No Pipes, Big Problem: Water Scarcity and Political Participation in Africa

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This project explores the effects of water access on political participation in Africa using data from Round 7 of the Afrobarometer survey.¹ More specifically, it seeks to evaluate the effect of water scarcity on participation, the effect of water infrastructure on participation, and whether a person's participation in political activities is related to their actual water scarcity (measured as self-reported lack of access) and/or perceptions of water as a service that should be delivered by the government. For example, an individual in an affluent neighborhood where in-house infrastructure reliably delivers water would likely react with anger at water scarcity. If such scarcity drags on or becomes more frequent, that anger could be directed at local authorities, regional politicians, or the national government, whomever is responsible for the correct functioning of infrastructure. In contrast, communities in rural areas or communities with fewer resources (including, perhaps, a lack of water infrastructure) may not have this same expectation of service delivery by political figures. It follows that water scarcity could become divorced from political participation, with increasing scarcity not resulting in increasing participation to the same degree as it might for those with higher expectations. In this way, the project seeks to identify whether self-reported political participation is higher for those who have no water infrastructure and suffer from an actual lack of water or among those who have water infrastructure but similarly do not have access to water.

Introduction

My analysis of the data yields three interesting results: that those experiencing scarcity are more likely to participate than those not experiencing scarcity, regardless of the presence of infrastructure; that those without infrastructure are more likely to participate than those with

¹ Round 7 (2019) includes the following states: Benin, Botswana, Burkina Faso, Cameroon, Cabo Verde, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, São Tomé and Principe, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe.

infrastructure, regardless of scarcity; and that the expectation of water access, measured by the presence of piped water infrastructure,² does not increase the political salience of actual water scarcity. This could suggest that resource deprivation is not affected by prior expectation and/or that the presence of water infrastructure is a more important factor influencing political participation than the scarcity of water itself. In turn, this could reflect a greater association between infrastructure and politics in the eyes of members of the public than an association between water, political participation, and the national government.

Literature Review³

The socio-economic role of water

Water is not just an extractable and consumable resource, but a basic necessity. While this may seem like a truism, it is increasingly important to remind policymakers that basic necessities are not, in fact, commodities. Water is a powerful catalyst of social action, an important indicator of inequality, and a crucial aspect of "lived poverty" (Mattes 2008). In countries and communities experiencing water scarcity, it is integral to political processes. It also functions as a class indicator: the wealthy consume far more water than the poor, a dynamic which is often exacerbated during times of water crisis (Alfonso, Kazama, and Takizawa 2022). Indeed, even solutions to curb water shortages can perpetuate existing inequality and have profoundly different impacts across socio-economic strata (Calverly and Walther 2022). This necessitates an interrogation and understanding of water which transcends water as a utility; water as measured by miles of channels; water as a monthly bill, weekly expense, or daily struggle. Access is about

² A note on terminology: the phrase "piped water" and "water infrastructure" are used interchangeably throughout the paper. "Piped water" should not be read to imply the presence of actual water, but rather the presence of water pipes.

³ Please note that the literature review which was submitted as a component of my international studies senior capstone is adapted from the literature review presented here following discussion with and permission from both instructors.

far more than physical infrastructure; reliable water is not dependent on pipes and faucets alone. It requires social and political processes to facilitate equitable and consistent supply (Calverly and Walther 2022; Immurana et al. 2022).

Demand for more and better water infrastructure in African states is concentrated in lower-income areas, with wealthier communities tending to name water as a lower government priority than other infrastructure issues (Leo, Ramachandran, and Morello 2015). Understanding the disparate and competing role water access plays between different socio-economic strata is the groundwork for exploring the role of expectation and service delivery in resource scarcity and political participation. This inequality of infrastructure between low- and high-income areas is just as important as absolute water deprivation, as perceptions of relative deprivation are strongly associated with reduced trust in government, although more research is necessary (Isbell 2023). This could be reflected in expectations of service delivery: does deprivation relative to individual/community expectations and the reality of others outweigh absolute deprivation? This project touches on this question by looking at measures of political action vis-à-vis deprivation relative to expectations.

It is also important to note the vital role of self-supplied and self-regulated water outside the coverage of modern water systems. These community self-help solutions are often the result of unequal and inconsistent coverage by water delivery systems (Dakyaga, Schramm, and Kyessi 2022). For example, evidence from Nigeria supports the idea that a wide swath of the African public may rely on community water solutions. As of 2022, urban areas in southwest Nigeria reported a 5% access rate to piped water; 66% of households rely on private boreholes or wells and a further 29% require off-site water access – defined as having to travel outside the household to the nearest available water source, usually a communal well or pump (Oyerinde

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and Jacobs 2022). The resource investment of communities and individuals into artisanal water solutions, although smaller than state investment in water delivery, is relatively more effective in improving water access (Oyerinde and Jacobs 2022; Bodea and LeBas 2014). Some scholars have noted that this situation, in which collective or individual action supplements or replaces the role of the government, could have a negative effect on political participation by weakening the bonds between the public and the state (Bodea and LeBas 2014). Furthermore, this self-supply does not automatically bridge the inequalities created by spotty infrastructure coverage. Self-supply can emphasize local power differences and reproduce marginalization on a community level (Dakyaga, Schramm, and Kyessi 2022).

However, not all communities are able to effectively create self-help solutions when modern water infrastructure fails or did not exist in the first place. Evidence from South Africa indicates that many poor communities are extremely reliant on government water delivery (Zerihun and Meshigo 2022). This has led some scholars to call for central governments to play a reduced role in the water supply and allow local governments to be the primary leaders in service delivery (Mamokhere, Musitha, and Netshidzivhani 2021). In Ecuador, the national government has devolved control over water as a resource for direct human consumption (i.e., drinking water) to local governments, building on a constitution which enshrines water as a human right and a legal structure which resists privatization (Wingfield et al. 2021). This local-first perspective is not unique to the water sector. Analysis of Ethiopia's healthcare system concludes that providing services and building a strong base of political participation both start at the local level (Croke 2020). These cases paint a complicated picture of potential relationships between service delivery and political participation.⁴

⁴ As referenced in the previous footnote, there is a large body of literature and research which explores the political economy of water and the role of water in community and grassroots movements. It is outside the scope of this paper to include a full discussion of these important contributions to our understanding of water struggle. For further

Linkages between service delivery and political participation

According to survey data from the Afrobarometer, the public in 34 African countries name transportation, water, and sanitation infrastructure more frequently than any other service as their top problems that should be addressed by the government (Leo, Ramachandran, and Morello 2015). In fact, even in times of large-scale crisis, citizens are more likely to perceive a crisis as a crisis of unmet basic needs, as opposed to being overly concerned with national-level challenges. In Mali, for example, survey respondents in rural areas were more likely to name challenges related to basic resources (including water) as the most important factor in a crisis, not the national political instability, civil war, or insurgency which were affecting Mali at the time (Bleck and Michelitch 2015). These two conclusions from the literature – that water and sanitation is a top policy priority of the public in many African countries and that a lack of access to water is a prevailing theme in the definition of "crisis" in times of conflict or instability – suggest that the study of resource provision and political participation is relevant even in countries experiencing instability and conflict.

Although satisfaction with basic services is recognized as a key component of creating a stable base of support for democratic systems, there is a lack of empirical analysis concerning the relationship between government service delivery and popular political participation, especially voting (Bratton 2006; de Kadt and Lieberman 2015; Isaksson 2010). However, certain studies paint with a broad brush, claiming that a lack of services creates more political action as communities organize politically in response to basic needs going unmet. This is increasingly true as political efficacy, defined as the degree to which people believe that their government is

research, the author suggests seeing *The Global Economy, Resource Conflicts, and Transnational Social Movements: Dimensions of Resistance to Water Privatization* by Dr. Caitlin Schroering (2021) for a rigorous and critical exploration of the topic.

responsive to their actions, increases (Hern 2016). This appears to contrast with the findings from the 2014 study conducted by Bodea and LeBas, emphasizing the need for further research. Alternatively, some researchers have claimed that exposure to public services, regardless of quality, increases political participation. In Mali, respondents in rural areas were more likely to see traditional chiefs and community leaders as the most important source of authority and were less likely to receive state-provided services. Those citizens with direct contact to the state (i.e., enrolling their child in a public school) were more likely to engage in activities such as voting and contacting elected representatives (Bleck and Michelitch 2015).

Although the focus of this paper is on water delivery and participation, there are valuable lessons to be learned from studies covering the political impact of other services. Education is often raised as an important service in regards to political participation, but will not be covered extensively by this review. Education services are inherently different from physical resource services such as water and electricity. However, it is worth noting that although education seems to have a positive effect on political literacy and a willingness to engage in political conversations, education may not have as strong a connection with political participation as prevailing assumptions might suggest (Kam and Palmer 2008; Mattes and Mughogho 2009). Interestingly, there appears to be little literature on the role popular education may play on water struggles in Africa, although popular education has played a critical role in water struggles elsewhere in the world (see Schroering 2021).

In a study using Afrobarometer data to examine the effect of electricity provisioning on political participation, Brass, Harris, and MacLean (2019) found that greater access to electricity led to less political participation. Those with sufficient access to electricity were more likely to have their basic needs met, and therefore disincentivized to participate politically. More

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electricity may mean more opportunities for leisure, such as watching television or listening to the radio, further distracting those with access from various forms of political participation. These results are supported by a second study analyzing the effect of changes in service coverage on support for incumbent politicians in South Africa, Namibia, Botswana, and Lesotho (de Kadt and Lieberman 2015). The research demonstrated a decrease in voter turnout for incumbent politicians when service coverage improved and suggested that greater service coverage increased contact with corruption, making voters less likely to support the current regime. The findings of these studies are consistent with research suggesting that higher levels of individual resources dampen political participation instead of enabling it (Isaksson 2010).

Other research has found that poverty, although not linked to an ideological or philosophical attachment to democracy, frequently leads to greater likelihood of political participation (Bratton 2006). These ideas are further reinforced by a study conducted in Ghana, which made the case that failure to provide services (in this case roads) can lead to greater political participation as the public seeks to hold elected leaders accountable (Harding 2015). An interesting parallel could emerge with water. As electricity access becomes more prolific, it becomes more individualized. Those with means, upon gaining access to electricity, are more likely to enjoy electricity individually– perhaps an in-home television. In more resource-deprived settings, electricity consumption is a community activity. Sports may be enjoyed on the television in a bar or restaurant, for example (Olken 2009; Venter and van Vuuren 2000). In poorer areas, water, like electricity, might be accessed communaly. Instead of each household or compound drawing water from an individual source, such as a private pump or tap, a community pump or well might be the primary source of water for the community. In resource-deprived or economically marginalized communities, the absence of water could be perceived as a collective problem requiring collective action. This could contrast with more wealthy areas, where water is drawn from an in-house tap or private well and the issue of water scarcity might be handled on a more individual level. As many measures of participation involve group action, this lends urgency to the work in this paper to explore the effects of water deprivation on political participation.

Studies which focus on taxation, a basic and important form of engagement with the state, have had varying results. Evidence from Nigeria points to the idea that paying taxes is more likely to occur when residents receive quality services, but only those services they can easily attribute to government action (Bodea and LeBas 2014). This idea is bolstered by evidence from Kenya, where researchers found that only easily attributable services are likely to lead to higher levels of political participation (Harding and Stasavage 2014). Other studies have found that providing electricity services has a strong positive impact on tax compliance (Blimpo et al. 2018). The resulting policy implication is that regimes will implement services they believe can be easily attributed to them, and ignore ones which are less attributable (Harding and Stasavage 2014). This raises the notable point that different forms of service delivery may impact different forms of political participation in different ways. Existing research indicates that access to certain services (water, electricity, etc.) may decrease political participation through voting, but other services (roads and education) may increase political participation through paying taxes.

Some studies have found that voting may not be the most effective measure of political participation in the African context, suggesting that it could be important to use multiple dependent variables to measure participation (Brass, Harris, and MacLean 2019). There are also tangential findings in the study focusing on southern Africa which lend support to the hypothesis proposed by this project. The study found that service provisioning may heighten expectations of

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government and elected leaders, prompting voters to look for alternatives to their current political leadership. This may cause political parties to avoid improving infrastructure or extending services because better services may result in strengthening political opposition (de Kadt and Lieberman 2015). However, there does not seem to be a large amount of literature on linkages between universal basic water provisioning and political participation. This may support the idea that politicians may benefit from allowing expectations for good service delivery to erode instead of seeking to improve services, leading to an eventual decline in political participation. This is especially true in areas where the state may have had a minimal presence to begin with (Bleck and Michelitch 2015). This idea may also be supported in research related to relative deprivation, where one study found that heightened feelings of both relative deprivation and relative advantage had a dampening effect on trust in government (Isbell 2022).

Water and political participation

The same study that found a negative relationship between increased electricity access and political participation also suggested that greater access to water could have a dampening effect on political participation, but the study notes that these results cannot be universally applied to other services and more research is necessary (Brass, Harris, and MacLean 2019). It is clear that in many cases of shortage and crisis, water is a flashpoint for civil unrest and protest. In South Africa, poor water infrastructure and resulting crises have sparked waves of public action (Masiangoako, Khunou, and Potter 2022; Tariq and Zhang 2021). These are not just protests against government failures, but against public-private partnerships (PPPs) and the failures of corporate actors in delivering water services, notably in India in response to the disastrous Latur Water Supply PPP project (Tariq and Zhang 2021). Increasingly, conflict over water has involved large corporations seeking to extract water resources from local communities, often causing shortages and severe pollution (Pointet 2022; Jaffee and Case 2018).

The prevailing wisdom among neoliberal institutions is that raw material extraction is a viable path to development for underdeveloped African states, a perspective which could increasingly encompass water. This view is parroted by some academics (Mlambo 2022). The question can be made even more base. The very concept of "development" as it relies on Western econometrics is a somewhat arbitrary and extremely narrow system which was violently imposed onto many African states by European imperialism (Taylor 2015). Increasingly, PPPs are the headlining mechanism for neoliberal extractionism. In a review of 35 failed PPP projects in the water sector, Zhang and Tariq (2020) found that water PPPs most frequently failed due to three broad reasons: political demand for de-privatization, illicit profit gain from the private sector, or significant service cost increases for the public leading to protest against the PPP or the private partner. As the prevailing prescriptions for development– privatization, austerity, and free trade – do little to help (and may even harm) local communities, understanding linkages between water scarcity, delivery, and political participation is increasingly critical.

This is a critical question of economic policy, as water access has clearly emerged as a source of contention in many areas. Granting private firms access to extract an almost unlimited amount of community water has already created tension, and is likely to continue to do so (Jaffee and Case 2018; Jaffee and Newman 2012). There are a multitude of examples where corporations have faced the ire of the public following attempts to exploit water resources. In El Salvador, protests from farmers resulted in the revocation of Coca-Cola's licenses to pump. In the 1990s, Enron's attempt to create a speculative "water bank" in the United States from which to profit in times of scarcity was protested against and eventually shut down (Hall and Lobina

2009). It is not just corporations that must be recognized as important actors in the services game either; non-governmental organizations (NGOs) are frequently involved in the delivery of basic services, which can have convoluted effects on political participation. In Uganda, NGOs can cause an increase of support for incumbent politicians when they provide services, but only when those same politicians can easily claim credit for those services (Springman 2022). Although the Ugandan public is more likely to have a positive perception of NGO-provided services than government services, they still attribute those services to politicians, perhaps by giving them credit for collaborating with NGOs. This can result in NGOs confusing the effect of service delivery on political participation by artificially inflating satisfaction with services and allowing underperforming governments an easy way out (Springman 2022).

Communities have employed a range of tactics to regain water rights, including public-interest litigation (Masiangoako, Khunou, and Potter 2022). This makes the measurement of a wide range of engagement strategies necessary for a rigorous discussion concerning the effects of water access on political participation. For example, traditional chiefs and community leaders have an important role in many areas, especially over land allocation, land issues, and resource conflicts (Baldwin 2011). Because of this, factors which may not seem significant in terms of political participation, such as communicating with traditional leaders, are treated seriously and included in the analysis.

It is also critical to reference the colonial and posty-colonial realities in many African states. Most pre-colonial economic systems on the African continent were razed or fundamentally altered by colonial violence (Ferguson 2007). In a particularly blatant example of neocolonialism, France heads a multinational agreement with multiple former colonies: the Communauté Financière Africaine (CFA). Through this agreement, France orchestrates the currency value for select West African states and requires they hold a significant portion of their foreign currency reserves in France, an arrangement which allows the French government to drain resources from former colonies while intentionally suppressing economic diversification (Taylor 2019). Neoliberal policies, including structural adjustment programs (SAPs) forced on developing countries by the World Bank as a condition for loans, often worsen the situation. In Ghana, following a SAP in the 1980s, debt grew over 300% in seven years, social services were slashed to the bone, and inequality worsened (Konadu-Agyemang 2000).

Theoretical Framework and Hypotheses

From past research, it is possible that service provision– or the lack thereof– has a dampening effect on political participation at both ends of the socio-economic spectrum. At one end, there is a group forced to fill in the gaps of service delivery for so long that it no longer manifests as an explicitly political problem, and at the other, a group for whom access to services has had a chilling effect on participation. This could hint at the existence of a "middle group," a group which has water infrastructure but perhaps not reliable water, for whom the interplay between expectation and actual scarcity spurs political action. In addition, it seems likely that a group which has become politically complacent on the back of stable resource provisioning would react with political action if their service was interrupted.

Evidence shows that many communities in Africa seek to implement their own water systems when the government fails to provide services, which could weaken the bonds between the state and the public (Bodea and LeBas 2014; Dakyaga, Schramm, and Kyessi 2022; Oyerinde and Jacobs 2022). This relationship between government service failure and public engagement suggests that in communities where there are low expectations that the government provide water services, lack of access to water will not be a significant catalyst for political action. Perceptions of relative deprivation are known to be important factors in regards to trust in government (Isbell 2023). Does this extend to expectations of services and political participation? Does the expectation of water services followed by a lack of water access, (i.e., a deprivation of water relative to expectation of water) impact political participation more so than the lack of water access itself? Additionally, not every community is able to create self-supply solutions in the absence of government services (Zerihun and Meshigo 2022). As such, this paper hypothesizes that the presence of piped water infrastructure will accentuate the relationship between water scarcity and political participation:

Hypothesis 1 (H1): Political participation will be <u>higher</u> among those experiencing water scarcity than among those not experiencing water scarcity.

Hypothesis 2 (H2): Political participation will be <u>higher</u> for those without piped water than for those with piped water.

Hypothesis 3 (H3): Among those experiencing water scarcity, political participation will be <u>*higher for those who have piped water infrastructure, a proxy for the expectation of water service delivery.*</u>

Among those experiencing water scarcity, *H3* predicts greater levels of political participation for the group which has piped water infrastructure, as opposed to the group without. It predicts a positive interaction effect between the presence of piped water infrastructure and the experience of actual water scarcity. Between these three hypotheses, this paper will attempt to

understand the role of water scarcity and water infrastructure on political participation, and whether the expectation of water service is a necessary prerequisite for a lack of water access to be a catalyst for political action.

Data and Methodology

This project makes an attempt to understand a complicated topic across a geographically enormous area with survey data from 34 politically sovereign states (out of a total of 54 sovereign states in the African continent) and thousands of ethnic identities, languages, religious practices, and social structures. Political participation is an ethereal concept which I attempt to measure using empirical metrics. Many of these metrics fail to capture the full range of what political participation means in any given community. As a student from the United States, I am an outsider to all of these contexts and cannot develop a full understanding of a concept as broad as political participation in each of these communities. As such, this project, like any piece of social science work, should not be seen as comprehensive, concrete, or prescriptive. The purpose of this project is not to cast generalizations across 34 unique states, but rather to take a broad look at possible linkages between water access and political participation, specifically trends which may transcend national borders. It is a rough attempt to gain additional understanding into the connections between resource scarcity and politics.⁵

This project analyzes data from the Round 7 Afrobarometer survey that was conducted from 2016 to 2018 (*Afrobarometer Round 7: Survey Schedule* n.d.). Afrobarometer is a non-profit organization headquartered in Ghana and Michigan State University which produces survey data on various topics of interest in public opinion in as many African states as possible

⁵ There is a wide body of research in other disciplines which explores the role of water in community organizing, education, and politics. Although this paper takes a more explicitly quantitative approach, there are many other lenses through which the issue can be explored.

with each survey round depending on funding and safety. It is considered the leading source for survey data on the African continent (Afrobarometer 2019). However, it is important to note that the Afrobarometer, and other Africa-based surveys, are not without criticism. Cultural factors, language barriers, and other implicit biases which affect face-to-face surveys could negatively impact the quality of the data (Kinyondo and Pelizzo 2018). Additionally, confusion and misunderstanding concerning sponsorship of the survey (i.e., whether a respondent believes it to be a privately organized survey or sponsored by the government) can change how participants respond to certain questions, which could have a particular impact on questions concerning political participation (Marfouk et al. 2021). However, the analysis conducted for this paper does not suggest that the sample has a serious socio-economic bias. Proportions of respondents for each possible score (0-12, with higher numbers representing a higher degree of asset ownership) of the Asset Index (described below) are provided in Table 1.

Table 1: Share of Respondents by Asset Index score

0	1	2	3	4	5	6	7	8	9	10	11	12	Total
5.7	2.6	11.8	6.4	16.9	6.4	13.8	5.4	11.7	4.3	7.8	2.4	4.7	99.9

Existing Afrobarometer working papers lend valuable insight into transforming the data into usable metrics. There is a precedent for combining certain variables into "indexes," an important tool to distill and make better use of available variables (Brass, Harris, and MacLean 2019; Isbell 2022, 2023). The current project creates two indexes of five variables each: an index of political action (*IPA*) and an index of political communication (*IPC*). It also tests three variables independently. Tables 2 and 3 provide the survey questions and responses used to create the indexes.

Questions	Response Categories
Here is a list of actions that people sometimes	0 ("no, would never do this"), 1 ("no, but
take as citizens when they are dissatisfied with	would do if had the chance"), 2 ("yes, once or
government performance. For each of these,	twice"), 3 ("yes, several times"), 4 ("yes,
please tell me whether you, personally, have	often")
done any of these things during the past year.	
If not, would you do this if you had the	
chance:	
Attended a community meeting? (Q21A)	0-4
Got together with others to raise an issue?	0-4
(Q21B)	
Joined others in your community to request	0-4
action from government? $(Q26A)$	
Contacted a government official to ask for	0-4
help or make a complaint? (Q26C)	
Participated in a demonstration or protest	0-4
march? (Q26E)	
Variables: 5	Maximum IPA score: 20 Minimum IPA score: 0

Table 2: Index of political action (IPA)

Questions	Response Categories
During the past year, how often have you	0 ("never"), 1 ("only once"), 2 ("a few
contacted any of the following persons about	times"), and 3 ("often")
some important problem or to give them your	
views:	
A local government councilor? (Q25A)	0-3
A member of parliament? (Q25B)	0-3
An official of a government agency? (Q25C)	0-3
Traditional leaders? (Q25E)	0-3
Religious leaders? (Q25F)	0-3
Variables: 5	Maximum IPC score: 15 Minimum IPC score: 0

Table 3: Index of political communication (IPC)

For each index, a higher number indicates a higher level of political participation or political communication. Any response with a value of 9 ("don't know"), 8 (refused to answer), or -1 (missing) for any of the variables in the index is omitted from the analysis. The choice of variables for each index is both thematic and practical. The *IPA* includes variables that all represent some form of political communication and share common response categories. The *IPC* includes variables that represent some form of direct political participation and share common response categories, which are notably different categories than those variables included in the *IPA*.

Three questions related to water access are used to create independent variables. As a proxy for an individual's expectation of water access, I use responses to the following question *(EA_SVC_B)* from the Afrobarometer: "*Are the following services present in the primary sampling unit/enumeration area: Piped water system that most houses could access?*" Responses to this question were observed by the enumerator and indicated with a value of 1 (yes) or 0 (no). This provides a picture of the presence of water service infrastructure in the sampling unit for that respondent. The presence of water service infrastructure (in this case, piped water) is assumed to imply at least some degree of expectation that the observed infrastructure will function, and is taken as a rough indicator of expectation of water service.

To measure actual water scarcity, I use responses to the following question (*Q8B*) from the Afrobarometer: "*How often in the past 12 months have you gone without enough clean water for household use?*" Responses range from 0 ("never"), 1 ("just once or twice"), 2 ("several times"), 3 ("many times") or 4 ("always"). Water scarcity is then collapsed into a binary variable (values of 0 and 1 being equal to 0, values of 2, 3, and 4 being equal to 1).⁶

To test a question of tangential interest, I use responses to the following questions (*Q55PT1; Q55PT2; Q55PT3*) from the Afrobarometer: "*In your opinion, what are the most important problems facing this country that government should address?*" This variable allows respondents to provide three of the top issues which they believe should be acted on by the government. Respondents could select "*water supply*" as a response to any one of the three questions, which share the same language, to indicate their position that water was among the top three issues they believe the government should prioritize.

⁶ Although the construction of the water scarcity binary to include a self-reported score of 2 on the scarcity side and not on the non-scarcity side did raise predicted values for every dependent variable slightly, it did not alter the relative value of the variables (i.e., the ranked order of binary combinations remained the same).

Some researchers have suggested that prioritizations of government infrastructure demands transcend demographic divides, including gender identity and urban versus rural populations (Leo, Ramachandran, and Morello 2015). When controlling for socio-economic status, the Lived Poverty Index- a combination of multiple variables designed to indicate the level of poverty of the respondent- is frequently used by researchers as a variable when using Afrobarometer data. The Lived Poverty Index will not be used in this project because it includes measures of water access, and therefore would not be a valid control for an analysis using the same measures of water access as an independent variable. Instead, an asset index (AI) of six variables is created to control for socio-economic status. This is derived from a series of Afrobarometer questions (Q89A-F) asking, "Which of these things do you personally own?" The enumerator then lists a series of items: radio, television, motor vehicle or motorcycle, computer, bank account, mobile phone. Possible responses for each are 0 ("no one in household owns"), 1 ("yes, someone in household owns"), and 2 ("yes, personally owns"). These values are aggregated into the Asset Index, with each respondent having a total score between 0 and 12. A higher number indicates a higher level of socio-economic status via asset ownership. Any respondent who gives a value of 9 ("don't know"), 8 (refused to answer), or -1 (missing) for any of the assets in the index is excluded from the analysis. The gender⁷ and education level of the respondent and country in which the interview took place are included as additional control variables, along with a measure of whether the respondent lives in an urban, semi-urban, or rural area.

Regime type is not included as a control variable, as there is no general agreement on whether or not electoral democracy actually leads to differences in basic service provisioning

⁷ I recognize the issues inherent in expressing gender as a binary variable, but this is a limitation of the dataset. No option was given for respondents to express a gender identity beyond "male" or "female."

(Harding and Stasavage 2014). Existing research has also noted that the politicized delivery of services (i.e., service delivery as a reward for political support) is not a significant confounding variable when conducting analyses. This is drawn from studies in South Africa, where delivering services as a reward for political loyalty was extremely difficult due to the inability of the African National Congress (ANC) to influence service delivery at a local level (de Kadt and Lieberman 2015).

To test the influence of actual versus perceived water scarcity on political participation, I conduct a series of ordered logistic regressions with country fixed effects using the *IPA* and *IPC* indexes as dependent variables. For each, I test the influence of actual water scarcity and expectations of water access on political participation while controlling for other factors that are likely to affect the dependent variables. I test the interaction between the two main independent variables to determine whether the influence of actual water scarcity on political participation is conditional depending upon a person's expectations of water access. Based on these analyses, I generate visualizations similar to those in other recent studies using Afrobarometer data (see Whitaker 2023 and Brass, Harris, and MacLean 2019) for clearer interpretation of the results.

When using Afrobarometer data, results cannot necessarily be generalized to the entire continent. The survey is more likely to be conducted in states not experiencing civil wars or significant violence or unrest (Leo, Ramachandran, and Morello 2015). This caution should be a general rule regardless, since the continent is composed of 54 unique states with as wide of a range of political, economic, and social systems as seen anywhere else in the world. Africa should never be treated as a monolith by academics.

Results and Discussion

As a prerequisite for using the piped water variable as a proxy for expectation of water service delivery, I derived a correlation coefficient for piped water and actual water scarcity (as a binary variable). A higher (closer to 1 or -1) correlation could have suggested that the presence of piped water infrastructure in the enumerating unit was extremely predictive of water scarcity, making it unsuitable for use as a separate variable. However, the coefficient is -0.15, suggesting that these variables are sufficiently distinct to avoid collinearity issues. The number of observations for every regression model and the subsequent predictions after filtering out N/A values is 37,317. This is a decrease of 8,506 observations from the original dataset of 45,823. The breakdown of respondents is given in Table 4.

	Water infrastructu		
Expressed water scarcity	No	Yes	Total
No	12,786 (34.26%)	16,193 (43.4%)	28,979 (77.66%)
Yes	5,227 (14%)	3,111 (8.34%)	8,338 (22.34%) ⁸
Total	18,013 (48.27%)	19,304 (51.73%)	100%

Table 4: Breakdown of Respondents by Binary Combination

⁸ It is interesting to note that this number is lower than many people would probably expect in the African context. Only 22% of respondents indicated experiencing water scarcity in the past year. In addition, over half of respondents had water infrastructure in the survey unit.

Figure 1: Mean IPA Score (0-20)

Mean IPA Score by Binary Combinations



Binary Combinations (Piped Water, Scarcity) of Independent Variables at 0.95 Confidence Level

Figure 2: Mean IPC Score (0-15)





Binary Combinations (Piped Water, Scarcity) of Independent Variables at 0.95 Confidence Level

Figure 3: Share Voted (0-1)

Mean Share Voted by Binary Combinations



Binary Combinations (Piped Water, Scarcity) of Independent Variables at 0.95 Confidence Level

Figure 4: Share Participated in Campaign Rally (0-1)



Mean Share Participated in Rally by Binary Combinations

Binary Combinations (Piped Water, Scarcity) of Independent Variables at 0.95 Confidence Level



Mean Share Named Water by Binary Combinations

Binary Combinations (Piped Water, Scarcity) of Independent Variables at 0.95 Confidence Level

Figures 1 through 5 show the mean values for each dependent variable⁹ based on the binary combinations of the two main independent variables. The figures provide an initial picture of the effect of piped water infrastructure on water scarcity and political participation. Across the board, the group with the highest participation are those in column three- those without piped water and experiencing water scarcity. The second-highest levels of participation are found among those without piped water but not experiencing water scarcity. With the exception of voting, where the order is reversed, the two lowest are those with piped water and not experiencing scarcity and those with piped water and experiencing scarcity. This indicates that both water scarcity and the absence of water infrastructure have a positive impact on political participation, but it appears to be the absence of water infrastructure which has the greatest positive effect on participation. In terms of the third hypothesis, we would expect column four

⁹ The figures are based on actual response values and do not include the control variables present in the regression analysis or the predicted values tables.

(those with piped water experiencing scarcity) to have higher values than column three (those without piped water experiencing scarcity), which does not seem to be the case.

The figures lend credence to the idea that water scarcity has a positive effect on political participation, as does an absence of infrastructure. However, they do not support the idea that the expectation of water service delivery is a necessary precondition for the political salience of water scarcity. Rather, they indicate that the absence of piped water, and not water scarcity itself, is a greater driver of participation. These results are further corroborated by the regression analysis conducted below.

The following regression models were used to generate Tables 5-7. Table 5 presents the results of a series of regression analyses testing the impact of water scarcity and various control variables on the dependent variables of political participation. Table 6 presents the same regression, but using the presence of piped water as the independent variable. Table 7 presents the results of a regression model with an interaction between the two independent variables.

Model 1: *lm([dependent variable] ~ scarcity binary + asset index + gender + education + country fixed effects (factor variable) + urban/rural (factor variable))*

Model 2: *lm([dependent variable] ~ piped water binary + asset index + gender + education + country fixed effects (factor variable) + urban/rural (factor variable))*

Model 3: *lm([dependent variable] ~ scarcity binary * piped water binary + scarcity binary + piped water binary + asset index + gender + education + country fixed effects (factor variable) + urban/rural (factor variable))*

	IPA	IPC	Voting	Campaign Rally	Most Important Problem
Water scarcity binary	0.54***	0.413***	0.011	0.029***	0.192***
Asset Index	0.137***	0.153***	0.014***	0.008***	-0.006***
Gender ¹⁰	-1.162***	-0.853***	-0.043***	-0.091***	0.015***
Education	0.041***	-0.014	-0.018***	0.002	-0.012***
Intercept	7.343	2.329	0.743	0.655	0.273

Table 5: Effects of Water Scarcity on Various Forms of Political Participation

Significance codes: *** p<0.001, ** p<0.01, * p<0.05

Table 6: Effects of Piped Water on Various Forms of Political Participation

	IPA	IPC	Voting	Campaign Rally	Most Important Problem
Piped water binary	-0.554***	-0.339***	-0.022***	-0.031***	-0.107***
Asset Index	0.145***	0.157***	0.014***	0.008***	-0.005***
Gender	-1.158***	-0.852***	-0.043***	-0.091***	0.014***
Education	0.044***	-0.013	-0.018***	0.002	-0.013***
Intercept	7.8	2.639	0.757	0.681	0.395

Significance codes: *** p<0.001, ** p<0.01, * p<0.05

¹⁰ It is interesting to note the role of gender in the regression tables. The dataset codes gender as a binary variable with a value of 1 representing a male respondent and a value of 2 representing a female respondent. Across all three regression models, a value of 2 for gender (indicating a female respondent) was associated with negative political participation for every dependent variable with the exception of naming water in a top three policy problem. This could suggest that women, who may be the ones most often dealing with water supply on a household or community level, are more likely to suggest it as a policy priority as it more directly impacts their day-to-day lives.

	IPA	IPC	Voting	Campaign Rally	Most Important Problem
Water scarcity binary	0.489***	0.424***	0.016*	0.028***	0.22***
Piped water binary	-0.506***	-0.279***	-0.017**	-0.028***	-0.069***
Scarcity * Piped water	0.003	-0.1	-0.17	-0.002	-0.082***
Asset Index	0.149***	0.16***	0.014	0.008***	-0.004***
Gender	-1.149***	-0.844***	-0.043***	-0.091***	0.017***
Education	0.048***	-0.01	-0.018***	0.002	-0.011***
Intercept	7.585	2.46	0.751	0.67	0.304

Table 7: Interactive Effects of Piped Water and Scarcity

Significance codes: *** p<0.001, ** p<0.01, * p<0.05

Table 8: Comparative scenarios for H3 (piped water, water scarcity)

НЗ	IPA, IPC, Voting, Rally, Most Important Problem
Yes, Yes > No, Yes	No, Yes > Yes, Yes

As demonstrated in the regression tables, there is compelling evidence that water scarcity has a positive impact on political participation. Across the board, for every model and every dependent variable, water scarcity is associated with higher participation, even controlling for a robust set of variables. Likewise, there is evidence that a lack of water infrastructure is associated with higher degrees of participation. Each regression model shows the presence of water infrastructure having a dampening effect on participation, across every dependent variable. However, there is little evidence that the presence of piped water infrastructure is a necessary prerequisite for water scarcity to be a driver of greater political participation.¹¹

For every dependent variable, results indicate that the absence of piped water and actual water scarcity was the most politically salient scenario. Based on the mean comparisons, this combination had the highest average levels of participation. In the regression analysis, the positive effect of water scarcity combined with the positive effect of lacking water infrastructure (the inverse of the negative effect of having water infrastructure) further demonstrate this effect. For IPC, IPA, voting, and campaign rally participation, this was followed by the absence of piped water combined with not experiencing water scarcity. This suggests that the presence of piped water infrastructure itself was the greatest driver of political participation. Those experiencing water scarcity and without piped water infrastructure had the highest predicted *IPA* and *IPC* scores (see Appendix A) and were the most likely to vote, participate in a campaign rally, and name water in their top three most important issues the government should address. The group with piped water and not experiencing water scarcity was the least likely to participate for every dependent variable with the exception of voting, where they were the second-least likely. (This could be capturing a wealthier urban demographic which is more likely or able to engage with highly structured methods of participation such as voting.) These findings are largely consistent with previous findings (see Brass, Harris and McLean 2019) that service provision can have a dampening effect on political participation. It is also possible that these findings capture an important characteristic of water services: that it is infrastructure which is linked to political participation and ideas of government, and that water itself is not considered a political issue so

¹¹ See Appendix A for tables of predicted values (per binary combination of independent variables) for each dependent variable based on the model 3 regression equation provided above.

far as it is a community problem. Further research is necessary to fully explore the nuances of this relationship.

Notably, the interaction effect between water scarcity and the presence of piped water infrastructure in the regression models for *IPA*, *IPC*, and campaign rally participation is not statistically significant. However, it is significant for both voting (significant at a 0.01 level) and naming water as a top-three problem for the government (significant at a 0.001 level). This largely follows expectations that those who both experience water scarcity and lack water infrastructure would be more likely to name water as a policy priority. Overall, the analysis finds enough evidence to support *H1* and *H2* but does not find enough evidence to support *H3*.

Limitations

There are multiple important limitations to the results presented in the study. The first and largest is the use of piped water infrastructure as a proxy for the expectation of water service delivery. Expectation is a difficult concept to measure, and a rigorous analysis would likely only be possible with a survey question which dealt directly with the concept of service delivery and expectation. The second is the scale of the data. A more detailed analysis covering a single country would most likely produce more policy-relevant results, especially as it would inherently account for specific country-level factors such as regime type. Lastly, the analysis relies on a rough categorization of water scarcity. A more rigorous project could introduce a finer measure in order to build a stronger picture of the relationships between scarcity and participation. Ethnic group identity and language could also be important determinants of political participation, especially in cases where a specific ethnic group has a specifically negative or positive relationship with national government or politics or the language of a specific community is not the same as that used by the government. However, including ethnic identity or language is not

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necessarily appropriate for this multinational analysis, and would be more suited to research focused on a specific country. Further research which attempts to narrow the question to specific states should include ethnic identity and language use as factors in analysis.

Conclusion

This paper lends insights into how water access affects political participation in African states. Specifically, it provides a broad look at how water scarcity and the presence of water infrastructure impact political participation. The paper further explores how the expectation of water service delivery influences the role of water scarcity in political participation. The paper finds that water scarcity and a lack of water infrastructure have positive effects on participation, but does not find that the expectation of water service delivery is necessary for water scarcity to be politically salient. Findings suggest that the absence of water infrastructure itself is largely a greater driver of political participation than is water scarcity, although the most powerful combination is actual water scarcity and an absence of piped water infrastructure. If H3 had been supported, it would suggest that policymakers and political leaders in Africa may not be incentivized to expand water services or improve infrastructure, even in the face of citizen demands; it may be easier to simply allow water services to deteriorate and expectation of services to erode. The hypothesis is not supported, suggesting that political leaders could be incentivized to expand and improve water services in order to avoid political consequences. However, it is also possible that the policy implications of the findings are closer to those expected with the hypothesis than face value suggests. If the presence of water infrastructure dampens political participation, but water scarcity seems to have a slightly weaker effect, then politicians may not need to ensure water services are functioning properly to reap the political benefits. Building pipes and pumps may be enough to dissuade dissent, even if those pipes and

pumps infrequently or rarely provide clean water. It is important to recognize the limitations in both the technique and scale of this project, and further research is necessary to examine the role of water in African politics. More detailed qualitative methods, including focus groups or interviews, could provide a more comprehensive view of the motivations underlying political participation in regards to water. As global climate change will likely contribute to increased water scarcity in the future, this question remains critical to academics, policymakers, and the people themselves.

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Appendix A

Mean values for each combination of the two binary independent variables based on the

predictions for each dependent variable generated by the regression models.

	Water infrastructure in survey unit			
Expressed water scarcity	No	Yes		
No	7.35	6.4		
Yes	7.9	7		

Table A1: Predicted IPA Score (0-20)

 Table A2: Predicted IPC Score (0-15)
 IPC Score (0-15)

	Water infrastructure in survey unit			
Expressed water scarcity	No	Yes		
No	2.82	2.23		
Yes	3.15	2.53		

Table A3: Odds of Voting in Most Recent Election

	Water infrastructur	re in survey unit
Expressed water scarcity	No	Yes
No	0.73	0.64
Yes	0.74	0.61

	Water infrastructure in survey unit			
Expressed water scarcity	No	Yes		
No	0.43	0.34		
Yes	0.46	0.4		

Table A4: Odds of Participating in Campaign Rally in Most Recent Election

Table A5: Odds of Naming Water in Top Three Most Important Issues for Government

	Water infrastructure in survey unit	
Expressed water scarcity	No	Yes
No	0.25	0.12
Yes	0.5	0.27