/kinship groups. Here, there was a tendency for water sharing to be done with community neighbours who could be living in different compound units.

Although we expected evidence of collective efforts to address water issues in Ga Mashie there was no evidence of this. On the other hand, in Madina, there was some evidence of collective action in the community specifically targeting improved water access. This included an institutionalized meeting of landlords within the community that meets regularly to find solutions to community problems including water. In one example, it was in the context of such meetings coordinated by local Assemblymen, that they agreed the community needed boreholes. An Assemblyman for Madina recounted:

> *"We discussed at various levels within the community and it was agreed we needed more boreholes. So, I had to channel the grievances of the community to the Assembly concerning the borehole. Now boreholes are going to be sunk everywhere to make water available. We are yet to witness the progress but I think it's a good step".*

The investment in the drilling of boreholes is primarily targeted at addressing the high cost of water sold by vendors. In Ga Mashie, although there are various opportunities for community level meetings through local chiefs, the local development authority (GAMADA) or other mechanisms, there was no evidence of such broad community participation, and similarly no evidence that water issues were being prioritized. As one element to potentially understand the

collective action in Madina, the next section highlights the resonance between community leaders and other community members in terms of what they stressed as important water access considerations.

3.2.4 Entitlements related to the community values and their effects on community water access

Based on our insights from the data, we found that the role of local leadership, particularly the ability to engage and identify with the concerns of their constituents, is particularly important for entitlements related to community values. First, it is important to emphasize that respondents in both communities ranked water as the most important social problem that needs to be addressed (The Kendell W was used to measure the level of agreement among respondents within each community)[7]. However, from the perspective of local public officials that we spoke to in both communities, there were key differences in how they understood and characterised water access. In Madina, two Assemblymen who serve different electoral areas within the community acknowledged that there are problems with water accessibility and to address it requires collective effort.

For instance, one Assemblyman in Madina remarked:

> *It's very bad. The current water situation in Madina has been in existence since time immemorial… but you know my sister for water, individuals cannot solve. It takes money to get it. So, the community can only think of a bore hole and the Assembly member needs to communicate the issue to the Assembly and we as Assembly members we have done our best and the government is currently working on that. In the meantime, we need some*

[7] We obtained a W value of 0.235 and 0.368 for Madina and Ga Mashie respectively and a p-value of 0.000 for both communities at a significance level of 0.05.

measure to address it.

Although the efficacy of the interventions, such as the sinking of boreholes, is beyond the scope of this study, these attempts illustrate the role of community leadership in enhancing collaboration between different agencies and which can inspire community members as well as legitimize their activities (Mitlin, 2013), with the potential to enhance the capabilities and functions of the poor (Ibrahim, 2006).

Meanwhile, in Ga Mashie, local leaders somehow tended to discount the existence of any water related problems, instead suggesting that they had adequate infrastructure and service and that the only issue is with the usual interruptions due to the rationing by the water company. An Assemblyman there was asked about water accessibility and he responded:

Oh, water, as for water we have no problem in this community. If you want to talk about water then you can go to Adenta, they have water problem because they don't have the pipes. In Ga Mashie, water is not our problem.

However, when we pursued further and suggested to him that our respondents complained about the water situation in the community he said;

Oh, there is water; just that sometimes it does not flow but this hardly occurs. As long as you can get water from the vendors and other nearby places it's not a problem.

Thus, for the Assemblyman, if one can access water, the means through which the water is accessed does not matter. This view was shared by the head of GAMADA who also said:

There is water but I know most of them buy from vendors who sell to them. Thus, it's only the cost that may be a problem for some.

The disconnect between the leadership of Ga Mashie and its citizens in terms of what current

water concerns represents another important consideration that could affect entitlement functions. In Madina, to the degree that residents have the same concerns as local leaders, this can be a foundation to enhance trust and to build collaboration towards addressing such problems. In Ga Mashie, interviews highlighted a disconnect between perceptions of the local officials and the public. From an entitlement perspective, we can see how such disconnects might impinge on the ability of a community to engage and address key concerns. On the other hand, we observe that the level of trust in local leaders such as Assemblymen and Members of Parliament to address water issues for both Madina and Ga Mashie were both low in our survey (Table 4) suggesting that citizens expect more from the political leadership than is currently available.

Table 4 Perceptions of community member's expectation of various actors for addressing their water needs

Who do you trust has more influence to advocate for the water needs of this community	**Research Location**		
	Ga-Mashie	Madina	**Total**
MP	38.3	27.5	34.0
Assemblyman/woman	25.0	35.0	29.0
Chief	9.2	1.3	6.0
Business and firms	1.7	0.0	1.0
Other opinion leaders	5.0	12.5	18.0
Myself/ Relative/ Friend	1.7	6.3	3.5
I can't tell	13.3	13.8	13.5
Nobody	5.8	3.6	5.0
Total	**100.0**	**100.0**	**100.0**

3.3 Relationship between community water entitlements and vulnerability

To summarize the above, we find that despite the presence of physical piped infrastructure, high cultural homogeneity and other factors that might lead one to expect that residents in Ga Mashie are better able to secure access to water as compared to their counterparts in Madina, this is not necessarily the case. In fact, the well-developed and flexible vendor networks and the correspondence between community views and that of the local leaders potentially provide clues that entitlements could be stronger in Madina. Here we consider in more detail how these specific entitlements might connect to differentiated vulnerabilities.

With the term vulnerability, we refer to the susceptibility of residents to adverse effects of diminished water access or conditions, i.e. intermittent supply (rationing schedule), high cost, time spent in getting access to water, and so forth. Our results show that, while it is not easy to say which community is more vulnerable than the other, depending on which aspect of water entitlement we discuss, different levels of vulnerability emerge. In our survey, when asked about times of water stress, residents in Ga Mashie suggest longer time spent accessing water and higher incidence of conflicts at water collection points as compared with Madina. On the other hand, cost of water and ability to access water from neighbouring communities appears to make Ga Mashie less vulnerable as compared with Madina. Finally, in terms of water quality, both communities are likely to be vulnerable. To illustrate this, we show how both communities cope with water stress which manifests in the form of water shortages. Figure 3 shows the coping strategies employed by survey respondents in times of water stress.

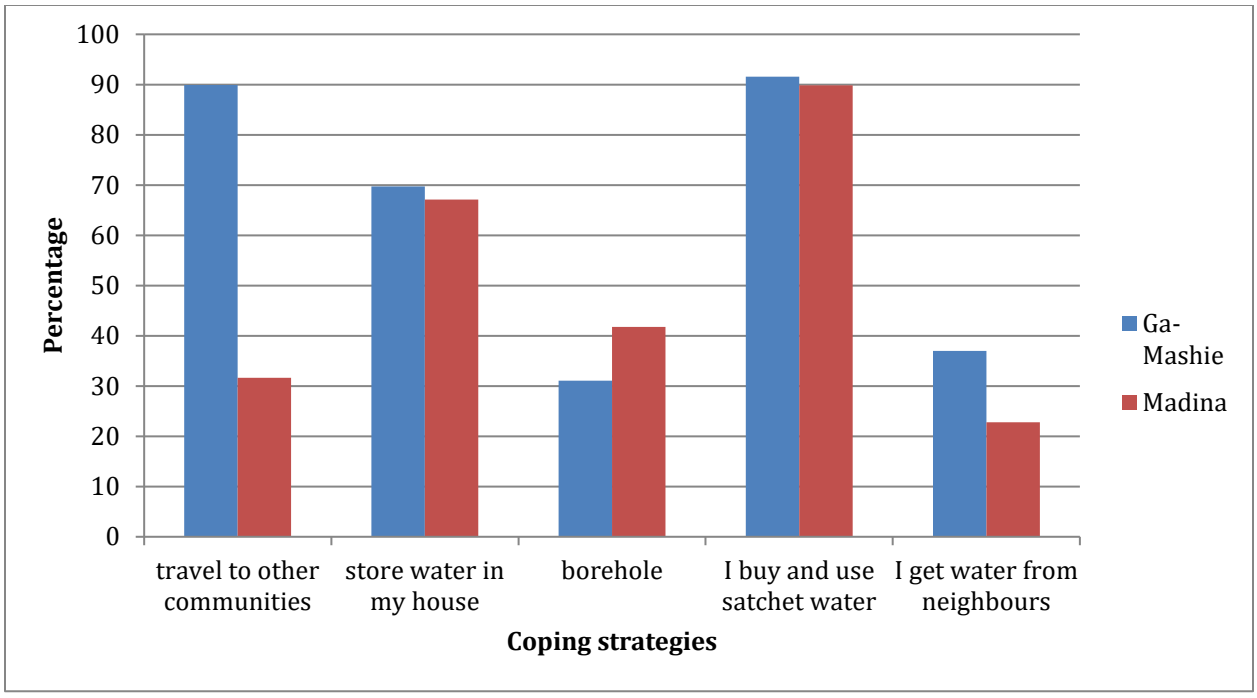


Figure 3 Coping strategies to access water in the absence of water from regular water sources for domestic use. (Source: Fieldwork, 2013).

From Figure 3, it can be observed in both communities that water storage, use of borehole water, use of sachet water and borrowing water from neighbours are the main coping strategies used by residents. Although water storage is common in both communities, in Ga Mashie, we observed poor water storage practices with potential implications for water quality. For instance, stored water by both vendors and households were placed along major streets because of crowding in house compounds. During times of shortage, vendors sell water from stored water littered along streets sometimes with poor coverings. In the Ga Mashie focus group, participants expressed various concerns about the quality of stored water.

> *I have water in containers that is over 2 months old. I have placed camphor in it. I do not want to use it because, I am scared that the tap will stop flowing and I won't have any*

water. But when I look under the water, I realize it is not good at all.

Thus, although Ga Mashie is captured as obtaining water from one of the high-quality sources (piped water from the GWCL network), the manner and form in which the water is stored and or delivered could compromise the quality of the water and could pose considerable health risks. These risks likely occur in Madina as well, as water passes through several storage facilities before it is consumed, from the GWCL, to tanker operators, and to community vendors and storage holding (cf. Songsore, (2010), shows that practices of unhygienic water handling and storage is linked to poor health outcomes such as diarrhoea). However, it is possible that the regular reliance on storage in Madina means that the infrastructure and practices are more systematized, while the ad hoc reliance on water storage in Ga Mashie may mean that the practices are less established.

During times of water stress in Ga Mashie, over 90 percent of respondents indicated they are able to travel to nearby communities to access water while just 30 percent of respondents in Madina similarly do so (Figure 3). In Madina, the situation is most likely one of the water tankers coming directly to them, or relatively wealthy residents travelling to further localities to access water. On the other hand, in Ga Mashie, residents might go on their own to nearby communities because that community is in the part of the city with extensive piped water coverage. Given the rationing schedule and similar considerations, while Ga Mashie may be without water, other nearby communities may have water. This is not the case in Madina where other neighbouring communities also lack access to piped water.

Somewhat ironically, from interviews and observations we learn that in some ways, Madina is less vulnerable in terms of water stress, precisely due to well-established vendor networks and relationships. In brief, regular customers in Madina might be prioritized in times of water stress,

while residents in Ga Mashie might be lower down in priority when the rationing schedule or low water availability makes access more difficult. The relative ease of access to water vendors in Madina also affects the time it takes to access water. For instance, we asked residents in both communities the time it takes to fetch water from vendors and there were significant differences in time spent to access water (Table 5), with those in Ga Mashie reporting comparatively more time (for both minimum and maximum times) to access water. The chi square analysis shows a p value of 0.002, surpassing the 5% significance level.

Table 5 Time spent getting water (in minutes)

Statistics	Community	
	Ga Mashie	Madina
Mean	35.56	9.68
Maximum	300	40
Minimum	1	1
Chi square test of time spent to access water		
X^2	46.210[b]	
Significance	0.002	

Table 6 also provides a summary of the price range of water in both communities. First, it is important to emphasize that, given greater access to piped infrastructure, unless there are interruptions in water supply, the cost of water in Ga Mashie is cheaper compared to that of Madina. As shown in Table 6, in Ga Mashie the cost of water is relatively low; below 0.9 $US (0.20 Gh pesewas) per jerry can (a jerry can is equivalent to 50 litres). However, the price can shoot up by more than 100% when there are interruptions in supply. On the other hand, in Madina, about 69% of respondents reported that the price per jerrycan of water is between 0.20 – 0.24 $US (0.40 – 0.50 Gh pesewas). In equivalent terms, this means the price of water per Jerrycan in Madina is always similar to the times when the price goes up in Ga Mashie. Stoler et al. *(*2012) reported that in Accra, many low income and slum residents pay vendors close to eight times the GWCL utility price. Thus, in terms of cost of water, there is a higher burden on residents of Madina, adding yet another dimension for consideration as to the complex comparative landscape of vulnerability.

Table 6 Different forms of water burden between Ga Mashie and Madina

	Community		
Burdens in water Access	Ga Mashie	Madina	Total
Cost of water per jerry can (US dollars)[8]			
less than 0.9	52.5	8.8	35.0
0.9	35.0	5.0	23.0
0.14	9.2	17.5	12.5
0.20	2.5	33.8	15.0

[8] Cost is in US dollars converted from Ghana cedis. We used the exchange rate of 1 GH Cedis – 0.48 USD as at the end of June 2013 when the survey was conducted.

0.24	0.8	35.0	14.5
Total	100	100	100

Chi square test of cost of water between Madina and Ga Mashie

X^2	117.593[a]
Significance	0.000

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.00.

In Figure 3, we also observe that sharing is used as a form of coping strategy particularly in Ga Mashie. As noted already, while in Madina respondents tend to share water with others outside their house compounds, in Ga Mashie we observed sharing occurred mostly within compound house settings with extended family members. This again has interesting implications for potential vulnerability—in this case, in times of water shortage it is possible that those with an extensive network of connections in different areas of the neighbourhood might benefit from more access options. In contrast, those sharing in the same compound or section of the neighbourhood in Ga Mashie might not be able to navigate water inaccess as effectively. Although earlier studies such as (Nyarko et al., 2008) had also suggested that in Accra obtaining water from neighbours remain the main coping strategy for low income households, the above discussion provides a more nuanced understanding of how and whom water is shared, and what the implications might be.

The final dimension of community vulnerability in relation to water entitlement is quarrelling and conflicts particularly around water collection points. Since both communities' access water from vendors, there is a high tendency for residents to congregate at water collection points. In Table 7, we show the responses that were given when respondents were asked if people quarrel / fight in their community because of inadequate water supply / when there is a water shortage.

Table 7 Different forms of community vulnerability in relation to water access

	Research Location		
Incidence of fights at water collection points	Ga-Mashie	Madina	Total
No	18 (15.0%)	46 (57.5%)	64 (32.0%)
Yes	102 (85.0%)	34 (42.5%)	136 (68.0%)
Total	120 (100.0%)	80 (100%)	200 (100%)
Chi square test of quarrying			
X^2	39.844[a]		
Significance	0.000		

More residents in Ga Mashie complained of fighting at water collection points compared with Madina. The result of the chi square analysis shows a significant difference between the two communities in terms of fighting / conflicts at water collection points—in Ga Mashie residents are more prone to conflicts at water collection points.[9]

[9] While we don't detail all the possible reasons for this here, a host of factors could be at play in this result, including the fact that there are relatively fewer water collection points in Ga Mashie (as compared with Madina). In the focus group discussions, it was also suggested that since people live with their kinsmen in Ga Mashie, the tendency for vendors to show favoritism by serving their own kin first is high. If this occurs, conflict might ensue. A final, and more controversial point, relates to cultural associations among the Ga as 'fighters', including that Ga Mashie is a center for grooming boxers in Ghana, and thus fighting might be encouraged or normalized, particularly among young males (Quarcoopome, 1993).

4. CONCLUSION AND POLICY IMPLICATIONS

In the context of Accra's low-income and unserved communities, the WHOs definition of improved water access fails to capture how and what access entails. As argued by Mahama et al. (2014), in Accra, Ghana, restricting access to water to mean only coverage is insufficient to reflect the multidimensional nature of access since issues of water quality, reliability of the supply of water and cost are key dimensions. Relying on an entitlements approach, our study captures some of the more nuanced dimensions of access, and allows us to more fully also think through the connections to potential vulnerabilities. As we have shown through comparison of two communities in Accra, household level water access is mediated by a bundle of endowments including socio-cultural, socio-economic, community values, and infrastructural conditions. Understanding water access through an entitlement approach reveals the how and what in access to water, highlighting key features which are often glossed over with official statistics, or through focus on which parts of the city enjoy access to piped infrastructure.

Although the mere presence of piped water infrastructure does not necessarily connote better access to piped water connections, the presence of piped water infrastructure in a community can certainly enhance water access and conditions in some instances. Since direct piped water connections often means more affordable water, as well as high quality water (due to lack of multiple mediators), this offers good reason to continue to push for extension of infrastructure. That said, the direct comparison between two communities in Accra, one with piped access, and one without, shows that access to piped water doesn't necessarily track against reduced vulnerability, particularly in times of shortage. In fact, somewhat counter intuitively, several of our results suggest that residents in Madina may be less vulnerable to shortages, while residents

in Ga Mashie face particular constraints and forms of entitlement failure (e.g. through familial and community conflict, inability to pay connection fees, and lack of priority among tankers and vendors in the broader Accra region). However, given the multiple connections involved with water vending and poor handling of water, water quality related risks can be high in both communities (Songsore, 2008), but perhaps especially in Madina. A study by Songsore (2008) showed that residents with direct access to piped water in Accra recorded a lower prevalence of diarrhoea while those who access water through communal standpipes and vendor services had a higher prevalence of the illness. Because Accra suffers from regular epidemics of cholera and other water-borne diseases (Mahama et al., 2014), there is a clear need to pay attention to the quality of water available for drinking and for other domestic usages. Also, the degree of correspondence between resident priorities and those of community leaders also highlights entitlement challenges for locales such as Ga Mashie, where leaders do not acknowledge challenges that are viewed as important in the community (affecting trust, and potential responses). While we have emphasized some of the counterintuitive ways that Ga Mashie may be particularly vulnerable, against what might be anticipated, we also have attempted to show a complex portrait, where we cannot easily say that one community is more or less vulnerable than *another*.

The discussions above present important implications for the dominant narratives at the global and national levels on what access entails and what approaches might work better particularly in low-income settings. While the tendency for reforms and investments in the water sector in Accra has focused on large scale infrastructure improvement, in areas such as Ga Mashie different interventions that focus on improved water handling and storage to address quality

issues, the number and location of access points, pricing schema for piped infrastructure, or other efforts focused on maintaining access during times of water stress might be needed. This could involve expanding access through opening new water vending points in a form of partnership between the water company, government and the community to enhance its sustainability and resilience. This is important to reduce the long waiting times and the likelihood of conflict at water collection points, and minimize the travel distances in search for water in times of shortage. Building partnerships for water and improving water access is very important since good local governance is critical to getting the best out of private as well as public providers (McGranahan and Satterthwaite, 2006).

Madina's status as an underserved community suggests that, in the long term, the push for expanding piped water infrastructure should continue. This is particularly so to deal with affordability and quality concerns. On the other hand, the success of private vendor initiatives in the community suggests that with the right policies and partnerships, government and other stakeholders can introduce model community standpipes or boreholes that would enable wider access and reduce the high cost of water –both major ongoing concerns in Madina. There is evidence to suggest that, in many locations, working with and through such independent providers can be a cheaper and effective way of improving and extending provision for water than conventional public-sector provision or reliance on large-scale private (often international) firms (Wutich et al., 2016; McGranahan and Satterthwaite, 2006). However, we do not naively suggest that small scale and artisanal providers are the 'answer' as we recognize many shortfalls of this approach (Keener et al., 2010; McGranahan and Satterthwaite, 2006). On this point, we agree with Morinville (2012, p. 48) that "there is room, and a growing need, for critical and

empirical explorations of SPSPs (Small Scale Private Service Providers) and their unfolding in specific localities." We also consider that there is reason to critically rethink the multiple goals of many current water policies and discourses, from extension of access, affordability, to efficiency and reductions of non-revenue water, that might necessarily work at cross-purposes (cf. Harris, 2013). As well, our findings have reinforced the point that care must be taken in proposals for water governance or management reforms in any setting since different localities might call for different responses (Mahama et al., 2014; Morinville and Rodina, 2013). The role of government in managing multi-provider water systems that benefit the poor might also be critically rethought to focus on facilitating the roles and functions of various actors, and to provide an institutional and regulatory framework in support of key needs (Adams and Zulu, 2015; Akbar et al., 2007). This sort of engaged and multi-actor approach might be especially needed to extend safe access in the short term to informal settlements, while the long-term goal might remain extending infrastructure to all communities.

At the metropolitan wide-level of Accra, while extending piped water infrastructure to all neighbourhoods may sound ideal, such infrastructure investments often do not extend services or improve quality where it is most needed. It is important that governments, including municipal or utility managers, have a thorough understanding of locally specific challenges that affect water access and reduce vulnerabilities. We have found an entitlement perspective to be particularly fruitful to show the specific bundles of entitlements that influence water access, and associated vulnerabilities. A focus on entitlements invites consideration not only of quantity, quality, regularity, and proximity to water access (often the focus of conventional assessment approaches) but also the culture and identity, social relations, and security that affects access,

and by extension well-being (Mehta, 2006). More so, an entitlement perspective supports the view that effective solutions for communities in need of improved water access needs to transcend technical factors to include a balanced consideration of natural and social factors (Brown and Pena, 2016).

In our case study sites, we have shown that, the bundle of endowment factors which include socio-cultural, socio-economic, values, and infrastructural factors and their associated variables enables a multi-dimensional framework to explain community and household level factors that mediate access to and quality of water and account for water-related vulnerabilities. While the data requirements for such an approach can be extensive, such approaches offer a necessary complement to the narrow quantitative studies that highlight only basic access, or the presence of infrastructure, that are often the sole focus and platform for policy at national and global scales.

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