Spring 2017

Human Water Security: It Boils Down to State Bureaucratic Capacity

Seth Howard

HUMAN WATER SECURITY: IT BOILS DOWN TO STATE BUREAUCRATIC CAPACITY

by

Seth Howard

A thesis submitted in partial fulfillment of the requirements
for graduation with Honors in the Political Science

_____

Nicholas Grossman
Thesis Mentor

Spring 2017

All requirements for graduation with Honors in the
Political Science have been completed.

_____

Martha Kirby
Political Science Honors Advisor

Human Water Security: It Boils Down to State Bureaucratic Capacity

.By
Seth William Howard
Department of Political Science
University of Iowa
May 10, 2017

Abstract: Contemporaneous global demographic, environmental, and economic trends have elevated water issues to the fore of human rights and national security debates. Ipso facto, a profusion of research has attempted to explicate water insecurity causes and effects. This article examines the foremost theoretical explanations, data, and discrepancies. It then proposes and quantitatively tests a more parsimonious and evidentially coherent state bureaucratic capacity theory of water security. The results support the proposed theory and reveal three significant conclusions. Times series analyses reveal mixed-type regimes produce reduced water security compared to autocracies and democracies, with closed anocracies performing worst; this finding persists when controlling economic development, political violence, and endemic natural freshwater resources. Higher state bureaucratic capacity produces greater water security. Lastly, improvements in bureaucratic capacity most positively affect civilian access to potable water in anocratic regimes. These findings suggest a reassessment of development and humanitarian aid efforts and redirection towards government administrative capacity building.

Keywords: State Bureaucratic Capacity, Regime, Water Security

Villagers in Viralimalai taluk, India, plastic pots in hand, can be seen trekking miles to fetch water (Tiruchirapalli, 2017). In Cape Town, South Africa, residents face a looming water scarcity crisis with dam water levels at only 12.3% of normal (Andersen, 2017). In Bolivia, Peru, and Ecuador water scarcity and access issues have generated protests, strikes, confrontational deaths, and even declarations of martial law in some Peruvian provinces (Vidal, 2017). Another news update: "Flint water crisis likely the cause of deadly Legionnaires outbreak" (Ganim, 2017). These headlines highlight water issue pervasiveness and import as an increasing security concern in both academic and policy debates.

The statistics are staggering. Five thousand children die daily due to preventable water and sanitation related diseases (United Nations Regional Information Center for Western Europe). 80% of the world's population is exposed to high levels of threat to water security (Vörösmarty et al., 2010). And four billion people face severe water scarcity (Mekonnen & Hoekstra, 2016). Access to drinking water has gender dimensions; wherein women and girls carry the primary responsibility of collecting water in households with access, which creates significant burden and result in girls missing school (UNICEF, 2011; Bagri, 2017, Frej, 2017). Since 1990, over 800 million people have gained access to safe drinking water, according to the United Nations; however, an estimated 884 million people globally do not have such privileges.

Clearly, the consequences of water scarcity, quality, and inequitable allocation, are profound; Water's ubiquity cannot be overstated; Water is essential for drinking, agriculture, livestock, electricity generation and many industrial processes. Dehydration can even lead to cognitive impairments, and even long term detriments when chronic (Grandjean & Grandjean, 2007; Wilson & Morley, 2003). Water is essential to cooking, cleaning, bathing, and gardening. Poor sanitation can, and frequently does, lead to waterborne diseases outbreaks (e.g., cholera,

salmonella, *shigella*, lead contamination) with concomitant economic production consequences. Gender and geographical location further intersect with water contamination and access (Sultana, 2007). Acute droughts periodically put millions of lives and livelihoods at risk.

Its centrality at the nexus of industrial development, agriculture, energy, environment, and human health makes achieving water security complicated. Both causes of water (in)security and subsequent effects are multidirectional and multifarious in nature. Understanding the central determinants of water security is vital to address global water issues, which are predicted to rise in importance as population increases, climate change deepens, and pollution endures, and natural freshwater resources are depleted. Governments already play key roles in public health, energy production, and traditional public goods. Contemporary water issues have produced growing government mediation. The impact governments have on water security and the underlying mechanisms that produce disparities in water security outcomes between states is still in contention. This study aims to advance water security literature by proposing and testing a novel bureaucratic capacity theory of water security.

Literature Review

The following literature review will define water security, provide a brief overview on existing literature on the sources of water security, introduce bureaucratic capacity as a potential determinant, and overview the existing literature on bureaucratic capacity.

Defining Water Security

Water security as a concept has received greater consideration over the twenty years, in both policy and academic debates.

No single, universal definition of "water security," exists. Multiple definitions of this concept exist; researchers in various fields define water security in ways that often emphasize

their area of interest (human rights, energy, agriculture, economic development, cleanliness, etc.), while international organizations tend to embrace broad, integrative definitions. The World Economic Forum elegantly defines the intersectional nature of water security in its definition, describing it as "the gossamer that links together the web of food, energy, climate, economic growth and human security challenges that the world economy faces over the next two decades" (World Economic Forum Water Initiative, 2012). The United Nations relatedly delineates it "as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability" (UN-Water, 2013). Grey and colleagues (2013) eschew comprehensiveness for a reductionist conceptualization, defining water security as "a tolerable level of water-related risk to society." WaterAid, an international organization aimed at improving access to clean water for marginalized populations worldwide, more narrowly defines water security as the "reliable access to water of sufficient quantity and quality for basic human needs, small-scale livelihoods and local ecosystem services, coupled with a well-managed risk of water-related disasters" (WaterAid, 2012). Its multidimensional nature engenders ongoing contention over water security theoretical bases.

Any research paper assessing the relationship between water security's and any phenomenon, given water's intersectional nature and ubiquitous essentiality, must avoid tautology in its definition. This proves a complex matter if one bravely attempts operationalizing the UN Water (2013) or World Economic Forum (2012) water security definitions. Paradoxically, the completeness by which they define state water security renders assessment of factors affecting water security incredibly difficult. Operationalization must also avoid control

and explanatory variable overlap with water security variable, antithetical variable operationalizations, and pleonasms that render drawing real conclusions overly complicated given variable phenomenological relatedness (Cook & Bakker, 2012). Therefore, this paper will focus, as WaterAid (2012) and in the 2000 UN Millennium Development Goals have in their operationalizations, upon the human security element of water security – that being the percent of a population with access to an improved water source. An improved water source is one where "human use is kept separate from use by animals and fecal contamination" (WWAP, 2015).

World Water Assessment Programme's anthropocentric operationalization implicitly factors water infrastructural investment, distribution, access, and resource allocation. Thus, this parsimonious definition allows one to assess the interacting effects of climate change, conflict, natural freshwater resources, civilian liberties, economic development, and state bureaucratic capacity on water security, temporally and spatially, without the confounding consequences of a multifactorial definition.

***Determinants of State Water Security*:**

Multi-sectoral importance has produced a gluttony of research ascertaining and defending innumerable causal variables influencing water security. Exhaustive evaluation of each factor's temporal, spatial, and multidirectional causal values would require a novel. However, several major broad affectors have been defended most rigorously, which can be split into two camps: environmental and human determinants of water security.

Environmental Determinants of water security include geography (Yoffe et al. 2004; Link, Scheffran, & Ide, 2016; MacDonald et al., 2011), climate change, existing natural freshwater resources (Grey & Sadoff, 2007), and global hydrogeological processes (de Suarez et al., 2014; Feger & Hawtree, 2013). Climate change exists as a complex connection wherein long-

term human causes are producing ongoing climate warming and shifts. The results of climate change are environmental phenomena and on a larger time scale than daily or annual anthropocentric water security, and not resolvable over a brief period by any singular state. Thus, climate change has been placed within the environmental determinants of water security category (Turral, Burke, & Faurès, 2011; Link, Scheffran, & Ide, 2016; Schindler, 2001).

The defended human determinants encompass a complex array of social, economic, political, and population factors. Human demographics and human geography, including population growth (Vörösmarty et al., 2000), urbanization, and population distribution (Sadik, 1991; Thompson et al. 2001), have been shown to affect water security. Logistically, Siting, design and construction of water sources (often called "water infrastructure") affects access as well. Economically, sectoral allocation of water resources (US Department of Energy, 2006; Delucci, 2010; Rosegrant & Ringler, 2000), economic development (Palmer, 2010), infrastructure more broadly (Grey & Sadoff, 2007; Thompson et al., 2001), and poverty and wealth inequality have in turn been defended as demonstrable influencers of water security (Hussain & Hanjra, 2004; MacDonald et al., 2011). Socio-politically, political will and community resilience to cope with water supply stresses (Turral, Burke, & Faurès, 2011; Langridge, Christian-Smith, & Lohse, 2006), management of water resources and supply services (Vörösmarty et al., 2010; Vörösmarty et al., 2005; Ahmad, 2003), domestic conflict, and interstate conflict all affect water security (Yoffe et al., 2004; Link, Scheffran, & Ide, 2016). There is even evidence that water security may factor into the political stability of a state (Gleick, 1993).

With the vast array of determinants, four factors have received the most import in water security research: intrastate and interstate violent conflict, economic development, civilian liberties, and climate change.

As awareness and understanding of climate change have improved, research has flourished contending the various consequences it will have and already is exerting. It has been argued climate change is quickly becoming one of the major determinants of water security (Turral, Burke, & Faurès, 2011; Link, Scheffran, & Ide, 2016). Climate change effects on water level, weather patterns and their severity, ground water, and agricultural production are all predicted to create negative consequences, particularly upon the impoverished, as the world adapts and faces human-induced global climate shifts and warming (Turral, Burke, & Faurès, 2011; Link, Scheffran, & Ide, 2016; Grey & Sadoff, 2007; Hendrix & Salehyan, 2012).

Conflict over water access and security have already happened. What's more, climate-related conflict over water security has been discussed at the UN Security Council as potential risks to international security (Detraz & Betsill, 2009). Water's centrality paired with developmental pressures, domestic demands, reduced water availability, pollution, and environmental degradation increases the likelihood that hydropolitics lead to military clashes (Bogardi et al., 2012; Dinar, 2002; Toset, Gleditsch, & Hegre, 2000; Bernauer & Siegried, 2012). The Malthusian argument posits that interstate violent conflict can arise over transboundary water disputes and as states try to compensate growing domestic demands with dwindling supply (Renveney and Maxwell, 2001). Domestically, water scarcity and inequitable access can produce political instability and violent confrontations (Homer-Dixon, 1994). In simple terms, conflict theory of water security posits that conflict reduces water security via the destruction of water-related infrastructure and disruption of governance.

The economic theory of water security maintains that countries with low economic development have higher water insecurity as they have lower capacities to build adequate water infrastructure, develop technological innovations to solve water resource issues, and fewer civilians can afford water (Jia, Zhang, Yang, & Xia, 2004; Liu, Yang, & Savenije, 2008; Hussain & Hanjra, 2004; Allan, 1996; Flörke et al., 2013; Zeitoun, 2011). Indeed, progress has been slowest in least developed countries, while middle income countries have more than halved the proportion of the population without access to an improved water source since 1990 (WHO Drinking Water Report, 2011). While economic development is clearly established as a water security influencer, its weight may be overstated. Water insecurity isn't restricted to underdeveloped countries, many OECD nations face pressing water issues. Drought and allocation issues in California and protests over water pollution in Flint, Michigan persist, while middle-income and water-scarce Turkey, hosting millions of refugees, has ensured otherwise surprisingly high water quality and access (World Resources Institute, 2015).

Most convincingly, researchers argue that civilian liberties improve access to water and overall state water security (Edwards, 2012; Tempelhoff, 2009; Holden & Jacobson, 2008; Hanna, 2005). The civil liberties argument is most convincingly defended by Jeffrey Edwards (2012). He and others assert that democracies, vis-à-vis civil liberties, enhance civilian voices and government accountability as civilians may make demands without fear of reprisals and with knowledge that they hold the power to re-elect a politician or elect one more receptive to their plight. Furthermore, in countries with robust civil liberties people are more secure that others will not ransack their water supplies and if an issue arises, they can inform the state and pursue courts for just compensation. In sum, freer, more democratic states, it is argued, have citizens that are better placed to pressure a state into ensuring equitable and consistent access to water. It

must be noted, the civil liberties argument rests upon the assumption that it is ultimately the state bureaucracy that determines water security, with civil liberties mediating its influence. Simply, the civil liberties theory of water security contends that civil liberties positively affects bureaucratic capacity which in turn ensures higher human water security. This civil liberties argument would those postulate that higher civil liberties rankings would correlate with higher bureaucratic capacity and consequently, water security. Thus, authoritarian regimes should be the least water secure and full participatory democracies the most water secure, with mixed-type regimes in-between.

Bureaucratic Capacity

Bureaucracy and "bureaucrats" have gained a more negative connotation in contemporary usage, yet evidence affirms its enduring importance in the management of resources (Aucoin, 1997). Political science employs bureaucratic capacity and related terms at times equivalently, at times meticulously differentiated, and not rarely as vacuous gobbledygook. Hendrix (2010) defines state capacity as encompassing both the state's military capacity and the state's civil society capacity, called bureaucratic capacity. Others use institutional capacity as synonymous with bureaucratic capacity, while some use it to differentiate from state administrative capacity (bureaucratic capacity) and overall national administrative capacity (capacity of NGOs, private companies, and bureaucratic capacity). Others use state capacity, bureaucratic capacity, and institutional capacity nearly synonymously. I will be using these terms interchangeably for the sake of variation and focus upon state bureaucratic capacity solely.

Bureaucratic capacity, like water security, is a multifaceted concept. Weber (1978) emphasized the importance of autonomous and professional bureaucracies in his framework, he suggested that it allows the state to manage complex matters, ensures efficiency in delegation

and implementation, stems corruption, and legitimizes the state's authority. Hendrix (2010) suggests that this capacity may be the state's professionalization of the state bureaucracy, its ability to monitor the population and its needs, its organization, its quality, its incentives and revenue generating capacity (Karl, 1997; Chaudhry, 1989), and its ability to efficiently manage, adapt, and respond to various situations and crises (such as drought, flood, oil spill, energy demands, etc.). Kaufmann, Kraay, and Mastruzzi (2009) created a country-level world governance index (WGI) that aggregates six governance dimensions: political stability and absence of violence, government effectiveness, voice and accountability, control of corruption, regulatory quality, and rule of law. While comprehensive, again this faces issues in operationalization. Testing relative variable impacts would thus lead to circular reasoning if one attempts to employ violent conflict or civil liberties, and decrease overall conceptual clarity (Fukuyama, 2013). Several researchers define state capacity as "the ability of state institutions to effectively implement official goals," thereby "avoiding normative conceptions about what a state ought to do or how it ought to do it" (Skkink, 1991; Hanson & Sigman, 2013). Kaufmann's government effectiveness measure may best satisfy these competing definitions while maintaining conceptual clarity.

As a limited commodity with some public good characteristics global variability in freshwater distribution, regime type, levels of economic development, and conflict, one must wonder what independent role bureaucratic institutions, if any, in ensuring water security.

Bureaucratic Capacity Theory of Water Security

Water has been conceptualized and constitutionalized (e.g., South Africa, Canada) as a human right, with access expressly protected. Democratic regimes are systems of government whereby all eligible members of a state select representatives of the state through transparent,

multi-party elections, thereby constituting majority rule. This system, in theory, provides a means of accountability of leadership to the people. Accountability, in this context is politician re-election and leadership electability. Thus, if the public is dissatisfied with water security, the populace may vote the leaders out of office, thereby providing an incentive to provide stronger public services, such as water sanitation and access, in democracies than autocracies.

However, mixed institutions, frequently called hybrid regimes or anocracies, are likely to have recently undergone societal upheaval, such as war, and are likely in a transitional governmental phase (Hegre, 2001). More likely to experience civil war, anocracies have even greater risk during transitions towards democracy and as the magnitude of that transition increases (Regan & Bell, 2010). As outlined above, war disrupts institutions and destroys infrastructure, both key components in water security. Given the likely proximity to conflict and political transitional nature in anocracies, those states are likely to exhibit reduced bureaucratic capacity. Despite increased government accountability and civilian liberties in anocratic regimes, its reduced bureaucratic capacity relative to strict authoritarian regimes is expected within the bureaucratic capacity theoretical framework to consequently produce reduced water security.

Political stability and regime change are two ways that bureaucratic capacity may be dampened. Anocracies themselves may inherently exhibit qualities that would reduce their bureaucratic capacity, due to incongruities in their mixed authoritarian-democratic nature. Research supports this supposition; Gurr (1974) found that mixed-type regimes exhibit lower durability (persistence and adaptability) than either highly autocratic or highly democratic states. Gurr concludes that his findings are consistent with Eckstein's "congruence-consonance" theory of political performance, which postulates "political institutions perform and endure best if (a) their authority patterns are congruent with the authority patterns of adjacent social institutions,

and (b) their authority patterns are internally consonant" (Eckstein, 1968 read in Gurr 1974). Bäck and Hadenius (2008) have argued that both stable democracies and stable autocracies are likely to foster high levels of state capacity; they found a J-curve relationship between regime type and state capacity. They contended that in consolidated democracies, state bureaucratic capacity is likely high due to both bottom-up control through a vibrant civil society and political competition, and by top-down control through a well-institutionalized administration. While state bureaucratic state capacity in consolidated autocracies is likely to reach a moderately high level because it is facilitated by top-down control. It is relatedly postulated that state capacity in mixed-type regimes is likely to be low as they maintain less bottom-up and top-down control. Anocracies posit a wrench in the civilian liberties theory of water security.

Nations face multiple threats to their water security; relationships between various threats are complex and intertwined. Threats from climate change, pollution, soil runoff, overuse, and environmental destruction cannot be considered in isolation and require a higher authority, the state, to address water threats. Water security's complexity and ubiquity throughout every economic sector creates issues in private or local level community civil organization management. Insuring water security requires monitoring environmental conditions and water tables, disaster mitigation planning, regulating amount of usage by competing entities, sanitation, water infrastructure development and implementation, resolving transboundary issues, sustainability assessment, providing clean water to civilians, and generating financial means to consistently manage each. items of legislation and fiscal measures that influence water management, service delivery and level of demand. Moreover, government decisions outside the water domain (i.e., decisions concerning energy prices, agricultural subsidies, trade agreements, and poverty reduction strategies, often have major impacts on water. Balancing both competing

water demands, intertwined threats, and considering external policy impacts requires strong national-level administrative capacity.

Water privatization, however, produces narrow business efficiency and profit-motive incentives that can lead to unequal distribution and access, making the above more difficult. Case in point: Bolivia witnessed violent clashes in 2000 after civilians experienced the repercussions of water privatization (Cochabamba, 2000). Neoliberalist privatization may suffice for traditional public goods, such as electricity or garbage disposal, but face greater challenges when applied to water. In Chile, strong state role in water management has been key to fulfilling civilian water rights, in an otherwise privatized water sector (Baer, 2014).

Decentralization reduces ability to adequately monitor, regulate, mobilize and implement changes as it confers lower human capital and less legitimate authority at the national level. Decentralized democracies, like Spain, and decentralized autocracies, like Qaddafi-era Libya, exist. Decentralization may confer high bureaucratic capacity at lower local level governance, the concomitant reduced administrative abilities and authority make ensuring national water security difficult. With natural water resources, industry, agriculture, people inequitably distributed throughout any given country, lower national level bureaucratic capacity would produce difficulties in regulating, balancing competing water demands, and addressing specific water issues.

If bureaucrats not professional or faces high turnover, the government will inherently face greater obstacles in its administrative duties. If the bureaucracy is conversely dominated by any interest group or economic sector resolving water distribution and usage issues, as competing demands may not be able to be resolved. Low bureaucratic capacity reduces politician incentive to undertake reforms necessary for successful policy making (Huber & McCarty, 2004).

As the world is seeing now in developed democratic nations, water challenges and demands can vary greatly by region. Some nations have adequately addressed this concerns while other democracies vary considerably. Decentralization, privatization, and high bureaucrat turnover can hinder administrative capacity even in democratic states. Civil liberties do not alone ensure state capacity to legislate, organize, monitor, implement, regulate and may fail to explain anocratic water insecurity. Civil liberties' mediational effect on bureaucratic capacity does not satisfactorily explain between and within regime variation in policy implementation ability or water security. State bureaucratic capacity may therefore have additional effects on water security independent of civilian liberty mediation. I theorize higher state bureaucratic capacity produces greater water security.

Hypotheses

H1: Democratic regimes are the most water secure.

H2: Anocracies are the least water-secure regimes.

H3: Higher state bureaucratic capacity improves water security.

H4: States with the lowest bureaucratic capacity will be the least water secure.

H5: Anocracies have the lowest bureaucratic capacity.

H6: Improvements in bureaucratic capacity will most positively impact water security in anocratic regimes.

The following paper tests these five hypotheses. I will explain my research design; highlight key findings; conclude with a discussion of the research strengths, limitations, and possible implications.

Research Design

The above hypotheses are tested through using several datasets that assess regime type, water security, natural water resources, economic prosperity, and state bureaucratic capacity. It is intended to assess the effect of regime type on water security. To do so accurately, three control variables are employed to reduce likelihood of any lurking causal mechanisms. The integral nature of water to life serves the question whether the direction of causality may be reversed. Indeed, there is evidence that water security may factor into the political stability of a state (Gleick, 1993). However, regime and bureaucratic capacity change occur due to a wide confluence of factors, thereby greatly diminishing the direct effect of water security. Furthermore, analyses were conducted to further resolve questions of reverse causality. The resulting dataset includes over 120 states in which there was accurate data on the explanatory (regime type, bureaucratic capacity), response (water security), and control (MEPV, endemic water resources, GNI/capita PPP) variables over the period 1996-2014. Time series analyses were limited to the period 1996-2014 due to available data in each of the variables. There has been robust international scholarly consensus that the post-Cold War era is uniquely characterized. Thus, limited to this interval can eliminate any major confounding shifts in global affairs and geopolitics as well as historical data that may be less accurately collected.

Water Security

Empirical analyses of water security generally range from access to clean water, local natural water availability, quality of sanitation services, and distribution of water resources. The Bangladesh Institute of Peace and Security Studies affirms, "Water security is essential for human access for health, wellbeing, economic and political stability. It is essential to limit risks of water- related hazards. A complete and fair valuation of the resource, sustainability of

ecosystems at all parts of the hydrologic cycle and an equitable and cooperative sharing of water resources is very necessary" (Water Aid, 2009) Indeed, water security not only involves access but equity, affordability, regulation, and distribution amongst competing household, agricultural, and industrial demands. This study uses World Bank data on the percent of a population with access to an improved water source its measure of water security, for it implicitly assesses investment in water infrastructure as well as distribution and allocation of resources (

Natural Water Resources

Any attempt to assess water security must be careful that natural climatic and freshwater resources are not confounding any results. Thus, World Development data on renewable internal freshwater resources per capita in cubic meters was utilized as a control variable. This measure includes internal river flow, groundwater, and rainfall estimates and thus serves as a robust control.

Economic Prosperity

Wealthier states have greater funds available to build water infrastructure. A control was used to eliminate any possible confounding relationship between regime type and economic prosperity affect upon water security. Various measures of economic security exist – from life expectancy to transportation infrastructure. This study used World Bank data on Gross National Income (GNI) per capita based on purchasing power parity (PPP), converted to international dollars.

Conflict

As mentioned previously, there is evidence of relationships between mixed regimes and conflict. As conflict destroys infrastructure and delivery institutions, a third control variable was used to ensure any relationship between water security and regime type is not simply the

relationship between devastating conflicts and clean water accessibility. Conflict was assessed using major episodes of political violence time-series data from the Center for Systematic Peace Integrated Network for Societal Conflict Research (INSCR) armed conflict and intervention data subset. A measure of major episodes of political violence (MEPV) was used as it assesses a wide range of state conflict types and addresses issues of political stability in its measure. The individual measure used, ACTOTAL, is a total summed magnitude of all societal and interstate MEPV, including civil warfare/violence, ethnic violence, and interstate and international violence/warfare. Given the powerful effect of conflict on population health and economies, it is the aim of this variable to eliminate this interacting variable to ensure it is the characteristic of the regimes affecting water security in data analyses, rather than an interaction of political upheaval.

Regime Type

Regime type represents a comprehensive state-level aggregate of civil liberties and provides a more solid foundation for theory testing than individual civil liberties measures alone can provide. Regime type is assessed using the reputable Polity IV dataset. The Polity2 variable was used, as it is a revised combined polity score modified to allow for more accurate assessment of time-series data. States are coded on a -10 to +10 integer scale, creating an autocracy-to-democracy gradient score, respectively. Most studies operationalize anocratic regimes using POLITY scores, with the cutoff range typically -5 to +5 on the POLITY scale (Fearon and Laitin 2003; Marshall and Gurr 2003). This range of scores on the POLITY index represents countries that are characterized by some democratic institutional elements and some autocratic characteristics. This numerical and conceptual range is much greater than that of democracies or autocracies. It is thus split up into two subcategories, open and closed anocracies,

as frequently done in Polity data sets, to better visualize relationships. Final regime types were partitioned such that autocracies = -10 to -6, closed anocracies = -5 to 0, open anocracies = 1 to 5, and democracies = 6 to 10.

Bureaucratic Capacity

Bureaucratic capacity will be measured using a subset of the Worldwide Governance Indicators dataset, which includes aggregate and individual governance indicators for 215 countries and territories over the period 1996–2015, for six dimensions of governance. The Government Effectiveness estimate will be employed as the operational measure of bureaucratic capacity. The measure, "captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5" (Kaufmann, Kraay & Mastruzzi, 2009).

Statistical Analyses

Relevant data were collected and translated into an accessible Microsoft Excel document, with missing variables eliminated from analyses, coded missing. The data was then imported into Stata software for statistical analyses. Relationships between regime type, bureaucratic capacity, and water security were assessed independently of control variables. Then, a more complicated model was assessed in which the interaction between regime type and water security was assessed while accounting for the three control variables. Multiple variable regression analyses were performed, and marginal effects of predictor variables on water security assessed.

Results

Simple frequency tables revealed that data analysis could be proceeded, given the robustness of data and variability in GNI/capita PPP, access to improved water sources, total incidences of major political violence, and in renewable internal freshwater resources. Despite a plurality of nations categorized of states categorized as democracy utilizing the Polity regime-typing methodology, there were significant numbers of each of the four regime types. Thus, it was deemed appropriate to proceed with further analysis.

Multiple preliminary analyses were then conducted to identify possible interacting variables, thereby narrowing the proper interaction and multiple variable regression analyses to assess whether regime type effects water security.

Conflict and Regime Type

A simple OLS regression analysis found major episodes of political violence (MEPV) correlated with regime type (Figure 1).

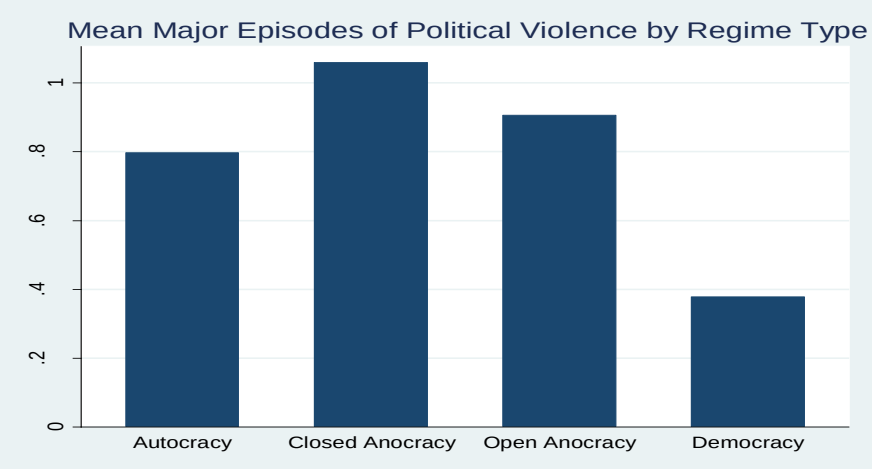

Figure 1. Bar graph of mean MEPV by regime type. Regression analysis was statistically significant ($p<0.000$), whereby more democratic states were significantly less likely to have a MEPV over the entire 1990-2014 interval.

Development and Regime Type

Interestingly, as seen in Figure 2, autocracies and democracies reported similar aggregate average GNI/capita in purchasing power parity (international $), and that was significantly greater than either mixed regime (closed or open anocracies). Democracies did not statistically differ from autocracies (p=.526), while anocracies and democracies report significantly higher (p=0.000) average GNI/cap. In the analysis, anocracies are coded 1, closed anocracies: 2, open anocracies: 3, and democracies: 4.

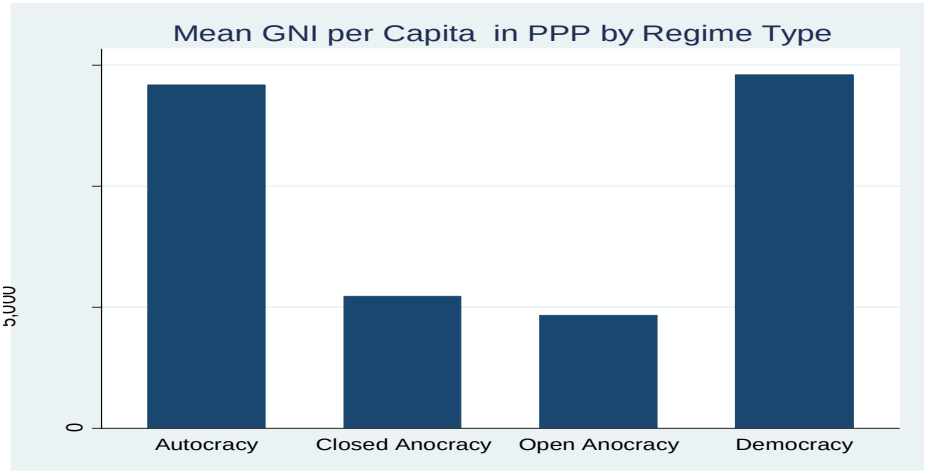

Figure 2. Aggregate GNI per Capita in Purchasing Power Parity, 1990-2014, by Polity classified regime type. Both anocratic regime types were significantly lower than autocracies or democracies (p<0.01).

Water Resources and Regime Type

It was assessed whether water resources differed between regime types to ensure water resources were not an inhibiting factor to reduce water security, nor possibly causally contributing to the development of one regime type over another. Analysis partially support the assumption of no relationship, as a mere 5% of the variability in water resources could be explained by regime type, and only open anocracies significantly deferred from the rest, having more abundant natural internal water resources than autocracies in a cross sectional analysis of water resources in the year 2014.

Water Security & Natural Freshwater Resources

An additional control analysis was conducted to assess whether natural freshwater resources has any effect on water security. No direct relationship was found (Table 1), as p=.5673, far above a .05 alpha level.

Table 1. Effect of National Internal Freshwater Resources on National Water Security

Source	SS	df	MS	Number of obs =	926
				F(1, 924) =	0.33
Model	109.110849	1	109.110849	Prob > F =	0.5673
Residual	307871.462	924	333.194223	R-squared =	0.0004
				Adj R-squared =	-0.0007
Total	307980.573	925	332.95197	Root MSE =	18.254

watersecurity	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
waterresources	-9.25e-06	.0000162	-0.57	0.567	-.000041	.0000225
_cons	83.49397	.6540301	127.66	0.000	82.21041	84.77753

Water Security and Conflict

Prior studies indicate the disruptive nature of conflict on delivery systems and infrastructure, thus a control analysis was conducted to see if conflict affects water security. Regression analysis supports prior studies, demonstrating that increasing magnitude of MEPV produces a negative consequence on national water security, supporting water-conflict literature

Regime Type and Water Security

The major question of the paper is whether regime type indeed affects water security. Preliminary analysis was conducted to test, prior imposing predictor or interacting variables, if regime type affects water security in a simple OLS regression. Results support that regime type does affect water security, using the measure access to improved water source (Figure 3), as the p-value<0.000. Given all the factors likely affecting water security, that regime type itself explains over 13% of the variance in water security reveals a robust explanatory relationship. These results support alternative hypotheses H1 and H2.

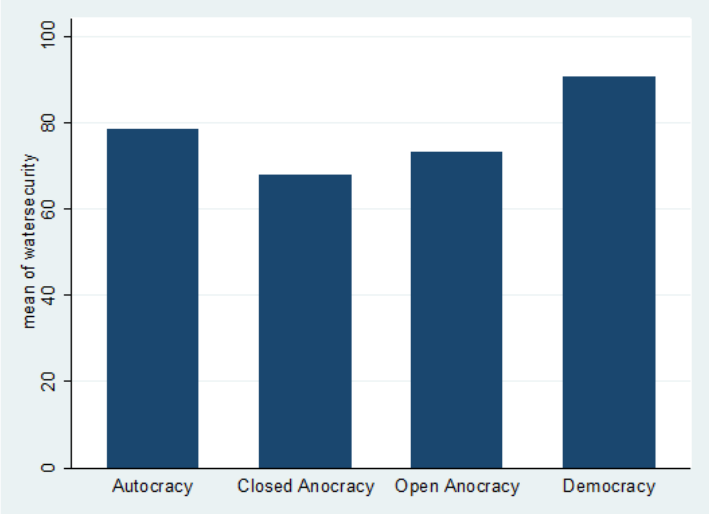

Figure 3. Effect of Regime Type on Water security.

Bureaucratic Capacity & Regime Type

As postulated, anocracies were significantly less water secure than autocratic or democratic regimes. Without accounting for higher order relationships, anocracies were characterized by low administrative capacities, despite their intermediate civilian liberties.

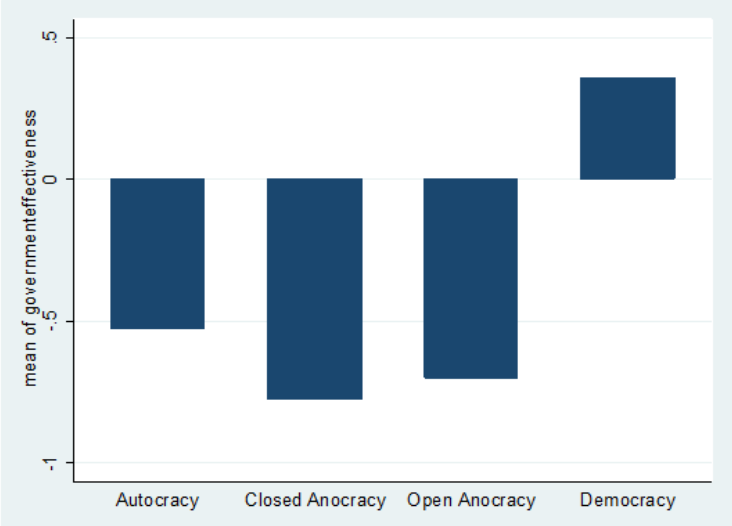

Figure 4. Relationship between Bureaucratic Capacity and Regime Type.

The above preliminary findings supported the proposed bureaucratic capacity theory of water security and that further analyses to deconstruct the relationships was founded.

Modeling Governance, Regime Types, and Water Security

With preliminary analyses supporting delving into the interacting causal variables affect national water security, multiple variable regression analyses with various predictor variable interactions were conducted to assess conditional, interaction, and marginal effects on water security. Analyses were conducted in a time series manner, thereby controlling for the effect of passage of time and ensuring accuracy in directional relationships.

Analyses revealed that GNI/capita, time, and regime type each significantly affect water security (Figure 3). Specifically, compared to autocracies, closed anocracies produce significantly reduced access to improved water sources (-4.2%, p=0.017), while a significantly larger percentage of the population of democracies has access to an improved water source (10.697%, p=0.000), compared to autocracies, even when controlling for time and the three control variables (MEPV, endemic freshwater resources, GNI/capita PPP). Interestingly, regardless of the other variables, the passage of time has a positive effect on water security, with each additional year that passes correlating with an increase of .129% of the population being water secure (p=0.045). Gross national income had a strong effect on water security, as expected (p<.01). Given the large numbers dealt with in GNI/capita, the correlation coefficient appears zero (0.0004884), only because a 1 international dollar increase has such a small, but still significant effect on water security. Interestingly, the presence of conflict (MEPV) and existing water resources did not significantly affect water security, when controlling for the other variables (p=0.070 and p=0.653, respectively). Regime type and the three control variables assessed have a strong interacting effect on water security, explaining 41% of the variability in national annual water security. Assessment of marginal effects of each conditioning variable on water security, with regime types compared to autocracies, a far more powerful marginal effect

of regime type (in terms of level of democratization) on water security than can be accounted for by natural water resources, degree of development (measured in GNI/capita PPP), or the presence and magnitude of any conflict (Figure 3).

Table 2. Multiple Variable Times-Series Regression Analysis of Factors Affecting Water Security, 1990-2014

	watersecurity
1b.regime	0.000
2.regime	-4.200
	(2.40)*
3.regime	0.773
	(0.41)
4.regime	10.697
	(7.50)**
year	0.129
	(2.01)*
mepv	-0.636
	(1.81)
gnicap	0.000
	(14.88)**
waterresources	-0.000
	(0.45)
_cons	-186.970
	(1.45)
R2	0.41
N	842

* p<0.05; ** p<0.01

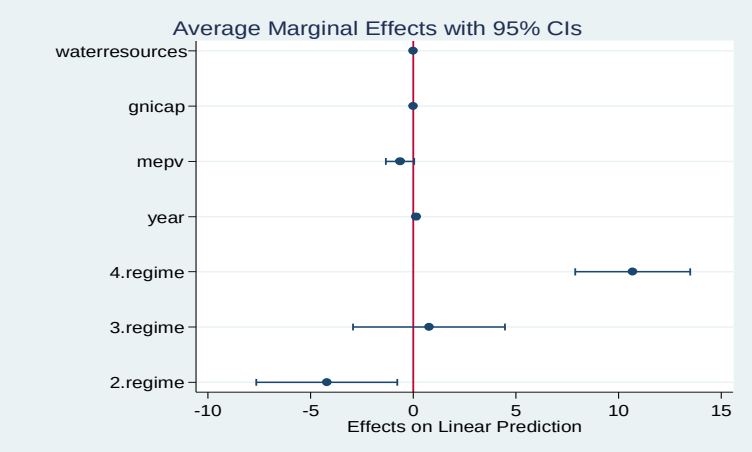

Figure 3. How do Various National Characteristics Affect Water Security?

As no direct relationship was found between natural water resources and water security, an interaction analysis was conducted to see if the effect of natural water resources was conditional on the regime. No interaction was found, thus suggesting, against intuition, that natural water resources have no significant effect (p>.55 for all regime type interactions) on

water security (Table 3). An interaction between regime type and MEPV also did not significantly affect water security (p>.160 for all regime types).

Table 3. Natural Water Resources and Regime Interaction Model on Water Security

	watersecurity
1b.regime	0.000
2.regime	-9.166
	(1.63)
3.regime	-0.442
	(0.08)
4.regime	5.294
	(1.08)
waterresources	-0.000
	(0.20)
1b.regime#co.waterresources	0.000
2.regime#c.waterresources	-0.000
	(0.18)
3.regime#c.waterresources	0.000
	(0.20)
4.regime#c.waterresources	0.000
	(0.09)
gnicap	0.000
	(5.98)**
mepv	-0.636
	(0.76)
o.waterresources	0.000
_cons	80.891
	(15.97)**
R2	0.42
N	137

A final interaction model, including interaction effects between regime and development (GNI/cap) was employed. This model was most robust, explaining 46.7% of the variance in water security. In anocracies improvements in GNI/capita conditions their negative effect on water security relative to autocracies.

Table 4. Development*Regime Interaction Effects on Water Security

	watersecurity
1b.regime	0.000
2.regime	-5.474
	(6.06)**
3.regime	-9.775
	(8.94)**
4.regime	10.561
	(13.24)**
gnicap	0.000
	(16.88)**
1b.regime#co.gnicap	0.000
2.regime#c.gnicap	0.000
	(6.13)**
3.regime#c.gnicap	0.002
	(16.12)**
4.regime#c.gnicap	0.000
	(4.92)**
year	0.072
	(2.15)*
mepv	-0.611
	(3.96)**
o.gnicap	0.000
_cons	-72.136
	(1.08)
R2	0.47
N	3,576

* p<0.05; ** p<0.01

Adding bureaucratic capacity as a control variable produced two interesting findings. First, both anocratic regime types reduced water security over time, compared to democracies and autocracies, even while maintaining the three control variables and state capacity (open, $p<0.013$; closed, $p<0.0001$, see Figure 4). Closed anocracies produced reduced water security compared to open anocracies ($p<0.065$). In this model, bureaucratic capacity had a significantly positive marginal effect on water security ($p<0.0001$).

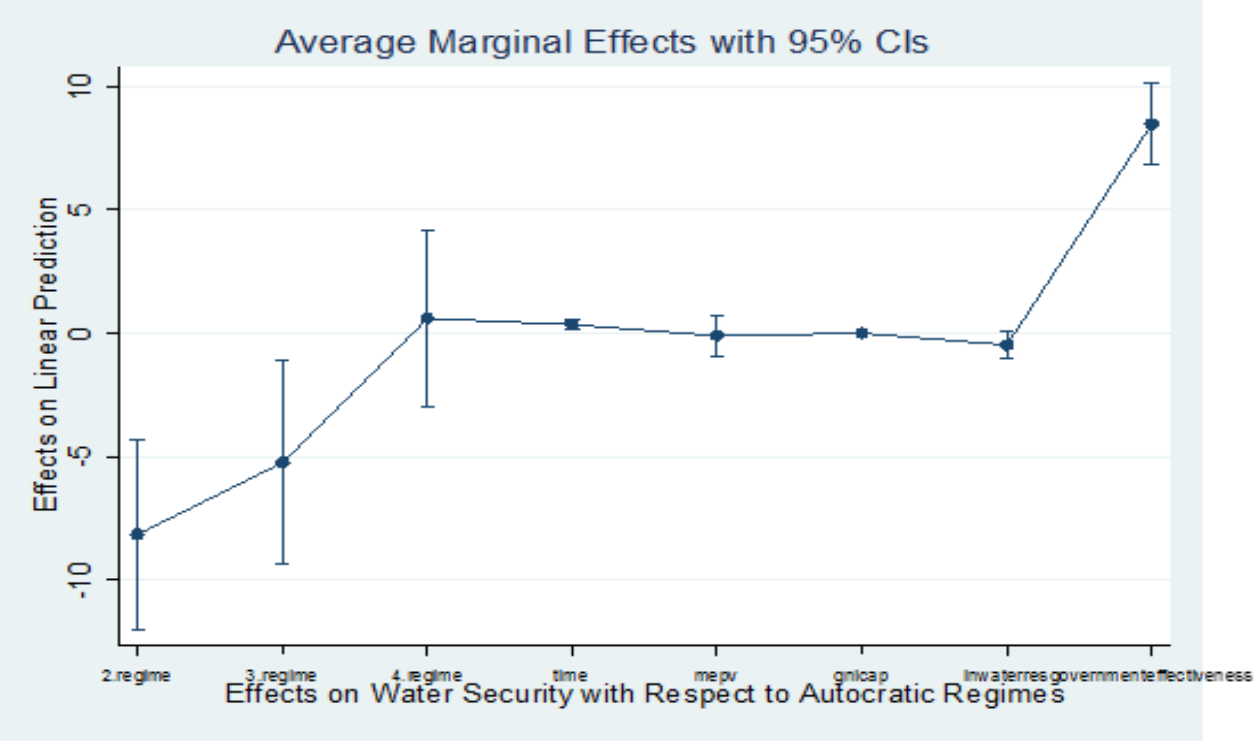

Figure 4. Marginal Effects of Regime Type on Water Security Compared to Autocracies over Time. In this figure, regime types in numerical order are closed anocracy, open anocracies, and democracies. The three control variables and bureaucratic capacity, coded, "government effectiveness" were included in the model.

An interaction between bureaucratic capacity and regime type was added to the model. In support of hypothesis H7 bureaucratic capacity (BC) produced a positive marginal interaction effect on both anocracy categories compared to autocratic and democratic regimes, even with BC and regime independently included (open, $p<0.000$; closed, $p<0.040$, see Figure. 4). In this

model, development, passage of time, and bureaucratic capacity maintained their own significant marginal effects ($p<0.020$, $p<0.003$, p,0.039, respectively), while closed anocracies still produced lower water security outcomes compared to autocracies ($t=-2.13$); no other regime affected water security. This model explained 52.07% of water security variability. See *Appendix A* for data output.

Discussion

The study advanced water security and bureaucratic capacity literature by bridging the gap and providing an alternative theory to the traditional civilian liberties theory of water security. By controlling for key variables across many nations, the study laid the groundwork for further exploration into the bureaucratic theory of water security.

Improving water security globally is an essential human endeavor, as water rights are a central human right, and a necessity in the realization of many other human rights. However, this study has several key limitations. First, it only assesses the period from 1990 to 2014, and once bureaucratic capacity variable is included, from 1996-2014, thereby limiting the generalizability over time to differences in regimes. Secondly, each predictor variable assessed only partially addresses the core concept attempting to be measured. Future analyses would be wise to account for multiple development indicators, as well as further natural resource variables, such as climate and topography (as both could affect water resources as well as creation of water related infrastructure). The renewable freshwater resource variable was limited in time series analyses as the measure was only assessed every two to every four years in each country, as such, an annual and equally comprehensive measure may better reveal relationships. World region was further not accounted for in this analysis, to determine whether world region, such as countries in Africa, condition the effect of regime type on water security, this could inform regional differences

interacting with regime characteristics (civilian liberties and bureaucratic capacity). Given the agglomeration of several datasets, data was missing from a significant number of states, thereby limiting analyses to only 165 countries. That gap in data must be filled to reach more conclusive findings. The government effectiveness proxy for bureaucratic capacity may be insufficient for future studies. Lastly, the dependent measure, water security, only assessed a small part of the unifying concept. While percentage access to an improved water source reveals distribution and accessibility of water, overall water infrastructure was not assessed, these additional aspects may be added without adding imposing best-practice assumptions on means of achieving water security. Future studies should distillate each factor tested and add others (sectoral distribution in water usage, degree of climate change regional impact, etc.) and further explore the specific causal mechanisms underlying bureaucratic capacity influence on water security.

Conclusion

Results of the study reveal several interesting trends and support all five alternative hypotheses. The data support several well-researched findings. The study reaffirms Democratic Peace Theory, with democracies being involved in significantly fewer and of lower magnitude major episodes of political violence. However, it challenges the civilian liberties theory of water security, and finds rather that not only did bureaucratic capabilities independently effect water availability, results indicate it may have a greater influence than civil liberties in affecting water security. Secondly, results support the theory that hybrid regimes are worse-off than either democracies or autocracies. This was evidenced by lower GNI per capita and more MEPVs. Anocratic water insecurity could not be explained by either. These findings support the underlying theory guiding the posited hypotheses. All was not lost for mixed-type regimes; improvements in administrative abilities mitigated otherwise negative relationship between

anocracies and water security. Water related natural disasters, droughts, and inequitable distribution may be most improved via domestic and outside support for state capacity building. As expected, conflict (MEPV) had a significant detrimental effect and development (GNI/capita PPP) had a positive effect on the water security measure employed, thus partially supporting conflict and economic development theories of water security. Contrary to expectations, naturally present water resources had no impact on state water security.

Several models, employing various controls and interaction effects, revealed that above and beyond the effect of conflict, development, and natural freshwater resources, governance significantly impacted water security, both in cross sectional analysis of the year 2014, and over the course of 1990-2014. What is more, the final model tested explained over 52% water security variance.

It was hypothesized (H1) that democratic nations would be the most water secure regime type. The results of this study support this alternative hypothesis. Indeed, a far greater percentage of people in democracies have access to an improved water source. That this phenomenon exists, even when controlling for naturally present water resources, conflict, and a development index suggest, as theorized, that intrinsic differences exist between different regimes, and these differences significantly impact population health and human rights, as indicated by water security. The broad audience costs faced by political leaders in democracies, as well as regular, open elections, likely imposes incentives to provide adequate social services to the citizenry. Furthermore, democratic nations, as scored in the Polity database, have relatively free media, further increasing transparency and accountability, both domestically and internationally. These findings provide support that additional research should be conducted to reveal the causal mechanisms by which regime type affects water security. However, democracies did not fair

significantly better than its authoritarian counterparts. Intriguingly, closed anocracies throughout every model most negatively impacted water security over time, even when controlling for conflict and development, support Bäck and Hadenius' theory of governance and regime type (2008). Bureaucratic capacity improvements produced the most dramatically positive effect on water security in open anocracies. While this could be simply a floor effect, it reveals possibilities in how to differential focus development aid to developing anocratic nations. Additional research would need to be conducted to assess whether differences in provision of social human rights (such as access to water) varies between the two anocratic regime types, and what causal mechanisms produce that difference.

Compared to autocracies, all three regimes types have a significant positive conditional interaction with gross national income per capita, whereby increasing development (GNI/capita) has a conditionally greater positive effect on water security on other countries than autocracies. Regardless increased conflict in hybrid regimes, as countries shift from autocratic, totalitarian governments to more representative democracies, accountability extends to a greater number of people and there are greater audience costs in diverting public funds toward private needs. It may be that the more open governments serve as a means of curbing corruption and ensuring public money as well as developmental aid, is directed towards expanding access to water as well as other social services.

Climate change experts project increased water stress and reduced water security, globally, in the coming years. This process has even already begun in many regions around the world, particularly India. It is vital that policymakers and development agencies understand the best means of addressing and mitigating water insecurity. As such, different regime compositions may require employment of unique aid and development tools. For example, reducing water

insecurity in autocratic nations may not be best served by direct monetary aid, given the results of the study. Furthermore, as hybrid regimes are found to be the least water secure nations, peacekeepers, NGOs, and UN aid agencies may be address potential threats to water security by preemptively arriving and providing water-related aid in nations undergoing state transition, and shortly thereafter. Water's essentiality to all human endeavors: industrial, agricultural, ecosystem maintenance, social, underscores the need to assess every factor affecting water security and human livelihood. This study finds that bureaucratic capacity has both an interactive effect with regime type on water security, and its own, independent positive influence. The mechanisms producing water security must be investigated further to provide policymakers with a best-means framework of addressing water issues at a state level.

This study's findings may have profound implications on the measures taken to address water issues both for international institutions, such as WHO, and nations. Finding that improvements in GNI and bureaucratic capacity have positive effects on water security could shift policy choices and measures taken to improve citizen access to clean water. Developmental aid may be beneficially directed toward government capacity building over time, as its centrality in producing higher water security outcomes over term has been found. State administrative institutions mediate how conflicts over water are handled. They provide frameworks for competing interests to peacefully resolve disputes and establish water sharing. They guide sustainable investments in conservation and water storage. Inadequate or absent institutions can contribute to poor planning and insufficient water supplies, potentially exacerbating social and political tensions. Poor governance or political will lead to inadequate resources directed toward maintaining and developing a clean, sustainable water supply. Capacity constrains may inherently undermine effective implementation and equitable targeting of services at both

national and local levels of governance, and may be greatest by countries characterized by incongruent autocratic and democratic institutions. Strong institutions provide means of establishing national water policy coherence, while private companies and civil society organizations may lack the authority, legitimacy, incentives, and ability to balance competing water demands. With a multiplicity of threats to water security (climate change, pollution, industry, unsustainable agricultural practices, national water resources, etc.), only the governments with high institutional capacities may balance these at times competing demands to ensure civilian access to potable water.

References

Ahmad, Q. K. (2003). Towards poverty alleviation: the water sector perspectives. *International Journal of Water Resources Development*, *19*(2), 263-277.

Allan, J. A. (1996). Water use and development in arid regions: Environment, economic development and water resource politics and policy. *Review of European Community & International Environmental Law*, *5*(2), 107-115.

Andersen, N. (5 May 2017). Water Crisis: Cape Town dam levels are now at only 12,3%. *The South African*. https://www.thesouthafrican.com/water-crisis-cape-town-dam-levels-are-now-at-only-123/

Aucoin, P. (1997). The design of public organizations for the 21st century: why bureaucracy will survive in public management. *Canadian Public Administration*, *40*(2), 290-306.

Baer, M. (2014). Private water, public good: Water privatization and state capacity in Chile. *Studies in Comparative International Development, 49*(2), 141-167.

Bagri, N.T. (25 April 2017). Bangladesh's water crisis: A story of gender. *Al Jazeera.* http://www.aljazeera.com/indepth/features/2017/04/bangladesh-water-crisis-story-gender-170416104845643.html

Bernauer, T., & Siegfried, T. (2012). Climate change and international water conflict in Central Asia. *Journal of Peace Research*, *49*(1), 227-239.

Bogardi, J. J., Dudgeon, D., Lawford, R., Flinkerbusch, E., Meyn, A., Pahl-Wostl, C., ... & Vörösmarty, C. (2012). Water security for a planet under pressure: interconnected challenges of a changing world call for sustainable solutions. *Current Opinion in Environmental Sustainability*, *4*(1), 35-43.

Cahill, A. (2005). 'The human right to water -- A right of unique status': The legal status and normative content of the right to water. *International Journal of Human Rights, 9*(3), 389-410. doi:http://dx.doi.org/10.1080/13642980500170840

Center for Systematic Peace. *Armed conflict and intervention datasets: Major episodes of political violence, 1946-2014*. Integrated Network for Societal Conflict Research.

Center for Systematic Peace. *Armed conflict and intervention datasets: Polity IV annual time-series, 1800-2014*. Integrated Network for Societal Conflict Research.

Cochabamba (10 February 2000). Water War in Bolivia. *The Economist*. http://www.economist.com/node/280871

Cook, C., & Bakker, K. (2012). Water security: Debating an emerging paradigm. *Global Environmental Change*, *22*(1), 94-102.

de Suarez, J. M., Cicin-Sain, B., Wowk, K., Payet, R., & Hoegh-Guldberg, O. (2014). Ensuring survival: Oceans, climate and security. *Ocean & Coastal Management, 90*, 27-37.

Delucchi, M. (2010). Impacts of biofuels on climate change, water use, and land use. *Annals of the New York Academy of Sciences, 11951*(1), 28-45.

Detraz, N., & Betsill, M. M. (2009). Climate change and environmental security: for whom the discourse shifts. *International Studies Perspectives, 10*(3), 303-320.

Dinar, S. (2002). Water, security, conflict, and cooperation. *SAIS Review, 22*(2), 229-253.

Eckstein, H. (1968). Authority Relations and Governmental Performance, a Theoretical Framework. *Princeton University NJ Center of International Studies.*

Eckstein, H. (2000). Case study and theory in political science. *Case study method*, 119-164.

Feger, K. H., & Hawtree, D. (2013). Soil Carbon and Water Security. In *Ecosystem Services and Carbon Sequestration in the Biosphere* (pp. 79-99). Springer Netherlands.

Flörke, M., Kynast, E., Bärlund, I., Eisner, S., Wimmer, F., & Alcamo, J. (2013). Domestic and industrial water uses of the past 60 years as a mirror of socio-economic development: A global simulation study. *Global Environmental Change*, *23*(1), 144-156.

Frej, W. (1 May 2017). Women Basically Ensure the Survival of Their Communities in Rural Kenya. *Huffpost*. www.huffingtonpost.com/entry/womenkenyawater_us_58f7a707e4b05b9d613f9895

Fukuyama, F. (2013). What is governance? *Governance*, *26*(3), 347-368.

Ganim, S. (30 March2017). Flint water crisis likely the cause of deadly Legionnaires outbreak. *CNN.com.* http://www.cnn.com/2017/03/30/health/legionnaires-disease-flint-water-crisis-study/

Gleick, P. H. (1993). Water and conflict: Fresh water resources and international security. *International security*, *18*(1), 79-112.

Gleick, P. H. (1993). Water and conflict: Fresh water resources and international security. *International security*, *18*(1), 79-112.

Grandjean, A. C., & Grandjean, N. R. (2007). Dehydration and cognitive performance. *Journal of the American College of Nutrition*, *26*(sup5), 549S-554S.

Grey, D., & Sadoff, C. W. (2007). Sink or swim? Water security for growth and development. *Water policy*, *9*(6), 545-571.

Gupta, J., Ahlers, R., & Ahmed, L. (2010). The human right to water: moving towards consensus in a fragmented world. *Review of European Community & International Environmental Law*, *19*(3), 294-305.

Gurr, T. (1974). Persistence and Change in Political Systems, 1800-1971. *The American Political Science Review, 68*(4), 1482-1504.

Hanna, R. (2005). *Democracy, Citizenship and Civil Society Participation in Watershed Management: The Case of the Piracicaba, Capivari and Jundiai River Basin Committee (CBH PCJ) State of Sao Paulo-Brazil* (Doctoral dissertation, York University (Toronto).

Hanson, J. K., & Sigman, R. (2013). Leviathan's Latent Dimensions: Measuring State Capacity for Comparative Political Research.

Hendrix, C. S. (2010). Measuring state capacity: Theoretical and empirical implications for the study of civil conflict. *Journal of Peace Research*, *47*(3), 273-285.

Hendrix, C. S., & Salehyan, I. (2012). Climate change, rainfall, and social conflict in Africa. *Journal of peace research*, *49*(1), 35-50.

Holden, W. N., & Jacobson, R. D. (2008). Civil society opposition to nonferrous metals mining in Guatemala. *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations*, *19*(4), 325-350.

Homer-Dixon, T. (1994). Environmental Scarcities and Violent Conflict: Evidence from Cases. *International Security*, *19*(1), 5-40.

Huber, J. D., & McCarty, N. (2004). Bureaucratic capacity, delegation, and political reform. *American Political Science Review*, *98*(3), 481-494.

Hussain, I., & Hanjra, M. A. (2004). Irrigation and poverty alleviation: review of the empirical evidence. *Irrigation and Drainage*, *53*(1), 1-15.

Jia, S. F., Zhang, S. F., Yang, H., & Xia, J. (2004). Relation of industrial water use and economic development: Water use Kuznets Curve. *Journal of Natural Resources*, *3*, 279-284.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2009). Governance matters VIII: aggregate and individual governance indicators, 1996-2008.

Langridge, R., Christian-Smith, J., & Lohse, K. (2006). Access and resilience: analyzing the construction of social resilience to the threat of water scarcity. *Ecology and Society*, *11*(2).

Link, P. M., Scheffran, J., & Ide, T. (2016). Conflict and cooperation in the water-security nexus: a global comparative analysis of river basins under climate change. *Wiley Interdisciplinary Reviews: Water*, *3*(4), 495-515.

Liu, J., Yang, H., & Savenije, H. H. G. (2008). China's move to higher-meat diet hits water security. *Nature*, *454*(7203), 397-397.

MacDonald, A. M., Bonsor, H. C., Calow, R. C., Taylor, R. G., Lapworth, D. J., Maurice, L., ... & O Dochartaigh, B. E. (2011). Groundwater resilience to climate change in Africa.

Palmer, M. A. (2010). Water resources: beyond infrastructure. *Nature*, *467*(7315), 534-535.

Regan, P. M., & Bell, S. R. (2010). Changing lanes or stuck in the middle: Why are anocracies more prone to civil wars?. *Political Research Quarterly*, *63*(4), 747-759.

Renveney, R. & J.W Maxwell, J.W. (2001). Conflicts and Renewable Resources. *The Journal of Conflict and Resolution, 45*(6).

Sadik S (1991) Population growth and the food crisis, *Food, Nutrition and Agriculture – Food for the Future*, no 1. FAO. www.fao.org/docrep/U3550t/u3550t02.htm#TopOfPage.

Schindler D.W. (2001). The cumulative effects of climate warming and other human stresses on Canadian freshwaters in the new millennium. *Canadian Journal of Fisheries and Aquatic Sciences, 58*(1), 18-29.

Sikkink, K. (1991). Ideas and Institutions: Developmentalism in Brazil and Argentina. Ithaca: Cornell University Press.

Sultana, F. (2007). Water, water everywhere, but not a drop to drink: Pani politics (water politics) in rural bangladesh. *International Feminist Journal of Politics, 9*(4), 494-502.

Tempelhoff, J. W. (2009). Civil society and sanitation hydropolitics: a case study of South Africa's Vaal River Barrage. *Physics and Chemistry of the Earth, Parts A/B/C*, *34*(3), 164-175.

Thompson, J., Porras, I.T., Tumwine, J.K., Mujwahuzi, M.R., Katui-Katua, M., Johnstone, N. and Wood, L. (2001). *Drawers of water II – 30 years of change in domestic water use and environmental health in East Africa*, p 26. International Institute for Environment and Development (IIED). http://pubs.iied.org/pdfs/9049IIED.pdf.

Tiruchirapalli. (4 May, 2017). Water scarcity in Viralimalai taluk. *The Hindu*. http://www.thehindu.com/news/cities/Tiruchirapalli/water-scarcity-in-viralimalai-taluk/article18382152.ece

Toset, H. P. W., Gleditsch, N. P., & Hegre, H. (2000). Shared rivers and interstate conflict. *Political Geography*, *19*(8), 971-996.

Turral, H., Burke, J. J., & Faurès, J. M. (2011). *Climate change, water and food security*. Rome, Italy: Food and Agriculture Organization of the United Nations.

UNICEF and WHO. (2015). *Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment*. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitaiton.

UNICEF. (2011). WHO. Drinking Water: Equity, Safety and Sustainability. *JMP thematic report on drinking water. UNICEF and the World Health Organization*.

United Nations (8 September 2000). *United Nations Millennium Declaration. 55/2*. United Nations General Assembly. http://www.un.org/millennium/declaration/ares552e.htm

United Nations Regional Information Center for Western Europe. *Making water a human right*. http://www.unric.org/en/water/27360-making-water-a-human-right

United Nations. *General assembly adopts resolution recognizing access to clean water, sanitation as human right, by recorded vote of 122 in favour, none against, 41 abstentions*. http://www.un.org/press/en/2010/ga10967.doc.htm

United Nations. *The Universal Declaration of Human Rights*. http://www.un.org/en/universal-declaration-human-rights/

US Department of Energy (December 2006). *Energy demands on water resources: report to Congress on the interdependency of energy and water*. http://www.sandia.gov/energy-water/docs/121-RptToCongress- EWwEIAcomments-FINAL.pdf

Vidal, J. (1 March 2017). As water scarcity deepens across Latin America, political instability grows. *The Guardian.* https://www.theguardian.com/global-development-professionals-network/2017/mar/01/water-scarcity-latin-america-political-instability

Vörösmarty, C. J., Douglas, E. M., Green, P. A., & Revenga, C. (2005). Geospatial indicators of emerging water stress: an application to Africa. *AMBIO: A journal of the Human Environment*, *34*(3), 230-236.

Vörösmarty, C. J., Green, P., Salisbury, J., & Lammers, R. B. (2000). Global water resources: vulnerability from climate change and population growth. *science*, *289*(5477), 284-288.

Vörösmarty, C. J., et al. (2010). Global threats to human water security and river biodiversity. *467*(7315), 555-561.

WaterAid (2009) *A global framework for action on sanitation and water (GF4A) focusing on national plans*, p 1. Discussion paper, WaterAid, UK.

WaterAid. (2012). *Water security framework*. WaterAid, London, UK. www.wateraid.org/~/media/Publications/water-security-framework.pdf

Weber, M. (1978) *Economy and Society : An Outline of Interpretive Sociology*. Berkeley: University of California Press.

Wilson, M. G., & Morley, J. (2003). Impaired cognitive function and mental performance in mild dehydration. *European Journal of Clinical Nutrition*, *57*, S24-S29.

World Bank, The. *GNI per capita, PPP (current international $) dataset*. World Development Indicators. http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD

World Bank, The. *Improved water source (% of population with access) dataset*. World Development Indicators. http://data.worldbank.org/indicator/SH.H2O.SAFE.ZS?page=4

World Bank, The. *Renewable internal freshwater resources per capita (cubic meters) dataset*. World Development Indicators. http://data.worldbank.org/indicator/ER.H2O.INTR.PC

World Economic Forum Water Initiative. (2012). *Water security: the water-food-energy-climate nexus*. Island Press.

World Resources Institute. (2015). Water Risk Atlas.

WWAP (United Nations World Water Assessment Programme). (2015). *The United Nations World Water Development Report 2015: Water for a Sustainable World.* Paris, UNESCO.

Yoffe, S., Fiske, G., Giordano, M., Giordano, M., Larson, K., Stahl, K., & Wolf, A. T. (2004). Geography of international water conflict and cooperation: Data sets and applications. *Water resources research*, *40*(5).

Zeitoun, M. (2011). The global web of national water security. *Global Policy*, *2*(3), 286-296.

Appendix A. Final Model Relationships.

Source	SS	df	MS	Number of obs	=	586
				F(10, 575)	=	62.47
Model	78279.0921	10	7827.90921	Prob > F	=	0.0000
Residual	72046.2027	575	125.297744	R-squared	=	0.5207
				Adj R-squared	=	0.5124
Total	150325.295	585	256.966316	Root MSE	=	11.194

watersecurity	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
regime# c.governmenteffectiveness						
Closed Anocracy	5.433477	2.634718	2.06	0.040	.2586319	10.60832
Open Anocracy	11.91888	3.253069	3.66	0.000	5.529535	18.30823
Democracy	1.188356	2.329268	0.51	0.610	-3.386555	5.763266
gnicap	.0001123	.000048	2.34	0.020	.000018	.0002066
time	.306992	.1031921	2.97	0.003	.1043126	.5096714
lnwaterres	-.4826226	.2759738	-1.75	0.081	-1.024662	.059417
governmenteffectiveness	5.254653	2.534392	2.07	0.039	.2768585	10.23245
regime						
Closed Anocracy	-4.833632	2.273448	-2.13	0.034	-9.298907	-.3683576
Open Anocracy	2.381037	2.756738	0.86	0.388	-3.033468	7.795541
Democracy	2.511355	1.963835	1.28	0.201	-1.345809	6.368519
_cons	82.90228	3.141851	26.39	0.000	76.73137	89.07318