WHERE IS THE SAFE WATER?
CAPTURING THE MISSING EXPLANATION IN INTER-COUNTRY VARIATION IN ACCESS

by

Shin Kue Ryu

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Dedication

Dedicated to my wife,
Jihae,
for journeying with me
through its completion

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List of Abbreviations

ADB	Asian Development Bank
ASCE	American Society of Civil Engineers
AWWA	American Water Works Association
EPA	Environmental Protection Agency
EPU	Economic Planning Unit
IEC	Information, Education, and Communication
IUIDP	Integrated Urban Infrastructure Development Project
MARD	Ministry of Agriculture and Rural Development
MFI	Multilateral Financial Institutions
MoC	Ministry of Construction
MoET	Ministry of Education and Training
MoH	Ministry of Health
MoPW	Ministry of Public Works
NCERWASS	National Center for Rural Water Supply and Sanitation
NDPC	National Development Planning Committee
RWSSP	Rural Water Supply and Sanitation Partnership
PCERWASS	Provincial Center for Rural Water Supply and Sanitation
PDAM	Indonesia Public Water Utilities
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WHO	World Health Organization
WPP	World Bank Water Partnership Program
WSP	World Bank Water and Sanitation Program

Abstract

WHERE IS THE SAFE WATER? CAPTURING THE MISSING EXPLANATION IN INTER-COUNTRY VARIATION IN ACCESS?

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Access to safe drinking water is an outstanding worldwide challenge with 663 million people living without its access as of 2015. The magnitude of the outstanding challenge varies by country. A variation that is perplexing, knowing engineering and financial solutions are established, abound, and accessible. This research investigates to what extent political and institutional variables matter. First, it employs path analysis and examines whether a statistical explanation is sufficient in explaining the variation. Second, it corroborates the previous analysis with in-country interviews with sector experts. The latter's importance resting on the identification of crucial intervening variables and further clarification in conceptualization of the set of variables under examination in the research. By employing quantitative and qualitative methods side-by-side, the research reaches three methodological implications and three theoretical implications. On methodology, we find detailed conceptualization matters when studying the variation for a multidimensional dependent variable. Without properly unpacking

the variable, researcher bias on observations tend to drive towards easily falsifiable associative conclusions. Second, when path-dependent intervening variables are missing from the dataset, statistical findings carry an inherent blind spot that persist to be unnoticed without complementary in-depth process-tracing case study. Third, the research opens the discussion on how best to incorporate "path-dependent variables" in comparative country studies, especially when the complexity of sequential nature makes them difficult for comparison; a methodological question that is linked with the generalizability of policy design and implementation studies. As for theoretical implications, the research contributes to three streams of academic research. First, the research opens the discussion on how well implementation theories rooted in Anglo-American history fit in the context of Asia. The findings demonstrate limitations in their generalizability due to different historical trajectories and their implications on institutional growth. Second, the research contributes to the state literature by unpacking the state. To what extent does the state matter to delivering a democratic outcome of universal access to water is explored. Lastly, the research contributes to theory by working towards a combined model of state and implementation to better capture the nexus of state development and international forces. Given the modus operandi of multilateral financial institutions are identical, the question becomes why do we see variation in loan performances between different countries. The question leads us into examining how the state absorbs the influences of "external forces". In conclusion, the methodological and theoretical implications arose in the process of finding a valid and reliable explanation behind the variation of interest. The layered complexity that arose as byproduct of the research is hopefully insightful in demonstrating why we have few convincing answers to such an important social science question.

Introduction

This research is the systematic search for valid and reliable explanations behind the variation in access to safe and reliable drinking water in different countries. It is a question that sits in the broader inquiry of why 663 million people are still without safe drinking water (UNICEF & WHO, 2015). Given that the latest estimate of the US population is at 318.9 million, and those without access to safe drinking water is more than twice the size of the entire US population, we could gauge the magnitude of this problem (World Bank, 2016, p. 68); a problem that is more concerning and pressing since the associations between poor quality water and illnesses are proven through multiple epistemological studies (Selendy, 2011).

Safe drinking water is something that citizens of the advanced industrial societies do not devote a lot of personal time concerning themselves with.[1] It is rare that you see populations in advanced industrial societies cut off from running water. However, it is a different story altogether in developing nations where acquiring water for daily consumption is a task that cannot be ignored; a burden that frequently fall upon women and children in poverty settings (Blackden & Wodon, 2006, p. 53).

[1] An exception occurred in the US with Flint, Michigan water contamination being the focus of media and political inquiry. Also, West Virginia water contamination due to chemical spill brought the safe drinking water issue to the fore.



Figure 1: Disparities in Drinking Water Circumstances
Source: (Left) Nelson Institute for Environmental Studies. (2016). *India: An Environmental Analysis.* Retrieved from http://blogs.nelson.wisc.edu/es112-311-3/2014/02/18/water/. (Right) Department of Water Resources. (2016). *California Geography and Its Water Needs.* Retrieved from http://www.water.ca.gov/swp/geography.cfm.

Recognizing the undeniable burden in time and resources associated with lack of access to safe drinking water, the question is, "why are certain populations able to live in circumstances where they could be oblivious to the mechanism of water supply service delivery while still being able to enjoy the benefits of water with the turn of a faucet while others have to search and toil for its daily acquisition?" A widening disparity when you realize that the expended effort may or may not result in the securing water of drinkable quality. A situation that could be best summed up on the Figure 1.

As the children in the pictures illustrate, whether one has access to safe drinking water or not cannot be entirely attributed to personal capacity. That is, individual labor

alone is not responsible for clean water production or access to it. Thus, gaining access to safe drinking water is a multi-fold question. A series of questions that begins with how do we currently acquire access to safe drinking. A question that anchors on our understanding of what is "safe drinking water".

In establishing the basics, "safe drinking water" or "clean drinking water" are labels bestowed to the solution comprised of H_2O molecules that is free of excess contaminants with known negative health consequences.[2] "Excess" is the emphasized criteria since H_2O solutions naturally carry solvents unless purposely removed.[3] Thus, it is both cost prohibitive and unnecessary to entirely remove solvents. It is still possible to extract pure H_2O yet pure H_2O is less desirable for consumption purposes due to its lack of taste.[4]

Permissible amount of solvents in water is frequently being updated by research (World Health Organization, 2011). However, it is important to note that establishing standards on advisory solvent thresholds is a modern exercise of the past century. In the US, the process was more rigorously pioneered in the United States with the Safe Drinking Water Act in 1974 (Environmental Protection Agency, 1999). Prior to this period, regulations existed but with varying performances across different States.

[2] Both definitions are used interchangeably, as they both describe solutions acceptable for consumption. If pushed for specificity, "clean drinking water" would be a subset of "safe drinking water" since definition-wise all "clean drinking water" free of contaminants would be "safe drinking water" whereas the opposite would not be true. Implications of this on policy will be discussed more thoroughly in the case studies.

[3] H_2O is called the universal solvent due to its ability to dissolve varies substances.

[4] Singapore's Deep Tunnel Sewerage filtration system separates and extracts H_2O molecules through micro-filtration. Due to its pure quality, it is suitable for consumption. And is done so in the form of souvenir bottles when visiting the treatment facility in the Chang-Gi area. However, in response to the suggestion that it lacked taste, minerals were added back to the pure H_2O for taste.

Regulations evolved with improved research on contaminants and health consequences. With the increase laboratory investments and the growing influence of hospitals empowered by deepening establishment of bacteriology, the science of health-consequences of solvents provided the supporting empirical evidence for designing regulations (Duffy, 1990).

Methods for removing and controlling various unwanted contaminants from the initial water source are established in both science and engineering. The American Water Works Association disseminates manuals over design, construction, operation, and maintenance (American Water Works Association & American Society of Civil Engineers, 2005; American Water Works Association, 2004). Guidelines are also available through the World Bank (WPP, 2012; WPP, 2012; WPP, 2012). Thus, the question can be reframed into asking why do we seeing such disparity in safe drinking water provision across different countries? That is, given the reliability of the science behind safe drinking water, why are we seeing variation in their access across different countries? Answering the question lies at the core of this research.

The research involved a lengthy process over a period of 5 years starting in 2012. In the beginning, regression models were calculated employing the World Bank Development Indicator dataset. This was because the dataset included longitudinal changes in the percentages of population with access to improved water sources. Based on a pre-selected set of explanatory variables based on existing literature, regression models were run to develop a path analysis diagram (Maruyama, 1998). This was the starting point of our inquiry.

When the path analysis diagram was drawn based on the statistically significant findings, multiple concerns emerged. Two main concerns undermined the strength of the path analysis conclusions. First, the path diagram was simplified to the point of not being able to capture and describe a meaningful causal mechanism. This was linked to the second concern in missing key observations. That is, the World Bank Development Indicator dataset was not a fully populated dataset but rather was patchwork of reported information by its member countries and partner organizations. Reporting frequently fell below 100% response rate. This aspect limited the number of data points available for regression analysis. This resulted in few variables surviving in the explanatory set, which in turn meant that the path analysis model could be constructed with only the few surviving explanatory variables.

Unconvinced by the findings of the path analysis alone, a secondary and complementary method was performed.[5] Although the path analysis calculations did not retain all the original pool of explanatory variables, it was still a finding that should not be thrown away entirely, as it serves to confirm the associative relationships between variables. Yet recognizing the lack of important intervening variables present in the path analysis diagram, a complementary method had to be employed to help identify the relevant intervening variables for a more calibrated explanation behind the variation among countries.

[5] Lester & Lombard (1990) and Lester (1994) recommends complementary comparative analyses in studying environmental policy.

This led to selecting and employing the process-tracing method with strengths in identifying the intervening causal process (George & Bennett, 2005, pp. 206-7; Beach & Pedersen, 2013). Its utility would be in enriching the path analysis findings by identifying the critical intervening variables absent in the model. The case studies were compiled via series of in-country interviews with sector experts and in-country archival research. Saturation via verifiable evidence was applied. Saturation supports external validity, as it exhausts the possible explanations. Verifiable evidence is necessary for peer-reviewers to check the results by replicating the research process.

The process-tracing method was performed on five countries. Two countries, Indonesia and Vietnam, were selected from the pool of countries run for the path analysis. They were selected based on their divergent performances in expanding safe drinking water between 1990 and 2010. Indonesia was visited twice and Vietnam was visited three times to collected primary and secondary observations.[6] Building from the collected observations, the causal mechanisms responsible for performance in the two country's drinking water sector are identified and presented.

The additional three cases of Malaysia, Singapore, and South Korea were selected to refine our understanding of the process at work in expanding access to safe drinking

[6] People often ask why in-country visits were necessary to collect secondary observations. The answer is simple. First, not all countries digitalized their archival resources. Hence, in-country visits were necessary to acquire these documents. Second, there is a knowledge silo problem that pervades the sector, where the availability of certain public documents is known but utilized by the few. These documents are often times very specific in function. Thus, it is unknown to the general public and even to fellow practitioners unless notified of its presence by those that are in the loop of the knowledge group. In other words, although some are available via the World Wide Web in the United States, its utility and impact only comes to light as important supporting materials of the causal mechanism at play when the local practitioners pointed out their relevance.

water. The three countries serve this purpose, as these are countries that achieved universal access to safe drinking water within a generation. That is, they serve as references since the cases would help unearth additional catalytic factors that enabled the rapid expansion in access to safe drinking water.

The selection of these cases are based on the logic that if expansion in access to improved drinking water sources could be modeled in the form of $f(a, \ldots, z) = access_{water}$ where critical factors $(cf)=\{a, \ldots, z\}$ are all critical factors to expanding access then the countries with poorer performances will possess less factors in that set that those with better performances. Hence, the selection of the latter cases is due to the assumption that $cf_{Indonesia} < cf_{Vietnam} < cf_{Malaysia,\ Singapore,\ South\ Korea}$. That is, we put to the test the assumption where we expect more critical factors at play in the latter case studies relative to the poorer performing case of Indonesia and Vietnam. Thus, the latter cases will help us identify them.

Expansion of access is often reduced to being linear and incremental due to the necessary time-lapse for engineers to construct systems and financiers to raise enough investment to pay for them. However, this explanation cannot be generalizable to all countries since not all countries were able to expand their coverage as fast as these countries. That is, if additional factors are necessary to rapidly expand coverage, these countries are likely to possess and exhibit them.

The three success cases further identify critical variables that may not be identifiable by studying just Indonesia and Vietnam, as these two countries still have not achieved near universal access to improved water sources. Process-tracing method is

applied to these cases to unearth and identify the missing critical intervening variables. The developmental trajectories associated with expanding access to water are reconstructed with primary and secondary data collected from the in-country visits.

The collected data and their corresponding analysis are presented in the following chapters. Before presenting the results, a section is devoted to data and methods. The section immerses in the methodological discussions for the sake of further clarifying how the methods employed in this research were aligned with evolving norms of "good" social science research, which is an area of on-going discussion amidst diverse methods employed in among social scientists with no shortness in recommendations (Collier, 1993; King, Keohane, & Verba, 1994; Laitin, 1995; Gerring, 2001; Brady & Collier, 2004; George & Bennett, 2005).

Results from the data analyses are presented following the chapter on data and methods. The results address the main hypothesis of this research, which is:

> H_A: *Variation in coverage expansion of safe drinking water is associated with the interactions between the political factors contributing to water policy prioritization, specific institutional arrangements for water policy implementation, complementary non-water sector policy developments, international engagements, and how they are leveraged against domestic implementing agencies.*

The sub-hypotheses generated from this hypothesis are:

H_{A1}: Water policy prioritization occurs when poverty eradication with aims to address inequity in government service provision to individuals is emphasized as a key tenet to the heads of state.

H_{A2}: Water supply policy implementation is more successful when urban and rural water infrastructure developments are housed in different agencies where urban utilities are financially ring-fenced and operate under commercial principles and where rural water supply system developments are integrated within rural health and livelihood improvement programs.

H_{A3}: Residential water supply policy implementation gains momentum when coupled early with other sector policies such as industrial complex development policies, low-income housing policies, rural livelihood improvement policies, and community health center development policies.

H_{A4}: Water infrastructure developments benefit from international lending and technical assistance where external funding sources and assistance agencies are either coordinated among them via joint review or coordinated through dedicated domestic institutions with powers to consolidate and enact legislations to remove identified bottlenecks during the project implementation process.

H_{A5}: Water infrastructure developments benefit from the state being a developmental state, particularly equipped with the capacity to peacefully and legitimately resettle populations within its borders.

This contrasts to the null hypotheses of:

H_0: *Variation in coverage expansion of safe drinking water is not dependent on water policy prioritization by political leadership, on institutional arrangements for water policy implementation, on complementary non-water sector policy developments, and on international engagement and how they are leveraged.*

The hypothesis stems from two realizations. First, studies on safe drinking water are dominant by the engineering, finance, or health fields (American Water Works Association, 2000; 2004; American Water Works Association & American Society of Civil Engineers, 2005; Selendy, 2011; World Health Organization, 2011). That is, access to improved water services are seen as engineering, finance, or health problems. What this means is that if populations are lacking access to safe drinking water then solutions are sought from these vantage points. The hypothesis challenges this paradigm. That is, the hypothesis suggests we are missing other critical variables necessary in explaining the variation in performance among different countries.

Second, technical knowledge and its associated advice are more readily available and transferable with the growth of information technology yet based on the variation among countries the development of worldwide reduced knowledge transfer platforms did not seem to have commensurate effects. That is, with technical assistance costs

brought down, countries with poor access ratios should be able accelerate their coverage. However, that is not the case. Hence, a more accurate explanation requires a broadened search for other critical variables. This applies to finance as well. In a time of unprecedented global wealth where average GDP-per-capita grown to USD 10,000 per person in 2015 from USD 4,270 in 1990 (World Bank, 2016), finding investment funds to source a fundamental human need is not expected to be difficult. Yet, we see variation among countries in satisfying this fundamental need with a global aggregate of 663 million people without access to improved water sources. Hence, there has to be a better explanation than the traditional explanation.

The traditional explanation in the form of the null hypothesis supports an apolitical explanation. A confirmation of the null hypotheses would be in the form where the apolitical variables included in the World Development Indicators should be sufficient capturing the variation in access to expansion in coverage of safe drinking water. The support for the alternative hypothesis would be in the form of context specific tracing of movement in the dependent variable being a more convincing and comprehensive than the Large-N studies results.

If evidence supports the alternative hypothesis, then the subsequent question is what theoretical frameworks in political science are best in allowing us to organize the identified and collected set of evidence and help assess their impact on the dependent variable. In the search of a relevant framework, the research draws on the literature in public administration and comparative politics. In particular, it draws from the implementation theorist works within public administration and state theorist works in

comparative politics. Implementation theory frameworks are drawn because we are examining a single policy objective of universal access to safe drinking water and isomorphic government agencies are typically tasked to achieve the objective. The latter is drawn due its rich scholarship on how international forces and colonial legacies impact state development. These elements that are known to be influential in post-colonial developing country contexts is insufficiently addressed in implementation theory scholarship, as the latter develops theories based on observations collected from the US and European settings. By drawing on the rich research traditions of the two streams of scholarship, it enables us to answer the following set of questions:

1. *If political and institutional variables matter, could the set of identified critical factors be organized and their impacts on the dependent variable assessed by theoretical frameworks developed by implementation theorist within public administration?*

2. *If political and institutional variables matter, could the set of identified critical factors be organized and their impacts on the dependent variable assessed by theoretical frameworks developed by state theorist within comparative politics?*

Implementation theorists emphasize the need to pay attention to the execution of policies. That is, policy formulation does not guarantee its implementation. Pressman

and Wildavsky observed this in their detailed study of federally funded Economic Development Agency (EDA) projects in Oakland, California (1973). While tracing the progress of the program, they observed various post-policy formulation factors that were undermining the fulfillment of policy objectives. Policy implementation involved multiple steams of activities with their own set of gatekeepers. The consequence resulted in delay and incongruent decision-making. These factors only came into light once policy was put into operation. That is, they were not anticipated during policy formulation. Hence, their study opened up subsequent studies on implementation that emphasized the need to pay greater attention to the environment and activities related to execution.

Early scholarship on implementation focused in an anticipatory top-down approach. That is, research resulted in recommending policy-makers to incorporate additional implementation factors when formulating policy. The targeted audience was policy-makers and the goal was equip them with foresight to navigate around possible road-bumps during policy implementation (Van Meter & Van Horn, 1975; Bardach, 1977; Mazmanian & Sabatier, 1981; Hogwood & Gunn, 1984).[7]

[7] Van Meter and Van Horn advocates two dimensions are crucial for successful implementation: amount of change sought and goal consensus (1975). Accordingly, policies designed for small changes and high goal consensus are most likely to be successfully implemented. The implementation process is also a product of six process-oriented variables: 1) policy standards and objectives, 2) resources and incentives, 3) quality of inter-organizational relationships; 4) characteristics of the implementation agencies, 5) economic, social, and political environment, and 6) disposition or response of implementers (1975, p. 464-472). Bardarch emphasizes the need for scenario writing process and paying attention to fixing the game (1977) in light of conflicts in inter-organizational settings. Scenario writing applies to structuring the sequence of implementation games that will have to be played in order to achieve desired results. Fixing the game applies to rearranging if necessary the parameters of the game in order to achieve desired results in the interactions. Hogwood and Gunn (1984) list 10 preventive measures that should be

Lipsky later challenged the overt emphasis and reliance on policy-makers' foresight on implementation. He advocated that successful policy implementation resides on the actual people delivering public services; those he termed as street-level bureaucrats (Lipsky, 1980). In his study, he shares how the operations of the street-level bureaucrats are not perfectly programmable as they often work in complicated situations. Police operating in potentially hostile encounters, lower-court judges ruling on first offenders, and doctors working in Veterans Administration hospital are provided as examples where professional discretion based on onsite observations take precedence over strict adherence programmatic rules. Street-level bureaucrats exercise discretionary judgment on rule application, as they are expected to be responsive to circumstances and compassionate to citizens' needs. The reason why Lipsky receives acclaim is because he asserts that the top-down approach misunderstands how policy implementation occurs.

> *When relationships between policy deliverers and managers are conflictual and reciprocal, policy implementation analysis must question assumptions that influence flows with authority from higher to lower levels, and that there is an*

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taken by policy makers to prevent implementation failure. They are: 1) circumstances external to the implementing agency do not impose crippling constraints, 2) adequate time and sufficient resources are made available to the program, 3) required combination of resource are available at each stage in the implementation process, 4) policy is based upon a valid theory of cause and effect, 5) relationship between cause and effect is direct with few intervening links, 6) a single agency is responsible for implementation and does not depend upon other agencies for success, 7) there is a complete understanding of, and agreement upon, the objectives to be achieve, and these conditions persist throughout the implementation process, 8) specify in complete detail and sequence the tasks to be performed by each participant in the implementation process, 9) ensure perfect communication and coordination among various elements involved in the program, and 10) those is authority can demand and obtain perfect obedience (Hogwood and Gun, 1984, p. 199-206).

> *intrinsic shared interest in achieving agency objectives. This situation requires analysis that starts from an understanding of the working conditions and priorities of those who deliver policy and the limits on circumscribing those jobs by recombining conventional sanctions and incentives* (Lipsky, 2010, p. 25)

His works and others of the bottom-up approach are critical of the policy-maker centric viewpoint (Lipsky, 1971; Ingram, 1977; Hanf & Scharpf, 1978; Elmore, 1979; Browning, Marshall, & Tabb, 1981; Barrett & Fudge, 1981; Hjern & Hull, 1982; Hanf, 1982). That is, top-down approaches overly rely on focusing on the arena of policy-making by political elites. It fails to take into account others actors involved in the implementation process. The top-down approach is also difficult to employ when implementation is by design fragmented and diffuse. That is, there is neither a single overarching and overriding statute nor single agency responsible for the all aspects involved in implementation. In addition, the overly reliance on political elites to better formulate policies to navigate implementation roadblocks fail to take into account the strategies employed by street level bureaucrats and targets in response to central government policies (Weatherly & Lipsky, 1977; Elmore R. , 1978; Berman, 1978).

Since the factors identified by the top-down approach and the bottom-up approach were all recognized to be important in implementation, later scholarship in the field offers frameworks to merge and integrate the various factors identified through the two approaches (Sabatier, 1986; Goggin, Bowman, Lester, & O'Toole, Jr., 1990; Winter, 1990, 2012). Among the Advocacy Coalition Framework, Communication Model of

Intergovernment Policy Implementation, and the Integrated Implementation Model developed by the synthesizing scholars, the Integrated Implementation Model developed by Winter will be tested to see how well it consolidates the collected set of evidence and help explain why certain countries performed better in expanding access to safe drinking water among their citizens.

Winter's Integrated Implementation Model combines the insights from evolving implementation scholarship into a singular model. It breaks down the policy formulation to results into a 4 stage process with policy formulation, policy design, implementation process, and implementation results. Social-economic context is treated as an extraneous factor that affects the entire process. The model's key contribution is breaking down the implementation process stages based on developments in scholarship. It is broken down to organizational and interorganization implemenation behavior, management, street-level bureaucrats' skills and will/interests, and target group behaviors. The models serves a useful blueprint as it conceptually outlines and delineates the different components related to implementation. Hence, whether it is able to generate insights on safe drinking water access variation will be tested.

Works of state theorists in comparative politics are drawn to examine whether they offer better frameworks to organize the collected data and whether it offers more convincing explanations on why we see variation in expansion of safe drinking water among different countries. State by definition the set of institutions that possesses the monopolgy in the legitimate use of physical force within a given territory (Weber, 1921).

Hence, the literature is relevant to our study because laws and its implementation, along with the ability to punish violators, are involved.

The definition of the state by Weber did not include variation in the state variable. Hence, using the state as an explanatory variable was a different matter that was applied and refined by later scholars (Nettl, 1968; Skocpol, 1979; Evans, Rueschemeyer, & Skocpol, 1985; Migdal, 1988; Johnson, 1999; Herbst, 2000; Fukuyama, 2004; Midgal, 2009).[8] Among the evolutions in state scholarship, we employ four frameworks from four seminal comparative politics scholars: Migdal, Scott, Johson, and Herbst (Migdal, 1988; Scott, 1998; Johnson, 1999; Herbst, 2000). Their works were selected out of the vast scholarship on the state because of their relevance to the cases.

Migdal's offers a framework to explain why developing countries find it difficult to have state apparatuses in the peripheral behave as it was intended by the central government. Scott offer the perspective where centrally guided action is not necessary something that we desire, as it often produces catastrophic results. Johnson provides the concept of the developmental state to explain East Asian economic miracle. Herbst offers an explanation behind failed states in post-colonial setting where capitals were not setup to govern but to extract and where the state was under no threat to effectively

[8] Charles Tilly's *Coercion, Capital, and European States* published in 1992 and the Hendrick Spruyt's counterargument book *The Sovereign State and Its Competitors* published in 1994 are also seminal works in the state literature. They are not cited here because their works offer competing explanation to the origins of the modern state in Europe. They are very relevant for the evolution of the state scholarship but not as relevant for this research. For the purpose of our research, Herbst's research that builds on Tilly's and Spruyt's work is more relevant as he examines the origins of the African states and the reasons why they differ from European modern states.

govern their terriority as borders were not threated with the emergence of international peace arbitration organizations, such as the United Nations Security Council.

These frameworks are relevant to the five case studies of Indonesia, Vietnam, Malaysia, Singapore, and South Korea. Indonesia, Vietnam, Malaysia, and Singapore are all post-colonial countries with a heterogeneous population. All countries received developmental loans from multilateral financial institutions to execute policy designed from the central government. Singapore and South Korea demonstrated their economic development capacities. All countries are post-colonial countries. Indonesia was colonized by the Dutch. Vietnam was colonized by the French. Malaysia and Singapore was colonized by the British. South Korea was colonized by Japan.

Thus, the question is then how much of the variation in expansion of safe drinking water, or its lack of expansion, can be explained by the frameworks developed by the states theorist in comparative politics. Does the evidence support the frameworks? And more importantly, do the frameworks offer a deeper insight into the impact of non-technical and non-financial attributes and their impacts on expansion of safe drinking water?

More specifically, the discussions on applications of theoretical frameworks can be summed as addressing the following questions:

1. *Is variation in access to safe drinking water an implementation problem of central government that can be intervened and resolved?*

2. *Or is variation in access to safe drinking water more of a result of the structure of the state that is ossified and reinforced from the country's unique history?*

3. *If relevant parts in both streams of scholarship were brought together to create a new framework that helps refine the explanation behind the variation in access to safe drinking water, what would it be?*

By answering these questions, the research contributes to the two steams of scholarship by testing existing theories and assessing their potential as solutions to an outstanding worldwide problem. Simply, if the frameworks are offering us insights to the principles on how the public sector operates, or not, in different countries, then they should also lend us the analytical lenses to find solutions to more rapidly provide safe drinking water for all. If not, we need to ask what are the theories missing in order to serve this function?

What we find is that regarding the expansion of safe drinking water, implementation theory fails to take into consideration of international factors, particularly in infrastructure development loans and technical assistance, and the structural factors of post-colonial political economy. State literature, on the other hand, lacks the detailed framework necessary to trace in closer detail policy delivery. As Fukuyama pointed out, a weak state does not mean they are weak across all sectors (2004). We see this at play

across the cases. Hence, the third question becomes relevant. If a new framework is developed to better fit the variation based from collected data, what would it look like?

Before these questions can be addressed, we first need to delve into a deeper discussion on both the significance and limitation of the results produced from employing the two different but complementary methods. Validity and reliability of the results will be reviewed alongside the discussion on why we witness different results from the two methods employed on the same substantive question. This section takes a deeper dive into the results to further propel their implications on the on-going methodological debate. Thus, the latter part of this chapter is devoted to going back to the existing literature on methodology and starting the discussion on how the dual method design of path analysis and processing-tracing would better serve social science inquiries.

The discussion chapter follows the results chapter and this is the chapter where we address all the questions posed before. It differs from the previous chapter by its dedicated discussion on implications to political science theories with emphasis on public administration and comparative politics theories. It is devoted to discussing how well the empirical findings fit the theoretical frameworks. With convincing evidence in support of the alternative hypothesis, the discussion then is how well can we summarize political and institutional factors and their relationship with the dependent variable. For this purpose, we examine implementation theories and their frameworks in public administration. Those covered before but in more detail. The focus on implementation theories is due to isomorphic policies on safe drinking water across different countries. Hence, implementation variation is expected to better correspond to the variation in

outcomes across different countries. We then examine theories of the state in comparative politics in much more detail. The broaden search into the theories on the state within comparative politics is because the scholarship better incorporates the impact of international forces and colonial legacies on the development of state-society relationships. In similar fashion, we examine how well the political and institutional variations identified to be responsible for the variation in the dependent variable can be summarized by the theoretical models developed in this field by juxtaposing the collected data upon these frameworks.

In at the end the of the discussion chapter, we open up the discussion on how, based on evidence, the theoretical insights from the two fields could be integrated into a single framework. That is, how the detailed insights from implementation theory and the broad identification and exploration of non-domestic and legacy factors can be combined to develop a framework on best capture all relevant factors in expanding access to safe drinking water.

In the concluding chapter, we return to the basic question of whether political and institutional attributes matter in the expansion of access to safe drinking water and summarize the findings. It opens the new territory of discussions on how considerations of political and institutional factors on safe drinking water provision should be incorporated in the country's efforts to expand access. That is, it addresses the question on how this research is made relevant to practitioners who are fighting the daily battle of trying to accelerate access to safe drinking expansion.

Data and Methods

Multiple datasets were utilized in this research. For path analysis, a pre-existing quantitative dataset from the World Bank was used.[9] The dataset compiles values on development indicators capturing various aspects of the country's development, i.e. it includes complimentary metrics on development beyond economic development indicators such as the GNP-per-capita (Hicks & Streeten, 1979; World Bank, 2016). In discussing this dataset and choice of analytic framework, we first review data then the statistical technique employed for analysis. This is because the quantitative dataset is readily available for anyone to download and to check the validity over the recorded figures. Thus, the emphasis is more on analytical calculations performed with the dataset figures. The emphasis on analytical technique is because the researcher had no influence on how the populated data were collected and compiled but had the freedom to choose and apply the most relevant statistical analysis.

Contrary to the quantitative dataset, the qualitative datasets were newly produced with new observations collected through in-country interviews and archival research. Since collection of new observations lies at the heart of qualitative research, the order of discussion is reversed where data collection methods are described before the actual data collection. This reversal in the order of presentation is deliberate as the qualitative

[9] The dataset could be downloaded from http://data.worldbank.org.

dataset is uniquely generated for this research and the reasoning behind why and how certain data was collected from the universe of possible observations needs to be explained. Unlike the World Bank dataset, the raw data populating the qualitative dataset are not readily available on public Internet servers.[10] This is due to the confidential nature of the interviews; confidentiality was necessary in order to hear from the interviewees on why certain alternative actions relevant for expanding access to safe drinking water did not exist or deliberately closed. As a result, the dataset enlightens us on the actionable decisions on policy formulation, design, and implementation.

Quantitative Dataset and Method

The World Development Indicator dataset is an agglomerated dataset created from data collected by various public and private partner organizations. The list of public agencies, partners, and private organization contributing to the World Development Indicator as of 2016 are reflected Table 1.

Table 1: List of Agencies, Partners, and Private Organizations involved in the World Development Indicator Dataset

Carbon Dioxide Information Analysis Center
Center for International Earth Science Information Network
Center for Research on Epidemiology of Disasters
Deutsche Gesellschaft für Internationale Zusammenarbelt
DHL

[10] Although not publicly available, the redacted interview transcripts will be submitted to journals for verification. It would be redacted to shield the identity of those interviews: a procedure that is aligned with the Disclosure Policies within Access to Information of the World Bank. That is, the need-based level of disclosure for the qualitative dataset is aligned with international norms.

USAID's Demographic and Health Surveys Program
Emission Database for Global Atmospheric Research
Eurostat
Food and Agriculture Organization
Institute for Health Metrics and Evaluation
Internal Displacement Monitoring Center
International Civil Aviation Organization
International Diabetes Federation
International Energy Agency
International Institute for Strategic Studies
International Labor Organization
International Monetary Fund
International Telecommunication Union
Joint United Nations Program on HIV/AIDS
Lloyd's List
National Science Foundation
Netcraft
The Office of U.S. Foreign Disaster Assistance
Organization for Economic Co-operation and Development
PwC
Standard & Poor's
Stockholm International Peace Institute
Understanding Children's Work
UN
UN Center for Human Settlements, Global Urban Observatory
UNICEF
UN Conference on Trade and Development
UN Department of Economic and Social Affairs, Population Division
UN Department of Peacekeeping Operations
UN Educational, Scientific and Cultural Organization, Institute for Statistics
UN Environment Program
UN High Commissioner for Refugees
UN Industrial Development Organization
UN International Strategy for Disaster Reduction
UN Office on Drugs and Crime
UN Population Fund
UN Statistics Division
Upsalla Conflict Data Program
World Bank
World Conservation Monitoring Center
World Economic Forum
World Federation of Exchanges
WHO
World Intellectual Property Organization
World Resource Institute
World Tourism Organization
World Trade Organization

Source: World Bank. (2016). *2016 World Development Indicators.* Washington, DC: World Bank, pp. vii-xi.

The 2016 dataset is comprised of 1421 indicators on 214 countries and autonomous territories.[11] The type of indicators included in the dataset range from absolute figures such as land area, calculated indexes without a ceiling such as the GDP per capita, and indicators with a fixed parameter such as percentage of population with access to improved water sources. That is, different methods are employed in formulating the indicators comprising the dataset; some are more intuitive than others. Details on how each indicator was measured are discussed in further detail in the Results Chapter.

Three key dimensions summarize the data set: indicator, time, and country. Information on a specific indicator is collected with reference to time and country. Although the dataset builds on a framework of comprehensive comparability, it is important to note that this is an incomplete dataset. That is, there are missing data entry points and this is relevant as it automatically excludes the missing data country from any comparisons in that particular category. It also weakens interpretation as cases without the variable figure are dropped reducing the overall number of cases that can be used to develop regression models including the particular explanatory variable. This is the more explicit concern in using this dataset, whereas the more implicit concern is over the inaccurate reporting and recording of data: a concern that results in undermining any mathematically derived conclusions on the country. That is, if the initially data used for calculation is inaccurate, the figure is non-representative of the actual conditions in the

[11] Autonomous territories include areas with independent fiscal arrangements, such as a Hong Kong and Macau. Although these territories pose concerns in analysis that include them, these data points do drop out in our analysis, as a result of imposing stringent criteria prior to performing statistical calculations for data interpretation.

country. Hence, any implications of mathematical results would also be unwarranted and invalid.

The concerns over the data points are brought up due to its implications on extent of accurate interpretation following the analytical statistical techniques. For example, regression technique is frequently employed by social scientists to examine the magnitude in effect the explanatory variables have on the outcome variable; the latter which is commonly rephrased as independent variables and the dependent variable.[12] Regression is a commonly accepted statistical technique, as it mathematically structures prediction, especially when the regression model has a high R^2, which is a mathematical calculation of how well the calculated regression model captures the variance in the data.

For this research, we apply additional techniques that build on multiple regressions. The additional steps of calculation are required for path analysis or structural equation modeling.[13] Path analysis is a technique that builds hypothesized causal chains that are tested with regressions. It is an extended use of regression where its use is pushed beyond prediction to explanation. The difference lying in improving our understanding on why certain explanatory variables have a higher coefficient weight than others in the regression equation. This is illustrated in Figure 2.

[12] In political science, democracy literature is well known to employ regression techniques, well represented by the works of Lijphart (1999) and Przeworkski et al (2000). By no means is the technique restricted to the research into the specific subject but rather pervasive across all social science inquiries.

[13] The term "path analysis" is interchangeably used with "structural equation analyses". Although not used in this dissertation, "path modeling", "causal model analysis", "causal modeling", and "latent variable analysis of structure equations" are also used interchangeably with "path analysis" and "structural equation analysis". The evolution in terms due to the evolutions in its use for research. Details on the changes of labels could be found in Maruyama (1998, p. 9-10).

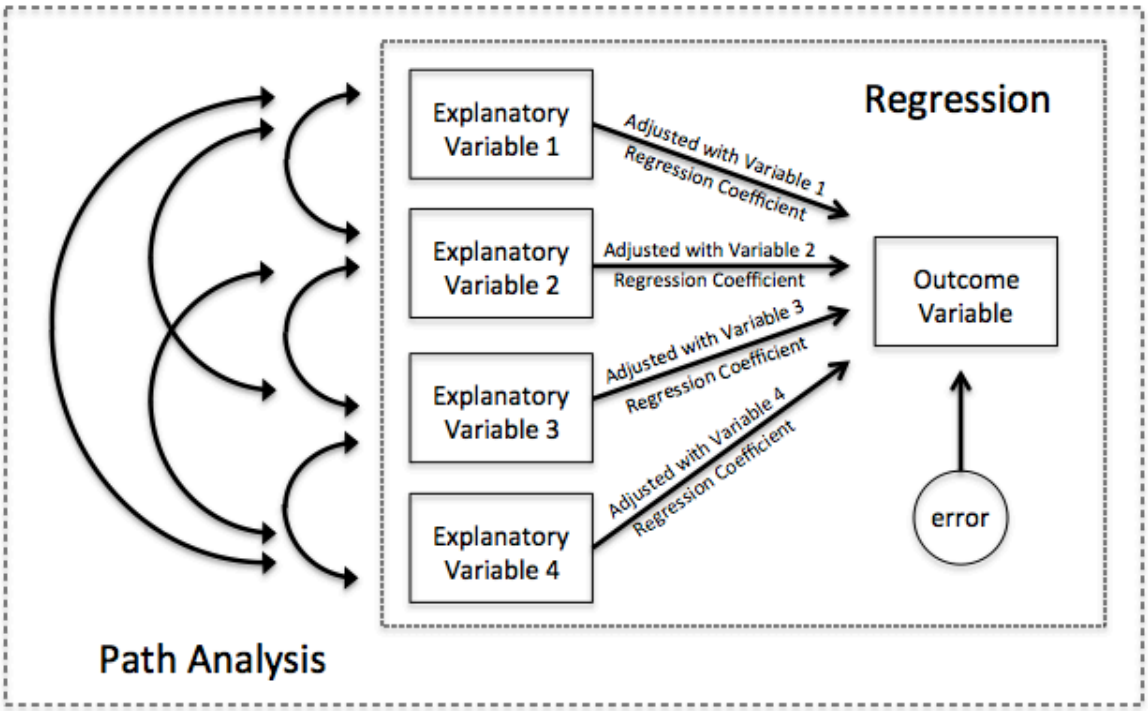


Figure 2: Regression and Path Analysis
Source: Modified from Figure 2.1 from Maruyama, Geoffrey M. (1998). *Basic of Structural Equation Modeling.* Thousand Oaks, CA: Sage Publications.

Regression models formulate how movements in the explanatory variables correspond to movements in the outcome variable. This is represented with arrows in Figure 2. The figure is a hypothetical example where the outcome variable's variation could be predicted by the set of 4 explanatory variables on the left plus an error factor that accounts for remaining variation in the dependent variable that is not captured by the 4 explanatory variables. In a regression model, the predictive formula would include fixed coefficients that mathematically adjust, or translate, changes in the explanatory variables to per unit expected changes in the outcome variable. If the model is valid and

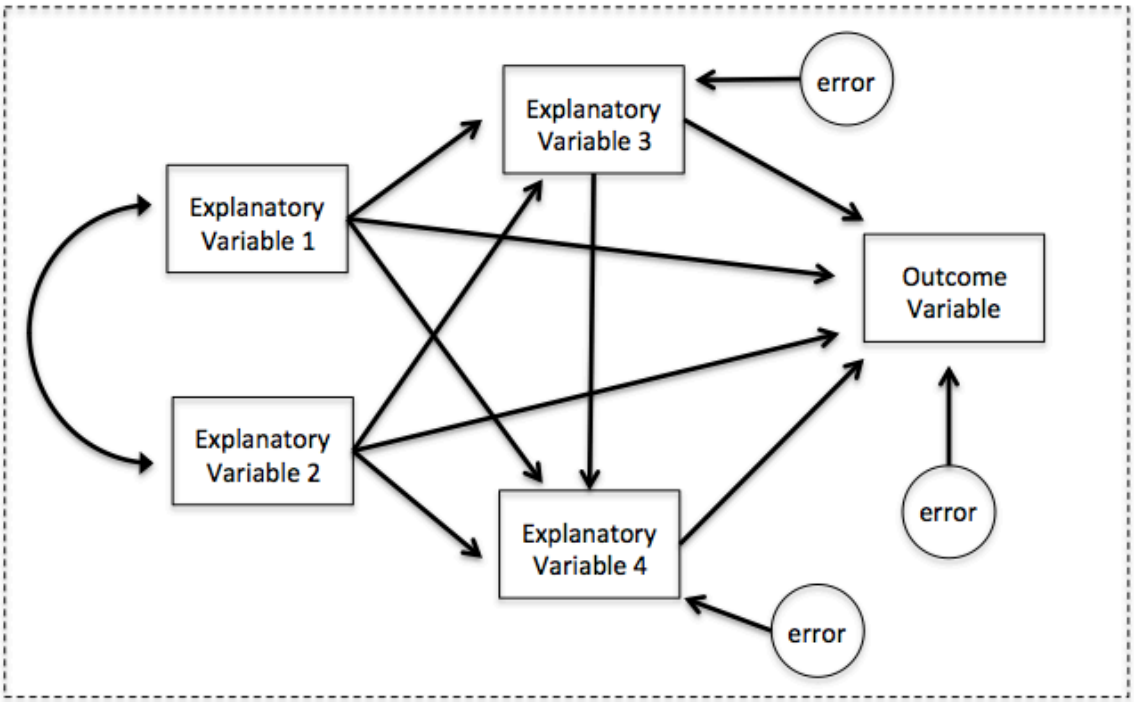


Figure 3: Hypothetical causal path constructed from path analysis calculations
Source: Modified from Figure 3.2 from Maruyama, Geoffrey M. (1998). *Basic of Structural Equation Modeling.* Thousand Oaks, CA: Sage Publications.

reliable, the model will accurately predict the value of outcome variable based on values of the explanatory variables.

Path analysis is built on additional regression analyses to disentangle the relationships between the explanatory, or predictor, variables. It is a technique employed to test the existence of relationships between the predictor variables that cascades to changes in the outcome variable. That is, it checks to see whether there is a domino effect among the explanatory variables; a domino effect that can be constructed that represents a causal mechanism lacing together the variables. By doing so, it helps us

think in the manner of process rather than components. This is illustrated in the Figure below, where the lines represent hypothesized cause and effect relationships.

The reason why path analysis is performed beyond linear regression analysis is because it tells a richer picture on the factors influencing the outcome variable. This is relevant for the posed research question because I am interested in why certain known variables of direct causal effect on the outcome variable do not come into play. For example, given certain physical components are required to construct water supply systems, the other necessary question is why are those components acquired and water supply systems built in one country while not in others; a question where a single linear regression calculation is not fit to answer. Furthermore, the nature of the dataset works to the comparative advantage of the path analysis.

> *The* [path analysis] *approach is particularly valuable in situations where, for various reasons (e.g., the variables cannot be manipulated ethically, comparison groups are not and cannot be made equivalent, a rich correlational data set is available to provide guidance for future research), experimentation was not done* (Maruyama, 1998, p. 7 with parenthesis added to the original text).

The method will be executed adhering to practices outlined by Maruyama (1998). However, in executing the method, practices outlined by other statistical texts will be referenced. This was necessary as despite Maruyama's text clarifies the additional steps to construct and test path analysis, a lot of the precursor statistical steps associated with

calculating regression were better explained in greater detail in other texts such as (Weiss, 2008; DeGroot & Schervish, 2002; Kennedy, 2008; Hamilton, 2009; Warner, 2008). Other reference texts will be cited accordingly following the applied techniques.

Qualitative Method and Data

Complementing the quantitative data analysis is the researcher-generated qualitative dataset. A series of country visits and in-country interviews were performed to construct the descriptive and comparative case studies. Preparations prior to country visits adhered to the good practices outlined by George and Bennett (2005) for case study research design and Rubin and Rubin (2005) for interviews.

Although George and Bennett (2005) and Rubin and Rubin (2005) were two main texts that were referred when designing and following through with qualitative research, it was by no means the only texts that have shaped the qualitative research process. Other referenced resources include Yin (1994), Maxwell (2005), King, Koehan, & Verba (1994), and Brady & Collier (2004) were referenced.[14] The more recent Beach & Pedersen (2013) text helped better contextualize the findings but because it was published after I had already engaged in the data collection process, it was only later consulted and is mainly referenced here for articulation on process-tracing .

[14] In addition to these references, Munck and Snyder (2007) is particularly informative in grasping the geneology of the methodological debate and corresponding advancements. Of particular, David Collier's and Adam Przeworski provides a good overview on the influence of methodology on the study of democracy.

Before presenting the qualitative dataset, or case studies, as they are more frequently referred to by, it is necessary to discuss the usefulness of case study methodology along with the criteria of good practice. To start this discussion, Ragin (2000) is a good starting point, as he lays out basic aspects of case studies.

> *The logic of the case study is fundamentally configurational. Different parts of the whole are understood in relation to one another and in terms of the total picture or package that they form. The central goal is usually to show how different "parts" of a case interconnect* (Ragin, 2000, p. 68).

This captures in essence the tasks of compilation following country visits and interviews; tasks that were necessary due to the multidimensional characteristic of water, which resulted in diverse yet fragmented testimonials based on their particular duties in the overall policy implementation process. For example, some would be only able to be share personal experiences on rural water since the person's professional duty only involved supervision of tasks associated with rural water supply systems. Thus, they refrained from speaking on urban water supply systems. Hence, additional analytical work had to be done following the visits to construct the country cases by adjoining the multiple interviews covering different dimensions of the water sector in different time periods. This was necessary to get a comprehensive national picture in the development of both rural and urban water supply systems. Thus, the above excerpt on weaving

together the mosaic of evidence is a good summary of what occurred and what is presented.

In addition, the following excerpt from Ragin (2000) is also a good starting point to discuss the criteria of a successful case study. Simply because he lays it out succinctly.

> *The success of a case study hinges on (1) the number of relevant aspects of the case the researcher can encompass with his or her explanation, (2) the success of the researcher in showing that his or her portrait of the case actually makes sense of all the aspects that he or she has deemed theoretically relevant, and (3) the agreement of other scholars that all relevant aspects of the case in question have, in fact, been addressed by the researcher in a convincing manner* (Ragin, 2000, p. 69).

Although a good starting point, broadened criteria are applied to this research. This is because this is a multi-case study, where comparisons are made across different countries to seek a deeper understanding in variation of the operating mechanism for the same dependent variable: expansion in national coverage of safe drinking water. Thus, additional criteria have to be layered on top of Ragin's criteria of single case studies. George and Bennett elaborate on this point (2005).

> *What, then, are some of the requirements that case study research must meet to overcome* [strict comparison or orderly accumulation] *difficulties?*

> *First, the investigator should clearly identify the universe-that is, the "class" or "subclass" of events-of which a single case or a group of cases to be studied are instances. ...*
>
> *Second, a well-defined research objective and an appropriate research strategy to achieve that objective should guide the selection and analysis of a single case or several cases within the class or subclass of the phenomenon under investigation. ...*
>
> *Third, case studies should employ variables of theoretical interest for purposes of explanation* (George & Bennett, 2005, p. 69 with inserted parenthsis by author for clarification).

The universe is the world since we are interested in the outstanding phenomenon of lack in access to safe drinking water for 663 million people. At the onset, Indonesia and Vietnam were selected because they are on extreme ends of performance in safe drinking water provision for their citizens. The additional three countries were selected as reference to how other countries were able to achieve universal access over a single generation. The three later countries serve to identify additional critical intervening variables that may have been missed in the cross-country examination of the first two countries.

The research objective is clear, as it was covered in the introduction. The research aims to understand variation in expansion of safe drinking water provision. The strategy is clear. It was to prepare interview schedules and meet policy-makers in the

countries who are and were responsible for safe drinking water policy. The coverage of experts included both domestic and international professionals working in the water sector.[15] Archival research was pursued in parallel with interviews to further locate documented references on significant events affecting the sector. This also falls into fieldwork, as the archival documents were not available unless the researcher was physically present in the countries.

Throughout the qualitative research process, variables for the purpose of explanation were explored. "Explored" would be a more appropriate term here rather than "employ" as suggested because the loose conceptualization of the variables emerged as a source of befuddled responses during interviews with the sector experts. The most conspicuous was the befuddled expression when asked about the dependent variable. The loose operationalization of counting equally those gaining access to safe drinking water via access by piped water systems and rainwater collection systems was a befuddling proposition. This was because the labor and capital involved in the two systems different in as much as the physical appearance of the final constructed product. Hence, "explore" is a more constructive description as it opened the door for additional discussions on the "variables of theoretical interest for the purposes of explanation".

George and Bennett (2005) further specified the tasks associated in designing the case study research. There are a total of six tasks and they specify them as follows:

[15] A wider net of professionals were interviewed in the process, as interviewees referred me to speak further with complementary policy makers such as urban planners and health officials.

1) *Specification of the Problem and Research Objective*
2) *Developing a Research Strategy: Specification of Variables*
3) *Case Selection*
4) *Describing the Variance in Variables*
5) *Formulation of Data Requirements and General Questions*
6) *Integration of the Five Design Tasks* (George & Bennett, 2005, pp. 73-88)

The first task was fulfilled early on. The research asks an important research problem on why we see variation in the provision of safe drinking water across different countries. An important question as its lack of provision has direct consequences to health. As for the research objective, this case study research would fall into the category of *Heuristic case studies,* which is defined as follows:[16]

> *Heuristic case studies inductively identify new variables, hypotheses, causal mechanisms, and causal paths. "Deviant" or "outlier" cases may be particularly useful for heuristic purposes, as by definition their outcomes are not what traditional theories would anticipate. Also, cases where variables co-vary as expected but are at extremely high or low values may help uncover causal mechanisms. Such cases may not allow inferences to wider populations if relationships are nonlinear or involve threshold effects, but limited inferences*

[16] There are six categorizations of theory-building research objectives: 1) atheoretical/configurative idiographic case studies, 2) disciplined configurative case studies, 3) heuristic case studies, 4) theory testing case studies, 5) plausibility probes, and 6) "Building Block" studies of particular types or subtypes (Lijphart, 1971; Eckstein, 1975; George & Bennett, 2005).

> *might be possible if causal mechanisms are identified (just as cancer researchers use high dosages of potential carcinogens to study their effects)* (George & Bennett, 2005, p. 75 with original italics in normal text).

The proposed research is a search for explanations and naturally, seeks to identify the causal mechanism at play behind the variation in safe drinking water provision rates among different countries. It includes the examination of outliers, which are the three latter countries. These cases exhibited an unusual outcome that was achieving universal access to safe drinking water in a very short period of time.

As for theoretical anchoring, the research question spans across both public administration and comparative politics. Within public administration, it is anchored on the implementation scholarship with intellectual heritage dating back to Pressman and Wildavsky (1973). This is because we are interested in why policies designed to expand coverage of safe drinking water led to different implementation results across different countries. Although rich in theoretical dialogue, the implementation scholarship has yet to develop a greater consensus over a general implementation theory (Winter S. C., Implementation, 2012; Lester & Goggin, 1998). This is attributed in part to moving policy targets manifesting from the inherent interactive and adaptive learning feedback loop in and during implementation. Consequently, the dependent variable of implementation research vacillates from process, behaviors, and/or outcomes. Thus, resulting in diversified polemic over what constitutes as the core theories within

implementation studies.[17] This research will examine how the empirical data on safe drinking water policy implementation confirms to the theories within implementation scholarship and further discuss how this study could contribute to a refining theory in implementation.

As for comparative politics literature, the research question is anchored on the state literature (Migdal, 1988; Scott, 1998; Johnson, 1999; Herbst, 2000).[18] Although the core research question is on implementation, it is not immune to the extraneous domestic and international forces at play. The effects of such forces at play is thoroughly discussed in the comparative politics literature, as it examines different political structures in different countries and how they shape the state apparatus that in turn leaves an imprint on civil society. Given that the research question is comparative in nature examining the different development trajectories of Government entities and arrangements, reviewing the state literature within comparative politics is not only of relevance but is also of a necessity to better situate the proper interpretation of empirical

[17] Examples of process oriented implementation scholarship include (Kelman, 1984) with a broader discussion of advancement of this implementation orientation discussed in Lester & Goggin (1998). Examples of behavior oriented implementation scholarship include Lipsky (1980), Riccucci (1995), Riccucci, Meyers, Lurie, & Han (2004), May & Winter (2009). Examples of the outcome oriented implementation scholarship include Meier & O'Toole Jr (2007). However, another more popular categorization of the implementation literature is through the 3 generations described by Lester & Goggin (1998) and Hill & Hope (2002). The generational categorization that is roughly described as explorers, top-down/bottom-up, and synthesizers.

[18] There is an equally rich literature on the state, spanning from conceptual discussions starting with Nettl, J.P. (1968) to later contributions on this front by Evans, Rueschemeyer, & Skocpol (1985) and Hall & Ikenberry (1989) to cite some frequently referenced discussions. Tilly (1990) and Spruyt (1994) cover competing forces in state origins along with Herbst (2000) covering origins of weberian state in colonial terriorities and its lasting effect on modern operations of the state in those countries. Stepan (1978), Migdal (1988), Scott (1998) covers state and society struggles. Skocpol (1979) and Goodwin (2001) cover states and revolutions. Bates (1981) and Evans (1995) examine state's inventions in markets. Despite the vast literature, the three cited has been selected due to their relevance and influence in how to search for explanations to the posed research question.

evidence. That is, the collected empirical data will not only speak to the developments in state literature within comparative politics but nesting the discussion also in the comparative politics scholarship is necessary to identify and formulate in relation to existing scholarship the explanatory causal mechanisms at play. The case studies examine to what extent the evolutions of political institutions following independence from colonial rule affect policy implementation.

With the research question being anchored across two different scholarships and taking the position that the research objective corresponds to the research objectives of other case studies categorized in the Heuristic Case Studies, the following questions arise: what would these traditional theories purport to as the causal mechanism behind the research question? That is, what does this scholarship purport to as the cause behind the variation in outcome? Based on traditional theory, what do we anticipate to find in our empirical data?

Suspected causes of variation based on Public Administration Scholarship

The responses to these questions are more open-ended than desired simply because the plentitude of scholarship suggest various critical variables and explanations. Pressman and Wildavsky (1984) study identifies two culprits to implementation failure: delay due to multiple veto points and lack of direct means for execution. In their own words, they describe them as follows:

> *If policy makers were to close the gap between design and implementation by gearing programs more directly to the demands of executing them, what sorts of actions might they undertake?*
>
> *First of all, an appreciation of the length and unpredictability of necessary decision sequences in implementation should lead the designers of policy to consider more direct means for accomplishing their desired ends. Since each required clearance point adds to the probability of stoppage or delay, the number of these points should be minimized whenever possible. …*
>
> *A second way of joining policy more closely to implementation would be to pay as much attention to the creation of organizational machinery for executing a program as for launching one* (Pressman & Wildavsky, 1984, pp. 145-6).

In applying their findings from their study to the research question on water, it would suggest that the countries with less clearance points and those with separate organizational machinery to execute the program would be better performers in implementing the policy objective of expanding access to safe drinking water. Diametrically, those with more clearance points and without the dedicated organizational machinery in executing the water program would be the poor performers.

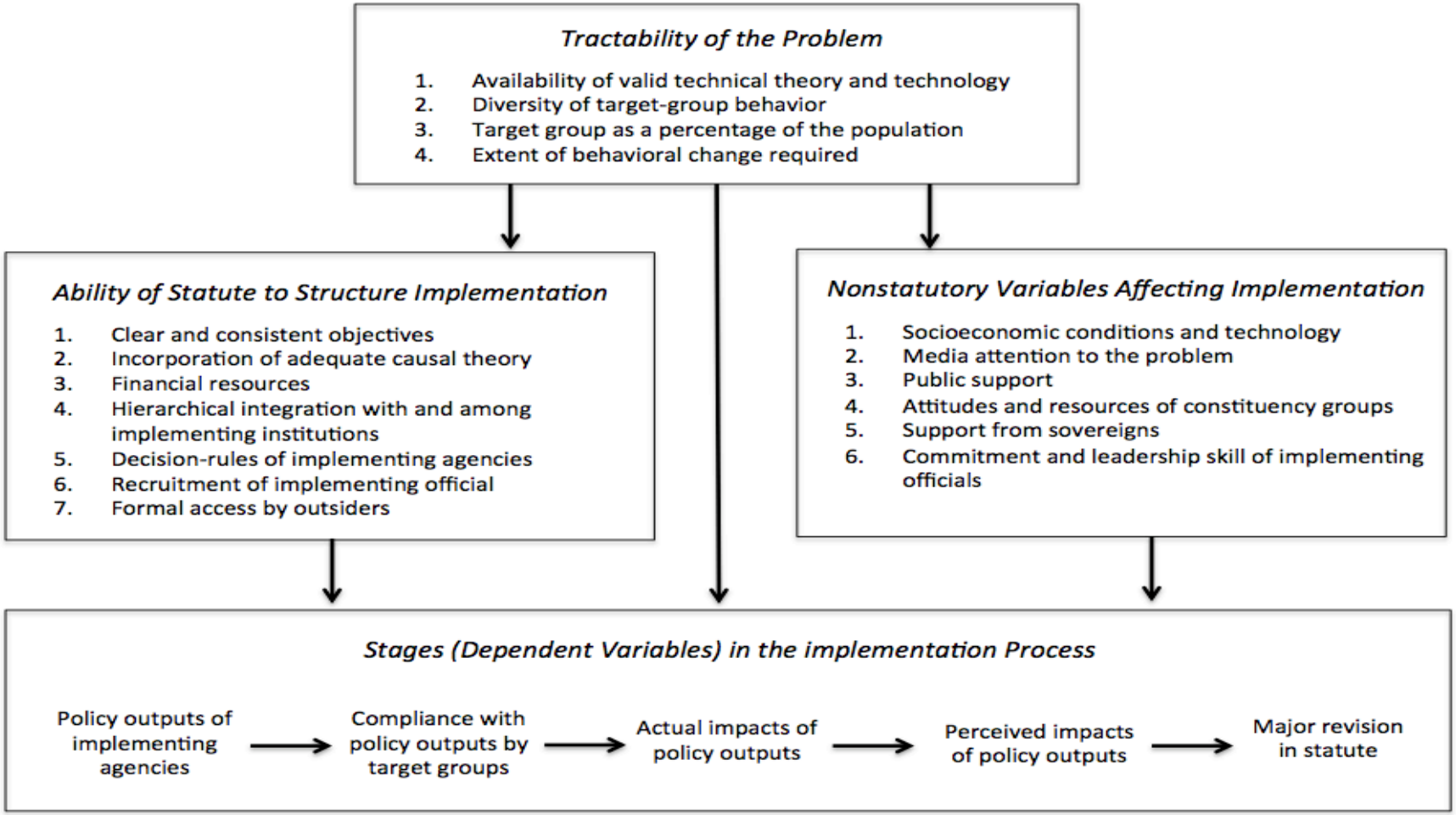


Figure 4: Skeletal Flow Diagram of the Variables Involved in the Implementation Process
Source: Reproduced from Figure 1-1 in Mazmanian, Daniel A. and Paul A. Sabatier. (1981). "Implementation of Public Policy: A Framework of Analysis". In Daniel A. Mazmanian and Paul A. Sabatier (Eds.), *Effective Policy Implementation* (pp.3-36). Lexington, MA: Lexington Books.

Mazmanian and Sabatier (1981) expand the pool of relevant explanatory variables. They argue that three cluster of extraneous factors affect the implementation process. Hence, they need to be incorporated and considered to ensure successful implementation. They group the three clusters as, 1) Tractability of the Problem, 2) Ability of Statute to Structure Implementation, and 3) Nonstatutory Variables Affecting Implementation. The skeletal diagram is presented below.

Tractability of the problem can be understood as solvability. That is, it asks whether the problem that the policy aims to solve is something that can be solved. Mazmanian and Sabatier (1981) lists their criteria of solvability as follows:

> [P]*roblems are most tractable if (1) there is a valid theory connecting behavior change to problem amelioration; the requisite technology exists; and, measurement of change in the seriousness of the problem is inexpensive; (2) there is minimal variation in the behavioral practices that cause the problem; (3) the target group constitutes an easily identifiable minority of the population within a political jurisdiction; and (4) the amount of behavioral change is modest* (Mazmanian & Sabatier, 1981, p. 9).

When examining safe drinking water provision on these criteria, it should be a solvable problem. The technology exists, specifically extraction, water treatment technology, and distribution. There is minimal variation in the behavioral practices, as people need to use safe drinking water when it is provided and move away from using

unhealthy alternatives. The target groups are those without safe drinking water who are not serviced by utilities or small water supply system operators. The amount of behavioral change is modest, as the distribution of water would improve the convenience of acquiring water. Hence, based on preliminary assessment, expanding safe drinking water provision to those without access is a solvable social problem that could be addressed by policy, more specifically by mobilizing technically trained labor and pooled funds.

The secondary cluster of factors is the *Ability of Statute to Structure Implication*. It is the formal design of the authority-imbued actions that is to take place in order to achieve the set policy objective. Mazmanian and Sabatier (1981) lay out 7 criteria, or bottlenecks, that can be grouped into this cluster.

> [L]*egislation that seeks to significantly change target-group behavior in order to achieve its objectives is most likely to succeed if (1) its objectives are precise and clearly ranked; (2) it incorporates a valid causal theory; (3) it provides adequate funds to the implementing agencies; (4) the number of veto points in the implementation process is minimized and sanctions/inducements are provided to overcome resistance; (5) the decision-rules of the implementing agencies are biased toward the achievement of statutory objectives; (6) implementation is assigned to agencies that support the legislation's objectives and will give the program high priority; and (7) the provisions for outer participation are similarly*

biased through liberalized rules of standing and by centralizing oversight in the hands of statutory supports (Mazmanian & Sabatier, 1981, p. 14).

Although all are very valid concerns, when applying this second set of criteria to safe drinking water, there is confusion. This is because some of the criteria are ambiguous and self-contradicting. For example, objectives are expected to be precise. But, how do we know that the objectives are sufficiently precise? Also, does precise have additional definitions beyond clear? That is, does precise also have a quality control component to it? Where precise not only means clarity on what but clarity in the level of quality standards as well for long-term sustainability? This question is relevant for water supply systems as physical presence of an asset does not necessary mean the system is operational in delivering consistent quality. If the latter more expansive definition of "precise" is applied, then we run into a conflicting criteria situation, as there is naturally a negative relationship between precise and minimal veto points when multiple professional oversights are required. A similar criticism on the model where precise and ability to exercise versatile leadership skills are often contradictory (Hjern, 1982, p. 303). Unfortunately, these conflicting points are not adequately addressed in the model. Similarly, the "adequate" funds criterion is a slippery-slope description. Without providing a framework that determines "adequate", this criteria could be easily abused, misused, and consequentially fall out of favor. Hence, this criteria needs to be further specified.

Also, the model assumes that all criteria are independent of each other and could be checked without automatically unchecking other criteria. This is clearly not the case for water. Thus, strictly adhering to their presented criteria, the naïve application to safe drinking water policy would translate to better implementation of safe drinking water policy when all the criteria are checked. That is, make sure to have a clear objective by declaring the aim is to achieve universal access to safe drinking water. Have it as a national priority. Have the statute be clear on why and how it will be addressed. Give the implementing agencies sufficient funds to meet their annual output targets. Reduce veto points to expedite progress. Examine and reform decision processes to minimize delay. Assign and allocate programmatic budget to agencies with mandates overlapping with policy objective. Include citizen participation within policy implementation to garner support in progress. However, the straightforward advice was difficult to carry out in reality, as shown by the collected evidence.

The third cluster of factors is the most underdeveloped part of the model due to its dynamic nature. It is titled, *Nonstatutory Variables Affecting Implementation* and includes perpetually moving factors such as political and media attention span accompanying socioeconomic developments. These factors are not dictated by policy design, yet are influential in the permanence of any program. Also, leadership of the implementing agency is also strangely included here. That is, the model treats commitment and leadership skill of supportive implementing officials to be a separate factor from support by sovereigns. The grouping of this factor under a separate cluster is

confusing as support by leadership would manifest in the statute to structure implementation.

If the factors are blindly accepted, the model predicts that socio-economic development that maintain political and media attention on safe drinking water will have their safe drinking water policies more successfully implemented. Also, those with capable leaders in the organization assigned to implement the safe drinking water policy and who prioritizes the expansion of safe drinking water provision will be more successful in their safe drinking water policy implementation. Whether these factors are indeed "crucial " is questionable, as within the US, a citizen's access to piped water sources is not dependent on news coverage on water.

Lastly, in the Mazmanian and Sabatier Implementation Model, the three clusters of factors are seen to influence the actual implementation process that is broken down into 5 stages: 1) policy outputs of implementing agencies, 2) compliance with policy outputs by target groups, 3) actual impacts of policy outputs, 4) perceived impacts of policy outputs, and 5) major revision in statute. The first 3 stages capture actual implementation whereas stages 4 and 5 are better captured under evaluation. Stage 1 refers to the outputs related to putting the policy into action.

> *Statutory objectives must be translated into substantive regulations, standard operating procedures for processing individual cases, specific adjudicatory (permit, licensing) decisions, and enforcement of those adjudicatory decisions. This process normally requires considerable effort on the part of officials in one*

> *or more implementing agencies in the form of technical analyses of the manner in which general rules apply to successively more concrete situations and then the actual application of those rules in thousands of specific cases* (Mazmanian & Sabatier, 1981, p. 21)

Stage 1 is easier said than done due to the multitude and magnitude of tasks. The authors suggest certain good practices useful in assisting the diligent and uninterrupted fulfillment of Stage 1.

> [I]*t is our contention that such slippage* [in translating statutory objectives into the policy decisions of implementing agencies in individual cases] *can be minimized if the statute stipulates unambiguous objectives; assigns implementation to sympathetic agencies who will give it high priority; minimizes the number of veto points and provides sufficient incentives to overcome resistance among recalcitrant officials; provides sufficient financial resources to conduct the technical analyses and process individual cases; and biases in the decision-rules and access points in favor of statutory objectives* (Mazmanian & Sabatier, 1981, pp. 21-2 with parenthesis inserted for clarification).

For safe drinking water, Stage 1 outputs would include, regulations on water quality and construction build quality, standard operating procedure development for public works project managers and health inspectors, issuing permits and licenses related

to construction companies and employees, and quality enforcement by technically competent construction supervisors and health officers. Clear objectives, prioritization, minimal veto points, incentives, enabling financial resources, and favorable biases would further enable the completion of these tasks.

The subsequent Stage 2 in implementation applies to compliance. Although the authors allude to the society at large and their reaction toward government regulations, this could be equally applied to the entire universe of actors involved in safe drinking water policy implementation. That is, compliance can be expanded to not only apply to actors outside publicly funded organizations but also *within* publicly funded organizations. More specifically, the authors argue that compliance goes hand-in-hand with detection and following sanctions.

> [T]*he probability that severe sanctions will follow from noncompliance is affected by the variety and magnitude of actions provided by statute; the resources available to implementing agencies to monitor noncompliance; the ability of constituency groups to supplement agency resources in monitoring compliance and bringing enforcement cases; the commitment of agency officials to prosecuting noncompliance; and the number of veto points involved in actually bringing enforcement actions* (Mazmanian & Sabatier, 1981, p. 22).

These factors could equally applied to implementing agency's own staff. That is, how well the staffs are complying with the issued directives is equally important to

enforcing regulations on non-agency target populations. More specifically for water, it is making sure that the agency staffs are aware and comply with standard operating procedures that include dutiful enforcement of construction and water quality standards. Stage 2 includes also the ability and action of societal actors to strongly advocate the adherence to those standards by delegated actors responsible for constructing, operating, and maintaining water supply systems, but also to the agency delegating these functions. This goes hand-in-hand with the aforementioned last two aspects that are commitment to prosecution and reducing veto points on enforcement.

Stage 3 in implementation covers sustainability and kicks off the feedback process. The stage reexamines the actual impacts of the policy outputs. At this stage, not only are the outputs and statutory objectives alignment reexamined, but they are also reexamined in the context of whether the existing arrangement is optimal in light of changing socio-economic context and technological advancements. The former includes changes to political leadership composition that may rearrange policy priorities with consequences in both existing and future resource allocations.

In translating and applying this to the expansion in safe drinking water coverage, it means how well the policy implementation process is shielded from the readjustment in policy prioritization led by those who have safe drinking water access. That is, hypothetically, the population who acquires access to safe drinking water would not necessarily be interested in continued public sector funding in investing to expand access to water, as long as they feel secure that they would not be losing access in consequence of advocated shift in prioritization.

On a different note, this stage also include considerations following changing socio-economic conditions such factories discharging pollutants into the river where there is a water treatment system located downstream. The new development, where the factory is developed, will derail traditional outputs and statutory objectives alignment. If the water treatment system was constructed without such foresight in the rise of pollution and is only able to treat water at a pre-pollution level. In this example, existing water treatment system designs would be obsolete unless expensive options such as moving intake pipes upstream to acquire less polluted water to feed into the existing system. The option may not even be an option if industries also move up the river to acquire less polluted water for their production process as well.

Stage 4 of Mazmanian and Sabatier's Implementation Model is similar to Stage 3 in that it still focused on manifested outputs and their alignment to the statute objectives. However, Stage 4 differs, as it is the *perceived* impact of the implemented policy by constituency groups and sovereigns. This reestablishes and reexamines implementation with policy formulation and design. As consequence, this may result in opening the dialogue to opening the dialogue to redesign and redirecting existing implementation means and potentially change outputs and its production process.

Stage 5 solidifies the process started in Stage 4 by including readjustments or revisions in statute. By doing so, it legally restarts the implementation process from the start with a new statute. This also suggests that the same clusters of factors will have different impacts on the implementation process, as it is a new process based on a new or revised statute.

In applying the model, Mazmanian and Sabatier suggest going through the following checklist comprised of 18 questions in order to estimate success in implementation:

Statutory Design Questions

1. *Are the statutory objectives precise and, if multiple, clearly ranked in importance? Moreover, if the statute is assigned to an existing agency, does it indicate the relative priority of these new objectives in the totality of the agency's programs?*
2. *Does the statute actually incorporate a valid causal theory?*
3. *Does the statute provide sufficient financial resources to the implementing institutions to enable them to conduct the necessary technical analyses, to apply the general objectives to thousands of specific cases, and to monitor target group compliance?*
4. *Does the statute minimize the number of veto points within and among implementing institutions and does it provide sufficient sanctions and inducements to enable supportive officials to overcome resistance among their colleagues and among target groups? If dealing with a regulatory function, does it provide for tax breaks or other forms of compensation to members of target groups who are particularly hard-hit by adjudicatory decisions?*
5. *Are the decision rules contained in the statute consistent with statutory objectives? For example, do they place the burden of proof on target groups?*

Do they give as much authority as possible within implementing institutions to those officials most likely to support statutory objectives? Do they make the granting of permits or licenses contingent on specific findings consistent with statutory objectives?

6. *Does the statute assign the responsibility for implementation to institutions (agencies) that are strongly supportive of its objectives and likely to grant the program high priority? Specifically, is it possible to create a new agency to administer the program or else to assign it to a prestigious existing agency that supports the objectives and is looking for a new program?*
7. *Does the statute maximize the opportunities for supporters external to the implementing agencies to participate actively in the implementation process? Specifically, does it provide standing for supporters to actively intervene in agency proceedings and to appeal agency decisions to the courts? Does the statute provide for evaluation studies by prestigious independent organizations to monitor the extent to which agency decisions and the impacts of those decisions are consistent with statutory objectives? Finally, is it possible to somehow centralize legislative oversight in the hands of supportive legislators?*
8. *What is the probability that changes in socioeconomic conditions or in technology during the foreseeable future are likely to undermine political support for statutory objectives? If the achievement of those objectives is*

contingent on technological innovation, what steps does the statute take to foster such progress?

9. *What can be done to counter the short issue-attention span of the mass media and the general public? In particular, is it possible to convince some of the more important media to hire specialist reporters to cover the general issue addressed by the statute?*
10. *What steps can be taken to activate any latent supportive constituencies and to assure that supportive groups have the necessary staff and other resources to monitor and to actively participate in the implementation process?*
11. *What can be done to assure that legislative and executive sovereigns who support the statute will actively monitor and intervene in the implementation process? In particular, is anyone available to serve as a "fixer" and does he have the staff and other resources to do so effectively? Moreover, what can be done to assure that subsequent legislation in policy areas relevant to the statute does not undermine statutory objectives and that attempts to revise the statute do not emasculate it?*
12. *Can anything be done to appoint implementing officials who are not only committed to the achievement of statutory objectives but also have above-average managerial and political skills* (Mazmanian & Sabatier, 1981, pp. 25-6)*?*

Critical Conditions Questions

1. *The enabling legislation or other legal directive mandates policy objectives which are clear and consistent (or at least provides substantive criteria for resolving goal conflicts).*
2. *The enabling legislation incorporates a sound theory identifying the principal factors and causal linkages affecting policy objectives, and gives implementation officials sufficient jurisdiction over target groups and other points of leverage to attain, at least potentially, the desired goals.*
3. *The enabling legislation structures the implementation process so as to maximize the probability that implementing officials and target groups will perform as desired.*
4. *The leaders of the implementing agency possess substantial managerial and political skill and are committed to statutory goals.*
5. *The program is actively supported by organized constituency groups and by a few key legislators (or a chief executive) throughout the implementation process, with the courts being neutral or supportive.*
6. *The relative priority of statutory objectives is not undermined over time by the emergence of conflicting public policies or by changes in relevant socioeconomic conditions that undermine the statute's causal theory or political support* (Mazmanian & Sabatier, 1981, pp. 29-30).

According to Mazmanian and Sabatier, these sets of questions capture the various clearance points for successful policy formulation and implementation. For the purposes of our research, these would constitute the wider pool of explanatory variables responsible for variation in access to safe drinking water. Hence, during our case studies, we would want to examine how well the empirical data supports the normative model of Mazmanian and Sabatier.

Although Mazmanian and Sabatier's process-oriented model is elaborate in its comprehensiveness, their work is contested by another group of implementation scholars. Mazmanian and Sabatier's work is recognized as a seminal work in the top-down approach and as consequence is targeted for criticism on this approach (Hill & Hupe, 2002; Winter, 2012). The "top-down" approach takes the position where implementation could be improved by both anticipatory and comprehensive policy design by the senior decision-makers. Other scholars falling into this category are Van Meter and Van Horn (1975), Bardach (1977), and Hogwood and Gunn (1984).[19] They differ from the

[19] Van Meter and Van Horn advocates two dimensions are crucial for successful implementation: amount of change sought and goal consensus (1975). Accordingly, policies designed for small changes and high goal consensus are most likely to be successfully implemented. The implementation process is also a product of six process-oriented variables: 1) policy standards and objectives, 2) resources and incentives, 3) quality of inter-organizational relationships; 4) characteristics of the implementation agencies, 5) economic, social, and political environment, and 6) disposition or response of implementers (1975, p. 464-472). Bardarch emphasizes the need for scenario writing process and paying attention to fixing the game (1977) in light of conflicts in inter-organizational settings. Scenario writing applies to structuring the sequence of implementation games that will have to be played in order to achieve desired results. Fixing the game applies to rearranging if necessary the parameters of the game in order to achieve desired results in the interactions. Hogwood and Gunn (1984) list 10 preventive measures that should be taken by policy makers to prevent implementation failure. They are: 1) circumstances external to the implementing agency do not impose crippling constraints, 2) adequate time and sufficient resources are made available to the program, 3) required combination of resource are available at each stage in the implementation process, 4) policy is based upon a valid theory of cause and effect, 5) relationship between cause and effect is direct with few intervening links, 6) a single

"bottom-up" cohort by emphasizing change inducing agents, i.e. those who are able to improve implementation's probability of success in attaining policy goals, are senior-level policy makers with greater creative room for policy modification and improvements.

Leading the opposing view, Lipsky is recognized to be the founding scholar emphasizing the bottom-up component of the implementation process (1980). In his study where "Street-level Bureaucracy" becomes a common term, he advocates that successful policy implementation resides on the shoulders of those in the front lines actually delivering public services. That is, statute objectives and implementation actions are best aligned when those working in the front lines are enabled to do so.[20] Thus, the variation in policy implementation is best understood by examining the behaviors, particularly the coping mechanisms of those working with limited resources. As a consequence of their operating environment, street-level bureaucrats intervene with actions in service delivery that are not part of the original design. Winter provides a succinct summary of street-level bureaucracy actions.

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agency is responsible for implementation and does not depend upon other agencies for success, 7) there is a complete understanding of, and agreement upon, the objectives to be achieve, and these conditions persist throughout the implementation process, 8) specify in complete detail and sequence the tasks to be performed by each participant in the implementation process, 9) ensure perfect communication and coordination among various elements involved in the program, and 10) those is authority can demand and obtain perfect obedience (Hogwood and Gun, 1984, p. 199-206).

[20] Lipsky notes in the 30th year edition that the 1980 book was written at a time of the civil rights movement in the United States. The movement was aimed to achieve social and political equity for African-Americans and a looming question was how to achieve equal rights in the government administration populated by Caucasian workers. Upon examination, Lipsky noted that the performance of critical public services was not the product of racism, personal attitudes, or indifference but of those of 'the predictable consequences of the structure of particular kinds of publics sector work' (2010, p. 212-3).

> *A typical response to the conflict they experience is to employ a number of conscious or subconscious coping strategies. Street-level bureaucrats will use tricks such as limiting information about services, making clients wait, making access difficult, and imposing a variety of other psychological costs on clients. A slightly different kind of coping strategy is to concentrate on a limited number of selected clients, types of programs, and solutions* (Winter S., 1990, p. 31 in summary of Weatherly and Lipsky, 1977).

Other notable scholar emphasizing the bottom-up approach is Elmore (1979) who employs the term "backward mapping". It emphasizes strategizing around the interaction point between the public organization and policy beneficiaries. It would strategize by identifying what needs to happen at the interaction point and moving back up the hierarchical ladder in order to provide the necessary resources. Elmore describes the logic of backward mapping and how it is different from forward mapping, a latter which most top-down approaches fall under (1980).

> *The logic of backward mapping is, in all-important respects, the opposite of forward mapping. It begins not at the top of the implementation process but at the last possible stage, the point at which administrative actions intersect private choices. It begins not with a statement of intent, but with a statement of the specific behavior at the lowest level of the implementation process that generates the need for a policy. Only after that behavior is described does the analysis*

> *presume to state an objective; the objective is first stated as a set of organizational operations and then as a set of effects, or outcomes, that will result from these operations. Having established a relatively precise target at the lowest level of the system, the analysis backs up through the structure of implementing agencies, asking at each level two questions: What is the ability of this unit to affect the behavior that is the target of the policy? And what resources does this unit require in order to have that effect? In the final stages of analysis the analyst or policymaker describes a policy that directs resources at the organizational units likely to have the greatest effect* (Elmore R. F., Backward Mapping: Implementation Research and Policy Decisions, 1979, p. 604).

The relevance of the top-down versus bottom-up debate to our research inquiry is the further expansion of variables critical variables that need to be considered. For the purposes of our research, the bottom-up approach emphasizes the much-needed attention in capacity. The capacity concern takes on deeper discussion in the following generation of implementation scholars. For purposes of brevity, we will cover two synthesizing frameworks, one by Goggins and colleagues (Goggin, Bowman, Lester, & O'Toole, Jr., 1990) and the other by Winter (2012). However, this is not comprehensive of the synthesizing frameworks. Alternative frameworks are summarized in Hill and Hupe (2002). The two frameworks were chosen to illustrate the broadening yet inconclusive literature on the general theory of implementation.

Goggin, Bowman, Lester, and O'Toole, Jr. attempt to bridge the top-down and bottom-up implementation literature by developing a synthesis model titled the "Communications Model" (1990). The model is built on the premise that implementation depends on the interpretation at play that is a function of local circumstances, particularly capacity constraining factors. Their own words are as follows:

> *Therein lies the key to implementation's variability. Interpretation is a function of* context*. Therefore, a single message, such as a federal statute, may be interpreted differently in different states. Even within a single state, the pluralistic and interactive nature of local-level policy adoption makes the probability of multiple, conflicting messages high. State-level implementation is correctly conceptualized as the sorting and interpreting of messages by recipients in contextually different settings. The result is a decision that determines the style that implementation takes* (Goggin, Bowman, Lester, & O'Toole, Jr., 1990, p. 33 with original italics in normal font).

> *In other words, even though the objective conditions may be identical in state X and state Y, the implementation decision may vary. This variance is a function of the manner in which decision makers interpret the information that they are receiving. Interpretation is related to characteristics internal the decision makers (such as their psychological predisposition) and external to them (such as interpersonal relations among politicians and representatives of organized*

interests). This is a little recognized but powerful part of the implementation process (Goggin, Bowman, Lester, & O'Toole, Jr., 1990, p. 38).

The importance of interpretation is captured in State Decisional Outcome and State Capacity variables that occupy the center of their model. State Decision Outcome is where the regional government, the State-level government in the case of the US, agrees to proceed in implementing the national, or federal in the case of US, policy. State capacity captures the ability of the local government to proceed with implementation. It is a function of *Organization Capacity* and *Ecological Capacity*. The former is a function of organizational structure, personnel, and financial resources. The latter is a function of contextual environment, mainly comprised of socio-economic conditions and their resulting political climate.

Goggin and colleagues argue that the model is capable of predicting and explaining state-level implementation processes, outputs, and outcomes (Goggin, Bowman, Lester, & O'Toole, Jr., 1990, p. 172). The model has further capabilities such as:

The Communications Model is also capable of specifying the conditions under which various state implementation decisions and actions about the timing of implementation and change in program form and content during implementation are likely to occur (Goggin, Bowman, Lester, & O'Toole, Jr., 1990, p. 172).

They base their assertion on a rather complicated research agenda built on 17 hypotheses generated from the model.[21] The hypotheses capture moving parts in the implementation cycle and are aimed to measure responsiveness of the local government in implementing central government policies. The 17 hypotheses generated to test responsiveness of local government to central government policy are as follows:

> ***H1****: If federally initiated messages are (a) accompanied by resources; (b) credible as a viable solution to a salient problem for that state; (c) clear; (d) consistent; (e) frequently repeated; and (f) actually received, the actors who make the joint decision for the state are more likely to opt for prompt implementation without modifications.*
>
> ***H2****: The more legitimate and credible the federal senders of messages, or principals, in the eyes of state officials, the more likely the state's implementation is to proceed promptly and without modifications.*
>
> ***H3****: States with larger, stronger, and more cohesive supportive advocacy coalitions and supportive state legislatures are more likely to implement programs promptly and without modifications.*

[21] It is "complicated" as the hypotheses are constructed around ambiguously operationalized terms. For example, one of the hypothesis is built as follows: "The more legitimate and credible the federal sender of messages, or principals, in the eyes of state officials, the more likely the state's implementation is to proceed promptly and without modifications." This is a moving target as "more legitimate" and "credible" are non-standardized terms open to interpretation.

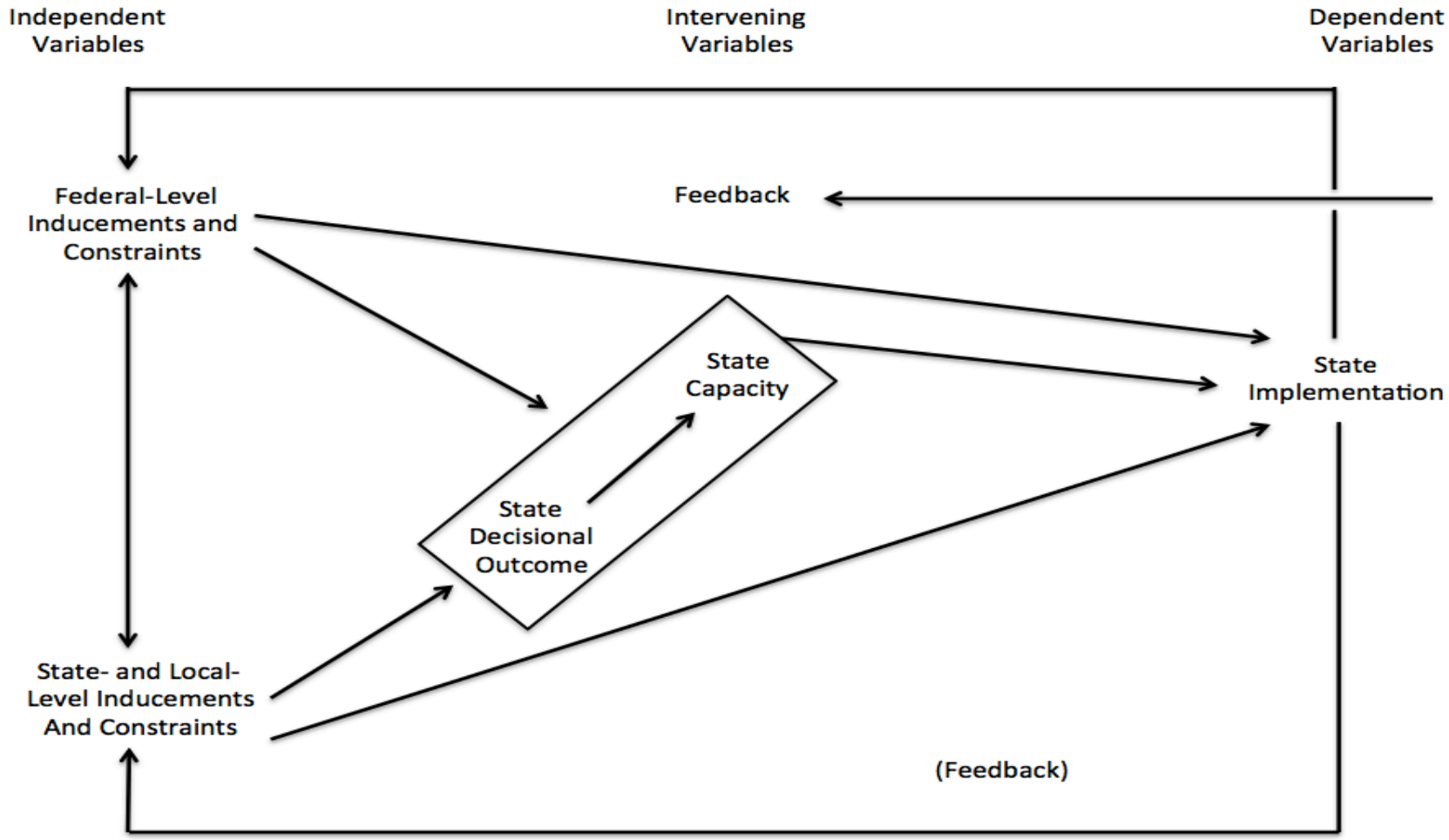


Figure 5: Communication Model of Intergovernmental Policy Implementation
Source: Reproduced from Figure 1.1 in Goggin, Malcom L., Ann O'M. Bowman, James P. Lester, and Laurence J. O'Toole, Jr. (1990). *Implementation Theory and Practice: Toward a Third Generation.* New York: HarperCollins Publishers

***H4**: If supportive messages initiated at state or local levels are (a) credible as a viable solution to a salient problem for that state; and are (b) clear, (c) consistent; (d) frequently repeated; and (e) actually received, then the actors who make the joint decision for the state are more likely to opt for prompt implementation without modifications.*

***H5**: The more legitimate and credible the supportive state or local senders of message in the eyes of state officials, the more likely the state's implementation is to proceed promptly and without modifications.*

***H6**: The greater the number of organizational units involved in the implementation process, the greater the likelihood of delay and modification during implementation.*

***H7**: The more personnel a state devotes to implementing a program, the greater the likelihood of prompt implementation without modifications.*

***H8**: The larger the program budget on a per capita basis, the greater the likelihood of prompt implementation without modifications.*

***H9**: States with greater financial resources at their disposal are more likely to implement a program promptly and without modifications.*

***H10**: The more conducive the state political environment to the program being implemented, the greater the tendency to implement a program promptly and without modifications.*

***H11**: The greater the salience of the target problem to the state and the greater the state media attention given to the target problem, the greater the tendency to implement a program promptly and without modifications.*

***H12**: The greater the agent's legitimacy, credibility, and capability of advancing the interests of the principal, the more responsive is the principal.*

***H13**: The greater the agency's collective expertise, skill, and capacity to advance the interests of the principal, the more responsive is the principal.*

***H14**: The greater the clarity, consistency, and credibility of the message, the more responsive is the principal.*

***H15**: The more personalized the channels of communications used by agents, the more responsive is the principal.*

***H16**: The better the fit between the principal's and the agent's political party, ideology, and psychological predisposition toward redesigning the policy, the more responsive the principal.*

H17*: The more a principal possesses policy expertise, the more experience he or she has as a state- or local-level elected or appointed official, and the more competitive a principal's district, the more responsive the principal* (Goggin, Bowman, Lester, & O'Toole, Jr., 1990, pp. 174-86).

The Communication Model covers both the top-down and bottom-up factors where caution is emphasized to achieve clarity for cooperation on both policy design and implementation directives emanating from the central government, which is a crucial top-down factor. The bottom-up factor is emphasized in research design whereby local government actors are surveyed to test whether the criteria above have been met. Thus, the model is "synthesized" as it requires the cooperation of both the policy-designers and implementing local government staff to test the model; a major research agenda and initiative that the authors request the next generation of implementation scholars to continue.

In relation to access to safe drinking water access, the case studies will be examined across these criteria to examine the extent on whether the proposed "interpretation-responsiveness" mechanism explains the variation between the different country's performances. This would be relevant as water policies were decentralized in at least the two case studies, Vietnam and Indonesia. Hence, to what extent of the central government-local government messaging was responsible for different performances will be explored.[22]

[22] I have cautiously used "explored" rather than "examined" here because the research design does not include surveying local government officials as recommended by Goggin and colleagues. However, local government officials were met and interviewed. Thus, it gives the basis for the use of the "explored" description.

The last model reviewed is the Integrated Implementation Model by Winter (1990; 2012). The model is comprised of two dependent variables: one being the outputs of implementers and the other outcomes targeted by policy objectives. They are both products of the policy formulation process, organization and inter-organizational implementation behavior, street-level bureaucratic behavior, and response by target groups and other changes in society (Winter S. , 1990, p. 20). Similar to the other implementation frameworks that were reviewed, implementation is an independent yet cascading stage following policy formulation and design. The distinction between the latter two is in the first being preoccupied with the political processes whereas the later is focused goals, instruments, and designation of the implementing organization.[23] The implementation process is mainly comprised of staff behaviors and resource dependencies among networks. Management is separated out in the diagram but it is interconnected with staff behavior and resource management.

The Integrated Implementation Model differs from the previous theories in its separation in policy formulation and policy design along with incorporating target group response. Although the policy formulation and design separation cannot be attributed to Winter alone, as Linder and Peters (Linder & Peters, 1984; 1990; 1990) have written substantially on the subject, incorporating it into an implementation model to help theoretically integrate the distinction between the two that has been made clear by the later

[23] Insightful resource on policy formulation would be Conlan, Posner, and Beam (2014). Additional resources on policy design and instruments are Salamon (2002), Eliadis, Hill, and Howlett (2005), and Howlett (2011). [23] However, separating out the policy design from policy formulation stage is a later development of Winter's, as the separation is not represented in his 1990 book chapter but appears in his 2012 book chapter (Winter 1990, 2012).

studies in the field. The model is different from other models, as it adds further weight to the importance of target-group responses as a change agent in implementation. Unintended target-groups responses that hamper effective implementation are those such as passivity by the intended target population and failing to take advantage by inaction or nonparticipation for social programs targeted for them. That is, they may have the right to services but either may be unaware of such a program or deliberately shy away from Government interaction due to stigmatization or fear. These aspects along with street-level bureaucrats behaviors that is unaccounted for during policy design are two advancements in the field that are incorporated in the Integrated Implementation Model.

Winter's model does attempt to pull together and reflect advanced insights in the field. Unfortunately, the model does not accompany detailed breakdown in the operationalization of the variables. That is, the model serves as a good diagram on the various critical components but lack the acuteness to formulate what those components should look like in order to accelerate the safe drinking water provision. This brings us back to our initial explanation that although the research question is nested in public administration's implementation scholarship, the unsettled debates over theory in the field and the loose operationalization of critical variables makes it unmanageable collecting evidence on all mentioned variables. Thus, the improved approach is to see what pool of relevant variables emerge in the interviews with policy-makers and implementers. They shed light on which of these models are best of fit in explaining implementation in their respective countries.

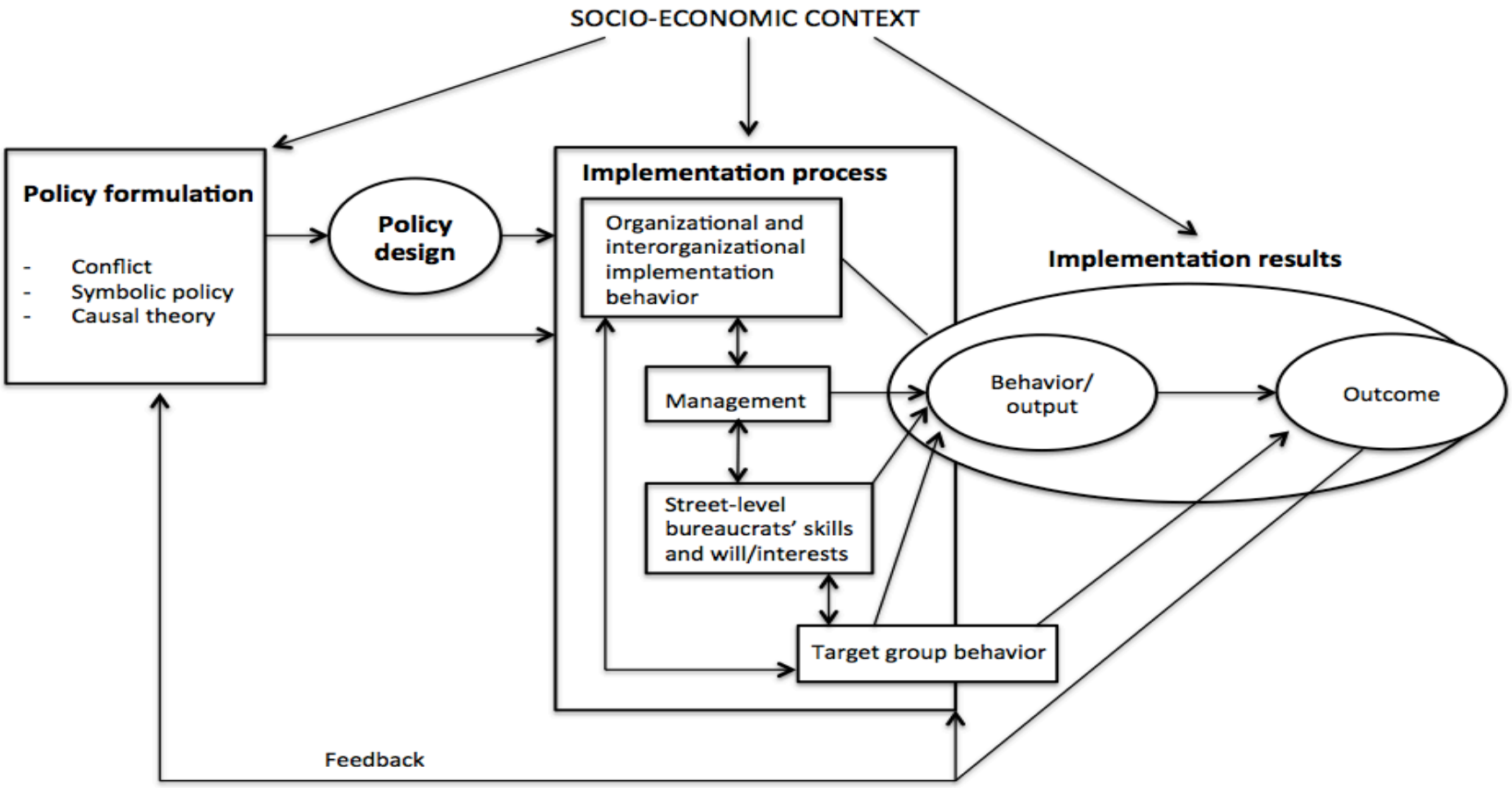


Figure 6: Integrated Implementation Model

Source: Winter, Soren. (1990). "Integrating Implementation Research." In Dennis J. Palumbo and Donald J. Calista (Eds), *Implementation and the Policy Process.* New York: Greenwood Press, pp.19-38; Winter, Soren. (Ed.) (2012). "Implementation." In B.Guy Peters and Jon Pierre, *The SAGE Handbook of Public Administration.* 2nd Ed. Thousand Oaks, CA: Sage Publications, Inc., pp. 255-64.

Suspected causes of variation based on Comparative Politics Scholarship

Comparative politics scholarship suggests different theories in explain the variation in outcomes between countries.[24] Consequentially, the most conspicuous or commonly associated with comparative politics is the influence of different political systems. Given the preeminent inquiry within comparative politics is variation in political systems and its imprint on social order and operations, regime-type is a crucial variable in explaining variation witnessed the particular country's social outcome (Lijphart, 1999). That is, according to comparative politics scholarship, the first suspect in explaining variation to access in safe drinking water among different countries would linking it to the particular regime-type of the country.[25] This is in turn because regime-type is strongly associated with the particular "state" that emerges within the country.

The "state" scholarship within comparative politics is a natural place to anchor the research question, as policy implementation is often folded into the broader conceptualization of the "state" within the comparative politics scholarship. However, for clarification, the "state" is a broader conceptualization than a single Government agency. It refers to the set of institutions that is able to exercise legitimate force within a

[24] As a result of drawing on larger number of country cases, typically more than public administration, and of which the countries are not all democratic, comparative politics widens the search for critical variables impacting political and social change. Comparative politics are includes the country's own political system as a key explanatory element. Hence, the difference between public administration and comparative politics is in their focus. Comparative politics includes considerations on how international relations and regime type impact the country. Public administration focuses more on how policies are implemented by government entities. The two scholarships have overlapping areas and these areas are examined and discussed.

[25] Although this statement treats regime-type as an independent variable, comparative politics scholarship on regimes is more often the other way around where regime-type is studied as a dependent variable (Moore, Jr., 1966; Huntington, 1991).

bound territory (Weber, 1921). Later scholars, further elaborate on the definition of the "state". Hall and Ikenberry elaborates:

> *A composite definition would include three elements. First, the state is a set of institutions; these are manned by the state's own personnel. The state's most important institution is that of the means of violence and coercion. Second, these institutions are at the center of a geographically bounded territory, usually referred to as a society. Crucially, the state looks inwards to its national society and outwards to larger societies in which it must make its way; its behavior in one area can often only be explained by its activities in the other. Third, the state monopolizes rule making within its territory. This tends towards the creation of a common political culture shared by all citizens* (Hall & Ikenberry, 1989, p. 2)

Following the definition, the state literature applies to our research question because we are interested in the public entities responsible for formulating and implementing safe drinking water policy for their citizens within their national boundary. The broad inquiry leads to specific inquiries over the importance of the rules and their associated processes and their impact in expanding coverage of safe drinking water.

At the onset, it was mentioned that four key scholars' works were particularly relevant for this research. They were Midgal (1988; 2009), Johnson (1982; 1999), Scott (1998), and Herbst (2000). This is particularly due to their contributions in advancing the study of state in a developing country context. Midgal helps open up the reality that the

state does not exert uncontested authority of control within a territory. That is, states are not all-powerful in dictating control over society and compete for social control in areas with strong legacies of social control. This is relevant for research on safe drinking water, as it questions the ability of the central government's state apparatus in guiding or even dictating the development of safe drinking water systems in areas away from the country's capital. It is also relevant since all the countries in this research were once colonized and only gained independence following the end of WWII.

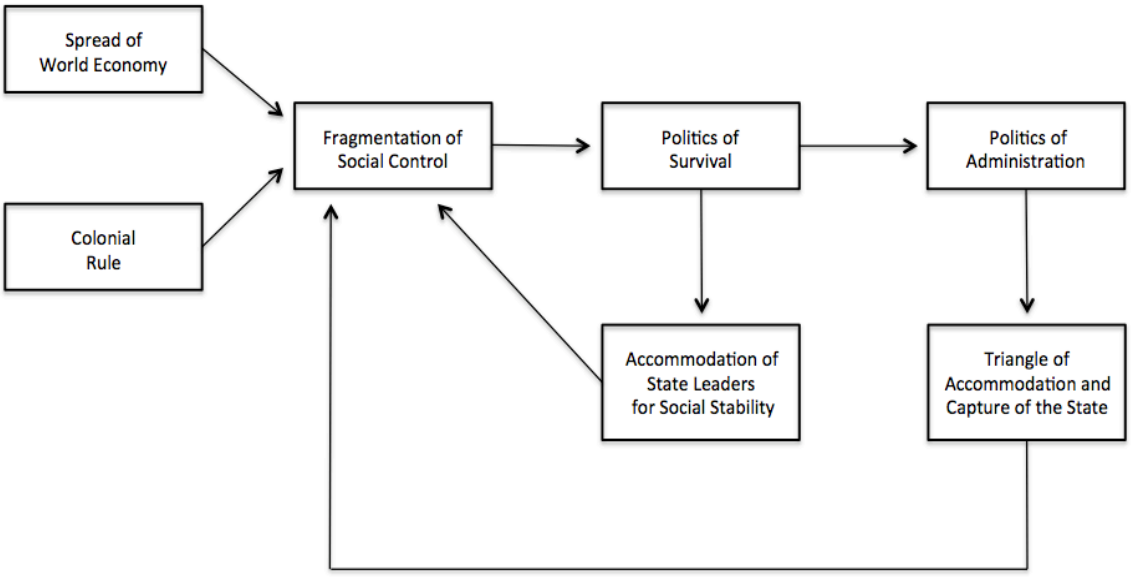


Figure 7: An Interactive Model of Relations between Weak Third World States and Their Societies
Source: Midgal, Joel S. (1988). *Strong Societies and Weak States: State-Society Relations and State Capabilities in the Third World.* Princeton, NJ: Princeton University Press, p.268

Another reason why Midgal's work is relevant for this research is because he asserts that the strong societies and weak state relationship is a reinforcing equilibrium. For research on safe drinking water, this means that the state could go through reforms on safe drinking water but the endorsement and enforcement of those reforms would be limited in areas ruled by strong societies. This is why Midgal's theory becomes relevant and requires us to examine whether the conditions sustaining the strong societies and weak states are prevalent in our cases. The variables that need to be examined are those depicted in his figure.

Johnson's offers an explanatory framework in the other end of spectrum. He points to the explanatory power of the state in development for those countries that are very successful in implementing reform policies. He is attributed to developing a new state categorization: the developmental state. It refers to the prioritization of the state on development and how bureaucrats legitimize their inventions in both economic and social realms in light of the changing developmental goals to economically enrich the country. Johnson elaborates on the aspect of legitimized intervention of the development state in this later writings:

> *The leaders of the developmental state do enjoy legitimacy in the sense that their claim to political power is based on some source of authority above and beyond themselves. They differ in this sense from authoritarian rulers whose continued rule depends on their monopoly of force remaining a genuine monopoly. The source of authority in the developmental state is not one of Weber's "holy trinity"*

of traditional, rational-legal, and charismatic sources of authority. It is, rather, revolutionary authority: the authority of a people committed to the transformation of their social, political, or economic order. Legitimation occurs from the state's achievements, not from the way it came to power (Johnson, 1999, p. 53).

The developmental state differs from the authoritarian state in the sense that it enjoys greater legitimacy.[26] That is, the state apparatus' core function goes beyond a vehicle of oppression and submission. It includes skillful intervention to aid and support domestic industries to navigate dynamic world economic trade. This does not mean the state owns the industry but rather works in tandem with industry. The "development state" concept matters, as countries of "development state" are predicted to catalyze economic growth. That is, it explains why countries are able to develop faster than other countries. By being aware of the characteristics of the developmental state, we will examine to what extent this explains the variation in expansion of coverage in safe drinking water.[27]

Scott takes an opposing view of Johnson through his work in *Seeing Like the State* (1998). He notes that the characteristics that are associated with the developmental state

[26] Authoritarian regimes are stable regimes originally conceptualized by (Linz, 1964). It categories countries that are neither moving toward democracies nor totalitarian regimes. Authoritarian regimes are classified as those where a certain leader rather than party ideals determines the governing mechanism.

[27] At the onset, the developmental state concept is relevant at least for one of the case studies, South Korea, as it is well recognized as a developmental state similar to Japan. Amsden (1989) and Woo (1991) are two key scholars who have researched the role of the developmental state of South Korea. For our research, we will examine to what extent the developmental state mattered for expanding safe drinking water, which is often categorized as a social infrastructure and therefore deprioritized in investment.

have led to wasteful use in resources and greater misery. He notes that the likelihood of failures of social engineering can identified by the presence of four conditions. He describes them as follows:

> *I shall argue that the most tragic episodes of state-initiated social engineering originate in a pernicious combination of four elements. All four are necessary for a full-fledged disaster. The first element is the administrative ordering of society ... The second element is what I call a high-modernist ideology. ... The third element is an authoritarian state that is willing and able to use the full weight of its coercive power to bring these high-modernist designs into being. ... A fourth is closely linked to the third: a prostrate civil society that lacks the capacity to resist these plans* (Scott, 1998, pp. 4-5).

Administrative ordering refers to the standardized indexing instruments used by the state. Due to its raison d'être, it is high on legibility and simplification. These include "the creation of permanent last names, the standardization of weights and measures, the establishment of cadastral surveys and population registers, the invention of freehold tenure, the standardization of language and legal discourse, the design of cities, and the organization of transport (Scott, 1998, p. 2)." Johnson notes that this simplification is a problem.

High-modernist ideology refers to arrogant and unsound faith on the deliberate comprehensive planning of human settlement and production. Although it is founded on

the belief of scientific progress, it is different from practicing science. Scott elaborates on the difference as follows:

> *High modernism must not be confused with scientific practice. It was fundamentally, as the term "ideology" implies, a faith that borrowed, as it were, the legitimacy of science and technology. It was, accordingly, uncritical, unskeptical, and thus unscientifically optimistic about the possibilities for the comprehensive planning of human settlement and production* (Scott, 1998, p. 4).

Scott cautions against a coerced top-down approach because it is flawed on two points. First, simplified legibility is incomplete in capturing valuable localized and often tacit knowledge. That is, by imposing and employing simplified standards are unfit in capturing the rich ecological and cultural diversity. Second, the belief that social engineering is actually something that can be perfected is unsound and dangerous. That is, any unrestrained actions stemming from this belief causes greater hardships.

Scott antithesis on the instrumentality of the state to ameliorate human conditions is relevant for our research on safe drinking water since it predicts that efforts to expand safe drinking water access via state intervention could potentially exacerbate circumstances of the targeted population. That is, state interventions of good intentions do not always live up to its original objectives. Hence, people could be worse off due to interventions.

As for our research, its relevance is in whether Scott's explanation of failure also could be generalized to safe drinking water. Another way to look at this is to ask whether the poorly performing countries exhibit conditions highlighted by Scott. To test this, we would need to be aware of those conditions when constructing the case studies.

The last singled out significant researcher in comparative politics relevant to our study is Herbst (2000). He offers explanations for state failure in Africa. That is, he asks why are we not seeing similar paths of statecraft in Africa versus Europe. His study unveils the different conditions facing the leaders in Africa. Those conditions clarify the incentives facing African leaders and in turn help explain why African states are as they are, which are failed states.

Herbst notes that unlike Europe, African countries did not have to fight for control over land. Labor and minerals has been the valuable commodity and not the produce grown from the land. Also, the boundaries were pretty much fixed and uncontested after WWII with the establishment of the United Nations, a war arbitration institution. Thus, negating the need to grow bureaucracies to defend the borders. This condition is very much different from the conditions in Europe where war mobilization was a crucial intervening variable behind the modernization of the state (Tilly, 1990). The African states were not forced to become strong, as they did not have to engage with one-another over territorial control.

This along with the colonial legacy of where capitals were located near or on ports, as colonizers were interested in extraction rather than governance, made it costly to later project power in remote parts of the country. That is, infrastructures were not in

place to reach outer low population density areas and there was little incentive to later invest in it for land was not the scarce commodity in Africa. The lack in existential threat combined with the economic disincentive to invest in outer lands away from the capital resulted in weak capacity states poor in its ability to improve human conditions for their citizens.

Herbst's explanation on the poor governance functions of the states in Africa is relevant for the safe drinking water question, as it points to deeper rooted obstacles. That is, the aspect Herbst's has pointed to is not something that can be addressed by a change of policy. That is, there are systematic disincentives in place preventing the strengthening of the state to effectively deliver public services to its citizens away from the capital. Even at the capital, the state is operating in an environment without checks in taking on a predatory character. That is, these state do not face the forces necessitating it to promote a well functioning state with emphasis on welfare. Hence, the application of Herbst's explanation on poorly functioning states is also relevant to the study in access to safe drinking water for we should expect similar conditions and factors at play for those making poor progress in expansion of safe drinking water.

Literature in both public administration and comparative politics has been covered because the research question posed by this research has not yet been asked and examined by scholars in both field. Hence, the literature only serves to suggest guidance on what could be possible explanations behind variance in the outcome. As reviewed, different scholars present and suggest different reasons. To what extent these explanations are supported by empirical data on access to safe drinking water is explored.

But before we present the newly collected empirical data in validating the various theories, we need to first cover the additional steps advised by George and Bennett.

Developing a Research Strategy: Specification of Variables

Having explored the possible explanations to the dependent variable variation in question, George and Bennett advises developing a *research strategy*. It involves the formulation of a hypotheses based on the theoretical developments related to the research question. A rudimentary approach is to define a dependent variable and specify relevant independent variables. More specifically, George and Bennett recommend answering the following questions in fulfilling this step:

- *What exactly and precisely is the dependent (or outcome) variable to be explained or predicted?*
- *What independent (and intervening) variables comprise the theoretical framework of the study?*
- *Which of these variables will be held constant (serve as parameters) and which will vary across cases included in the comparison?* (George & Bennett, 2005, p. 79)

Some of the above questions have already been answered. The dependent variable is access to safe drinking water in the country. It is operationalized as the percentage of population with access to water delivered through means decreasing fecal contamination. Thus, safe drinking water access could be gained either by pipe networks

transporting contamination-free water from a water treatment plant or via covered wells to extract, store, and protect water of acceptable illness-free quality until its manual retrieval. The dependent variable is a combination of those outputs. The outcome is where people with access are then is sheltered from the high risk of acquiring waterborne diseases.

The independent variables for the qualitative research portion are not preset. This is deliberately done, as the purpose of the research is to sift out the relevant variables from the universe of potential explanations. Due to imperfect fit of the reviewed theories to the research question, the most convincing explanation among competing explanations has yet to be determined. Hence, by predetermining the set of independent variables, it would introduce researcher bias and potentially fail to identify other relevant independent variables. Thus, the preferred approach is to leave this open-ended and ask the decision-makers what mattered the most for them when they were working on water policies in their countries. That is, the independent variable selection would be left to the actual practitioner operating in the sector rather than letting predispositions to take hold with potential to introduce researcher bias and sway the interview in a particular direction.

This does not mean that the theoretical advancements in the field are disregarded. But rather it is more due in reflection of the field, as different scholars offer very different frameworks for explanation. Public administration literature highlights the potential challenges leading and executing implementation. Multiple cascading factors may derail policies from achieving their objectives. These factors range from the political formulation process, policy design, organization and inter-organization relationships,

behaviors of street-level bureaucrats, and target-group responses. These are also pervious to changing interests and prioritizations of citizens over time. Comparative politics scholarship casts a wider the net of independent variables ranging from historical legacies, international forces, and internal security challenges. These additional variables are separate from the variables highlighted in the implementation scholarship.

Another reason why a predetermined pool of variables is not selected at the onset of data collection is due to the imprecise operationalization of the independent variables. There is an inherent crudeness in operationalization of the independent variables. "Crudeness" in the aspect that they could only be operationalized in the form of dichotomous dummy variables. In order words, we could only guess whether certain conditions existed or not. These aspects could help explore relationships but it would be better left to the interviewees to describe the most important factors in their own words within the causal mechanism they hold true to be at play in expanding, or preventing, access to safe drinking water. Furthermore, this has the benefit of unearthing and identifying pivotal intervening variables.

Case Selection

In exploring the causal mechanism at play in different countries and how they are responsible for the variation in expansion of safe drinking water, two countries at the opposing ends of the variation are selected for comparability. This was done in this research. Indonesia and Vietnam were selected as their performance in expanding access to improved water sources varied.

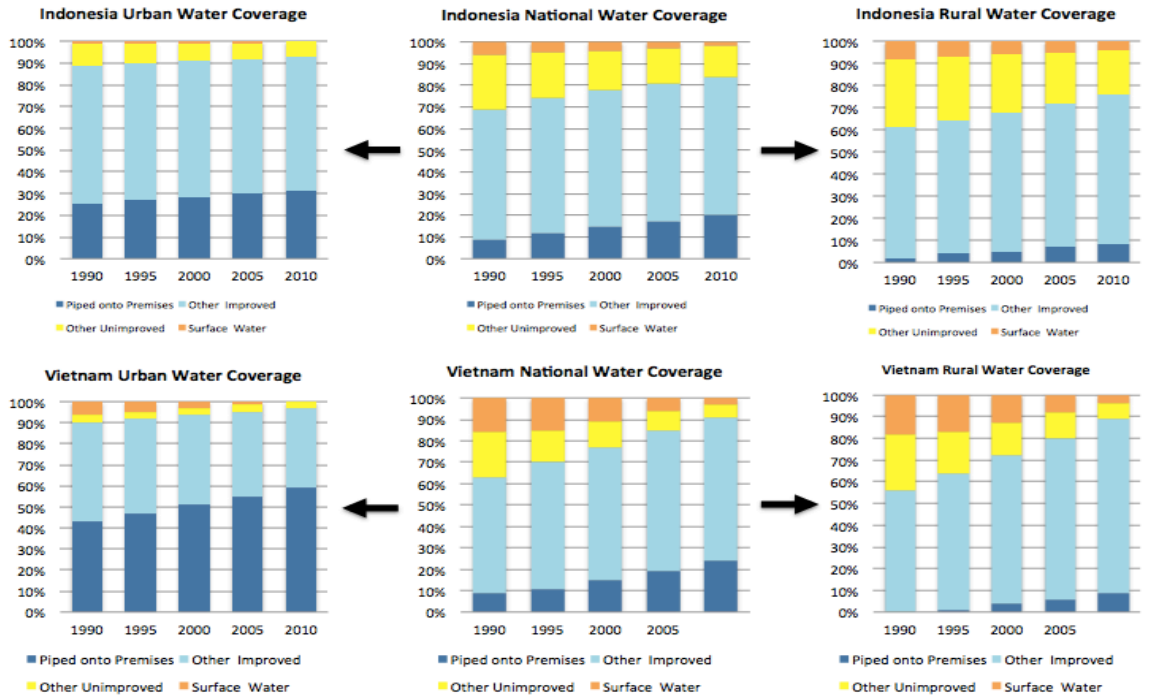


Figure 8: Variations in the Dependent Variable for Indonesia and Vietnam
Source: UNICEF and World Health Organization. (2015). *25 Years Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment.* Geneva: World Health Organization.

As for the 3 additional cases, they were selected as they achieved universal access to water within a single generation. Hence, their selection is to further verify and validate the identified causal mechanism from the first two countries.

Describing the Variance in Variables

How variance is formulated defines the limits in interpreting the analytical results. A dichotomous variable may provide simplicity yet may only permit more general conclusions, especially when its "yes or present" is operationalized very loosely. On the

other hand, if it is too specialized, then it may undermine validity in any generalizations. This is more so when there are few cases. Then there is the challenge of conceptualization-operationalization alignment. That is, do we have a clear understanding and definition of the variable under investigation and are the formulated measurements valid and reliable? This aspect also impacts and defines permissible interpretations of research findings.

For this research, the unit of variance in the dependent variable is pre-set. It is the percentage of population with access to safe drinking water. It is a percentage figure employing a ratio measurement scale. The variable has an absolute zero and the intervals between the integers carry the same mathematical interpretation.

As for establishing the variance in the independent variables, this would be something that will follow the collection of empirical data. This is because two things will occur once the data is collected. First, it will become clearer on which of the variables are actually relevant from those identified by different streams of theories. Second, empirical data will help us determine whether the variance of the relevant variable was properly constructed.

Formulation of Data Requirements and General Questions

George and Bennett advise on the specification of data requirements for reasons of comparison (2005, p. 86). It starts with asking the same set of questions across different cases so that the variation will inform us the relevance of the variable in the explanation. It is recognized to be similar to the statistical method of preset variable data

collection. However, the difference is that there is an exploratory component when conducting interviews and when the causal mechanism is unknown. In these cases, the critical variables are not known from the onset and therefore by only collecting information on the variables under-utilizes the advantages in empirical data collection of in-depth interviews. A strict adherence to this rule is unwise since the opportunity to mining of critical variables is overlooked.

However, recognizing the rationale behind the concern raised by George and Bennett, the research proceeds in a uniform manner with all interviewees. First, the data on the dependent variable is presented to the interviewees. I then ask if they would be able to explain the longitudinal change in the dependent variable. In all the interviews, my primary job was to listen attentively. Clarifications on the dependent variable was provided when needed. The clarifications were restricted to elaborating on the organization that collected the figures and what the figures represent. Probing was done for clarification purposes, especially when the interviewees shared an unfamiliar critical event. The probing was intentional and done for the purposes of identifying further resources to gain deeper and more accurate understanding of the mentioned event.

Questions were posed for comparisons, especially for clarification on whether a certain mechanism was at play: mechanisms interviewees mentioned were important in properly understanding the progress in access coverage in the particular country. Probing questions were asked at the end when the interviewees seemed to have exasperated in sharing their experiences and their thoughts on the key factors behind the longitudinal changes. The empirical data were collected for comparison purposes and an honest effort

was put into reconstruct the critical events in a chronological order for improved comparison.

Evidence-based Case Studies

A total of five case studies have been reconstructed. Each case study starts with the variation in the dependent variables and traces their explanations. The explanations are constructed using interviews as skeletal frameworks that are later padded with archival data collected also during the country visits. For example, interviewees in Vietnam frequently quoted the National Target Program to be responsible for explanation in access to safe drinking water in the rural areas. Hence, after the interviewees, additional archival research was done on the National Target Program for additional details. By doing so, it not only improved accuracy but also improved validity as these triangulating sources are available for verification by peer-reviewers.

The case studies in this section are raw reconstruction of what was explained and does not delve into discussion on which theoretical frameworks are more applicable. Any analytical work such as pattern identifications and theory confirmations based on the case studies is covered in the following chapters. Thus, the presented case studies below may seem to have less in common with other case studies other than their adherence to chronological order. This is not to be of concern as the research towards comparability in the subsequent sections.

Indonesia

Between 1990 and 2010, Indonesia's access to safe drinking water increased nationally by 15%. People's reliance on unimproved water sources dropped from 31% to 16% in the same period. Another way to put it is that during this period, water sector developments resulted in providing ⅓ of population relying on unimproved water sources with access to safer water. Majority of the reduction was in the form of moving away from the poorest option of unimproved sources, as surface water usage marginally dropped from 6% to 2% between 1990 and 2010. Overall, rural people relying on unimproved water sources dropped 11% between 1990 and 2010. In the urban sector, there was a marginal 3% drop from 10% to 7% between 1990 and 2010. On the other hand, access to piped water on premises increased nationally by 11% from 9% to 20%. The increase reflects the 6% increase in urban population gaining access to piped water on premise between the period and 6% increase among the rural population during the same period.

In searching for explanations behind Indonesia's longitudinal variation, both primary and secondary data were collected and examined in an identical fashion. First, sector experts were sought out and interviewed. These ranged from Government officials responsible for policy design and implementation to water sector experts from International Organizations responsible for both project funding and technical assistance. From their collective interviews and follow-up archival research, the following actors and developments were identified as critical factors behind the variation in Indonesia.

Indonesia's water supply system development is handled by the Ministry of Public Works (MoPW). The Ministry oversees its construction both in urban and rural areas. More specifically, there is a separate Water Supply System Development Department under the Division of Human Settlement within the Ministry. MoPW, however, is responsible for new construction and technical quality supervision but not the operation and maintenance following the newly built facility. For piped water supply systems, this is the responsibility of the local water enterprises (PDAMs).

The background of the water sector prior to the crisis can be split according to the Development Plan of the country. The Fifth Development Plan covers the years 1989 to 1993. The period is marked by long-term development agenda that is spread across all sectors, including water. Water production capacity improved with additional treatment plants. Production capacity was reported to have increased by 14,000 liters/sec during this period to a total 66,252 liters/sec by 1993 (Ministry of Public Works, 2010).[28]

The increase in treatment production capacity was catalyzed by bilateral and multilateral finance and overseen by the Ministry of Public Works. The water supply loans were not separated out as a separate loan but were combined with other urban

[28] There is a discrepancy between Government reported figures and International Observer figures. According to the Government records, 14,000 liters/sec was good to be used by 6 million people in the urban areas and 42 million people in the rural population. However, this does not confirm to International Observer survey figures because if this was the case then the coverage rate of 66,252 liters/sec can be converted to coverage for 227 million people; meaning that Indonesia would have had 100% coverage since its 1993 population is registered at 188 million. Even taking into account the large NRW that has been mentioned by the country sector specialists, the coverage estimations to production is incongruent. If a US average consumption amount of 100 gallons per day per person was applied, where 400 gallons per day per household is the basis, then Indonesia's production capacity working in full capacity every second of the day would service 15 million people or 8% of the 188 million people of 1993.

infrastructure developments. The integrated urban infrastructure development program, or more commonly known as P3KT in Indonesia, was successful during the 4th Development Plan in mobilizing international aid and thus the engagement framework was carried forward into the 5th Development Plan as the framework to engage with external financing entities.

P3KT was formulated following ADB assessment report that was critical of water sector development. The 1995 ADB water supply loan identifies the following problems:

> *Piped water supplies are often intermittent and require further treatment by the consumers to be safe for drinking. The shallow wells used by households without access to piped water often have poor quality water, are contaminated and provide only seasonal supplies* (Asian Development Bank, 1995, p. 2).

In response, the Indonesian Government formally adopted the Integrated Urban Infrastructure Development Program (P3KT). It was aimed to strengthen the local government and PDAM involvement in addressing the water sector challenges. More specifically, it included the following tasks:

i) *The preparation of integrated medium-term investment programs (PJMs) and feasibility studies;*
ii) *the enhancement of institutional and financial capabilities through preparation and implementation of local institutional development action*

plans (LIDAPs), local revenue improvement action plans (RIAPs), and corporate plans for PDAMs; and

iii) *the strengthening of decision-making through consultations between the central, provincial, and local government agencies* (Asian Development Bank, 1995, p. 3)

From interviews with Government officials, it was noted that the 1995 advice actually forced the bankruptcy of the PDAMs (personal communication, March 14-18, 2016). The loan pressed the PDAMs to face their poor-performance problems and develop workout plans. Yet, circumstances were further exacerbated by the lack of technical capacity at the local government level. That is, the local government was not equipped to take on such a task over a very short period of time. Thus, the disengagement of business as usual disrupted even the marginal developments occurring during the period with new investments. This is not the say these initiatives were not needed, as multiple interviewees also shared similar professional opinions of the problems of the period (personal communication, March 14-18, 2016). However, the forced recognition of the problems and the push to develop workout plans faced strong backwind due to the lack of local government capacity. The delay was compounded when faced with rapid regional autonomous efforts during the *Reformasi* period starting in 1998. The unpopular central government initiative has lost its teeth when Suharto stepped down and subsequent 1999 elections brought in a multiparty system with no clear majorities (Bunte & Ufen, 2009, p. 13).

Although production capacity was high during Suharto rule, it did not directly translate to water access. This is because the water has to be distributed via a network for access. In this service delivery process, many things can go wrong and stun the growth in coverage. One of the main bottlenecks would be the lack of technical and financial capacity of the staff in PDAMs. That is, when PDAMs are not staffed with those equipped without technical capacity, timely maintenance duties are not performed. If financial independence and its management capacity undermined, then the utility faces financial uncertainty by being unable to stay financially afloat and draw investments to expand coverage and deliver services. This was reported to have happened, as political appointees assumed technical managerial role. Also, tariffs adjustments were determined not by the utility based on its financial needs but was determined by the local government without subsidizing deficits caused by the below cost-recovery tariff rates.

Although PDAMs were created with commercial principles in mind, it did not occur in reality. Utilities were not ring-fenced but were treated as cash cows by mayors and governors to subsidize the local government budget. The porous nature of the PDAMs internal finances has been a noted problem by many interviewees. Some noted that this was exacerbated with decentralization that happens after the Suharto's fall from power, resulting in only 53% of PDAMs being graded as healthy, whereas 27% are critical and 20% are sick.[29] Furthermore, their mismanagement is also highlighted by

[29] These figures are direct quotes from an anonymous interview with a senior Government official.

their high Non-Revenue Water rates hovering around 33%, meaning that 33% of the total treated water is lost during the operation and do not generate any revenue.[30]

Administrative reforms to fold water into a broader urban development continued to take place during the 6th Development Plan. This resulted in the diversification through combination of offices under the Ministry of Public Works. The consequence was also that the most decision-making authority was elevated to the higher echelon official creating longer hierarchy in reporting.

The administrative efforts during the 6th Development Plan were undermined with the Asian Financial Crisis that hit Indonesia in 1997. The exchange rate was hit hard with the rapid devaluation of the Indonesian Rupiah jumping from 2.348 Rupiah/Dollar in 1997 to 14,850 Rupiah/Dollar in 1998 (International Monetary Fund, 2016). This automatically made it much more expensive to service foreign debt repayments on infrastructure projects. Adding to the injury, political instability was on the rise in Indonesia with change in power with Suharto stepping down with quick passing of the fiscal and administrative decentralization laws by the legislative body. Due to these expedient circumstances, water infrastructure budget formulation was delayed. That is, although the state was becoming better consolidated on water infrastructure development, the state was paralyzed on implementation due to the political uncertainty and rearrangements in law-making authority following Suharto's fall from power.

[30] For detailed analysis on Non-Revenue Water, Asian Development Publication by Frauendorfer and Liemberger (2010).

Electoral decentralization, or *Reformasi* as the Indonesian refer to the period following Suharto's end of authoritarian rule, had a catastrophic impact in the water sector. The most notable change is the shift of authority on public finance. Prior to the *Reformasi* period, MoPW controlled the capital investment budget. Elected Governors and Mayors who were policy-wise aligned with Suharto buttressed the leverage MoPW held over in the local government water supply system development. The hierarchical alignment continued to the PDAM representatives, who themselves were appointed by Governors and Majors. However, the usurpation of Suharto rule combined with rapid decentralization policies shifted the balance of power to the other extreme of locally elected leaders. The newly elected local leaders then pushed back on local policy directives emanating from the central government. For water, the local government only invested 10 trillion Rupiah (USD 760 million) over the period of 5 years; a marginal investment relative to the sector need that is estimated at 250 trillion Rupiah (USD 19 billion).[31] The protective attitude toward the fiscal decentralized budgetary process combined with already mismanaged PDAMs made it difficult to drive technical reforms that were emancipating from the central government; these reforms were aimed at improving local PDAM operations. Also, the local governments set the tariff rates. They were kept low below 3,000 Rupiah per m^3 or USD \$0.23 per m^3.

[31] These figures are from anonymous interview with a senior Government official. It was also mentioned that despite the sector estimates on need, the central government funding for water is only about 20% or 52 trillion Rupiah where 33.9 trillion Rupiah is allocated to Directorate General of Human Settlements and where 19 trillion Rupiah is allocated to water source development projects. Hence, investment needs are critical bottlenecks in Indonesia's water sector. As for the USD conversions, they are based on rough 2016 exchange rate. Thus, they only serve as a proxy conversion figures, as it does not take into account accurate conversion factors over different years.

Decentralization shifted the role of the central government from a direct implementing body to an enabling body (Ministry of Public Works, 2010). This was because Regents and Mayors dictated development plans in their jurisdictions, as they held the power of the purpose with fiscal decentralization. This created considerable delay in urban infrastructure development, as the local governments were just not equipped for project design and implementation. The local governments were still in the phase of building institutions and craving out jurisdictions, as seen in the case of new provinces being created in eastern Indonesia. The positive outcome from decentralization was the expansion in citizen participation and improved public oversight on implementation of Government projects.

In early 2000, USAID was called to perform an assessment on PDAM performances. This was because PDAM operations were not transparent making it difficult to develop programs to improve its performances. Baseline studies took place resulting with USAID publishing their assessment of the sample PDAMs (2005). From this report, it can be harnessed that the currency crisis was only one of many problems PDAMs were culturing. Other problems including low human technical capacity, conflicts in internal validity among reported data, and inability to acquire additional investment for expansion. The report pushed for a Baseline surveys to be created for all PDAMs. This function is assumed by Supporting Agency for the Development of the Drinking Water Supply System (BPPSPAM) in 2005.

The baselines studies unearthed performance problems but there were also other administrative complications among PDAMs that needed to be resolved following

decentralization. PDAM assets ownership were being split with administrative jurisdiction splits that were taking place as in the case of PDAM Cilegon and PDAM Serang Mandiri (Ministry of Public Works, 2010). This was problematic, as the split was also carried out along the lines of customers as well. With the split more in focus, the split PDAMs were required to be financially independent of each other. This meant that cross-subsidization in tariffs could not happen across PDAM districts along with a smaller customer base. Given water utility follows economies of scale where larger customer bases permit the spreading of initial capital assets costs, a smaller customer base meant that a higher tariff rate has to be charged amongst them to recoup costs.

Furthermore, the legacy of forcing the transparency of the financial and technical woes of the PDAMs closed the doors to the possibility of receiving commercial loans during time of financial dearth. That is, with the financial difficulties disclosed, PDAMs could not tap the alternative source of financing outside of public budget allocation. Lending to the PDAMs was recognized as a well-known risky business for the commercial banks. Hence, commercial banks did not lend to the water utilities, as they would expect greater and more secure returns on lending to other sector projects in better financial standing. Or if they do lend, the premium charged on the loans will make it prohibitive for the utilities to receive loans without further exposing themselves to cash flow risk. That is, without a corresponding increase in revenue and without the utility already generating profits, increase in principal and interest payments will threaten the financial viability of the utility. Correspondingly, interviewees mentioned that no alternative financing sources were available when PDAMs were bankrupted and influx of

public funds dried up (personal communication, March 15, 2016). In short, PDAMs were not properly funded following their forced recognition of their financial difficulties. The lack of funding into the utilities took their toll with time with asset depreciation and amortization. This situation has long-term consequences where by it raised the future investment costs required to put the utilities back in healthy operating conditions.

The circumstances persisted until the dust started to settle following the landscape altering 1999 post-Suharto elections. In 1999, Administrative Decentralization Law 22 and Fiscal Decentralization Law 25 were passed. In 2004, the Drinking Water Decentralization Law 32 that clarified and solidifying the responsibilities of the different agencies and tiers of Government (Asian Development Bank, 2012). According to the interviewees, it still was not sufficient in encouraging the flow of funds into the sector (personal communication, March 14, 2016). However, there was an improvement in monitoring and evaluation with the establishment of Water Utility Board (BPPSPAM). BPPSPAM was responsible for monitoring the performance of all the utilities in the country. Metrics were developed and with the data collected, the utilities were categorized. However, this still did not translate to an influx of funds, as the central government has few funds to allocate. Rather the effort was to put the utilities in good financial and technical standing to receive funding from the private sector. There were developments on this front with few utilities gaining access to commercial financing, especially with the help of interest payment subsidy program enacted by the President in 2009. However, interviewees did mention that those who were able to put together the application to access the interest payment subsidy and commercial lending were the ones

that actually did not need more help as these were the utilities that were already in good financial and technical standing (personal communication, March 14, 2016). That is, the low capacity utilities, which were those in dire need of additional help, were actually not being able to take advantage of the help that were presented. Thus, it was recognized that the problems still do persist in Indonesia drinking water sector till this day. This is evident in the more recent ADB update on the challenges facing the sector. The 2012 ADB report lists the sector challenges as below:

i) *Inadequate regulatory framework for water supply and sanitation*

ii) *Inadequate cross-sector policy coordination on the provision of improved facilities for water supply and sanitation; too many institutions and organizations are involved in the development of water supply and sanitation and more intensive coordination is required.*

iii) *Decline in the quality and quantity of drinking water in urban areas. Many households in urban areas still rely on non-piped drinking water sources of poor quality, and the demand for water exceeds the supply from these sources.*

iv) *Rapid growth of urban population has been greater than the development of improved water and sanitation infrastructure. Investments for connections of urban water supply have failed to keep pace with the growth in urban population.*

v) *Low community awareness on the importance of clean water use and sanitation practices remains.*

vi) *Limited provision of improved drinking water by PDAMs and by privately owned water supply companies, especially in urban areas.*

vii) *Limited capacity of subnational governments to ensure that improved drinking water and sanitation systems are in place or operating correctly.*

viii) *Inadequate investments in improved drinking water supply and sanitation systems, both for public and private sources, resulting from a dependency on the central government's budget allocation to support initiatives related to drinking water and sanitation facilities. The weak financial performance of PDAMs is the reason they are unable to obtain alternative funding* (Asian Development Bank, 2012, pp. 14-15).

On the rural side, it was the responsibility of the Ministry of Health to develop rural water supplies (Ministry of Public Works, 2010). However, to what extend this was dutifully fulfilled prior to 1993 is unclear. What is clear is that the Ministry of Health launched a pilot project titled, "Water Supply and Sanitation for Low-Income Communities (WSSLIC)" in 1993. It employed a Community Based Development (CBD) model where each village was tasked to form a Village Implementation Team or Village Water Committee. This group would responsible for formulating the Village Action Plan (VAP) that includes the type of water service to be delivered along with specifying details on finance, labor, and management commitments of all parties involved, including community, government, and contractors. The VAP was a requirement before any financial commitments and any technical shortcomings were filled with project staff assisted the villagers (Bhatnagar, Dewan,

Torres, & Kanungo, 2003). The original WSSLIC program ended in 1999 but received a new round of funding and was extended to beyond 2000. The two phases are distinguished as WSSLIC I and WSSLIC II. WSSLIC I was funded by the World Bank where USD$69.5 million with USD$45.1 million in the form of a loan to expand water coverage of 3.1 million people in 2,030 villages (World Bank, 2000).

The PAMSIMAS program took over the WSSLIC program in 2006. Combined funding from the World Bank, AUSAID, and the Indonesian Government funded the program. USD$275.10 million was dedicated to the program between 2006 and 2013. Although approved for implementation in 2006, PAMSIMAS executes its first project in 2008 due to delay in new coordination channels that needed to established by having the Ministry of Public Works leading the program. The move came about because water was seen as the professional realm of infrastructure development. Hence, Ministry of Public Works was seen as more suitable candidate to guarantee quality control. Ministry of Health was still involved as they were responsible for water quality and sanitation behavior change. Ministry of Home Affairs was responsible for community involvement. Despite the change in the leading ministry, it was not reflected largely at the community level as implementation was still left to the communities. This was also because WSSLIC consultants were being hired under the PAMSIMAS program.[32]

PAMSIMAS scales up what has been established as working formula in WSSLIC, which is Community Based Development. PAMISMAS covered 5 times the number of

[32] Interviewees mentioned that there was an initial pushback from the Ministry of Public Works on hiring the same consultants. However, after their own trial-and-error period, these consultants were deemed valuable as they retained valuable lessons. Hence, they were eventually hired by the Ministry of Public Works to carry-on the same work under PAMSIMAS.

villages than WSSLIC. However, engagement strategy in implementing PAMISMAS differs from WSSLIC due to the decentralization. Rather than selecting villages to participate under WSSLIC, the approach changed to including those villages that indicated desire to participate. According to an interviewee, this was double-edged sword in implementation. On the positive side, it meant that only those who are going to be cooperative are included. This is because once interest is received, the village is then asked to satisfy a list of requirements to be included for funding. On the negative side, this also meant that even though there is a need in the village, if awareness is low or if there are other competing priorities, it means that there will be low participation. Hence, the job description of the project officers was expanded to engage in communications to expand demand. When asked if there was an umbrella organization among the villagers participating in the program, the sector specialist mentioned that although a forum exists, interaction and sharing of information among themselves does not happen frequently.

During visits to the field and upon asking how people coped before Government programs, people replied by saying that people simply either bore holes or dug wells. The problem with these alternatives is that water quality is not stable. Hence, programs such as PAMSIMAS helps by digging deeper boreholes to minimize quality fluctuations. Once dug and setup typically with an elevated water tank, a Water Association is setup to manage the system. When profits are generated, it would be used to build the management offices. When asked whether Water Associations engage in public awareness campaigns, the reply was “no”. This is because these associations are already backlogged to extend connections. Hence, they felt there is no reason to advertise.



Figure 9: Illegal shallow borehole and jet pump working in place of a water utility
Source: Personal Picture taken in Indonesia.

Vietnam

Vietnam's access to safe drinking water increased by 28% between 1990 and 2010, which corresponds to people's reliance on unimproved water sources dropping from 37% to 9% in the same period. In other words, 4 out of 10 people were relying on water resources of questionable quality in 1990 and in twenty years time only 1 out of 10 people still remain to do so. In search of causes behind this improvement, both primary and secondary data were collected and examined in search for causes.

First, sector experts were sought out and interviewed. These ranged from Government officials responsible for policy design and implementation to experts in International Organizations responsible for project funding and technical assistance.

From their collective interviews, the following developments were noted as enabling factors in catalyzing Vietnam progress on expanding access to safe drinking water.

Upon posing the question on how they would explain the access to safe drinking water performance over time in the country, all the interviewees emphasized the need to separate urban sector developments from rural sector developments. This compartmentalized approach was crucial to understanding the various changes affecting the country's water sector. This was due to two key reasons. First, the institutions and processes employed to provide safe drinking water to the two broad categorizations of populations were inherently different. Second, different actors are involved in servicing water in the two broad categories due to the different residential patterns and water resource availability of the two different populations. The roles and responsibilities of the involved public agencies are defined by public law on organizations. Political and social organizations are involved as well. However, in the case of Vietnam, the social organizations are co-opted by the Government as different social organization such as the Farmer's Union, Women's Union, and Youth Intellectuals all fall under the Government endorsed Fatherland Front.[33]

Vietnam is a single party Government. However, it is multi-tier party where the central political party cohort is supported by regional branches and vice-versa. The Communist Party and the National Assembly differ in the latter's ability to enact laws

[33] This is one of the key reasons why network accountability aimed at harnessing independent social organizations supervision is of limited, if not inapplicable, concept to be applied in Vietnam, as no social organizations can freely form without approval from the Government. They also assume a minor role, where their impact is more on awareness building and not necessary on physical access to water.

and ratify treaties. That is, the Communist Party does not pass laws but offers broader guidelines in which specific laws would manifest from in the National Assembly. Yet, the Communist Party holds significant authority in the country, as its authority spans ubiquitously in the electoral system and expands further into the state apparatus as it holds clout in the appointment of heads of line ministries. This latter authority is crucial to understanding the developmental direction of the state since the line ministries develop and propose legal reforms commanding the operation of the state. That is, in Vietnam, the President and the Prime Minister along with the line ministries has the authority to promulgate binding regulations.

With the identification of multiple actors operating in Vietnam, the question is who is authorized to influence the policy-making and implementation process in Vietnam? The urban and rural distinction is relevant here, as urban water supply policies are led by the Ministry of Construction (MoC) and the rural water supply policies are led by the Ministry of Agriculture and Rural Development (MARD) in Vietnam. MoC was in charge of water construction prior to 2003. However, after that year with SOEs being setup, the latter took on the role of water service delivery and investment. SOEs are financially ring-fenced organizations dedicated to operate water utility and service under commercial principles. That is, they are expected to demonstrate cost recovery through imposing tariffs on water usage. The standards and performance indicators were for the SOEs were established over a 2 years after the passing of the SOE legislation.

Due to relative financial autonomy demonstrated by the SOEs, a in-country water sector specialist (personal communication, March 11, 2016) noted that MoCs assume a

minor role once capital assets are constructed; capital assets mainly include the water treatment facility and the bulk water transfer facilities. Once construction is complete, it is the responsibility of the SOEs to operate and maintain facilities, including expansion of its customer base to further improve its financial standing. The financial autonomy of SOEs enables them to directly request additional funding from the Ministry of Planning and Investment and access commercial loans. Thus, expanded access to safe drinking water in the urban areas has to be explained with SOEs in the center as the main implementing body and other regulatory and financing institutions influencing the commercial operation of the SOEs.

As for addressing technical capacity shortages in the SOEs during their early expansion, civil engineering faculties from technical universities were seconded to fill those gaps. Efforts to address arising technical shortages were gradual with early efforts involving donor fellowship to send engineers abroad for post-graduate work. The fellows then came back and occupied positions in universities and governments and trained the future cohort of engineers and technicians. In the early days, there were only 30 civil engineers in a graduating class at the tertiary level. However, after 2000, polytechnics alone were producing 50 to 100 graduates a year. Technical schools modeled after the French system also was established to prepare technicians. Universities and community colleges were producing more graduates and engineering became popular because employment prospects after graduation were bright.

Rural water supply system development in Vietnam falls under MARD. Unlike the decentralized approach of urban water supply system development, rural water supply

system development is centralized. That is, MARD retains the budget and decision-making authority in allocation of funds for rural water supply system development. This approach permits a deeper penetration of central government authority in the provinces, districts, and communes, as the local water supply system development is dependent on intergovernmental transfers. However, according to in-country water specialists and Government officials (personal communications, March 7-11, 2016), the majority of the rural population gained access to safe drinking water not through piped water supply systems but through alternative and lower cost options such as protected well and protected springs. These testimonials by the interviewees are further validated by USAID Demographic and Health Survey data.

Another aspect that is crucial to understanding the rapid coverage of water infrastructure in Vietnam is that all land belongs to the state. Thus, concerns over exercising eminent domain for public projects were not in contestation in the first place. This does not mean that the military was involved in land clearances for public projects. Land clearances were the responsibility of the provinces, which they willingly abided by since it meant they were receiving central government transfers for the construction of infrastructure. This in turn would make then competitive in attracting foreign investment.

Separating out the different type of water supply system development is due to two overarching factors. First, rural populations have greater access to better quality water sources. That is, water carrying less overall amounts of harmful solvents and suspended solids. Hence, simple treatment is sufficient to improve the quality of water to potable standards. Second, rural populations are typically dispersed. Hence, the low-

density separated population clusters make large investments in treatment plants and distribution cost-wise prohibitive. That is, the necessary human and capital resources to construct and operate piped water supply system are not available. This includes the willingness and ability of the users to pay fees to cover long-term operation and maintenance costs to prevent the system from dilapidating in the future.

The question then is how was Vietnam able to expand safe drinking water coverage in Vietnam by 33% between 1990 and 2010. When posed with this question, the interviewees (personal communications, February 20-27, 2013 and March 7-11, 2016) all attributed the critical driver to be the National Target Program (NTP) spanning over 15 years from 2000. The program was implemented in three sequences where each phase accounted for 5 years. Hence, NTP I, NTP II, and NTP III and their associated institutions involved in implementation were attributed to the improvement. The Prime Minister created the NTP program in 1998 (Prime Minister Decision 237) and the period between 1998 and 2000 was dedicated to establishing and improving the composition and roles of the steering committee. The National Target Program was not only created for improving rural water supply, as other national targets were looped under the broad initiative. However, the notable aspect is the prioritization of the National Target Program for Clean Water and Environmental Hygiene in the Rural Areas, which came second in the Prime Minister's Decision (Prime Minister Decision 71), being only behind the first priority, which was the NTP on Poverty Reduction and Employment.

Prior to the 1998, the interviewees (personal communication, March 7-11, 2016) noted that UNICEF was the key driver in improving rural water supply sector. UNICEF

helped build over one hundred thousand wells with hand-pumps over a period of ten years (Vietnam Ministry of Construction and Ministry of Agriculture and Rural Development, 2000). According to a Water Specialist in the International Organization (personal communication, March 7, 2016), individual efforts account for additional two to three times the amount of water supply systems built during the ten year UNICEF program.

Scaling up the small-scale UNICEF efforts to a national program came about with the increase in developmental aid and broadening of international engagement. In 1997, the Danish International Development Assistance (DANIDA) supported the development of the *National Rural Clean Water Supply and Sanitation Strategy up to Year 2020*. The joint consultative report and roadmap was endorsed as national policy by the approval of the Prime Minister and the two key technical line ministries (Prime Minister Decision 104/2000/QD-TTg).

When asked why the national program was developed then and not before or not later, many could not comment (personal communication, March 7-11, 2016). However, those who were able to comment noted that early 1990s were a period of limited foreign aid influx in the country. Although economic reform *Do Moi*, which literally means "renovation" but refers more practically to permitting of private enterprise activities and the growth of the market economy, started in 1986, engagements with external funding agencies were few. This is due to the foreign aid embargo that only was lifted in 1993 (World Bank, 2004, p. ix). The World Bank resumed its lending operations in Vietnam in 1993. Prior to 1993, the last loan was in 1978 for the Dau Teng Irrigation Project

(World Bank, 1989). Similarly, the Asian Development Bank did not lend to Vietnam since 1979 (Wihtol, 1988, p. 55). It only resumed lending operations in 1993 (Asian Development Bank, 2015). The reintroduction of foreign aid was followed by Vietnam Government's internal adjustment complementing its absorption. The Ministry of Finance's Circular 16/TC-TCDN of 1997 was issued to guide the financial management mechanism of investment projects for systems of water supply and sanitation of cities and town employing ADB loans (Vietnam Ministry of Finance, 1997). Hence, these internal public administrative developments needed to take place prior to scaling up efforts. Particularly because the central and local governments lacked resources to implement a scaled-up national rural water supply program. That is, the timing of the national rural water supply program being on the cusp of 2000 is speculated to be the result of establishing the necessary prior institutional arrangements.

As for the specific timing, the National Target Program was launched following the *National Rural Clean Water Supply and Sanitation Strategy up to Year 2020*. The National Target Program I was launched in 1998 by the Prime Minister (Prime Minister Decision 237/1998/QD-TTg) whereby specific targets were proposed. In the Decision, the target was set at 80% of the rural population having access to clean water by 2005. Funding would be comprised of a capital budget of 3.6 trillion Dong (USD $271 million)[34] and other sources of 12.8 trillion Dong (USD 965 million).

Through NTP I, 23 million more rural people gained access to clean drinking water. It increased the portion of the rural population with access to clean drinking water

[34] Based on 1968 exchange rate of 13,268 Dong/USD published by the World Bank.

to 62%. NTP I's impact is assessed successful in emphasizing the central government's role in rural water supply development and access. However, NTP I was remembered as an initial program. That is, as NTP I was being rolled out, it was realized there needed to be significant modifications in order to improve the effectiveness of the program.

At the end of the NTP I, a Joint Assessment Review was conducted to identify and propose improvements to be incorporated in NTP II. Institutional wise, National Center for Rural Water Supply and Sanitation (NCERWASS) and the Rural Water Supply and Sanitation Partnership (RWSSP) was established under MARD to further buttress the National Target Program's Standing Office NCERWASS was setup a project implementation monitoring and evaluation unit. It works with Provincial Centers for Rural Water Supply and Sanitation (PCERWASSs) in issuing project guidelines and standardizes project data collection. RWSSP serves as an information agency whereby it pools provincial project needs and maintains forums for partnership mobilization.

In parallel with new institutions, new laws were passed during NTP II to further facilitate project implementation by empowering state authorities. A series of circulars and decisions were passed. For guidance, coordination, monitoring and evaluation of NTP, the following legal documents were issued:

- *Joint Circular No.93/2007/TTLT/BNN-BYT-BGDDT to define coordination mechanism among MARD, MoH, and MoET*
- *MARD Decision No.51/2008/QD-BNN in defining indicators for monitoring and evaluation*

- *MARD Decision No.1797/QD-BNN of the Manual on Construction Procurement of RWSS schemes*
- *MARD Decision No.734/2009/QD-BNN-TL on the Master Plan on Information, Education, and Communication (IEC) efforts for the rural water supply and sanitation*
- *Government Decision No.131/2009/QD-TTg on enabling mechanisms/policies for increased investment, management and utilization of rural water supply facilities*
- *MARD Decision No.2151/QD-BNN-TCTL on the approval of "Domestic water quality management project 2010-2020"* (Vietnam, 2012, p. 5).

For financial management, the following legal documents were issued:

- *Joint Circular No.80/2007/TTLT-BTC-BNN and No.48/2008/TTLT-BTC-BNN to amend Circular No.80 of MARD and MoF on the management and use of State budget for NTP 2006-2010.*
- *Joint Circular No.95/2009/TTLT-BTC-BXD-BNN of MARD, MoF, and MoC on principles, definition methods, and jurisdiction for setting up water tariffs in urban, industrial, and rural areas*
- *MoF Circular No.100/2009/TT-BTC on the issuance of tariff framework for domestic water consumption* (Vietnam, 2012, p. 5)

For engineering and technology standards, the following legal document was issued:

- *MoH Circular No.04/2009/TT-BYT on National Technical Norm for Drinking Water Quality* (Vietnam, 2012, p. 6)

Although legal frameworks were redressed, it was noted that it took time to disseminate their implications in the provincial levels. This was enabled by the directive to further synergize the efforts of MARD, Ministry of Health (MoH), and Ministry of Education and Training (MoET). MoH and MoET has complementary roles in clean water and environmental hygiene as MoH was responsible for health awareness programs through the village health workers and the MoET was responsible for educating and inculcating hygienic behaviors among students.

Information, Education, and Communication (IEC) efforts were bolstered in NTP II. IEC became more coordinated with the provinces actively engaged in Water Week awareness activities. The coordination efforts involved the Women's Union, Youth Intellectuals, and Farmers Union members in the District and Commune levels. The interviewees shared that as a result of those activities, awareness increased among the population and encouraged shying away from consuming water from non-improved water sources (personal communications, March 7-11, 2016).

When asked whether there were any push back on reforms proposed under NTP II, interviewees mentioned that any push back was annulled by the donors' collective voice and position that if the reforms are not incorporated in the continuing program then donors find it difficult to pledge further support (personal communications, March 7-11, 2016). This leverage was effective as the Government sought to involve the international

community in seeking both technical assistance and financial support. As a result, changes further propelled efforts in expanding access to rural areas by revising monitoring indicators on progress.

NTP III that followed NTP II continued the central Government intervention as all phases of NTPs had a signature trait of where the central government held the budget, although MARD held onto the majority of the program funds. When asked whether this was catalytic, the interviewees noted that it helped as it meant less people to meet in order to get clearance and to get projects implemented (personal communications, March 7-11, 2016). That is, people knew exactly whom they needed to speak to with regards to rural water supply system development projects. This aspect economized expensing efforts to get projects up and running for the international partners. For MFIs, this served as a catalyst since the loan approval process requires fulfilling various internal administrative procedures within MFIs themselves as well. Therefore, reducing the number of people to contact to get responses and approval enabled them to process loans in a timely process as delay may end up in futile efforts due to internal staff rotations.[35] Hence, the prevention in delay helped economize and materialize engagement with client country government officials.[36]

[35] Internal staff rotations refer the to process where the staff's responsibilities shifts due to changing positions within the organizations or shift in ordering of tasks due to altered prioritizations by management.

[36] "Materialize" refers to actually getting the project being approved for a loan by the MFIs. It is noted that engagements with government officials do not necessary lead to loan approval by the MFIs. There are multiple reasons behind this, one being delay and unresponsiveness due to the involvement of multiple actors.

Multiple institutional developments to place between 1990 and 2010 in Vietnam to aid in the timely implementation of clean water supply policy prioritization. The Resolutions adopted by the VIII and XI's Party Congress (Vietnam Ministry of Agriculture and Rural Development, 2006) and the Comprehensive Poverty Reduction and Growth Strategy (Vietnam Prime Minister's Office, 2003) reformed the administrative institutions to better carry out policy implementation necessary for expanding safe drinking water. The autonomous urban utilities incorporated as SOEs could request financial assistance directly to the MPI. MARD was designated as the lead coordinating and implementing agency for top-down inter-governmental transfers for the rural water supply system developments. Although improvement has been noted, the experts shared that the overall figures may be under-representative of the actual improvements. This is because cities at the special, 1, 2, and 3 levels achieved over 90% coverage in the urban sector. That is, the relative lower figures are results of averaging the improvements in the areas brought under the urban sector (personal communication, March 7-11, 2016). On another note, quality-wise, it may draw a better picture, as not all water pouring out the improved water supply systems meet national water quality standards issued by the MoH in 2002 (Vietnam Ministry of Health, 2002).

Through multiple interviews with policy makers, a consensus emerged on the critical drivers behind the longitudinal variation on access to safe drinking water. Engaging multiple experts involved in the policy making process and identifying the key causes employing the underlying logic of the Delphi method whereby on issues dealing with complex and multiple interaction effects, seeking expert guidance and analytical

understanding help eliminate unlikely causes. To improve robustness of such consultations, the findings were further triangulated to eliminate alternative explanations. Hence, as a result of the process, the institutional developments that were relevant to longitudinal variation in access to safe drinking water has been identified and described above.

Malaysia

By 1990, 90% of Malaysian citizens have access to improved water sources. This figure improved to 98% coverage by 2015. Given the relative high starting point of Malaysia's water coverage at 1990, it begs the question of how Malaysia, which is just across the broader from Indonesia, was able to be at 90% national coverage by 1990 while Indonesia was at 69% national coverage by 1990 (WHO and UNICEF, 2015). In search of explanations, a month was spent in Malaysia to interview policy makers and conduct archival research in October 2014.

This collected evidence is presented in chronological order. This is because subsequent institutional reforms are best understood by contextualizing it in reference to prior institutional arrangements and policies. Presenting the t_{-1} condition is more relevant in the case of Malaysia because subsequent reforms are to improve implementation by refining the various components necessary to accelerate it.

Malaysia's water coverage starts very early predating to the colonial times. During British rule, the Medical Department reports on the condition of water supply coverage. All large towns under their administration had water supply systems build with

basic modern technology of sedimentation, slow sand filtration, and chlorination (MacGregor, 1948, p. 29). However, these water supply systems did not extend into the rural areas. Shallow wells were used in the rural areas with those near rivers left to use river water to meet their drinking water needs. From the records, there was a clear urban-rural distinction, rightfully so, due to the different cost requirements in building the two systems.

The investment in water supply systems during the colonial period was urban-centric because it was the resident areas of the colonial administrators along with where their attended their affairs. Water supplies were also developed in other densely populated areas such as plantations and mines to prevent epidemic outbreaks since it translates to loss in labor productivity (Struthers, 1951). Accordingly, complimentary institutions were developed such as the Sanitary Boards to oversee sanitary practices by the labor force were being adhered to.[37] Water supply was tied to health at the time, as disease outbreaks were frequent with dire consequences both in lives and in plantation and mining outputs.

Despite the frequent outbreaks, an interviewee noted that Malaysia's situation was better than other British colonial areas. Malaysia was a resource rich country and hence valuable for the British Empire. Water supply systems in urban areas were well developed along with hospitals. According to the interviewee who was responsible for health policy in the country later after independence, it was noted that water

[37] This does not mean that people lived in pristine hygienic standards, as disease outbreaks were still very common at the time. But rather it refers to the establishment of institutions whereby guidelines and laws were developed by these institutions.

developments could be traced along with the change of direction in health policy in the country before and after independence. Before independence, the focus of national health policy was urban and restorative. After independence, the focus shifted to rural and preventative. As for water supply development, this is not exactly accurate, as the national water supply system development budget still favored the urban areas. However, it still does hold a ring of truth since the national budget did dedicate a significant budget in rural water supply development, where at times it occupied ⅓ of the entire national budget dedicated to water supply development. Given that the rural water supply development budget was entirely dedicated to simpler water supply system developments unlike the urban water supply development budget where the latter often involved water resource development projects, this is a large devotion to purely expanding coverage in access to water. It explains why rural water coverage expanded early in Malaysia compared to its neighboring country Indonesia.

Following Malaysia's independence from the British, investments in water supply were prioritized early. Not only was there a dedicated budget to its development but there also were already staff commitments to water supply system projects. Already by 1950, 60 water supply schemes were prepared to be implemented when funds become available (Federation of Malaya, 1950). Due to the limited funds to satisfy all their water needs, priority was set early by dedicated funds to areas in high risk of an epidemic outbreak. These were urban areas with rapid population growth and areas of urban concentration with severe shortages (Economic Secretariat, 1956). Resources for water supply development were not allocated to areas where wells could suffice. State Water

Boards are established early to devote attention to formulating policies to plan self-financing ability of water supply systems in the future.

Due to the health implications, water investments ranked high in the immediate after-math of Malaysia's independence. Health and education policy was ranked as priority number 2 in national development in 1956 and as a part of the health policy urgent water supply schemes would be attended to (Economic Secretariat, 1956). The prioritization is directly translated into increased investment where water supply investments in the national budget is increased nearly two-fold in the 2nd Malaya Development Plan covering the years from 1960 to 1965 (Federation of Malaya, 1961). It is explicitly mentioned, "the provision of safe source of drinking water is a necessary support and supplement to the extension of medical services to the rural areas (ibid, 1961, p.43)". The emphasis for expanding water coverage for health reasons is carried over to the other two provinces of Sabah and Sarawak that join the Malaya federation to create Malaysia in 1963. That is, budget allocation for water supply development is baked into development policies for the two provinces as well. By 1965, it was made clear that out of $150 million dedicated for water supply development ⅔ will be spent in the urban areas whereas ⅓ would be dedicated for the rural areas (Federation of Malaysia, 1965).

The devotion to urban areas was due to anticipatory planning. Anticipated industrial development and urbanization was expected to put pressure on water resources in urban areas and hence, investments needed to take place accordingly. All the investments were publicly financed, as water supply systems did not demonstrate cost-recovery. It was also not in a position to levy high tariffs, as people were poor. The

Government planned this forward where heavy subsidization of water supply systems were recognized to be inevitable. The plan was when incomes rise, the utilities would be able to charge more but not before. This also meant that there was a heavy burden on public finances to meet the entire water infrastructure needs. In this regards, the necessary to obtain external assistance was highlighted. In order to secure and obtain external funds, the Government mobilized and dedicated their staff for feasibility studies to be eligible for review. Four schemes were pushed in preparation of reviews; they are Penang State water supply scheme, Kuala Lumpur new water supply scheme, Sungei Muar water supply scheme, and Sandakan water supply scheme (Federation of Malaysia, 1965).

To execute the implementation of national policy, institutional design was tackled on early. By 1961, National Development Planning Committee along with its secretariat the Economic Planning Unit was established in the Prime Minister's office to oversee development plan implementation. This was a dedicated unit to ensure that the policy improving feedback loop is working. It was mandated to "review the causes of delays and difficulties in the implementation of national development plans and propose specific solution (Federation of Malaysia, 1965, p. 90)." It was headed by the Head of the Civil Service and included among others the Department of Statistics.[38] The inclusion of the

[38] It included Bank Negara Malaysia Governor, Treasury representative, Ministry of Commerce and Industry representative, Ministry of National and Rural Development representative, Economic Planning Unit representative, and the Department of Statistics. The others were not highlighted since they are expected members from the Ministerial level. The Department of Statistics is an anomaly, as it is a department-level and not a ministerial-level.

two positions is noteworthy, as it is connected with later developments as well as it highlights two key implementation obstacles: manpower and information.

Capacity deficiency is recognized early as a bottleneck. Capacity is more literally applied in Malaysia's case where it refers to technically able planning staff. In order improve capacity of planning staff, external actors such as UN, World Bank, and foreign foundations were tapped for training. This was in addition to the sending their own staff for overseas' training. Lack of technical expertise hindered both formulation and implementation not only at the Economic Planning Unit but also at the Ministerial level. Hence, capacity-building efforts was pushed onto the Ministries as well. This was supposed to be executed but setting up a dedicated planning and research unit.

Capacity deficiency was not only recognized in the staff but also in information. Basic economic and financial statistics were not available and its collection was vital to sound policy formulation and implementation. As a means to collecting information, the National Operations Room was setup in the Deputy Prime Minister's Office. It was a room that was dedicated to displaying progress on government projects by state and district. All forms of information were collected, "Maps, charts, diagrams, films and tape recordings supplement the verbal and statistical reports (Federation of Malaysia, 1965, p. 91)." The idea originated from military operations overseen by the Deputy Prime Minister during the Emergency of 1948-60, which the Government was involved in quelling Communist movements in the country.

The National Operations Room occupies a critical story in Malaysia's development because it centralizes the reporting lines among the various ministries.

Each ministry was responsible for updating and reporting on their progress within the National Operations Room. Troubleshooting was performed based on the reported information through regular meetings. Furthermore, parallel Operation Rooms were setup at the state and district levels. The Deputy Prime Minister visited these rooms to hear progress during his inspection trips. From this platform, he heard the concerns and problems facing implementation of government projects along with representatives from other ministries.

In addition to strengthening oversight through centralized reporting, the Government took on administrative reforms to improve communication. Communicating the significance and priorities of the central governments to the state and district level was upmost importance. The institutional arrangement to achieve this was to supplement clear-cut directives and planning guidelines with secondments of federal officers to the states. This was to help align the central-local planning and implementation procedures as well as ensuring effective implementation by communicating the necessary resolving actions back to the central government.

The secondments also served another function at the state level. They helped fill the capacity gap at the state level in preparing foreign grant and loan financing projects. The central government had greater experience on these matters and thus was able to assist the state government in its preparation. This was aided further by implementing standardized plans, which also served to prevent delay and save costs. Cost savings was sought also on another dimensions whereby the use of locally manufactured material and equipment were encouraged.

By 1966, information on water supply development was being regularly collected. As a result, few adjustments were made. First, small water supply schemes are financed entirely through domestic funds. This is significant point since it means that the government is willing to take on delay for larger systems if foreign assistance is likely while it does not wait take this stance for smaller systems. This is important as it means that the Government is deliberately prioritizing by burdening the rural water supply development onto itself. If left to external financing, rural population coverage would have been slow since financing is expected to be much more difficult due to generally poor population, smaller customer base, and smaller consumption amount. Thus, this combination makes it a risky investment vis-à-vis to the urban sector where the latter has higher incomes, large and variegated customer base permitting cross-subsidization, and large consumption amount, especially when industrial customers are serviced as well.

The dedicated support for smaller water supply systems includes schemes covering the Federal Land Development Authority estate projects. These are projects whereby the Government purchases and clears the jungle to build plantations. The plantation lots are loaned to the rural poor through a lottery under a Government program run by the Authority. Under the program, not only is the lot provided but houses are provided as well. These houses are equipped with water services (Bahrin & Thong, 1988).[39]

[39] The origins of the resettlement idea is rooted in the Government relocation programs during the 1948 Emergency where hundred of thousands of squatters in the jungles were moved to New Villages equipped with roads, water supply, and electricity (National Archives of Malaysia, 1974). They were moved because they posed a threat to the Government, as anti-Government Communist

With the growing number of the water supply schemes being continuously built in the country by 1970 with help from IBRD and ADB, management reforms take place. Water supply accounts are separated out from the Public Works Departments in each of the provinces to the separately established Water Supply Division to be ring-fenced with separate financial and accounting systems. This is relevant since it curbs the ill practice of meshing water supply revenues with local government revenues and reducing potential cash-flow crisis in covering necessary operation and maintenance expenses.

Improvements in rural water supply schemes are also seen by 1970. The Medical and Public Health Department collaboration with WHO/UNICEF resulted in the development and provision of low-cost safe piped water schemes. This collaboration is important as WHO/UNICEF collaboration feeds over to the environmental sanitation initiative the country takes on early and then scales up. That is, although help on water supplies is relatively marginal compared to the sanitation efforts, WHO/UNICEF's impact on sanitation improvements in the country is indisputable (Ryu, 2016). This is also relevant to the Malaysia's water story because sanitation engineers are later responsible for building water supply systems in the rural areas. The construction of water supply systems is used as an incentive to get the rural population to install latrines per village level. Furthermore, the sanitation engineers are housed in the rural health care centers in their continued operations to construct water supply systems in the rural areas.

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rebel forces were recruiting sympathizers from these rural poor along with relying on them for supplies.

By the end of 1970, which coincides with the end of the First Malaysia Plan, the direction for water infrastructure development is set. Urban water infrastructure leverages foreign assistance. Rural water infrastructure is executed through domestic funds in bifurcated manner. For the non-mobile rural population, Ministry of Health takes charge of water supply schemes are built by the Ministry of Health under their environmental sanitation program. For the mobile rural population, water coverage is extended as a part of the Federal Land Development Authority Program. The institutional responsibilities are baked in and continue throughout the remaining Development Plans.

Table 2: Institutional Responsibilities for Water Supply in Malaysia

	Implementation	Operation
Urban Supplies	State JKR[a]	State JKR
Rural Supplies through extension of Urban Systems	State JKR[a]	State JKR
Rural Supplies in isolated settlements	MOH	Village Council
FELDA Schemes	Federal JKR	State JKR
Regional Development Authority Schemes	Federal JKR	State JKR

[a] Under guidance of Federal JKR

Source: Asian Development Bank. (1982). *Malaysia: Profile of the Water Supply and Sanitation Sector.* Manila, Philippines: Asian Development Bank, p. 2.

As Malaysia enters its Second Malaysia Development Plan starting 1971, one of key administrative bottlenecks was its shortage of technical and managerial capacity and capability. This came natural with the growing scope and scale of Government. The concern that it would pose as an obstacle to continuous growth was raised and was to be addressed earlier than later. On this front, a couple of actionable items were taken on.

First, a Standards and Costs Sub-Committee within NDPC developed guidelines for project designs and standards. Second, National Committee for Development Administration with Development Administration Unit as it secretariat was granted with the responsibility of delivering advice and guidelines for administrative improvements. Third, Training and Career Development Division was established within the Public Services Department. Public service had to be made more attractive for those with desirable skills to join public service. Recruitment also had to be streamlined for the timely recruit in vacant areas to prevent delay on project implementation. Fourth, National Institute for Development Administration is setup to buttress the Training and Career Development Division.

During the 2nd Malaysia Development Plan, the Statistical Department also partnered with UNDP for training and to work towards automation of statistical data collection. This was deemed necessary following the Population Census that was taken place in 1970. With improved survey capacity, data for policy formulation, implementation, and evaluation improves as well. In addition to improving statistical capacity, budgetary capacity is strengthened with the introduction of programming and performance budgeting. Once again, manpower is an identified bottleneck. More accountants were recruited by the Government to fill this shortage in capacity. This development strengthens the NDPC meetings that convene once a month in the National Operations Room.

Administrative reforms continued to take place during the 2nd Malaysia Development Plan with the newly created National Action Council (NAC) that is setup in

1971. This is a new organization that is setup for the specific purpose of ensuring Government apparatus' adherence to implementing the New Economic Policy. Completing the NAC is the Implementation, Coordination and Development Administration Unit (ICDAU) that absorbs the DAU. ICDAU's role is to identify implementation roadblock and making sure remedial actions are taken to prevent further delay. ICDAU works also with the new authorities that are established by the federal government to facilitate coordination. These are Jengka Authority, Pahang Tenggara Authority, Johore Tenggara Authority, and Trengganu Tengah Authority (Federation of Malaysia, 1973). Staffs from both Federal and State Governments work together in these authorities.

With continuing scope and scale of Government, manpower is in constant shortage; a shortage that is accentuated with loss of manpower to the private sector. In highly technical areas, foreign specialists are contracted. The foreign technical staffs were deployed on for project design, supervision, and implementation. This addresses shortcomings in capacity while also preventing delay. Also, reorganization is done where administrative staffs are rotated into technical departments so that technical staffs are freed from administrative work. In addition, tendering of projects is spread out more evenly to prevent bunching that would lead to delay.

Despite various efforts to strength and optimize use of limited technical capacity, the thinning out of capacity was inevitable. This is because the Government was expanding rapidly while at the same time more complicated socio-economic development programs were drawing and tying down experienced personnel. 1970s was a fertile time

for various regional studies following the Population and Housing Census of 1970. Long-term urban and land use policies studies take place during this decade.

Another key development that takes place in the early 1970s is that the Federal Government provides equipment to accelerate rural water supply development in the provinces (Federation of Malaysia, 1976). This policy is in alignment with Government priority to improve the health of the rural poor by targeted provision of social amenities. In 1978, the Federal Government decided to entirely subsidize the capital costs for the rural water supply program in revenue deficit states of Kedah, Kelantan, Melaka, Perlis, and Trengganu while subsidizing $\frac{2}{3}$ in other states (Federation of Malaysia, 1979). Not only was equipment provided but also an expanded budget was allocated for the development of rural water supplies. This was complemented by the continued secondment of experienced Federal planning staff to the provinces. Also, to further improve the alignment between the Federal Government and the State Government, District Officers are granted greater authority in resolving delays in implementation to Federal Government projects. Their strengthened role stems from their ability to bring voice problems within the Prime Minister backed Operations Rooms to expedite remedial actions. That is, on issues they report do not get resolved at the District and State level, it is reported up to the National level to be informed to the Prime Minister. This is made possible by the regular reviews of progress and problems by the Prime Minister along with the solidifying of the policy and program feedback loop established through the Operation Rooms.

The Third Malaysia Plan was a period of continuous growth for the Government. Public enterprises were created during this time to serve in various sectors. With the growth of public enterprises, the need to monitor financial management was recognized. This led to establishing financial and managerial audits within the government. The National Institute of Public Administration was tasked to assist in this role by helping design management information capabilities within the public corporations. The relevance of this to water is that sound financial standing is essential during the operations and maintenance phase of water infrastructure and the establishment of financial management audits established both the culture and procedure of ensuring this is taking place.

During the 1970s, an important institutional change occurs to accelerate construction of rural water supply. The Ministry of Health gets a dedicated public works unit, the Environmental Health and Engineering Unit. It was setup under their National Environmental Sanitation program (Ministry of Health, 1974). Prior to this unit, engineers from the Ministry of Public Works were seconded to the Ministry of Health but had to report back the project request to the Ministry of Public Works. That is, their working arrangement was where they identify the public works needs of the Ministry of Health but still had to get approval from the Ministry of Public Works since there was no dedicated budget allocated to the Ministry of Health. All rural water supply scheme development funds were allocated to the Ministry of Public Works.

By setting up the Environmental Health and Engineering Unit and by having a dedicated budget, water supply development was accelerated. When asked of its impact

during an interview with a past official having worked in this unit, it was mentioned that this was a game changer as not only it expedited approval in construction of water supply systems, it also enabled capacity building within the Ministry of Health. Capacity building in the sense that they were able to hire and train dedicated staff. Prior to this, the secondment staff would be on rotation and thus, newly seconded staff had to be constantly trained. A dedicated unit and dedicated staff prevented this. Also, by having a dedicated budget, it allowed them to build capacity to execute project faster since they did not have to wait for the Ministry of Public Works to lend them staff and equipment, which was constantly delayed since these resources were allocated according to priority in the Ministry of Public Works. This meant that allocation of these resources was prioritized to meet the larger urban projects. This resulted in delay in progress on rural water supply development.

While rural water supply schemes for the non-migratory rural population received a boost by a dedicated public works unit situated in the broader Environmental Sanitation program, the migratory water supply development received a boost with the Government encouraging the advance purchase of land for Federal project. Land was purchased for resettlement policies as a means to alleviate rural poverty. The Ministry of Lands and Regional Development worked with provinces with denser populations to encourage migration from resource-poor areas to land-rich areas. Given land was a crucial element to this program, securing land for Federal projects delayed progress on projects and permitting Governments to purchase and hold onto land removes this delay. Furthermore, during the 1970s, the developments projects at the poor provinces of Kedah, Kelantan,

and Perlis received a boost with a special technical assistance with UNDP and World Bank (Federation of Malaysia, 1979). Melaka and Trengganu received the same type of assistance from Australia and New Zealand. In terms of project preparation, given manpower shortages was recognized as a key bottleneck, both operating expenses and manpower resources were both reviewed for development expenditures.

As a result of the various efforts by the Government, national water coverage rate at 59.4% by 1980 (Federation of Malaysia, 1981). This is a 20% jump when compared to the 40% coverage rate in 1960 (Federation of Malaya, 1961). In the search for explanations, it is undeniable that capital investments behind physical infrastructure construction and administrative reforms to remove delay were critical. However, this only explains what happened but does not get into why it happened in Malaysia, as it did. To better understand the why, it is necessary to understand the poverty eradication orientation of the Government. Not only was poverty eradication was crucial component of the New Economic Policy that set the direction of the Economic Development Plans but how poverty is defined. Below excerpt helps defines the wider conceptualization of poverty applied in Malaysia:

> *Judgments on poverty made solely on the basis of household income also do not accurately reflect the living standard or welfare of the country because it does not take into account the various public services that have been provided by the Government. ... Schools, clinics, roads, bridges, water and electricity provided have widened the opportunities of the lower income groups, particularly in the*

rural areas, for participating in the economic life of the nation and in uplifting their standard of living. The values and benefits of these services, however, have not been quantified in terms of income of the household (Federation of Malaysia, 1983, p. 76).

This orientation on provision of Government services to alleviate the poverty conditions of the mass population was an endearing ideal preached and practiced by the second Prime Minister Razak (Razak Bin Hussein, 1961, 1963). That is, this perspective is institutioned in Malaysia's bureaucracy early on by the Deputy Prime Minister who later becomes the 2nd Prime Minister. The institutional imprint continues onwards with his successors, particularly through the longest reigning Prime Minister Mahathir Mohamad who serves 22 years in office who rose to power due with help from Prime Minister Razak (Mohamad, 2011). It is no coincidence that the above excerpt of poverty is taken from the Mid-Review Report of the Fourth Malaysia Plan published in 1983, which is two years after Prime Minister Mahathir assumed office. As a result, 4% of the national budget was being dedicated to water supply (Federation of Malaysia, 1983). A figure that excludes water project melted into the federal land develoment and regional development projects.

1980s was also a time when water infrastructure started to benefit from the growing complementary institutional developments. In the urban areas, the expandion in supply of low-cost houses were prioritized. This was achieved by providing low-interest loans of 4% provincial and other Government agencies, specifically for the development of low-cost

houses. Furthermore, a trust fund was allotted to each province for land acquisition, site preparation, and infrstructure development (Federation of Malaysia, 1983). In addition, commercial banks and finance companies were directed to reserve 10% and 20% of their respective loan portfolios for the housing market. By pushing, domestic financial institutions to expand their loan portfolio in the housing sector, this lead to a growth in homeownership, which in turn expanded water access coverage with corresponding water infrastructure development.

The effort on housing improvements also occurred in the rural sector. The Village Rehabilitation Program was launched to provide material assistance of up to $1,000 per house was provided. The program was built on cooperative self-help whereby the villagers came together for village improvement projects. This catalyzed infrastructure coverage, including water, in the rural areas. This program also benefitted from the anchoring of the gotong royong on the expanded outreach and coverage of complementary central government facilities such as the rural health care centers.

Rural health care coverage expanded significantly with continuous investment in health care facilities. These facilities are relevant, as the health care staff are responsible for initating behavioral change in the rural area to promote in incalcate hygienic and sanitary habits. That is, awareness and demand for water facilities started with them and enabled by the engineers; the latter being responsible for overseeing the water supply construction when sanitary targets are met by the villagers. The rural outreach broadened its reach by having a dedicated program to include the aboriginies. Modern facilities such as housing, water, electricity, clinics, and schools were provided (Federation of Malaysia, 1983).

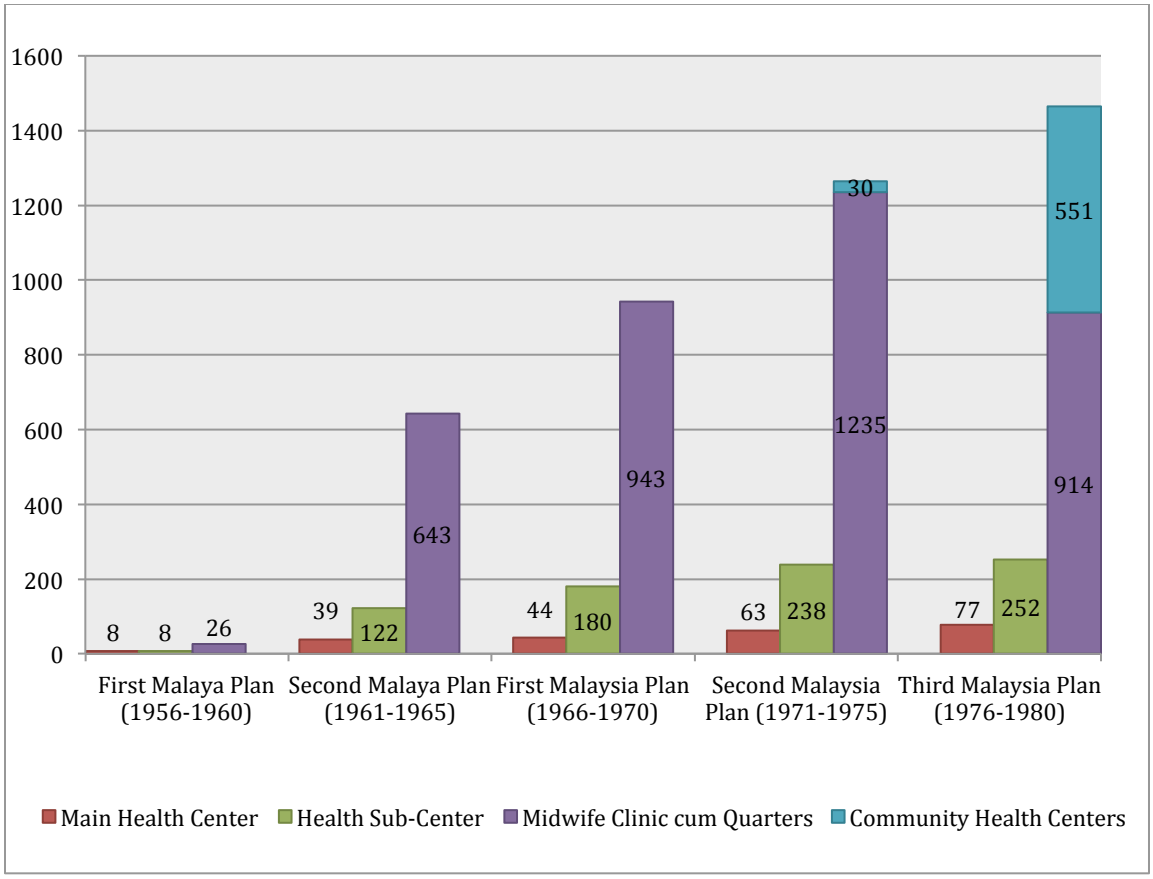


Figure 10: Development of Rural Health Facilities in Peninsular Malaysia between 1956-1980 in Cumulative Number of Units

Source: Ministry of Health. (1980). *Annual Report 1980.* Kuala Lumpur, Malaysia: Ministry of Health, p. 45

As for the administrative reforms of this period, greater attention to customers convenience was emphasized, as in the case of expanding one-stop bill payment and service centers covering water services. A consolidated approach to water supply management by bringing in the functions of the Water Board, Water Department, or Public Works Department into a single water supply department. The improved customer service was further solidifed by establishing the commercial accounting systems in provinces that did not use them, such as Melaka, Pulau Pinang, and Terengganu (Federation of Malaysia, 1986).

Also, in light of upholding commercial values and in consideration of rising costs for water infrastructure, water tariffs were raised.

As a result of these efforts, 70% of the population has access to safe drinking water by 1985. Federal spending on water expenditure increases slightly during the 5th Malaysia Development Plan to 4.5% (Federation of Malaysia, 1986). This will later result in raising national coverage to 78.3% (Federation of Malaysia, 1991). The recipe for water supply expansion remains the same with continual increase in water capacity to meet rising demand for water in the urban areas. As for key developments, the National Land Code and the Land Acquisition Act was amended for minimize delay in land acquisition for public sector projects.

The period spanning across 4th, 5th, and 6th Malaysia Development Plans was a time of rapid scaling up in coverage. The public mechanism for water supply provision was established and this was a time of replication and expansion. This is evident as at the end of 1995, water treatment capacity is at 10,479 Mld. This is roughly 2.5 times the capacity in 1985. 1995 is also the time when capacity exceeds demand. What is corresponds to is that there is near universal coverage in urban areas and the urban water treatment plants are operating below potential. Thus, from 1990s onwards, urban sector water infrastructure policy is geared towards reducing non-revenue water to improve the financial operations. Between 1990 and 2000, non-revenue water is brought down from 43% to 28% (Federation of Malaysia, 1996). This is still relevant to water coverage since it improves the financial position of the utility and hence, improving its sustainability.

Table 3: Water Treatment Capacity and Supply, 1985-95 (Mld)

	1985		*1990*		*1995*	
State	*Treatment plant capacity*	*Demand*	*Treatment plant capacity*	*Demand*	*Treatment plant capacity*	*Demand*
Johor	*431*	*431*	*983*	*529*	*1,520*	*931*
Kedah	*237*	*237*	*478*	*374*	*837*	*602*
Kelantan	*135*	*104*	*149*	*116*	*441*	*187*
Melaka	*150*	*114*	*143*	*137*	*184*	*175*
Negeri Sembilan	*208*	*182*	*230*	*230*	*483*	*370*
Pahang	*276*	*201*	*528*	*369*	*822*	*542*
Perak	*552*	*468*	*644*	*564*	*838*	*722*
Perlis	*24*	*24*	*54*	*43*	*139*	*63*
Pulau Pinang	*418*	*343*	*494*	*452*	*695*	*577*
Sabah	*249*	*188*	*367*	*363*	*708*	*488*
Sarawak	*324*	*183*	*388*	*282*	*709*	*433*
Selangor[1]	*1,000*	*1,000*	*1,793*	*1,406*	*2,768*	*2,475*
Terengganu	*158*	*71*	*291*	*114*	*335*	*201*
Malaysia	*4,162*	*3,546*	*6,542*	*4,979*	*10,479*	*7,766*

Note:
[1] *Includes Wilayah Persekutuan Kuala Lumpur*
Source: Federation of Malaysia. (1991). *Sixth Malaysia Plan, 1991-1995*. Kuala Lumpur, Malaysia: Federation of Malaysia.

In terms of coverage, urban water coverage is no longer an issue by 1995 and the only the rural population's water coverage needs to be addressed. By 1995, 89% of the entire population has access to safe drinking water. This lower figure is in reflection of 77% in the rural areas (Federation of Malaysia, 1991). Correspondingly to the issue of rural water supply, dedicated rural water supply programs are launched continuing into the 1990s.

Continuous investments in the rural areas through rural water supply programs results in additional coverage. This includes the Special Rural Water Supply Program that focuses on laying down reticulation systems for water distribution from newly

created water sources on top of Rural Water Supply and Sanitation Program that is involved in the direct construction of the water supply systems. As a result, by 2000, water coverage in the rural areas are further improved to 93.47% (Ministry of Health, 2000).

Singapore

Evidence employed to construct Singapore's path to universal access to safe drinking water was collected through two primary means similar to other case studies. First, there were the interviews with senior decision-makers and policy advocates. This was then followed up with archival research in the Urban Redevelopment Authority's Library, National Library, and the National Archives of Singapore. The interviews by nature were roughly an hour in length. A general question was presented by asking them to identify the critical factors that served to catalyze universal access to safe drinking water in Singapore. The identified factors and events then were followed-up by archival research. The Urban Redevelopment Authority's library houses government documents. The National Library houses studies and newspaper clippings. The National Archives houses senior policy makers' public speeches, most prominently Prime Minister Lee Kuan Yew's past public speeches.

A month was spent in the country to collect both primary and secondary data. Decision-makers were contacted beforehand with referrals and introductions leading to additional decision-maker interviews in the country. Due to ample surviving documentation, supporting evidence and in-depth coverage on the critical factors

identified on policy prioritization, formulation, and implementation were also located and retrieved. All relevant data collected during fieldwork are presented in the following pages.

Singapore achieved 100% access to improved drinking water sources by 1990 (WHO and UNICEF, 2015). Hence, restricting the comparison to the period between 1990 and 2010 like Indonesia and Vietnam is unsuitable in identifying a causal mechanism at play; simply because there is no variation in coverage between those times. Hence, progress has to be retraced prior to 1990. To search for a causal explanation in Singapore's case, it is necessary to go back to the 1950s to the time when it was still part of the British Empire. This is because this was the time when the Singapore Improvement Trust (SIT) was operating.

SIT is the predecessor for the later Housing and Development Board (HDB) that will assume a critical role in expanding access to safe drinking water to Singaporean citizens. SIT was mandated to take on development projects on the island to improve the living conditions for its residents. Its main task was to build back-lanes, which refers to opening up rear access to congested buildings for ventilation and sanitation (Singapore Improvement Trust, 1958). After World War II, circumstances changes where it was then tasked to take on housing projects to address the shortages. People were migrating into Singapore but were setting up temporary huts without basic health facilities such as access to clean water. The growing squatter population was a public health threat, as the potential for an epidemic was high.

A housing survey was taken in 1947 to assess the housing circumstances in Singapore and to devise a solution. The Report of the Singapore Housing Committee 1947 confirmed the poor residential conditions of Singaporeans (Singapore Improvement Trust, 1958). Given the overcrowding, it recommended the development of a Master Plan to control land development use, as Singapore being an island, the most important resource was land.

1947 is an important time in history for Singapore, as it laid down key foundations in Singapore's development. First, it launched Singapore's public sector intervention into housing. This was seen as inevitable at the time, as half a million people in Singapore was estimated to live in the slums (Singapore Improvement Trust, 1953). Population was expected to grow at 40,000 every year.[40] Hence, if not address, the situation was anticipated to exacerbate. In terms of water access, this means that water coverage rates were expected to fall, if left unattended, as those moving into squatter areas will add to the total number without access to safe drinking water.

Second, it led to the push for a Master Plan that will dictate land development in Singapore. Land is the most valuable resource in Singapore and thus, efforts were made early to optimize its use. The Master Plan was to be heavily influenced by the planning and housing policies employed in the United Kingdom. This was because Sir Patrick Abercrombie was in-charge of researching the latest developments on the subject. To

[40] The rapid growth in population in Singapore is attributed to the influx of immigrants from China and Malaysia (Seng, 2013). The exodus of Chinese out of China was due to the civil war leading up to the Communist Revolution in the late 1940s. The Malay migration was due to the 12-year-long 1948 Emergency and the resettlement of the rural Chinese by the British to prevent communist uprising.

study this, he traveled back to the United Kingdom (Singapore Improvement Trust, 1949). Upon his return, the Master Plan is finalized and SIT becomes the implementing body until it is dissolved and replaced by the Housing and Development Board in 1959; an institution that is established when Lee Kwan Yew's People Action Party wins majority seat in Government in the Legislative Assembly General Elections in 1959. Lee Kwan Yew campaigns on housing policy advocating a housing authority that will clear slums and provide interest-free government loans for homeownership (Lee, 2012).

Following the dissolution of SIT, the housing construction function was moved to the Housing and Development Board while the planning function was moved separately to the Planning Department. This was done all during the Singapore was still a British colony. Singapore did not gain independence from the British Crown like their neighbors Malaya. This was because the British wanted to hold on to Singapore in order to maintain their trade bases spanning from Suez, Colombo, Singapore, and to Hong Kong (Gale Asia, 2013). The reversal in the British position came about when they lost the Suez. With the change of position, Singapore then joined the Malaya Peninsula in 1963 along with Sarawak and Sabah to form the Malaysia.

Prior to forming Malaysia, two water agreements were signed between the city council of Singapore and the province of Johor, Malaysia. These were the Tebrau and Scudai River Water Agreement and the Johor River Water Agreement. The first was signed in 1961 and the second was signed in 1962. Both are abstraction rights for water from the rivers in Johor that is to be transported to Singapore. Singapore would create the Public Utilities Board in 1963 to obtain and treat the transported water. The

abstraction agreements were necessary because despite Singapore's ample rainfall, its terrain did not retain water. That is, when it rained, it flowed out to the sea. There were no natural reservoirs to secure water supply. Hence, the water agreements were crucial lifelines to Singapore's development. More so, since the British of Singapore fell within a week to the Japanese when the Japanese blew up the pipes supply water to Singapore during World War II.

The timing of the water agreements was serendipitous since Singapore would join Malaya in 1963 only to be asked to leave the Federation in 1965. Lee Kuan Yew later mentions that even in the departure from Malaysia, ensuring Malaysia will uphold the water agreements were crucial. This was achieved by including a guarantee to uphold the water agreements in the Separation Agreement signed by both parties in 1965. Lee Kuan Yew went further in the negotiations to have Malaysia pass a constitutional amendment guaranteeing this agreement (Gale Asia, 2013). Following Singapore's departure from Malaysia, Lee Kuan Yew prioritized water security, which included developing reservoirs on the island to hold rainfall.

By 1965, the key components to the water access story in Singapore become established. First, Singapore is reliant on Johor for its raw water sources. Second, the water is then transported, treated, and distributed by the Public Utilities Board. Third, the distribution translating to actual access by Singaporean citizens involves them moving into residences where they have access to plumbing for convenient use. For the last step to be accessible to the entire population, rent or ownership of homes with plumbing needs

to be within the financial means of people in different income strata. The difficult would be expanding this coverage to the poor, and this job falls into the work order of HDB.

Before an elaborate discussion on HDB, PUB first needs to be covered. PUB when it was setup, it was given board powers. It was a monopoly by nature, where it is the only entity that is permitted to provide water to all domestic, governmental, commercial, and industrial needs in the country. It holds the authority to set rates and charges to ensure its financial independence. It can set its rates independently without review or approval of Government (International Bank for Reconstructuion and Development, 1965). From the 1986 PUB reports that are available, PUB has always posted a profit in water revenue collection (Singapore Public Utilities Board, 1986, 1987, 1989).

PUB's other key role was its responsibility to develop additional water sources to meet all the water demand in Singapore. This included developing reservoirs both within Singapore and also in Johor, within the confines of the agreement details. The agreements were restricted on the maximum amount of abstraction. Hence, facility construction by PUB was permitted as long as the total amounts fall below the agreed max amount. An example of this in action is the construction of Linggui Dam in Johor built by PUB.

Since water access is the focus of this study, the role of HDB in Singapore cannot be overlooked. Increasing housing units, especially for the poor, was financially challenging. This was because housing requires a lot of upfront costs. International lending was unavailable because housing as not treated as a category of productive

investment (Housing and Development Board, 1960). That is, it was not treated to be part of the industrial development program and hence, was ineligible for lower-costs loans.

PAP endorses the atypical development strategy of focusing on low income housing policy. Units are rapidly built by HDB. The need for housing was accentuated with the Bukit Ho Swee Fire that displaced the squatter population and placed them on the streets. Despite the tragedy, HDB seized the opportunity to barricade off the burned illegal squatter areas. This was to prevent the squatter population from re-entering and settling in these areas. In response, the PAP campaigned on housing unit delivery to the homeless. HDB was forced to deliver.

Lim Kim San helmed HDB at the time. This point is relevant because he delivered on his promise of rapidly delivering housing units, where his personality in running HDB were explanations behind it success construction (Latif, 2009). Two points come to the fore in dealing with outsourced construction workers. First, he took a strong stance against rising construction material costs. When granite costs crept up, HDB opened up its own quarry to live out the threat that price increases will not be tolerated. Second, he made sure that things are built up to standards. When a contractor built a slanted house, he ordered it to be rebuilt. This position of Lim Kim San at HDB was important since costs had to be controlled. The 1-unit houses were being rented out at S$20 per month. It was a cost that was seen as attractive even to the poor. The government was subsidizing the costs and hence, a low-cost construction built to exact

standards was an expectation that had to materialize. HDB delivered on these goals. As the Government's financial position improved, HDB flats were sold rather than rented.

The main difficulty was resettling squatter populations out of areas with poor water access to newer more modern houses equipped with water access. For this purpose, the resettlement policy of 1964 was passed to clarify compensation on resettlement. In 1968, the Central Provident Fund (Amendment) Act in 1968 was passed permitting people to use their Central Provident Fund saving to purchase HDB flats (Housing and Development Board, 1968, p. 16). As a result, the number of housing applications went up. The continual increase in housing units and resettling those without access to water into these homes, access rates to water mirrored homeownership. By 1989, 87% of the 2.6 million Singaporeans were living in HDB flats (Housing and Development Board, 1989).

With growing access to water follows greater consumption. This requires securing greater quantities of water resources. This required a longer-term plan since the only way to secure greater amounts of water was to barricade the streams and canals where water will flow out into the sea. However, by doing so without clear measures to control pollution then pools of polluted water only remain. This is counterproductive since the point is to secure clean water resources that are less costly to treat. There are plenty of water surrounding Singapore as it is an island. However, the cost of meeting water demand through desalination plants was cost-prohibitive, at least in the early days of post-independence.

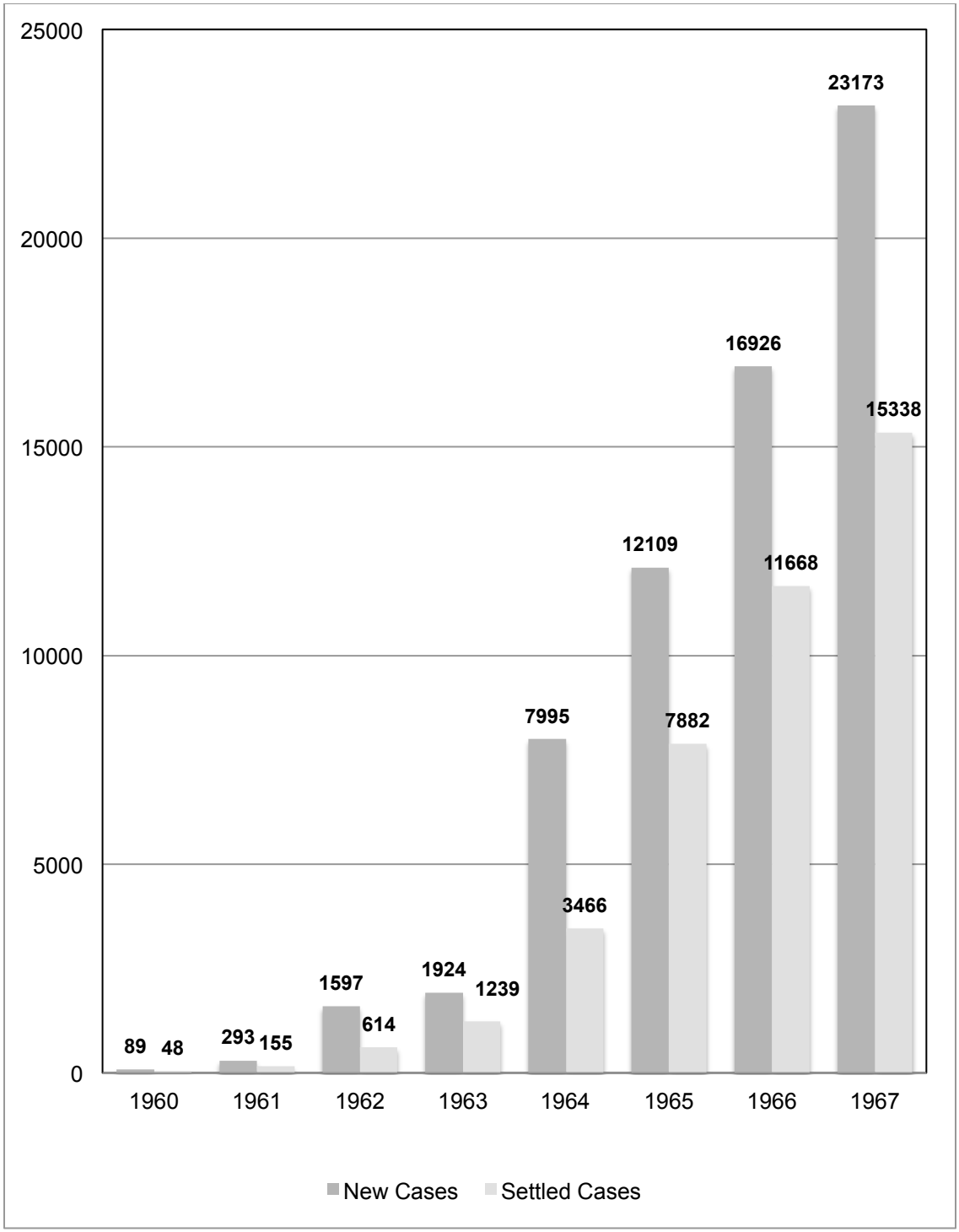


Figure 11: Families Rehoused From Clearance Areas

Source: Reproduced using figures in the 1967 HDB Annual Report. Housing and Development Board. (1967). *Annual Report.* Singapore: Housing and Development Board, p. 63.

Table 4: Clearance and Compensation Statistics

Year	Moved to Resettlement Areas	Rehoused in Board's Accommodation	Found Own Accommodation	Total number of households	Compensation Paid
1957	67	3	70	140	109,000
1958	146	50	107	303	317,000
1959	131	132	160	423	472,000
1960	132	45	207	384	330,000
1961	57	77	160	294	273,000
1962	198	342	277	817	883,000
1963	307	589	285	1,181	1.7 M
1964	150	2,584	909	3,643	3.2 M
1965	182	4,570	1,758	6,510	5.5 M
1966	266	4,158	1,594	6,018	5.1 M
1967	90	4,002*	1,892	5,984	4.1 M
1968	123	4,063*	1,677	5,863	3.1 M
1969	416	3,924*	2,179	6,519	4.8 M
1970	277	3,922	1,926	6,125	4.1 M
Total:	2,542	28,461	1,926	44,314	34.0 M

* Includes shopkeepers/industries relocated to Board's accommodation

Source: Housing and Development Board. (1969). *Annual Report.* Singapore: Housing and Development Board; Housing and Development Board. (1970). *Annual Report.* Singapore: Housing and Development Board.

In the backdrop of having to secure independent sources of water, Lee Kuan Yew lays out plans to develop reservoirs by damming up the streams and canals. This was the central tenet of his coordination policies among the ministries. He quotes, "the water situation was coordinated for nearly all of the 31 years I was in office from my office. So no ministry can go against what is required to increase water supply (Gale Asia, 2013)." He oversaw progress on this matter by getting monthly reports directly from PUB.

Water security ranked a high priority to the Singapore Government where even the Singapore Armed Forces equipped with pipe fixing abilities was established to become a credible deterrent to Malaysia threat to cut off water. That is, the Singapore

Government was ready to notify the UN Security Council would go in to fix the water pipes in the case it was sabotaged. Lee Kuan Yew mentioned although this was never invoked, the Singaporean Government built up the capacity to do so (Gale Asia, 2013).

Another key reason why Singapore worked towards developing their independent water supply is because they are not able to regulate the environment of the intake areas. That areas falls under the Malaysian jurisdiction. Hence, when pollution goes up, Singapore is not at entire liberty to strongly enforce their environmental standards. Hence, Singapore needed to develop water resources within their borders that they would be able to strongly enforce their environmental regulations. This led to the development of NEWater system where an underground sewerage system is develop to extract water and treat the water using filters and releasing it back to the streams and canals.

To ensure water in the steams and canals in Singapore can be reclaimed in the future, Lee Kuan Yew launches the 'Clean and Green Singapore' campaign in attempt to constraint people's behavior to stop polluting the waterways.[41] Not only is the Head of State's role critical in spearheading awareness campaigns, Lee Kuan Yew served as a critical lubricator in ensuring collaboration occurs among the ministries on his priority projects. Cleaning up the Singapore River is an example of this. An interviewee highlighted that coordination was achieved with initially uncooperative ministries by threatening to report the lack of cooperation on necessary action to get the project moving.

[41] The campaign is a broader campaign to prevent littering and develop greenery in the city. The latter better explained as implementing Lee Kuan Yew vision to 'build a city in a garden' rather than a 'garden in a city'. The direct relationship between the campaign and water resources is due to his explicit mention that they are indeed connected to prevent people from polluting the waterways (Gale Asia, 2013)

This threat worked since Lee Kuan Yew was known to frequently check progress on priority projects.

South Korea

South Korea is another relevant case, as it reached universal access to safe drinking water for all its population in a very short period. More precisely, it was able to do so in roughly 50 years counting from the 1953, the end of the devastating Korean War with an estimated 1.25 million battle deaths (Lacina & Gleditsch, 2005).

Data on South Korea's progress on expanding access to safe drinking was collected with through a country visit. For a period of a month, senior government officials were met to inquire about the progress and their reasons. That is, the question was posed in asking what they knew were the critical enabling factors in being able to make speedy progress.

The interviewees provided their share of what they believed were critical drivers. They also suggested specific references, typically Government publications, for additional search. These were all collected and this section provides a consolidated description what was discovered.

The natural starting point is the Joint Monitoring Program figures for South Korea. By 1995, 97% of the South Korean population had access to improved drinking water sources (WHO and UNICEF, 2015, p. 71). The coverage for piped water services reaches 100% in 2015. This is a drastic improvement when compared to 17% piped water coverage rate in 1961 (Ministry of Environment, 2008). That is, the main question is how South Korea was able to increase their piped water coverage from less than 1 in 5 person coverage to near universal coverage in merely 34 years.

The reference starting point is 1953 since it is the year that marks the signing of the armistice to mark the end of the Korean War.[42] The War had devastating costs on the country's water infrastructure. The War destroyed more than 50% of the waterworks facilities (Ministry of Environment, 2008). The dire water situation was exacerbated with the surge in returning refugees to a country where 18% of all houses were destroyed during the War (Korea Research Institute for Human Settlements, 1996). This meant people had to first settle in refugee settlement units, which also translates to no permanent plumbing for water in the temporary units.

Water access was one of many difficulties facing the Korean population in the immediate aftermath of the war. With security consideration in mind, large amounts of aid flowed from the US to Korea to stabilize the economy and strengthen the military. Between 1953 and 1961, the US provided foreign aid to Korea through its Foreign Operation Administration (FOA) and International Cooperation Administration (ICA). The Agency for International Development (USAID) would later take over these functions in 1961. FOA was created in 1953, ICA was created in 1956, and USAID was created in 1961. Before USAID take over in 1961, USD 1.743 billion was sent to South Korea to stabilize the country following the War.

Post-war circumstances meant new institutions were being established. The Reconstruction Ministry assumed a central role in rebuilding the country, where among the first things it would be do in the in 1950s was to build more housing units to alleviate the refugee situation. However, the demand greatly outstripped the number of constructed housing units during the 1950s.

[42] Stueck's book titled, "Korean War," provides rich details on the War and the various international events leading up to the armistice (1995).

As for the water infrastructure restoration efforts, the city of Seoul would enact and proclaim Ordinance 23, "Seoul's 1st War Damage Waterworks Restoration Bond Special Accounting Ordinance," in 1953 to reconstruct the various devastated waterworks networks and facilities.[43] This is of the earliest attempt to the restore water in the metropolitan areas.[44] With help from the US, water supplies were the first to be restored to their pre-war levels. However, demand was still greater than supply and new large-scale projects to transform water resource to residential water supply do not happen until the 1960s.

The post-war reconstruction period prior to 1960 was a time of political and social unrest. In 1960, the First President Rhee, Syngman was pushed into exile with the student-led April 9th Movement opposing his authoritarian rule. The Second President, Yun, Bo-Seon comes into power in 1960 but is ineffective in bringing stability. His time at the Presidency is short-lived as Major General Park, Chung Hee leads a military coup d'état in 1961. These events are relevant to the water story, as instability in politics prior to the 1963 is replaced with stability following Park, Chung Hee becoming the 3rd President of Korea following the 1962 elections as he starts building the institutions for long-term development in the country. This is reflected in the series of 5-Year Development Plans implemented during his time in office.

Water access via water infrastructure development in the 1960s can be traced to multiple streams of engineering projects. Foremost is water resource development. The reason for its prioritization was two-fold. First, the two major objectives of the 1st 5-Year Economic

[43] The "Special Accounting" refers to separated-out accounting dedicated to this project.
[44] The description "one of the earliest" is used cautiously here for a reason. Seoul's attempt to restore it waterworks is explicit. However, I cannot assume that other similar efforts did not happen elsewhere, as other records show that expansion efforts took place in other metropolitan areas in the 1960s. This indicates that facilities were in place. However, it is unclear whether restoration efforts took place between 1953 and 1960 on these facilities.

Development were increasing food supply and developing industry. Both heavily relied on water resource availability; water was needed to grow food and water was need in industrial production. However, water resources availability in Korea is highly cyclical. That is, although Korea receives on average 1,274mm/km^2, rainfall is not uniform through the changing seasons. Most notably, ⅔ of all water that can be acquired via rain falls between June and September. The remaining rainfall is then spread throughout the remaining months. This is problematic because it means Korea experiences flood during the summer months, which is then followed by drought. This is evident in the coefficient of river regimes for the major Korean Rivers.[45]

Table 5: Coefficient of River Regimes in Korea vs other International Rivers

River (Korea)	River Regime	Rivers (International)	River Regime
Han River	580 (170)	Ōyodo River (Japan)	110
Kum River	540 (300)	Missouri (USA)	75
Sum-Jin River	510 (330)	Seine (France)	34
Nak-Dong River	360 (180)	Nile (Egypt)	30
Young-San River	330 (170)	Rhine (Germany)	16

* The figures in brackets refer to the coefficients after multipurpose dams were built.
Source: Ministry of Construction. (1991). *River Environment Management Basic Survey Research.* Seoul, South Korea: Ministry of Construction.

Stabilizing the river flow was a high priority. Floods were problematic leading to both loss of life and property. Secondly, it was necessary in order to increase

[45] Coefficient of river regimes is the ratio between the high and low flow amounts in the rivers. Higher mean there is a greater variability in the river flow.

productivity in both agriculture and industry. This required the construction of dams. The dams would hold water during the monsoon season and release it gradually over the draught months. Because dams do not get built overnight, long-term planning had to be established. This led to its prioritization and the formulation of the *10-Year Water Resource Comprehensive Plan* that serve to guide water resource infrastructure developments from 1966 to 1975.

A couple of institutional developments took place along with this long-term planning. First, water was treated as a valuable resource. Thus, a water budget was established. Water budgets refer to taking account of the inflows and outflows of the water in specific areas. Works to take an accurate account of the water budget was put in action. This leads to our second development, which were river basin survey projects in the 4 largest rivers in Korea. The four largest rivers are Han River, Nak-Dong River, Kum River, and Young-San River. The Han River Basin Joint Survey Team was put together in 1965. Following the Han River survey, Nak-Dong River survey took place in 1966. These early initiative improved the capacity to replicate similar studies in other rivers.

Third, enabling laws were passed during the period of the long-term plan. These are the Special Multipurpose Dam Act enacted in 1966, Countermeasures against Typhoons and Floods Act enacted in 1967, and River Act enacted in 1971. The Special Multipurpose Dam Act established the legal authority for multipurpose dam construction and led to the creation of a state-owned enterprise, the Korea Water Corporation, to oversee the construction, operation, and maintenance of the dams. When asked why new

sets of dams were needed in the country rather than modifying existing dams to an ex-senior official from the Ministry of Construction, the reply was that alternative was not a viable option at the time. This was because all existing dams built during the Japanese colonial period were hydroelectric dams that were designed to continuously let out water for electricity generation. So it was by design unsuited to retain water. The second reason was that there were shortages in electrical supply. Thus, shutting down the dam meant greater shortages to electrical supply. This would dampen efforts for industrial development so modifying existing dam structures was not a viable option.

The multipurpose dams had various functions but it main was to retain and stabilize the water supply for agricultural and industrial uses. The stabilization would later benefit in the development of residential water supply in the metropolitan areas, as the Korea Water Corporation later supplies bulk water supply to the treatment plants in the metropolitan areas. As a result, 16 multipurpose dams were built between 1966 and 2013 (Ministry of Land, Infrastructure, and Transport, 2013).

The River Act of 1971 further solidified the paradigm of treating the water as a resource. It regulated the preservation, maintenance, and its use. The law also explicitly proclaims the management of the rivers first falls upon the Minister of Land and Construction. The authority stays with the Minister unless delegated to the heads of regional jurisdictions explicitly with decrees. This also meant that the central government was responsible for developing and transforming water resources as well. This occurred, as the state took charge of the negotiations in foreign aid for water sector development.

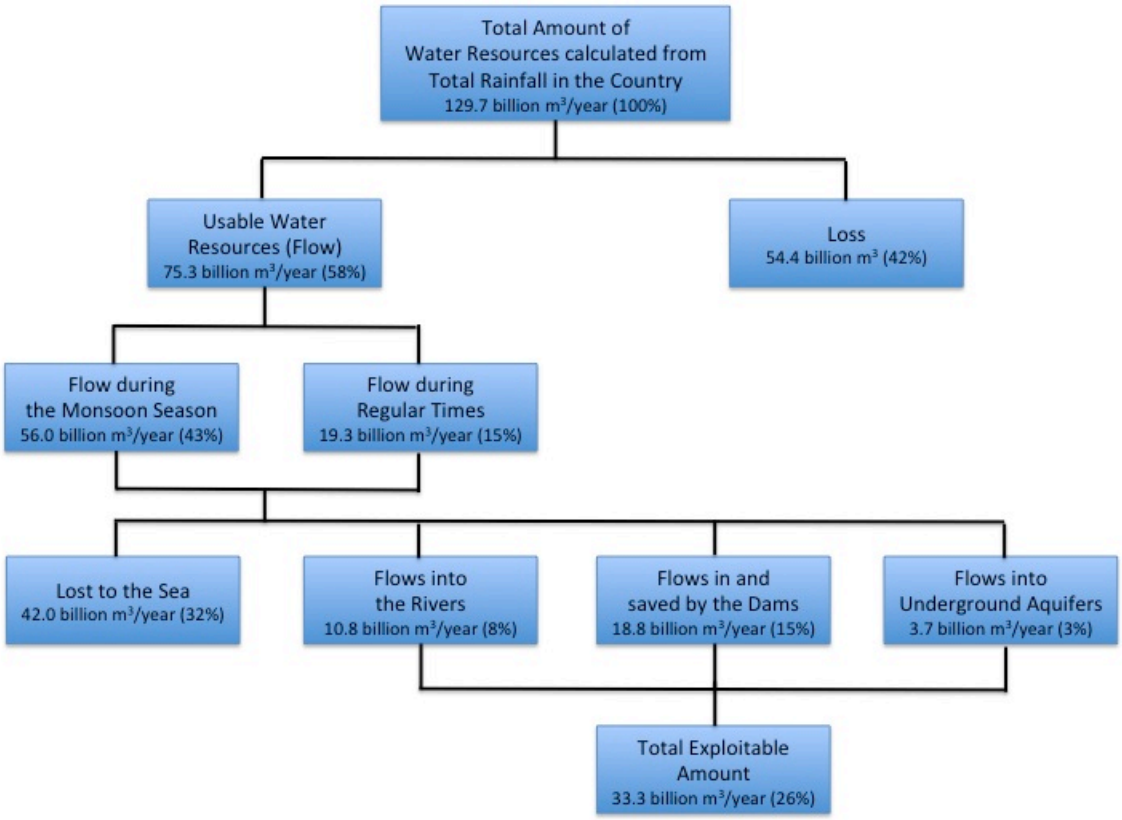


Figure 12: Water Budget for the Entire Country (For Year 2007)
* The titles of the boxes were translated by the author.
Source: Ministry of Land, Infrastructure and Transport. (2013). *2013 국토의 계획 및 이용에 관한 연차보고서*. Seoul, South Korea: Ministry of Land, Infrastructure and Transport, p. 404.

Two key concerns arise with rapidly securing infrastructure funds from abroad. First, concentration of decision-making authority within the central government was efficient as it served as a focal point for negotiations. However, the concentration opens up room for abuse. Although corruption is difficult to measure, implementation is not. The latter was established and strengthened in the case of South Korea. The Acts were followed by Presidential Decrees that allocated and coordinated ministerial cooperation in the implementation of the law. This is then followed by ministerial decrees that specified

the roles and procedures involved in carrying out the law at the ministerial level. Decrees at the ministerial and municipality level have "implementation" typically in their title and involved very detailed tasks such as filling out forms by whom and sending it off to whom. President Park's tenure is full of this institutionalizing process, as new laws are passed to support the execution of the Economic Development Plans.

Another defining character of President Park is his frequent visit to the field to check on progress. In other cases, he would invite those who were expected beneficiaries to report to him. An example of this is the invitation of a rural farmer couple once a month to the cabinet meeting to report on the rural village beautification program titled, "New Village Movement." He wanted to hear directly from the farmers and then open discussions with his cabinet members on progress of Government projects that would address the needs of the farmers. The President was very visible in his field trips around the country, as it would be broadcasted to the public.

Another concern facing the rapid accumulation of securing foreign loans is capacity. That is, for the projects to proceed without delay and slippage, technical capacity needed to grow in parallel to meet the labor requirements. On this front, the 1st Science Technology Promotion 5-Year Plan was launched in parallel to the 1st 5-Year Economic Development Plan in 1966 (Kim, et al., 2010). The goal of the plan was to increase the technical human resources of 299,414 people to 601,763 people by 1966. The Plan was to meet this challenge by investing in universities, technical high schools, and night trade schools. This Plan was coordinated at the highest level in planning, as the Technology Management Bureau was formally setup in the Economic Planning Board in 1961 to review the technical

feasibility of all development project. This was crucial to materialize the industrial development lies at the heart of the 1st 5-Year Economic Development Plan. As a direct result of this Plan, the Korea Institute of Science and Technology was setup in 1965.

Building human technical capacity was not only done through schools but through pairing in the international projects as well. Projects were awarded to both international and domestic technical staff. According to a retire project manager, the split in labor among the two initially was where the international companies such as US's Henningson, Durham & Richardson and Canada's Stanley Associates Engineering would be responsible for the more complicated designs where the domestic companies would be responsible for the less complicated designs. Korean companies would learn on the job and through experience. This paired growth enabled the Korean companies to build and advance their technical skills.

Domestic technical capacity was built in the manufacturing private sector with joint ventures with more established overseas companies such as U.S. Pipe and Japan's Kubota. These companies would setup shop within the country in the 1960s to domestically produce pipes for water distribution networks. Korea Steel Piped Industries Corporation partnered with U.S. Pipe. East Asia Metal Industries Corporation partnered with Japan's Kubota Steel Industries. In addition to these companies, local companies were setting up shop to supply the growing demand in material for water infrastructure. These include Pusan Pipe Corporation, Dong-Ju Steel Manufacturing Corporation, and Hyundai Steel Pipe Corporation to name a few. These companies would investment in R&D to customize material production to meet local needs.

Table 6: Water Infrastructure Projects with Foreign Financing Component

Project Title	Year	Size (in '000 USD)		Conditions		Lending Institution	Contracting Institution	Grant Element
		Withdrawn Amount	Agreed Amount	Interest Rate	Grace-Repayment Period			
Daegu Piped Water Supply	1964	1,759	2,400	2	11-30	USAID	Daegu Metropolitan City	66.94
Pusan Piped Water Supply	1966	8,034	8,034	3	5-15	German KFW	Pusan Metropolitan City	42.2
Seoul Piped Water Supply	1967	2,853	3,260	2.5	12-30	USAID	Seoul Metropolitan City	63.33
Incheon Piped Water Supply	1967	1,716	1,800	2.5	11-30	USAID	Incheon Metropolitan City	62.63
Kwangju Piped Water Supply Facilities	1967	1,680	1,680	0	3-13	JWRF [a]	Kwangju Metropolitan City	25.71
Daejun Piped Water Supply Expansion	1967	1,515	1,640	0	4-16	JWRF [a]	Daejun Metropolitan City	60.29
1st Phase of Soyang River Multipurpose Dam Construction	1967	1,098	1,100	0	2-13	JWRF [a]	Korea Water Resources Corp.	50.01
2nd Phase of Soyang River Multipurpose Dam Construction	1968	13,016	13,050	0	4-13	JWRF [a]	Korea Water Resources Corp.	55.23
Chungju Piped Water Supply Expansion	1969	900	900	0	2-13	JWRF [a]	Chungju City	50.01
3rd Phase of the Soyang River Multipurpose Dam Construction	1970	7,728	7,504	0	4-13	JWRF [a]	Korea Water Resources Corp.	55.23
Seoul Piped Water Supply Expansion	1971	8,737	8,800	0	5-16	ADB	Seoul Metropolitan City	62.44
Andong Multipurpose Dam Construction	1971	16,904	22,000	0	6-19	ADB	Korea Water Resources Corp.	68.4
Pusan, Daegu Metropolitan City Piped Water Supply Facilities	1972	5,493	5,700	7.5	6-15	ADB	Pusan Metropolitan City and others	14.6
Divergent In-take Project for Metropolitan Piped Water Supply	1972	25,352	25,600	7.5	5-14	ADB	Korea Water Resources Corporation	13.74
Daechung Dam Construction	1974	33,490	40,674	3.5	7-14	Japan OECF	Korea Water Resources Corp.	40.69
Watershed Metropolitan Piped Water Supply System Facilities	1977	28,300	30,000	8.3	5-14	ADB	Korea Water Resources Corp. and others	8.88
Choong-ju Multipurpose Dam Construction	1978	60,295	66,527	3.5	6-14	Japan OECF	Korea Water Resources Corp.	39.41
Pusan Metropolitan City Piped Water Supply Expansion Project	1978	14,269	15,000	7.4	5-15	ADB	Pusan Metropolitan City	14.74

Samlangjin Pumped Storage Hydroelectric Power System	*1980*	*47,759*	*52,630*	*9*	*5-15*	*ADB*	*Korea Electric Power Corporation*	*4.75*
Regional Piped Water Supply Facilities	*1981*	*16,500*	*38,100*	*10.1*	*5-20*	*ADB*	*Ulsan City and others*	*-2.47*
Regional Piped Water Supply System Project	*1983*	*17,536*	*32,841*	*4.5*	*7-18*	*Japan OECF*	*Pusan Metropolitan City and others*	*37.17*
Hapchun Multipurpose Dam Construction	*1983*	*50,256*	*85,891*	*4.5*	*5-18*	*Japan OECF*	*Korea Water Resources Corp.*	*35.17*
2nd Piped Water Supply System	*1983*	*51,288*	*78,500*	*Variable*	*5-7.5*	*IBRD*	*Korea Water Resources Corp. and others*	*-*
Regional Medium and Small Cities' Piped Water Supply Facilities	*1983*	*25,949*	*60,000*	*10.5*	*4-20*	*ADB*	*Ministry of Government Administration and Home Affairs*	*-4.98*
8th Piped Water Supply System Facilities	*1984*	*26,797*	*70,000*	*10.5*	*5-20*	*ADB*	*Ministry of Construction and Transportation and others*	*-3.39*
Daejun Piped Water Supply System	*1984*	*4,392*	*9,262*	*4.75*	*7-18*	*Japan OECF*	*Daejun Metropolitan City*	*35.4*
Modernization of Piped Water Supply Facilities	*1984*	*1,116*	*12,209*	*4.75*	*7-18*	*Japan OECF*	*Seoul Metropolitan City*	*35.4*
Juam Dam Construction	*1984*	*31,421*	*46,733*	*4.75*	*7-18*	*Japan OECF*	*Korea Water Resources Corp.*	*35.4*
3rd Step of Regional Metropolitan Pipe Water Supply System	*1985*	*89,282*	*95,000*	*Variable*	*3-12*	*IBRD*	*Korea Water Resources Corp.*	*-*
4th Piped Water Supply System (Nam River, Daegu)	*1985*	*34,009*	*38,000*	*Variable*	*3-12*	*IBRD*	*Daegu Metropolitan City and others*	*-*
9th Piped Water Supply Facilities	*1985*	*0*	*27,000*	*10.25*	*3-22*	*ADB*	*Incheon Metropolitan City and*	*-3.31*
Imha Multipurpose Dam Construction Project	*1987*	*35,421*	*48,396*	*4.25*	*7-18*	*Japan OECF*	*Korea Water Resources Corp. and others*	*38.94*
Daejun Piped Water Supply Loan Project	*1989*	*8,355*	*10,394*	*4*	*7-18*	*Japan OECF*	*Daejun Metropolitan City*	*40.7*
10th Piped Water Supply Project	*1989*	*6,332*	*10,400*	*Variable*	*4-21*	*ADB*	*Korea Water Resources Corp.*	*-*
Juam Dam System Regional Metropolitan Piped Water Supply	*1990*	*28,012*	*34,000*	*Variable*	*5-10*	*IBRD*	*Korea Water Resources Corp.*	*-*

[a] Japan War Reparations Fund

Source: Ministry of Environment. (2008). 생활에서 생명까지 맑은 물로 지켜온 100 년: 한국상수도 백년사. Seoul, South Korea: Ministry of Environment. Original figures from Korea International Cooperation Agency. (2006). *한국에 대한 개발원조와 협력.* Seoul, South Korea: KOICA.

Stabilizing the supply of water resources, securing finances for water infrastructure construction, and formulating a plan to improve human technical capacity were key ingredients to getting the water infrastructure built. The next critical factors are establishing a delivery network with sustainable operation and maintenance practices. That is, making sure people actually get "access" to the rapidly developing national water infrastructure projects. This can be split into two pathways. One focuses on expanding coverage in the urban areas whereas the other focuses on the rural areas.

Water treatment facilities and distribution network development focused initially on 6 major cities: Seoul, Pusan, Incheon, Daegu, Daejun, and Ulsan. These were the cities experiencing the greater urbanization pressures as people congregate in search of work. Treatment capacity was in constant expansion to meet the growing need. Foreign donors mix of grant and low-cost loans enabled the expansion in treatment capacity in these cities. The growing demand for water in the metropolitan areas that justified the continual expansion in treatment capacity and distribution networks cannot be explained without addressing the housing policies being executed in these cities. This is because water consumption increases when consumption means are shifted from communal standpipes to in-house connections; a shift that owes to reducing the squatter population and increase homeownership in units with internal plumbing.

Korea's housing situation at the end of the Korean War was dismal. Returning refugees and the devastating landscape left by the war meant surviving houses were in disrepair, if not destroyed. United Nations Korea Reconstruction Agency along with US assistance started building housing units for the refugees. However, the number constructed

did not meet the need, as only 190,000 units were built between 1951 and 1956 (Korea Research Institute for Human Settlements, 1996). In response to slow progress, housing policy was built into the 5-Year Economic Development Plans. The Government decided to actively intervene in supply as relying on private sector housing developers were not the solution. This was because first, they could not meet demand, and second, they were only building units to cater to the higher income groups. To implement the intervention, the Korea Housing Corporation was established in 1962. Along with establishing the state-owned enterprise, the Public housing Act, Land Accommodation Act, Architectural Act, and City Planning Act were all enacted in 1963 to broaden the intervention authority of the Government on matters related to housing construction including setting standards for construction. In 1967, the Korea Housing Trust was setup based on the Korea Housing Trust Act that was aimed to extend financing to the general public to be used for homeownership.

As a result of the Government intervention, 866,000 units were built between the 1st and 2nd 5-Year Economic Development Plans spanning across 1962 to 1971. Despite the dramatic growth in housing unit construction, it still did not meet demand. In response, the 10-Year Housing Construction Plan was formulated alongside the 1st Land Construction Comprehensive Plan that was carried out between 1971 and 1981. This included the development of satellite cities, which expedited laying down water distribution networks, as they were less conflicting existing structures. The 3rd, 4th, and 5th 5-Year Economic Development Plan phases witnesses a drastic increase in housing unit availability. A total of 2,032,000 units were built in the 15-year span from 1972 to 1986 (Korea Research Institute for Human Settlements, 1996). The supply of housing units continuously grow and this is

evident in the difference between total number of units between 1960 and 1990, where is the increase is from 3,464,000 units to 7,374,000 units. This corresponds to near universal coverage where 96% of the urban population has access to piped water services (WHO and UNICEF, 2015).

For the rural population, water coverage worked in two phases. Potable simple water facilities were built in the villages during the 1970s under the New Village Movement. These were then later replaced by pipe network extensions from larger treatment facilities. Given that the latter is melted into the urban water supply development story, how the villagers were able to gain access to water in the 1970s is discussed in greater detail. Rural water supply system development in the 1970s was nested within the broader New Village Movement at the time. The Movement was both a communal village beautification program and a poverty eradication program whereby villagers were encouraged to work together for village improvement projects. The Movement abated the growing income disparity between the urban and rural areas to minimize the rapid rural-to-urban exodus. The latter was problematic because rapid urbanization was directly contributing to the growth of urban squatter population and urban poverty. Also, the mass exodus of the rural population was made it difficult to improve agricultural productivity and increase agricultural output to reduce the negative balance of payments from having to import food.

The Movement was anchored on communal collaboration fueled by village-level leadership and executed by all village members. Government help manifested in both material help and technical support. Material help was in the form of concrete bags equally distributed to all 33,000 or so villages at the beginning of the movement. There were no

Government guidelines on how these bags would be used. It was to be determined by the villagers themselves. However, this form of material subsidy did not continued but rather in the subsequent year, only half of the total number of villages would be given a new supply of concrete bags. The beneficiary villages were selected based on evaluations conducted by the Ministry of Interior. This created competition and incentive villages to be productive with the materials. Although material support was distributed through competition, technical support worked in the opposite. Villages were categorized into under-developed villages, self-help villages, and self-reliant villages. Technical support was operated to help move villages towards self-reliant villages where this category included the development of non-farm based income.

During this period, the Ministry of Health and Social Affairs built potable water supply systems. By the end of 1980, 28,120 villages out of 32,624 villages or 86% of all villages acquired water supply systems (Ministry of Interior, 1980). These were simple systems typically gravity based water supply systems with sand filtration where water tanks are built in higher elevation areas and used gravity to distribute water. The replacement of this system with extension pipes from urban treatment facilities was because operation and maintenance did not occur properly. More specifically, an interviewee mentioned that the biggest problem was that the sand filter needed to be refurbished from time to time but the locals charged with this responsibility did not dutifully perform this duty leading to erosion in water quality. The extension pipe from the urban treatment facilities that was later connected to the existing pipe network within the village resolved this problem.

Results

The results of the analyzing the data are presented in two sub-sections in this chapter. This is to separate the analyses from the case studies from the path analysis results from the World Bank Development Indicators. The separation is deliberate as the two dataset enlighten our understanding of the reasons behind the variation in the dependent variable differently. Hence, meshing them together would at this point be more confounding than clarifying.

The analyses of the case studies are presented first. This is because it builds on the rich primary and secondary data collected on the countries. The analyses focus on building a comparative framework to help identify patterns behind variation. It all starts by visualizing the longitudinal changes in access to safe drinking provision in the countries and mapping out key events impacting the trajectories. The aim is to provide an accurate yet distilled explanation behind the movements in the dependent variable.

Quantitative analysis then follows. It goes through combing the data prior to statistical analysis. The analysis is then explained. The analysis further complemented with discussions what we can say with confidence that the data supports and what we cannot say since we do not have a strong empirical support. The latter is necessary to prevent ourselves from over-extending the implications and applications of the findings.

The chapter then concludes by merging the two findings. It does this by identifying how much of these findings illuminate our understanding of the dependent variable. More simply, it answers the question, "how did these analysis benefit us in better understanding why 663 million people still do not have access to improved drinking water?" This then leads us to the question on how this research further propels the theories of public administration and comparative politics: a subject that will be thoroughly discussed in the subsequent chapter.

Findings from Qualitative Analysis

The qualitative analysis was conducted through a multi-step process. First, the longitudinal changes in access to safe drinking water were traced. For countries where the data could be broken down in more detail, it was done so. This is because as mentioned in the introductory chapter, there are multiple ways to provide safe drinking water. The data often separates the most sophisticated yet convenient form of safe water delivery that is providing water through pipes onto the customer's premises. As the following graphs show, the distinction is recognized and drawn when available.

For the three benchmarked countries of Malaysia, Singapore, and South Korea, the figures are compiled from archival data since the Joint Monitoring Program figures that the World Bank and the UN employs only started collected the comparative country data from 1990 onwards. Hence, there is a difference in presentation for these countries than the Indonesia and Vietnam. As for Singapore, the safe drinking water coverage figure is not used but another set of figures are used as its substitute. These are public

housing figures. We will discuss this more thoroughly later but this is a suitable substitute as all public housing constructed by the Housing and Development Board included running water. As for the South Korea, piped water figures are used, as this was the method in which the country measured and traced its progress on providing safe drinking water to it citizens. How the country was able to rapidly expand coverage for piped water service will be covered.

Once the longitudinal changes in coverage of safe drinking water has been traced. Interviews and archival research was referenced to start understanding the country's particular trajectory. That is, based on the available evidence, the most plausible explanation had to be put together. The strength of the explanation rests on the frequency of other supporting evidence and the elimination of alternative explanations. This is what is presented. Following the explanations, the question then becomes whether the explanation is applicable to the other cases. That is, we answer whether the causal mechanism developed could be applied to other case studies to explain their different trajectories in different countries. This exercise helps identify and/or refine our understanding of the critical variable responsible for the different performances in the different countries.

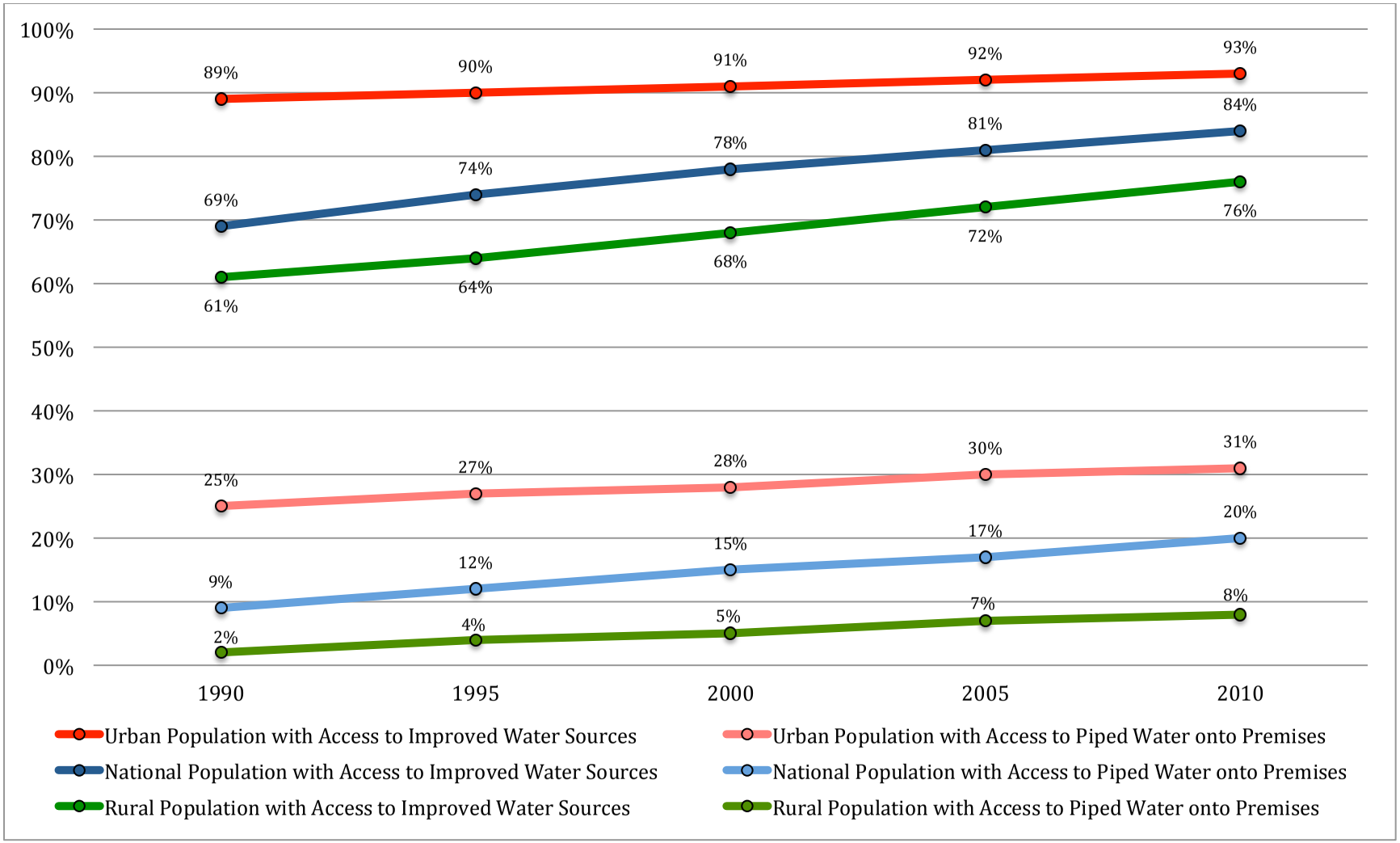


Figure 13: Indonesia's Longitudinal Changes in Access to Improved Water Sources
Source: UNICEF & WHO. (2013). *Estimates on the use of water sources and sanitation facilities: Indonesia.* Geneva, Switzerland: WHO.

Indonesia

Indonesia is the poorest performer of the five selected case studies. Access to improved drinking water sources increased 15% over the period of 20 years. However, upon closer examination, access to piped water onto premises increased 11% over 20 years. At the end of the 2010, only 20% of the entire population had access to piped water. This means that the difference of 4%, which corresponds to the difference in the increase in access to improved drinking water sources and the increase in access to piped water onto the premises, is attributed to the population gaining coverage through other means such as covered wells and rainwater collection.

When the interviewees were asked what they saw as responsible for this relatively slower coverage expansion, they noted a couple of key historical events that occurred in the country that had significant implications on how public administration operated in the country. The earliest important event in the 1990-2010 timeframe in the water sector was the coerced bankruptcy of the PDAMs that were responsible for operation and maintenance of the water supply systems. Bankruptcies that were long time brewing due to the alleged kickback arrangement between Suharto and the Governors. That is, Governors had to pay tribute to the Suharto family for central government transfers. This took the form where, for example, 80 billion Rupiahs were allocated from the central government to the local governments to build facilities but only 55 billion Rupiahs worth of quality facilities would be built. The construction work was granted to affiliates involved in the kickback scheme as well. This resulted in a lot of assets that did not work properly. At the same time, the Government artificially kept the tariffs very low. The combination reflected the lack in

expectation of local government water supply systems to return the central government transfers. Furthermore, PDAMs losses were exacerbated, as its accounts were not separated from the local government accounts. The cash revenues generated from its services were being used for priority projects of the local government, as they were being lumped into the general coffers of the local government.

In response to this financially unsustainable situation, multilateral financial institutions refrained from any further lending to these utilities unless they become transparent in their financial management. As financial operations became transparent, it became clear the poor performance of the utilities were due to poor management more than the financial crisis that affected the entire country.[46] It was recommended at the time for the utilities to own their problems and declare bankruptcy. This would push the utilities from halting any further financial bleeding while working on a workout plan that will ensure their long-term financial viability.

The problems facing the water sector went beyond just the financial dimension. Multiple issues was identified and communicated to the Indonesian Government by the Asian Development Bank (1995). The Indonesian Government adopts the Integrated Urban Infrastructure Development Program in response to the ADB report.

[46] Although the performance of the water utilities are not analyzed during the peak of the financial crisis in Indonesia between 1997 and 2002, a subsequent report in 2005 demonstrates the variation in performance among PDAMs cannot be attributed to debt alone (USAID, 2005). Some were partially due to the exchange rate fluctuations but mismanagement is seen as a greater problem. However, blaming it all on mismanagement is also inaccurate as proper management was an uphill battle due to poor existing facilities. Simply, the equipment is in such a poor condition that that great management has marginal impact for obvious reasons.

Efforts to implementing the program were cut short with the end of Suharto's authoritarian government and start of electoral decentralization in 1998.[47] A period popularly known as the "Reformasi" takes hold in Indonesia. It is a period defined by centrifugal forces resulting in granting of greater regional autonomy. The scope and power of the central authority was diminished as provincial bodies acquired greater discretion over how they can spend the locally generally funds. The Administrative Decentralization Law 22 and Fiscal Decentralization Law 25 solidified this immediately after the removal of Suharto. The laws were quickly passed to prevent reversal to authoritarian rule.

Fiscal and administrative decentralization paralyzed water supply sector. This is because the local PDAMs had outstanding debt to the central government from the Suharto years. Thus, the Ministry of Finance was not willing to lend further to the PDAMs unless the local government and its legislative body was willing to pledge a guarantee of its payback. The local government was not willing to do this because the Ministry of Home Affairs and the Ministry of Finance wanted the local government to pledge their general allocation money generated from the local tax revenues. This was the money that paid the local government staff salaries. So if in the case that PDAMs does not pay, the Ministry of Finance was going to cut this general allocation money. The local government was not going

[47] President Suharto stepped down due to the financial crisis faced by the country. The exchange rate that was 2,348 Rupiah to a dollar in the beginning of January in 1997 jumped to 14,850 Rupiah to a dollar at the end of June in 1998 (International Monetary Fund, 2016). An interviewer mentioned that the exchange rate jumped even higher to 17,000 during the crisis period. This is not reflected by the IMF, as exchange rate for Rupiah was suspended from being posted after the June 30, 1998 posting. The exchange rate was not posted until February 13, 2002. That is, it was posted as "not available" until 2002 when the exchange rate stabilized and went down to 10,166 Rupiah to a dollar. The exchange rate has significant repercussions on the fiscal condition of the Government.

to forego receiving this transfer for their PDAM. The local government was not going guarantee their PDAM using the funds that is being reserved in their government that it uses to meet their day-to-day needs. Hence, this also meant that multilateral financial institutions were not engaging the local governments for water since the central government was not guaranteeing any loans going to PDAMs.

Coordination challenges came with decentralization came coordination challenges with a lack of ownership.

> *Recently we did a project in* [a region]. *In the water utility there, they had customers begging for water. There was a whole group of people in the coastal line. They could have serviced them. A million people was in this particular community and they service less than 100,000 people. They can probably double the number of connections that they have by increasing water connections and by channeling the water from the adjacent regency. So I asked who has the authority over this water. And they say that they went through a channel a couple years ago in the Ministry of Public Works to ask for the regency's cooperation. I asked them did you negotiate with* [the adjacent regency] *to get access to water? Let's find out if you can get a permit to get access to water. There is got to be someone in the Directorate of Human Settlement in the Ministry of Public Works that can help you. So we went back to them and to the guy in water resources and asked them if they can get a permit to extract water from this particular channel. Because* [the foreign financing institution] *cannot fund anything unless all the permits are in place. That is your*

> *responsibility to do that. But the staff in the Directorate of Human Settlement says that is not our responsibility but of the local government. We kept going around and around in circles. And every time, we try and do something, the people living along the shoreline between 1 and 5 miles from the shore have been over-pumping the groundwater where the recharge does not even come close to the amount of water that is being pumped out of there. Saline intrusion into the groundwater is taking place. The water can't be used from everyday consumption or use. So people paying on average, in this community, 400,000 Rupiah per month for water and they get 1/10 of what you can get from a household connection. It is a tragedy* (Anonymous Country Sector Specialist, 2016).

The combination of aforementioned events made it difficult to rapidly expand safe drinking water coverage in Indonesia. The forced transparency of poorly managed PDAMs slowed any new investments, as the utilities had to first solve their financial management issues. The financial transparency also scared off any lending from commercial institutions. Poor financial management meant the utilities were of high risk. Hence, commercial lending preferred to lend elsewhere, if it could lend at all due to the financial crisis.

Rapid decentralization following 1999 has its own set of problems. Decentralization in term of budgetary authority and allocation was assumed quickly. However, this did not mean that the local governments were equipped with the administrative capacity to quickly execute the plans devised and determined by local politics. Local governments did not have the technical capacity. In certain areas, what constitutes as a local government were even

being contested, as new provinces and districts were splintering apart from existing jurisdictions.

Weak local government capacity became a chronic problem. It became a chronic problem as the local governments deliberately distanced themselves from the central government. Directives and assistance from the central government was viewed and treated with skepticism, as it was viewed as a legacy of the previous authoritarian government. This was counterproductive and paralyzing, as the central government ministry in charge of water supply system development had no project budget and had to rely on the local government allocation for all future projects. The Ministry of Construction at the national level faced delay in project development, as it now assumed an advisory role to the local government's administrative body and had to get approval from the local parliament. The noticeable delay was noted in reference to Suharto's time in office. Public works projects designed and executed by the central government was executed faster because the budget was allocated to them and also the local government was cooperative in expediting approval, as the governors and mayors were more subservient to the authoritarian ruler. After Suharto, however, delay was the day-to-day reality of project development and implementation due to skepticism, mistrust, and protectionism actively assumed by the local politicians. Water infrastructure being in poor financial health did not help its prioritization, as newly elected politicians were more interested in investment more visible public infrastructure such as roads.

As for information, education, and communication campaigns that would cascade to increased political pressure to their elected politicians, interviewees mentioned that it was not actively engaged. This was because increased awareness would need to manifest into service

connections. Recognizing the lack of financial resources due to aforementioned reasons, awareness activities were not as publicly and actively pursued as other countries.

The dearth of investment in the water supply sector continued throughout the remaining period of examination. In recognition of the problems facing the water utilities, Water Supply System Development Support Agency (BPPSPAM) was setup in 2005 following the success of the USAID program. BPPSPAM was setup to collect comparative data on the utilities. It was to help inform and better formulate policy solutions. Also, it was to help in exploring potential public-private partnership (PPP) arrangements.[48]

Despite the efforts, the sector still has outstanding issues that still need to be addressed. This is most evident in the 2012 ADB sector report. The problems identified in the 1995 ADB report are repeated and reminded. It is also confirmed by the UNICEF&WHO Joint Monitoring Program data. Only 20% of the total population has access to piped water onto premises. Only 31% of the urban population has access to piped water onto premises and only 8% of the rural population has access to piped water onto premises in 2010.

[48] The PPP arrangement here is of a more limited definition of PPPs. It refers to the arrangement where the private sector is engaged to finance and develop public infrastructure. In this case, it would mean finding private sector partners that are able to design, build, finance, operate, and maintain water supply systems. For more additional details, please refer to World Bank. (2015). *PPP Reference Guide 2.0.* Washington, DC: World Bank.

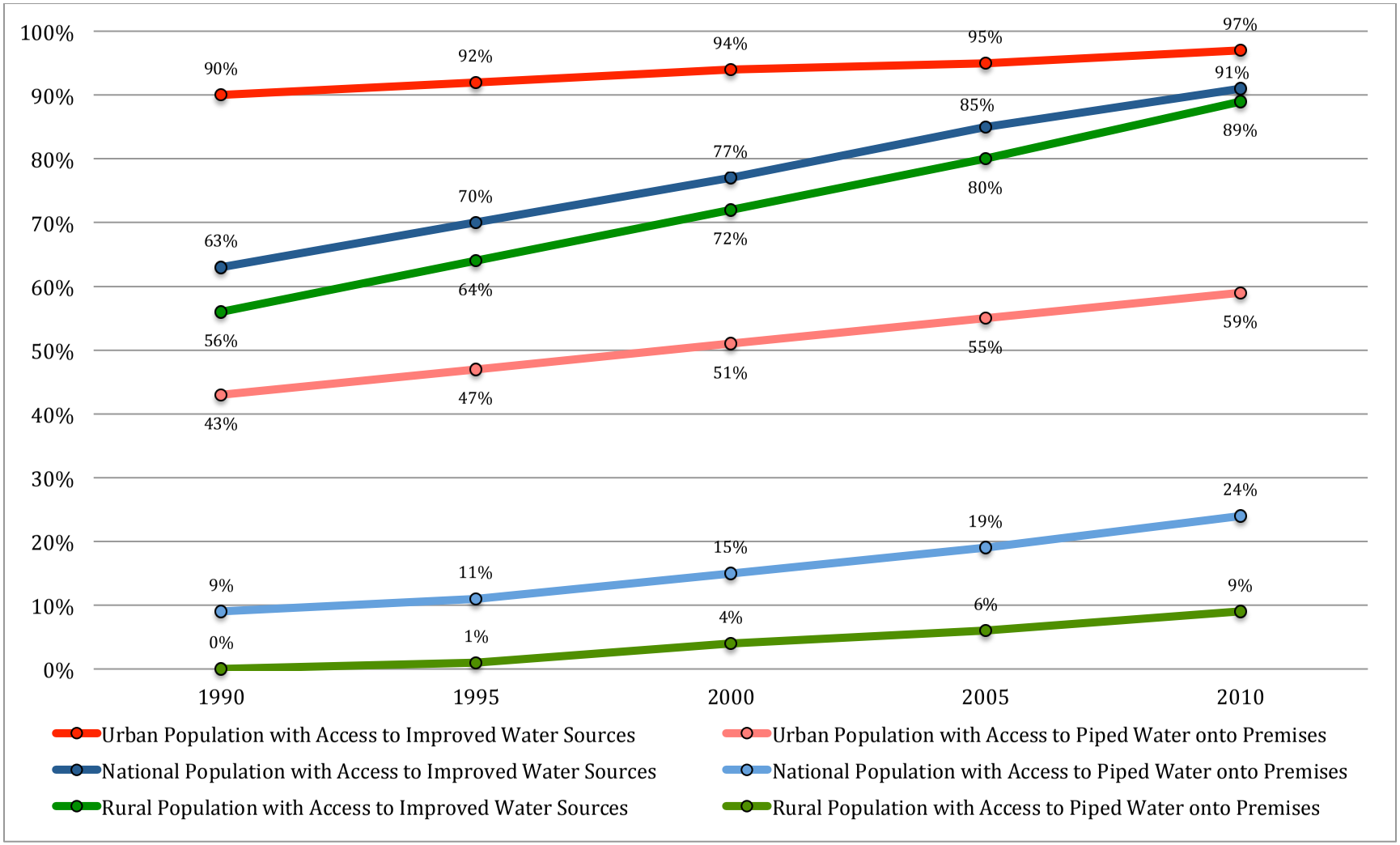


Figure 14: Vietnam's Longitudinal Changes in Access to Improved Water Sources
Source: UNICEF & WHO. (2013). *Estimates on the use of water sources and sanitation facilities: Indonesia.* Geneva, Switzerland: WHO.

Vietnam

Vietnam's performance is at a contrast with Indonesia. In the same period as Indonesia, it was able to nationally expand citizens' access to improved water sources by 28%. As the graph illustrates, the slopes of the coverage expansion over time is steeper than Indonesia. Before getting to the question on why the two countries' performances are so different, we first need to articulate and elaborate on the key factors propelling Vietnam's coverage expansion.

To better grasp the details of the critical factors in water supply expansion between 1990 and 2010, a couple of unique local conditions needs to kept in mind. First, it is the 1986 Economic Reform of Vietnam, more commonly known in the country as "Do Moi". The most significant consequence of Do Moi is the growth of the market and decentralization. It also opened doors to foreign investment in the country. Shortly after in 1993, the foreign aid embargo was lifted on Vietnam. As a result, World Bank and the Asian Development Bank resumed lending. Both are critical extraneous factors as they help explain subsequent water supply policies.

In Vietnam's longitudinal change in coverage expansion, it should be noted that the rapid increase is driven by coverage improvements in the rural population. Sector professionals assured me that this was the case. More specifically, it was due to the series of policies aimed at expanding rural water supply coverage. It started prior to 1990. There was an UNICEF program on wells and hand-pumps that started around late 1980s. It continued onwards until a 20-year rural water strategy was devised and drafted with the support from DANIDA in 1997. The 20-year rural water strategy became the blueprint

on how rural water coverage will be tackled in the country. The National Target Program (NTP) was the physical and financial realization of the strategy. Or in other words, it encapsulated implementation of the strategy. The NTP was designed with the Ministry of Agriculture and Rural Development, Ministry of Health, and Ministry of Education and Training as its implementing bodies. MARD would take the leading role, as they received the greatest amount within the program. The Prime Minister set a target. He proclaimed that 80% of rural population should have access to clean water by 2005. The program was allocated a capital budget of USD$271 million.

NTP I lasted 5 years between 2000 and 2005. NTP II followed and lasted until 2010. Lot of changed were coupled with NTP II. The National Center for Rural Water Supply and Sanitation (NCERWASS) was created to provide technical assistance to the projects. Rural Water Supply and Sanitation Partnership (RWSSP) was created to inform and match foreign donors with projects seeking funding. Both entities were to buttress the NTP Standing Office in charge of overseeing the executing of the program. NTP II was equipped with new regulations to clarify quality standards and coordination procedures of involved parties.

The main factor in NTP's success has been attributed to the coordinated and concerted voice of donors and the setup of the one-stop shop in the Vietnam Government. NTP relied on foreign capital for its execution. Yet, the donors were adamant certain changes needed to take place to improve implementation before pooling their resources to the NTP program. This negotiation process coupled with donor field visits resulted in a largely modified program as NTP I transitioned to NTP II.

As for the growth in urban populations access to piped water onto premises, it was attributed to the solid performance of the state-owned-enterprise utilities. The urban utilities expanded their network and coverage during the 20-year period. The utilities were of good financial standing and were operating autonomously. Hence, additional investments required by the utilities were directly requested to the Ministry of Planning and Investment. When asked about the Ministry of Construction's supervisory role over the utilities, it was noted that the Ministry had little control over the utilities once the capital assets were constructed. It was also deemed unnecessary as these utilities internalized sufficient technical capacity and did not face financial difficulty. Ministry of Construction's smaller role was also in result of decentralization following Do Moi where the local People's Provincial Council then became the authorizing entity.

The main financial challenge facing urban utilities were of securing large sums of investment for expansion. Ministry of Planning and Investment supplied these loans along with establishing tariff guidelines to improve the financial sustainability of these utilities. Ministry of Finance and Investment assumed the primary role in Vietnam's urban water supply and this is clearly indicated in Decree 117/2007/ND-CP issued by the Government on treated water production, supply and consumption.[49]

The weakening of the Ministry of Construction role following Do Moi was perpetuated by the evolving political-economic landscape in Vietnam. Following Do Moi, Vietnam was on its path to attracting significant foreign direct investments (FDI).

[49] The 2007 Decree synthesized the many legal documents developed on technical infrastructure following the 2003 Construction Law.

Provinces that were able to attract large FDIs were granted greater autonomy in their local government decision-making. The Communist Party of Vietnam permitted this because those provinces contributed greater to the Vietnam central government treasury for redistribution into the poorer provinces (Jandl, 2014). That is, the governors who were successful in attracting FDI and promoting peaceful economic growth in their province were granted greater authority to make decision concerning their province.

The strength of Governors vis-à-vis Ministers were verified on two occasions through two different interviews. One specialist mentioned that is the case, as the Governors rank higher within the party system than ministers. Another specialist verified

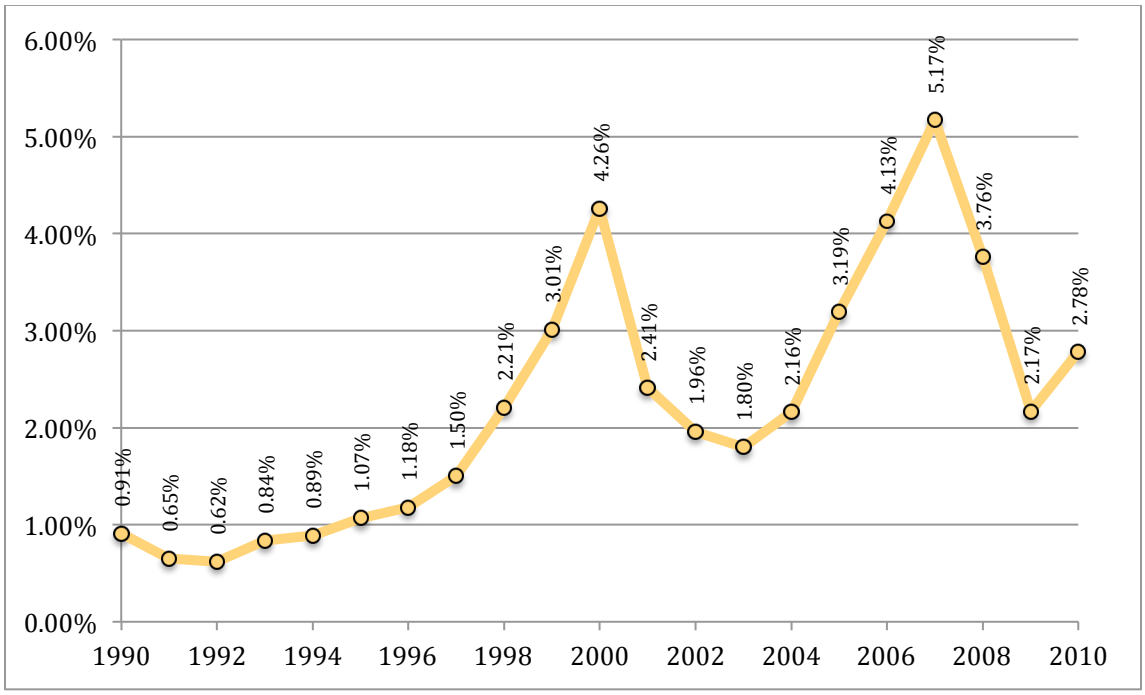


Figure 15: Foreign Direct Investment, net inflows (% of GDP)
Source: World Bank. (2015). *World Development Indicators.* Washington, DC: World Bank.

Table 7: Net Contributors to the Central Budget

Province	Region	% of revenue retained in province	% of revenue transferred to central treasury
Ho Chi Minh City	Southeast	26%	74%
Ha Noi	Red River Delta	31%	69%
Binh Duong	Southeast	40%	60%
Dong Nai	Southeast	45%	55%
Ba Ria-Vung Tau	Southeast	46%	54%
Khanh Hoa	South Central Coast	53%	47%
Vinh Phuc	Red River Delta	67%	33%
Quang Ninh	Northeast	76%	24%
Da Nang	South Central Coast	90%	10%
Hai Phong	Red River Delta	90%	10%
Can Tho	Mekong River Delta	96%	4%

Note: The table is reproduced from Jandl, Thomas. (2014). "State versus State: The Principal-Agent Problem in Vietnam's Decentralizing Economic Reforms". In Jonathan D. London (Ed), *Politics in Contemporary Vietnam: Party, State, and Authority Relations*. New York: Palgrave Macmillan, p. 64-83. The source has been updated with details upon verification.
Source: Ministry of Finance. (2008). *Final Accounts of Local Budgets FY 2008*. Ha Noi, Vietnam: Ministry of Finance.

the Governors of provinces generating surpluses are at greater liberty in making decisions over infrastructure investment. The reason why this is relevant to the explanation is that it describes the uninterrupted increase in urban coverage via pipe networks. Investments were proactively made by the provincial governments in order establish the infrastructure to further attract FDI.

In summary, the factors that enabled Vietnam to accelerate and maintain their momentum in expanding safe drinking water coverage are 1) a dedicated rural water supply program that was continuously improved through foreign technical assistance and proactive evolution of domestic institutions, 2) prioritization of urban infrastructure

development by governors with technical capable and financial astute state-owned enterprises, and 3) the systematic change brought by domestic reforms that catalyzed the absorption of foreign interventions via legal administrative developments, and 4) a redistributive policy maintained by the Communist Party that was ideologically driven by focusing on poverty eradication.

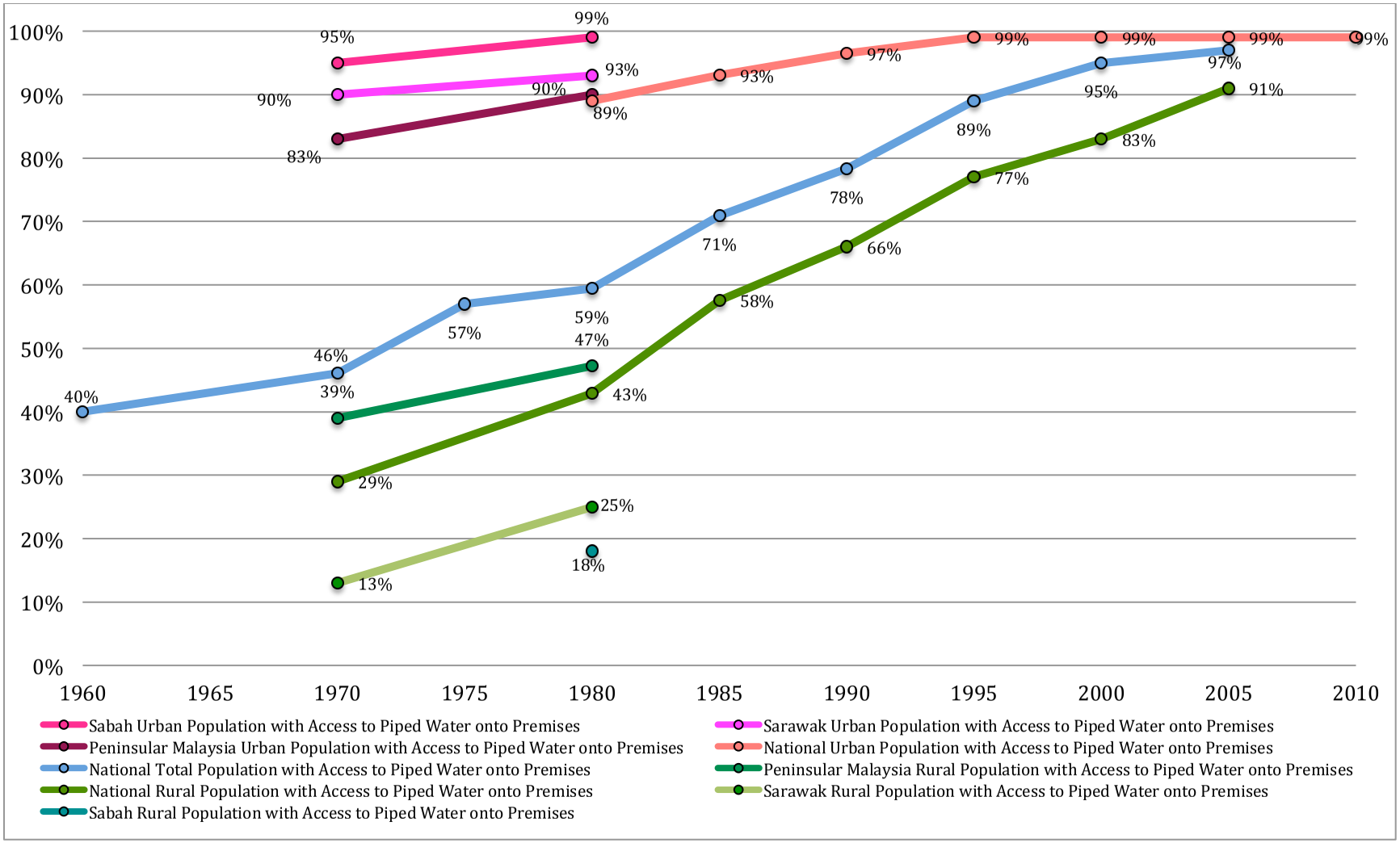


Figure 16: Malaysia's Longitudinal Changes to Provision of Piped Water

Sources: 5-Year Development Plans of Malaysia dating back to 1955 and up to 2010. This includes the 1st and 2nd Malaya Development Plan and 1st to 7th Malaysia Development Plans. All published by the Malaysia Government.

Malaysia

Malaysia is the first of the three countries where the entire process towards universal access to improved drinking water sources was traced and its causes examined. Given the high provision rates of safe drinking water already by 1990, pre-1990 data was collected. The evidence examined colonial data and post-independence data. From what was collected, the following explanations emerged.

Water supply development meeting a certain quality standards was well-recognized early on as archival records dating back to the 1950s show Town Boards assuming the responsibility of enforcing these standards. The draft 5-Year Development Plan covering 1950 to 1955 included construction of 60 water schemes. Public sector involvement in water provision continued as the idea of State Water Boards being independent and financially self-supporting is floated in 1955. At the same time, water supply development was the second highest priority in national development within the 1st Malaysia Development Plan covering the period 1955 to 1960. Plans for 111 rural water supply schemes were included in the 1960 Plan. The 2nd Malaya Development Plan dedicated $174.9 million for the Malay Peninsula. This figure is 2 times larger than the allocation to water supply systems under the 1st Malaya Development Plan. The 2nd Malaya Development Plan included 159 additional rural water supply schemes to be built during this period with $49 million allocation. It was to increase the piped water coverage beyond 40%, which was the coverage in 1960. Production capacity at the time was at 100 million gallons per day of treated water.

During the 2nd Malaya Development Plan period, the National Development Planning Committee (NDPC) and its secretariat the Economic Planning Unit (EPU) was setup to identify cause of delay and difficulties in implementation and to propose solutions. The staffs of these entities lacked technical capacity and thus, their technical capacity was strengthened through overseas post-graduate studies, mentoring by advisors from the UN, the Columbo Plan, Ford Foundation, and the World Bank. The two were pivotal institutions in executing policy and respectively so setup in the Prime Minister's Office. The Chairman of NDPC served as the head of the Civil Service.

NDPC works closely with the Treasury Economic Division, Department of Statistics, Economic Research Department in Malaysia's Central Bank, Planning & Research Division in the Ministry of Agriculture and Cooperatives, and Planning & Research Division in the Ministry of Education. The Planning & Research Division of the Ministry of Health and Ministry of Transportation are included in this committee from 1970.

NDPC is particularly important to the explanation, as detailed considerations of many policy problems are NDPC's special responsibility. NDPC and EPU help state government and local authorities to improve planning and implementation procedures through short-term assignments of federal officers to the states. NDPC also conducts field tours to visit projects and resolve development problems.

Within NDPC, there is the Development Estimate Sub-committee and the Standards & Costs Sub-committee. The former is responsible screening estimates and the later is responsible for developing standard plans and utilizing locally sourced

materials. These two sub-committees' function was integrated to the general objective of developing sufficient portfolio of projects that is properly studied to facilitate securing of foreign assistance.

In addition to the NDPC and EPU, a National Operations Room was established by 1965. It was organizationally located within the Deputy Prime Minister's Office and displayed progress on public development program arranged by state and district. This arrangement was mimicked at both the provincial and district level with Rural Development Committees and State Operating Rooms along with District Rural Development Committees and District Operating Rooms. The Deputy Prime Minister who oversaw the National Operations Room would visit the provincial and district offices to check progress. The arrangement was intended to expand information control and facilitate decision-making for development.

1965 was a time of change for Malaysia as a whole because the eastern provinces of Sarawak and Sabah decided to join the Peninsula Malaya provinces to form the Federation of Malaysia. $202.0 million was budgeted for water supply systems in the 1st Malaysia Development Plan. It included the completion of 40 new treatment plants that increased production capacity by 48 million gallons per day and to service an additional 1.15 million people. Also, all small schemes in the rural areas were entirely financed by domestic funds. This was to prevent any delay from expanding coverage in the rural area. In 1996, a pilot project to provide safe piped water in sufficient quantity at a low cost was developed by the Medical and Public Health Department with the assistance of WHO&UNICEF.

During the 2nd Malaysia Development Plan covering 1970 to 1975, spending on water increased 21.5% from the previous plan. External finance from ADB and IBRD were tapped. The Durian Tunggal scheme for Malacca received a $15 million from ADB whereby British Special Aid covered the cost of design and supervision. $21.6 million for the Sungel Muda project to supply provinces Wellesley and Penang was financed by ADB. $10.8 million from IBRD was loaned to the Sungei Langat scheme to supply water to Kuala Lumpur. A total of 204 water supply systems were in West Malaysia and 4.5 million people were using piped water.

In the rural areas, a systematic investigation into possibilities of using groundwater sources was explored. This was to see whether these source developments would be more economic for small rural communities. Small schemes were being continuously provided in the rural areas. The rural expansion covered isolated communities and new land development schemes.

The 2nd Malaysia Development Plan period was a time of public administrative reforms. This was because capacity was being attenuated over time with expansion of government projects. It was identified that there was a problem of acute shortage of senior and experienced staff required for implementing the project and for the operation and maintenance of treatment plants. Therefore, on the administration side, public service recruitment procedures were streamlined along with engaging in early recruitment and placement of local personnel. The private sector capacity was utilized for design and supervision of reoccurring projects. Overseas personnel were recruited when necessary.

National Committee for Development Administration was setup during the 2nd Malaysia Development Plan. It worked the Development Administration Unit (DAU), which serviced as the Division to provide advice and guidance for administrative improvements in the major sectors of the economy. Furthermore, Training and Career Development Division was established within the Public Services Department (PSD). External help was sought as well on capacity. The UNDP/SF project took place during this time to train and enhance data processing capacity for the Department of Statistics. The latter would be responsible for analyzing the National Manpower Survey conducted in 1973.

At the most senior level, monthly briefings were reactivated with the Prime Minister, Ministers, NDPC, Secretary-General of Ministries, and Heads of Department at the National Operations Room. Treasury, EPU, DAU, PSD, and Department of National Unity (DAU) conducted the budget reviews.[50] Programming and performance budgeting was adopted. However, it was also recognized that a large corps of accounting officers needed to be recruited. The Government Staff Training Center expands to the National Institute for Development Administration. The Institute is responsible for professional training and research into administrative problems.

The National Institute of Public Administration (INTAN) was strengthened during the 2nd Malaysia Development Plan. INTAN provided management consultancy services and management audits were applied to Government operations. It also was

[50] DAU was responsible for reviewing expenditures in considerations of the social objectives of the country.

responsible for developing courses focused on implementation and coordination. The Institute was responsible for carrying out education programs to better align the civil service with central government objectives.

This was a time of active integration of knowledge centers. University cooperation was promoted. EPU gets a new Implementation Division dedicated to monitoring. General Planning Unit (GPU) is setup and develops the National Integrated Data System. The GPU and DAU jointly were dedicated to problem-solving and removing bottlenecks. The DAU is later absorbed into the Implementation Coordination and Development Administration Unit in 1971. These developments are significant, as the research conducted by these entities are graphed into the 3rd Malaysia Development Plan.

Financial management of water supply systems evolved as well. The State of Selangor setup the Water Supply Division within the Public Works Department (PWD) to install and oversee separate financial and accounting system. State Government contributes in financing the expansion of water network to adjoining rural areas. Other provinces follow this model. In necessary circumstances the private sector was utilized to prepare financial reports and assess operating efficiency.

During the mid-term review of the 2nd Malaysia Development Plan, the budget is revised. The budget allocation for water projects in Sarawak is increased by 2.5 times and 2 times in Sabah for the remaining 1973 to 1975 period. By 1973 6 million people in West Malaysia had access to piped water.

The 3rd Malaysia Development Plan continued its investment in water. Expansion of water supplies to poverty and new regional development areas were assigned high priority in order to provide social amenities and to prove the health and quality of life for the rural poor. Also, the expansion of water supplies will provide the necessary infrastructure for further development of towns and their surrounding areas. Johor Muar Phase I, Penang Sungai Muda Phase II, Kuala Lumpur Phase III, and Johor Segamat, Johor Labis urban water supply project were implemented during this period. $70.4 million was dedicated to the Federal Land Development Authority Program during this period.[51] $100 million was dedicated for rural water supplies during this period. In 1988, the financing policy of rural water supply projects was modified in order to accelerate progress. The federal government bears the total capital costs of the project in deficit States of Kedah, Kelantan, Melaka, Perlis, and Trengganu and 2/3 of the costs in other States including Sabah and Sarawak.

Administratively, federal EPU offices were setup in the provinces to help State Planning Units (SPUs) in identification and preparation of projects for external financing. Regional authorities continued to expand. South Kelatan Development Authority and Bintulu Development Authority in Sarawak were created in 1978. They added to the existing Jengka Authority, Pahang Tenggara Authority, Johore Tenggara Authority, and

[51] The Federal Land Development Authority program refers to the plantation estates developed from clearing of jungle land. The estates are part of a poverty alleviation program where the poor will be allotted a land to work and eventually purchase the land. It was a federal program whereby the federal government purchased and cleared land for crops. Houses equipped with water and sanitation was built to increase desirability of voluntary migration to these estates. At the end of 1980, 97% households in rubber estates and 99% households in oil palm estates had access to free piped water.

Trengganu Tengah Authority. All authorities were staffed by both Federal and State Government representatives. However, capacity at the provincial level was weak. In 1978, UNDP and the World Bank executed the State and Rural Development Project due to weak capacity in the State Economic Planning Unit. Australia and New Zealand helped Melaka Trengganu in identification, preparation, and implementation. In light of these circumstances, Federal Revenue Grant for project development was increased. Standardization of project identification and submission format was developed. In the process, it was made sure the review included operating expenses and manpower resources.

In 1977, Malaysian Administrative Modernization and Manpower Planning Unit (MAMPU) was setup the Prime Minister's Department. It was responsible for management auditing to assess operating efficiency. In absence of capacity, foreign consultants were still be relied on. However, when foreign consultants were employed, they were urged to be partner and hire local firms.

In 1976, the Local Government Act was passed. It emphasized that the local authorities are responsible for preserving and protecting public health in their areas. Following, in 1978, new PWD was setup in Ministry of Health and Ministry of Home Affairs for preparation of plans and engineering designs. The Government was also then encouraged to purchase land in advance. At the end of 1980, Population and Housing Census was carried out. The census is relevant as its data is utilized to design housing policies during the 4th Malaysia Development Plan.

The 4th Malaysia Development Plan is marked by rapid increase in both urban and rural water supply coverage. In the urban areas, along with on-going developments on water supply systems, the housing sector received help from the federal government. The federal government provided a 4% loan to the States for low-income housing development. Commercial banks and finance companies were directed to allocate a minimum 10% to housing in 1981 and 20% in 1982. Homeownership was being promoted through the Special Housing Loan Scheme.

In the rural areas, the Village Rehabilitation Program was launched. It supplied material assistance in value of up to $1,000 per household. The materials were to be used in conjunction with collective self-help. It was devised to promoted integration of Organ Asli by upgrading basic facilities such as water. Through the program, the metric of poverty was better defined. In Malaysia, poverty is not narrowed defined as household income because it does not take into account public serviced by the Government, such as clinics, water, and subsidies. Rather poverty alleviation strategy rests on the provision of basic services.

In terms of implementation, the 4th Malaysia Development Plan was a time of consolidation and integration. Water Supply Departments were established in each State. Previously, water supply system development and management was delegated to a mosaic of entities such as the Water Board, Water Department, and Public Works Department. Furthermore, a push for adopting commercial accounting systems was in place. To assist in project development, the Integrated Project Monitoring System was launched to share and integrate all requirements to project development. Data was

gathered and shared on 19,000 public projects. Other information systems were adopted at this time, such as the Management Information System for chief executives and Public Enterprises Management and Evaluation System. On the legal front, amendments to the National Land Code and the Land Acquisition Act took place to the expedite land acquisition for project implementation.

A framework for efficient and productive public sector was promoted in the Government. It was applied to all facets of Government. The combined result of these factors resulted in 70.9% of the total population gaining access to piped water through 4,162 million gallons per day water treatment production capacity. Coverage among the urban population was higher with 93.1% having access to piped water services by the end of 1985. In the rural areas, 57.6% of the population had access to piped water services. This is a figure that is still significantly higher than the 1990 figures in Indonesia and Vietnam.

At the end of 1985, the growth of the public service was curbed. Public Private Partnerships of Build-Operate-Transfer was being tested in the water sector. For large utilities, unaccounted for water (UAW) studies were conducted. It was shown that UAW was 43% on average. Meter under registration and systemic losses was identified causes. It also pushed to upgrade and rehabilitate old structure rather than building new. Work on reducing UAW was launched during the 5th Malaysia Development Plan.

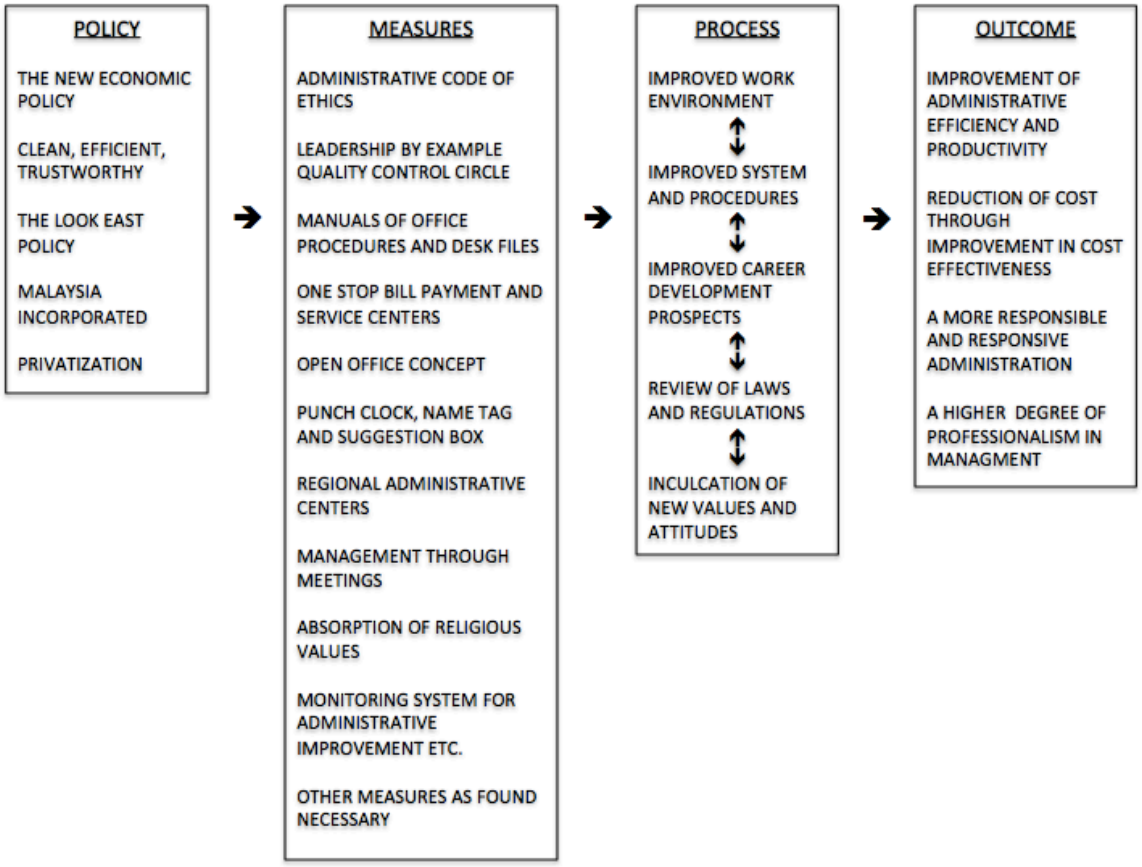


Figure 17: 4th Malaysia Development Plan (1980-1985) Administrative Measures
Source: Federation of Malaysia. (1980). *4th Malaysia Development Plan*. Kuala Lumpur, Malaysia: Federation of Malaysia.

In the rural areas, alternative sources were explored. A complementary Special Rural Water Supply Program was carried out alongside the normal rural water supply scheme developments. The latter involved installation of reticulation systems to distribute water from newly completed source works. Other sources such as groundwater and rainwater sources were exploited.

The 6th Malaysia Development Plan starting in 1990 was a time of increasing efficiency. UAW was reduced to 38%. Evolved computerized systems were adopted. A

computerized scheduling system that monitors physical progress in addition to financial monitoring was adopted. Affordability and willingness to pay is more carefully examined as cost recovery and tariff structure are considered. Implementation of commercial accounting systems was reviewed with emphasis on increasing efficiency in revenue collection for long-term financial viability. In 1994, Johor State Water Department became the first state water authority to be corporatized in the country; a demonstration of the privatization movement.

Post-1995 are times where water scarcity is an issue. National Water Council created in 1995 to resolve legal, institutional, and financial issues in order to improve and coordinate river basin development management on a national basis. To further address, the water scarcity issue, UAW is further reduced to 28% by the end of 2000. Although figures are available after 2000, the analysis stops at 2000, as the steep slope to expanding access is more relevant to our research inquiry.

In summary, multiple crucial factors emerge as drivers in Malaysia's continuous expansion in piped water services. Foremost and most conspicuous is the clear commitment to develop water supply systems as demonstrated in the Development Plans. Budgets were allocated and process closely monitored. However, for large projects, project preparation was done with attracting foreign capital, particularly of the development banks. On top of the transparency in commitment, active public administration reform in improving implementation took place. These manifested differently over time but they focused on identifying the problem and coordinating among relevant actors to resolve the problem. Coordination was centralized and

responsive to the most senior level civil servant. Institutions were setup to build capacity with a long-term vision.

As for continuously growth in the rural piped water coverage, it is attributed to the dedicated commitment to extending government services to the remote areas. This is driven by framing poverty alleviation to not only focus on improving incomes but also in improving coverage of public services. The commitment to expanding rural coverage is further demonstrated by funding rural water supply system entirely with domestic funds. And later by providing material in the form of grant in unreached areas. Federal Land Development Authority projects immediately helped move the rural poor to estates with water. Hence, these federal projects further expanded safe drinking coverage in the rural areas.

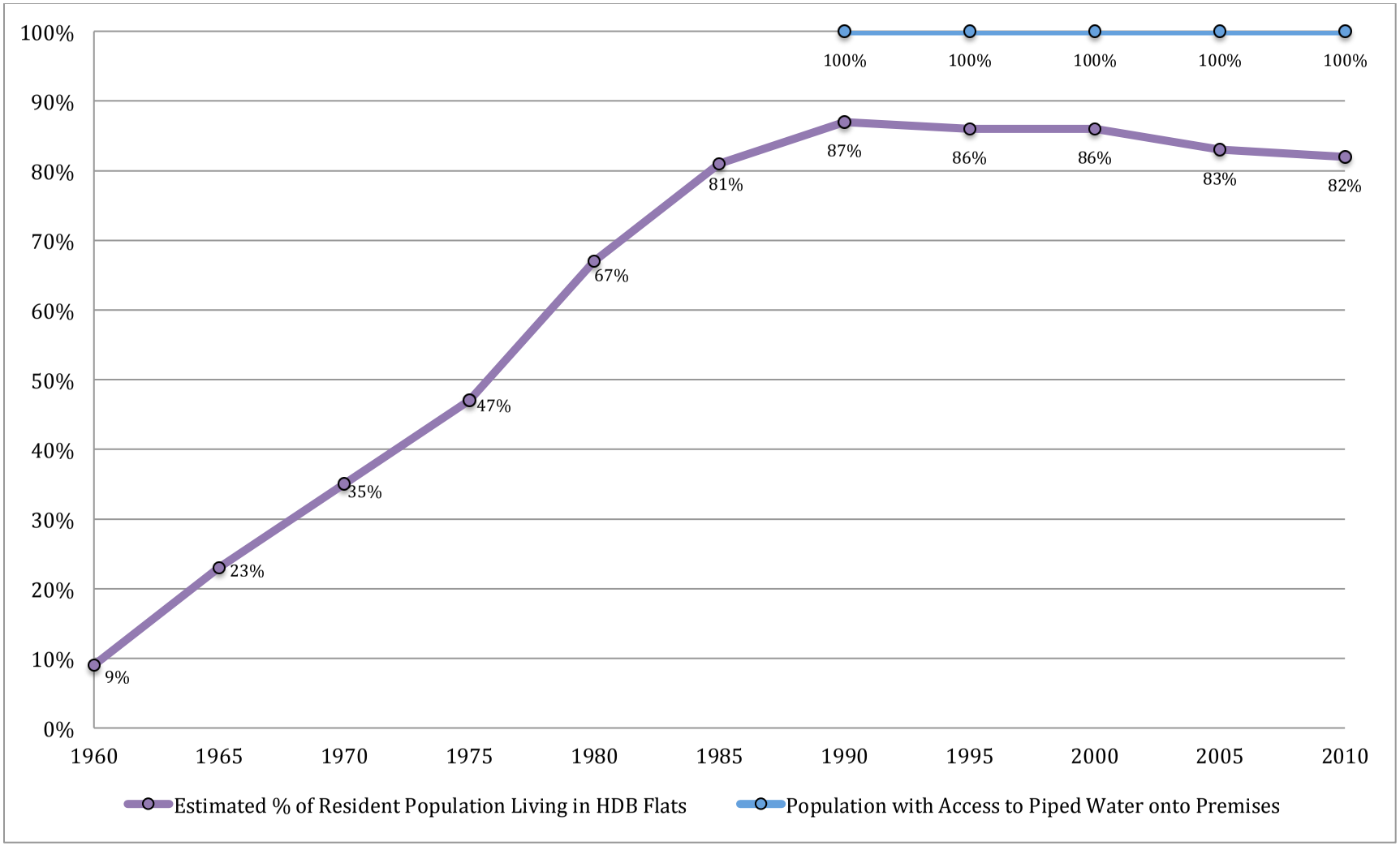


Figure 18: Singapore's Longitudinal Changes in Access to Improved Water Sources
Source: Housing & Development Board. (2014). *HDB Annual Report 2013/2014.* Singapore: Housing & Development Board.

Singapore

Singapore reached universal access to improved water sources by 1990. Hence, pre-1990 events that were responsible for expansion in coverage were asked during interviews and archival documents. Upon examining the various sources, certain critical drivers behind the expansion in coverage were identified. Multiple enabling factors were at play in Singapore. Most important circumstantial factor is Singapore precarious situation on water resources. That is, at the time of separation from Malaysia, Singapore did not have the water resource infrastructure to supply enough water to its citizens. Water had to be transported from Johor of Malaysia.

Singapore's precarious situation with water resources was well recognized by Prime Minister Lee Kwan Yew. More so since the British in Singapore surrendered to the Japanese as direct result of the Japanese cutting off the water supply to the island. Prime Minister Lee Kwan Yew prioritized water resource development throughout his career as Singapore continued to rely on Malaysia for its water supply and also the water supply agreement between Malaysia and Singapore had an expiration date. Furthermore, Singapore's dependency on Malaysia for its water supply was frequently reminded by the leadership in Malaysia with its threats to cut it off in times of discord between the two countries.

Building reservoirs increased water resources in the country. Reservoirs were seen as a solution since Singapore received ample rainfall. At the time of independence, Singapore did not have infrastructure to retain all the rain. Although water resource development is a crucial part of the explanation in expanded coverage of safe drinking

water, it is not all the explanation. This is because increase in water resources does not directly translate to safe drinking water provision.

Singapore's expansion in safe drinking water coverage is better attributed to expansion in public housing. As the graph shows, the percentage of people living in public housing in Singapore is particularly high. This did not come by chance but was result of deliberate policy. Although independent safe drinking water access is not available prior to 1990, it is safe to assume the public housing residence figures mirror the accelerated path in which Singaporean citizens acquired safe drinking water. This is because all public housing was equipped with piped water.

The question then becomes reframed to how Singapore was able to rapidly increase public housing provision. Singapore did this first disbanding the previous housing agency, the Singapore Improvement Trust, and replacing it with the Housing Development Board (HDB) in 1960. Lim Kim San was appointed the first Chairman and started his work firing everyone that was not competent. HDB then developed their own building course to rapidly fill the human resource shortage. HDB was able to operate with a bit of leeway and not follow strictly to Building Ordinance procedures that would cause delay in construction. This was permitted because constructing low-income housing was the upmost priority at the time. More so, since the Bukit Ho Swee Fire in 1961 left close to 16,000 on the streets overnight. HDB received the full backing of the People's Action Party (PAP) and its leader, Prime Minister Lee Kwan Yew. The Prime Minister actually ran campaigns promising the rapid construction of affordable public housing.

Rapid construction of public housing biggest threat was rise in material costs. Suppliers could easily hike up the price during a time of scarcity. Lim Kim San threatened the suppliers that if the prices go up, HDB will directly intervene and produce the materials. This threat was put in play as HDB opened up granite quarries and sand quarries to stabilize price. Upon verification that HDB will carry out its threat, the private sector suppliers stabilized their price. In return, HDB expedited payments to contractors to make sure HDB was not a source of delay in construction. Lim Kim San would personally tour the construct cites and point out irregularities to be addressed. All housing at the time was built with water, electricity, and modern sanitation.

Constructing public housing is ineffective in moving people better environment health, if people choose not to move to public housing. This was tackled by lowering the cost of home ownership. Homeownership financing programs were put in place where people would pay less than 20% of their income to purchase a house and within 5 miles of their work area. This became a reality in 1964 with the "Home ownership for the People" scheme and as a result people chose to move to the public houses. The estates were maintained by staffing Housing and Maintenance Inspectors and Estate Officers. These would public servant who would inform the new residents on inculcating amiable community living behaviors. This sustained demand for HDB units.

In 1963, the Public Utilities Board was established under the Prime Minister's Office. It was responsible for servicing electricity and water. In the same year, Lim Kim San, the previous Chairman of HDB, became the National Development Minister. He calls the Public Works Department under the Ministry of National Development once a

week to follow-up on progress. During his tenure, a coordinating body is setup to bring together various statutory boards so that roads would not be dug up and close repeatedly. It was to make sure water pipes and drainage pipes are installed at once.

The role of the Government in expanding access to safe drinking water was further strengthened with the Land Acquisition Act in 1966. It enabled the government to acquire compulsorily land of private and commercial use in the case of public interest. The state would determine payment of compensation. In the case of acquiring squatter land, the squatter were given HDB allocation. This Act permitted the state to increase its ownership from 44% to 85% in the future.

Singapore continues the formula of moving people into improved housing to expand coverage of safe drinking water. There are more technical developments in Singapore's water sector that come later. However, it is less related to expansion in coverage but more related to reducing dependency on Malaysia for its water. That is, the process in which water is supplied evolves over time but for the end-user it does not alter their status of having access to safe drinking water.

In summary, Singapore's path to universal access to safe drinking water is best explained by following the developments associated with expanded housing coverage in the city-state. Singapore's case study is relatively simpler because it does not have a rural population and a much smaller geographical boundary relative to the other case study countries. However, the usefulness in Singapore's case study is in its clarity on how access to safe drinking water could be expanded rapidly in urban areas.

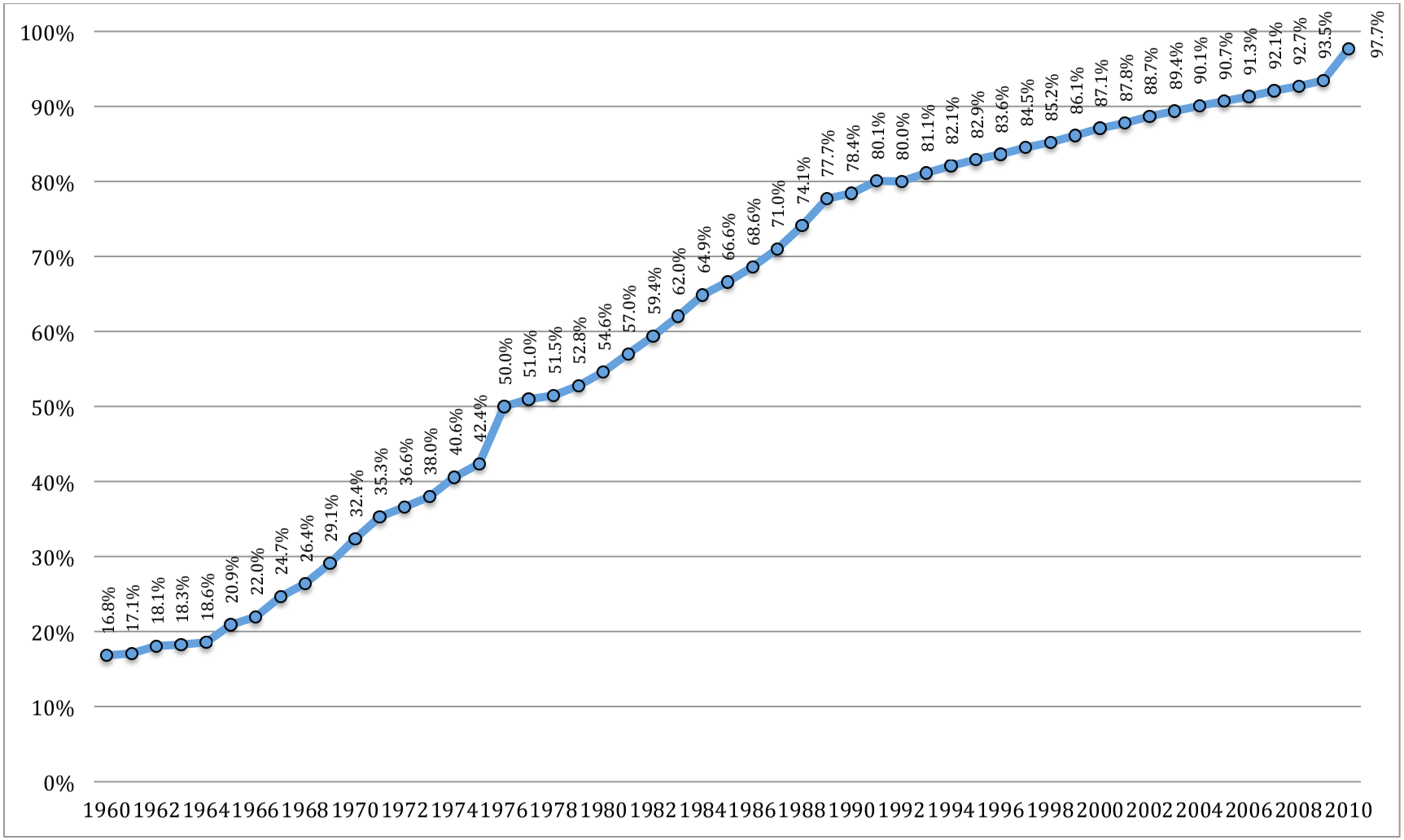


Figure 19: South Korea's Longitudinal Changes in Access to Piped Water

Source: Ministry of Environment. (2008). 생활에서 생명까지 맑은 물로 지켜온 100 년: 한국상수도 백년사 지방광역상수도편. 서울, 대한민국: 환경부, p. 282.

South Korea

South Korea registered 97.7% coverage of piped water services in the country in 2010. This figure includes both urban and rural populations. Thus, the question once again is how South Korea was able to achieve this feat within half a decade. In the case of South Korea, the country invested early in developing and expanding water treatment facilities in the urban areas. Seoul's 1st Facility Modification and Expansion Plan was executed between 1961 and 1963. Pusan launched its 1st Water Supply Expansion Project in 1960. Daegu engaged in its 1st Water Source Expansion Project in 1959. Investments in water supply facilities were executed early with external aid. United States aid was a key resource along with the Japanese War Reparations Fund.

Due to external source engagements, project preparations were led by the central government. The central government was actively engaged in establishing the legal foundations in the early 1960s. Water supply ordinance regulations were engaged in 1962. With this legislation, the Minister of Interior approved cities' and provinces' water ordinances instead of respective Mayors and Governors. Central government role at the helm of infrastructure development in the country was further solidified with the National Land Plan Basic Design. It was a 20-year long-term plan on land development and utilization in Korea for years 1966 to 1986.

To execute the 20-year land development plan, various laws were passed. These included the Land Accommodation Law, City Planning Law, Architecture Law, National Land Construction Overall Plan Law, Special Multipurpose Dam Law, Regional Industry Development Law, etc. Legal foundations were established to grant central government

authority to execute the long-term visions of the country. For the purpose of our inquiry, another key factor was drafting of the 10-Year Water Resource Overall Development Plan covering the years 1966 to 1976. The 10-Year Plan changed the treatment of water from a free resource to an economic resource. A water budget of established as a result. The state-owned enterprise of Korea Water Corporation was inaugurated in 1967. These early policy and legal foundations help establish direction and sequence in water infrastructure development.

Water supply systems in urban areas were built with a combination of external and domestic funds. This approach was adopted because domestic funds alone were not sufficient in meeting all the infrastructure development demands. Also, projects utilizing external funds were preferred as those projects involved utilizing foreign technical knowledge. They were opportunities for both Korean Government and domestic companies to acquire knowledge and experience on how infrastructure projects should be executed. The technical knowledge partnerships were not only forged on project management but also in material production. US Steel and Kubota of Japan engaged in technical partnerships with Korea's domestic companies for domestic production. The domestic production of water infrastructure materials helped keep the material costs down in the long-run.

The continued expansion of the safe drinking water coverage in the urban areas is attributed to Korean Government's involvement in public housing. The state-owned enterprise Korea Housing Corporation was established in 1962 to cater to the neglected low income housing market. Private sector housing companies were only engaged in

meeting the larger profit generating high-income population's housing needs. This was persistently the case due to the housing shortage. Hence, the Korean Government created the state-owned enterprise and established also the Korea Housing Fund in 1967 to facilitate homeownership. The aim was to rapidly increase the number of available housing in Korea. Water supply systems are integrated with housing as the Water Supply and Sewerage Division is placed within the Urban Housing Bureau within the Ministry of Construction in 1968.

A 10-year Housing Construction Plan is drafted to map out housing projects between 1972 and 1982. The goal was to satisfy 82.8% of urban housing demand and 88.4% of national housing demand by 1982. Subsequently, in 1986, the 6th 5-Year Economic Plan is dedicated to the construction of 2 million houses. The growth in housing supply maintained the momentum in piped water coverage in the urban areas.

In the rural areas, short-term water supply systems were developed with community labor during the New Village Movement and overseen by the Ministry of Health and Social Affairs. These systems are short-term as they are minimal filtration system, often only have a sand-filtration system. They were not meant to be permanent, as these systems are later replaced by water transported from urban treatment plants with production capacity growth. In 10 years of the New Village Movement, potable water supply facilities were constructed in 21,205 villages (Ministry of Interior, 1981). By 1980, 7.8 million people out of a total rural population of 9.5 million people had access to potable water supplies. Thus, 82% coverage was achieved in the rural areas by 1980. The rural village beautification movement sustained growth in coverage in the rural areas.

In summary, South Korea's growth in safe drinking water coverage started sequentially with early establishment of legal foundations. The central government spearheaded the effort in infrastructure development, as external resources were sought out. External resources both in finances and technical transfer were sought. Continued investments in production capacity by focusing on reservoir development and treatment plants allowed uninterrupted expansion in coverage. Domestic production of pipes kept the costs down. Government engagement in high density housing helped maintain coverage expansion in the urban areas while preventing the growth of slums due to increased population migration into urban areas.

In the rural areas, a village beautification effort titled the "New Village Movement" served as a catalyst in involving community labor in constructing potable water supply systems. The government was actively involved in promoting the movement, as it was the primary objective of the 3rd 5-Year Economic Development Plan. Water supply coverage was not the primary goal but rather a by-product of rural productivity improvement and improvement of environmental health efforts. However, its success in the expanding coverage of access in improved water sources is self-evident with the number of villages owning potable water supply facilities after 10 years of the movement.

The five case studies have been analyzed by tracing the events associated with longitudinal changes in the dependent variable. They offer glimpses into the mechanism at play behind the longitudinal variation. Commonalities in significant events and developments will be examined in-depth later in the section. However, prior to exploring

them, we first move to how well quantitative analyses reflect the detailed process-tracing analyses of the case studies.

Quantitative Analysis

The quantitative analysis works off the already prepared and accessible World Bank Development Indicators.[52] As a starting point, calculating regression coefficients for all 1418 explanatory variables do not make practical sense.[53] Project management-wise, selecting a limited set of explanatory variables is preferred simply because 1.67 x 10^{3855} regressions[54] would have to be run in order to test the entire universe hypothesized causal pathways designed from the remaining variables minus the outcome variable in the dataset. Not only is this not recommended in the management of time, it is also methodologically unsound since it naively assumes that all development indicators matter in the expansion of safe drinking water; an interesting proposition but a farcical one if pitched to the environmental engineers. Thus, the structural equation model should be built on the existing understanding or starting propositions. In other words, although the dataset is impressive and the collaborative efforts laudatory, testing all permutations both unnecessary and unwise.

The structural equation model that is illustrated in the path analysis diagram should be built on existing knowledge of associations. Based on a rudimentary

[52] The dataset is easily accessible via the web.
[53] The 1418 explanatory variables comes from subtracting the three outcomes variables: percentage of national population with access to improved water sources, percentage of urban population with access to improved water sources, percentage of rural population with access to improved water sources.
[54] This figure was calculated from the permutation calculation of ${}_{1418}P_{1418}$ or 1418!.

understanding of drinking water sciences and its infrastructure, the following 37 independent variables were selected with their respective reasons.[55]

Table 8: Narrowed pool of independent variables used to construct the structural equation model to be tested

	Variable label, Code, and Definition [a]	Reason for its inclusion
1.	*GDP per capita (constant 2000 US$) (Series Code:* NY.GDP.PCAP.CD*):* GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars.	Gross Domestic Product (GDP) the leading indicator of economic productivity of the country since its creation following the Great Depression (Kuznet, 1934).[56] An adjusted, GDP per capita is preferred, as it is indicative of productivity and income per person. Given water service is delivered in exchange for fees, increased productivity and corresponding incomes are expected to translate to increased demand for water use and related water infrastructure.[57]
2.	*Population, total (Series Code:* SP.POP.TOTL*):* Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who	Population figures are included as they serve as the denominator in calculating percentage of the population with access to safe drinking water. Apart from the denominator role, population has a direct impact on demand, as increase in the absolute population

[55] The project started off with a rudimentary understanding of water infrastructure, as it is not the key research topic of political scientists. Thus, the rudimentary understanding was self-taught with reviewing American Water Works Association publications, visits to water treatment plants, courses taken at the World Bank, and reiterative interactions with water infrastructure specialists in both the Asian Development Bank and the World Bank.

[56] Although it has been under criticism for it failure to include other important aspects of development, it is undeniably still the most frequently employed development indicator (Costanza, et al., 2014).

[57] This is a broad yet valid assumption; "broad" because water demand is contingent on multiple factors such as population, economic cycles, technology, weather, climate, price, efficiency and conservation programs, etc. (Billings & Jones, 1996; American Water Works Association, 2000). It is valid because water is treated as a "normal" good where consumption rises with income (Billings & Jones, 1996, p.4).

	are generally considered part of the population of their country of origin. The values shown are midyear estimates.	figures presses for increased investment in water infrastructure. It also has a negative effect, as reduction in population translates to less usage affecting the financial sustainability of the water utility.
3.	*Population in urban agglomerations of more than 1 million (% of population) (Series Code:* EN.URB.MCTY.TL.ZS*):* Population in urban agglomerations of more than one million is the percentage of a country's population living in metropolitan areas that in 2000 had a population of more than one million people.	Hypothetically, more people in urban agglomerations of more than 1 million should make it easier to expand access to safe drinking water. This is because drinking water supply systems operate on the economies of scale where the marginal costs of connecting extra users to an existing water distribution network should decrease.[58]
4.	*Land area (sq. km) (Series Code:* AG.LND.TOTL.K2*):* Land area is a country's total area, excluding area under inland water bodies, national claims to continental shelf, and exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes.	Land area should have an effect on access to safe drinking water. This is because larger land areas make it more costly to develop water supply infrastructure. It means more pipes have to be laid and water towers built when extending service coverage. In remote residential communities, it means new water systems have to be built.
5.	*Renewable internal freshwater resources per capita (cubic meters) (Series Code:* ER.H2O.INTR.PC*):* Renewable internal freshwater resources flows refer to internal renewable resources (internal river flows and groundwater from rainfall) in the country. Renewable internal freshwater resources per capita are calculated using the World Bank's population estimates.	Renewable internal freshwater resources per capita is associated with expansion in access to safe drinking water, as the water supply systems development depend on its availability. Water supply systems are treatment and transportation systems. Thus, it is responsible for creation of water resources, which is done by nature.
6.	*Annual freshwater withdrawals, total*	Annual freshwater withdrawals is

[58] There is a condition to this assumption. It assumes that when water treatment systems are built, its production capacity is a function of both existing and anticipated future demand. That is, there is ample production capacity to satisfactorily service additional new connection without disruption to existing customers. This is relevant as it is only under this condition that economies of scale hold. If additional connections require additional water extraction and treatment systems to be built, effects of economies of scale is suspended.

	(billion cubic meters) (Series Code: ER.H2O.FWTL.K3*):* Annual freshwater withdrawals refer to total water withdrawals, not counting evaporation losses from storage basins. Withdrawals also include water from desalination plants in countries where they are a significant source. Withdrawals can exceed 100 percent of total renewable resources where extraction from nonrenewable aquifers or desalination plants is considerable or where there is significant water reuse. Withdrawals for agriculture and industry are total withdrawals for irrigation and livestock production and for direct industrial use (including withdrawals for cooling thermoelectric plants). Withdrawals for domestic uses include drinking water, municipal use or supply, and use for public services, commercial establishments, and homes. Data are for the most recent year available for 1987-2002.	associated with expanding coverage of safe drinking water, as it directly measures the water supply infrastructure that is being developed in the country. This should be multiplied with the subsequent indicator to calculate the exact amount devoted to residential water supply.
7.	*Annual freshwater withdrawals, domestic (% of total freshwater withdrawal) (Series Code:* ER.H2O.FWDM.ZS*):* Annual freshwater withdrawals refer to total water withdrawals, not counting evaporation losses from storage basins. Withdrawals also include water from desalination plants in countries where they are a significant source. Withdrawals can exceed 100 percent of total renewable resources where extraction from nonrenewable aquifers or desalination plants is considerable or where there is significant water reuse. Withdrawals for domestic uses include drinking water, municipal use or supply, and use for public services, commercial establishments, and homes. Data are for the most recent year available for 1987-	This indicator is directly associated with increase in access to safe drinking water as it measure how much of the water resources in the country are devoted to residential water services. Because this is a percentage figure, it should be used to calculate the absolute figure. This is because a lower percentage in one country does not necessary mean that fewer financial resources are devoted to it relative to other countries. Rather it may be more representative of the agricultural and industrial developments in the country. Given these developments should not undermine expansion in coverage of safe drinking water, using this indicators as it is measured would open up room for misinterpretation.

	2002.	
8.	*Public and Publicly Guaranteed, official creditors (Debt Outstanding and Disbursed, current US$) (Series Code:* DT.DOD.OFFT.CD*):* Public and publicly guaranteed debt from official creditors includes loans from international organizations (multilateral loans) and loans from governments (bilateral loans). Loans from international organization include loans and credits from the World Bank, regional development banks, and other multilateral and intergovernmental agencies. Excluded are loans from funds administered by an international organization on behalf of a single donor government; these are classified as loans from governments. Government loans include loans from governments and their agencies (including central banks), loans from autonomous bodies, and direct loans from official export credit agencies. Data are in current U.S. dollars.	Increased in official credit amounts are expected to be associated with increase in access to safe drinking water. This is because multilateral development institutions such as the World Bank and Asian Development Bank have processed low-cost infrastructure loans to countries working to expand safe drinking water coverage.[59]
9.	*Net official development assistance and official aid (current US$) (Series Code:* DT.ODA.ALLD.CD*):* Net official development assistance (ODA) consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list	Increased amounts of Official Development Assistance and Official Aid should increase access to water sources since they target such impoverished areas of concern. However, not all ODA and aid is targeted for water. Hence, this should be recognized. Furthermore, there is a high likelihood that this indicator overlaps with the "official creditors" indicator. To avoid multicollinearity, independence test should be run with the variable.

[59] There are too many lending documents to cite here. Also, it would be a misrepresentation of the significance of the documents since some had greater impact on the sector than just the lending component. To better capture the reform significance of the documents, the lending documents will be referenced and reviewed within the case studies.

	of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of 10 percent). Net official aid refers to aid flows (net of repayments) from official donors to countries and territories in part II of the DAC list of recipients: more advanced countries of Central and Eastern Europe, the countries of the former Soviet Union, and certain advanced developing countries and territories. Official aid is provided under terms and conditions similar to those for ODA. Part II of the DAC List was abolished in 2005. The collection of data on official aid and other resource flows to Part II countries ended with 2004 data. Data are in current U.S. dollars.	
10.	*Investment in water and sanitation with private participation (current US$) (Series Code:* IE.PPI.WATR.CD*):* Investment in water and sanitation projects with private participation covers infrastructure projects in water and sanitation that have reached financial closure and directly or indirectly serve the public. Movable assets, incinerators, standalone solid waste projects, and small projects are excluded. The types of projects included are operations and management contracts, operations and management contracts with major capital expenditure, greenfield projects (in which a private entity or a public-private joint venture builds and operates a new facility), and divestitures. Investment commitments are the sum of investments in facilities and investments in government assets. Investments in facilities are the resources the project company commits to invest during the contract period	This indicator directly measures the amount of private sector participation in water supply and sanitation. Although there is still ambiguity in the indicator due to different laws on private sector participation in public infrastructure, where certain countries permit a larger investment involvement whereas other countries only limit private sector participation to operation and maintenance contracts of smaller contractual sums (World Bank, 2015), it is anticipated that increase in private participation is associated with increase in more infrastructure being built.

	either in new facilities or in expansion and modernization of existing facilities. Investments in government assets are the resources the project company spends on acquiring government assets such as state-owned enterprises, rights to provide services in a specific area, or the use of specific radio spectrums. Data are in current U.S. dollars.	
11.	*Public and Publicly Guaranteed, commercial banks (Debt Outstanding and Distributed, current US$) (Series Code:* DT.DOD.PCBK.CD*):* Public and publicly guaranteed commercial bank loans from private banks and other private financial institutions. Data are in current U.S. dollars.	This indicator reflects commercial lending activity. While recognizing that not all lending activity are related to water, they are still anticipated to be associated as increased commercial lending activity establishes the system to access necessary commercial loans for service coverage expansion.
12.	*External debt stocks, public and publicly guaranteed (PPG) (DOD, current US$) (Series Code:* DT.DOD.DPPG.CD*):* Public and publicly guaranteed debt comprises long-term external obligations of public debtors, including the national government, political subdivisions (or an agency of either), and autonomous public bodies, and external obligations of private debtors that are guaranteed for repayment by a public entity. Data are in current U.S. dollars.	This indicator is anticipated to be associated because it refers loans taken on by the public sector to achieve public policy goals.
13.	*Foreign direct investment, net (BoP, current US$) (Series Code:* BN.KLT.DINV.CD): Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows total net FDI. In	Foreign investment is expected to result in construction and expansion of water infrastructure. This is based on the assumption that labor-intensive foreign investment operates with an incentive to protect labor. Given poor health is a treat and investing in safe drinking water is a preventive measure, it is expected that labor-intensive foreign investments will expand safe drinking water coverage.

	BPM6, financial account balances are calculated as the change in assets minus the change in liabilities. Net FDI outflows are assets and net FDI inflows are liabilities. Data are in current U.S. dollars.	
14.	*Improved sanitation facilities (% of population with access) (Series Code:* SH.STA.ACSN*):* Access to improved sanitation facilities refers to the percentage of the population using improved sanitation facilities. Improved sanitation facilities are likely to ensure hygienic separation of human excreta from human contact. They include flush/pour flush (to piped sewer system, septic tank, pit latrine), ventilated improved pit (VIP) latrine, pit latrine with slab, and composting toilet.	Increased improved sanitation facilities should increase access to improved water sources since they are complementary infrastructure.
15.	*Number of under-five deaths (Series Code:* SH.DTH.MORT*):* Number of children dying before reaching age five.	This indicator is included under the assumption that high figures will signal a crisis and necessary public policy will be formulated to abate the figures. Although included as a signal of the crisis at hand, this indicator is has to be dealt with caution due to the recursive relationship it has with the "access to safe drinking water" variable.
16.	*Health expenditure, public (% of government expenditure) (Series Code:* SH.CPD.PCAP*):* Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. Data are in current U.S. dollars.	Access to safe drinking is expected to expand as health expenditures increases. This is because health officials are typically responsible for water quality examination and remedial action to illnesses arising from poor drinking water.
17.	Births attended by skilled health staff (% of total) (Series Code:	An increase in the number of health staff is expected to promote awareness of the consequences of poor quality

	SH.STA.BRTC.ZS): Births attended by skilled health staff are the percentage of deliveries attended by personnel trained to give the necessary supervision, care, and advice to women during pregnancy, labor, and the postpartum period; to conduct deliveries on their own; and to care for newborns.	drinking water. This indicator captures the health services coverage and interaction between citizens and health service workers.
18.	*Community health workers (per 1,000 people) (Series Code:* SH.MED.CMHW.P3*):* Community health workers include various types of community health aides, many with country-specific occupational titles such as community health officers, community health-education workers, family health workers, lady health visitors and health extension package workers.	More health workers are expected to increase awareness on the health consequences of unsafe drinking water.
19.	Nurses and midwives (per 1,000 people) (Series Code: SH.MED.NUMW.P3): Nurses and midwives include professional nurses, professional midwives, auxiliary nurses, auxiliary midwives, enrolled nurses, enrolled midwives and other associated personnel, such as dental nurses and primary care nurses.	The inclusion of this indicator is the same reason as other health care workers. An increase in the number of health care workers are expected increase public health awareness. Thus, translating into greater demand for drinking water supply infrastructure development.
20.	Physicians (per 1,000 people) (Series Code: SH.MED.PHYS.ZS): Physicians include generalist and specialist medical practitioners.	The inclusion of this indicator is the same reason as other health care workers. An increase in the number of health care workers are expected increase public health awareness. Thus, translating into greater demand for drinking water supply infrastructure development.
21.	*Researchers in R&D (per million people) (Series Code:* SP.POP.TECH.RD.P6*):* Researchers in R&D are professionals engaged in the conception or creation of new knowledge, products, processes, methods, or systems and in the	Researchers are indirect measures of scientists in the country. If there are more scientists, it is expected that there will be more policies based on scientific research. Given the prevalence of scientific studies backing the health consequences of unsafe drinking water,

	management of the projects concerned. Postgraduate PhD students (ISCED97 level 6) engaged in R&D are included.	I expect more researchers will push for more water infrastructure to be built. Also, more directly, researchers are needed in labs to test water quality.
22.	*Technicians in R&D (per million people) (Series Code:* SP.POP.TECH.RD.P6*):* Technicians in R&D and equivalent staff are people whose main tasks require technical knowledge and experience in engineering, physical and life sciences (technicians), or social sciences and humanities (equivalent staff). They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers.	Technicians are also indirect measures of scientists in the country. If there are more scientists, I expect it to have positive externalities in policy prioritization whereby they would influence the construction of modern facilities, particularly reliable and convenient access to safe drinking water. Also, more directly, technicians are necessary in designing, constructing, operating, and maintaining water supply systems.
23.	*Research and development expenditure (% of GDP) (Series Code:* GB.XPD.RSDV.GD.ZS*):* Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development.	Research and development expenditure is expected to be associated with safe drinking water coverage expansion because a direct result of R&D investment is the increase in the number of laboratories. Labs are of critical importance to water supply systems as they are responsible for performing routine water quality checks. Although not all R&D is for environmental labs, it is still expected to be associated with water supply systems. Particularly, it would be indicative of the quality of water supply systems.
24.	*School enrollment, primary (% gross) (Series Code:* SE.PRM.NENR*):* Net enrollment rate is the ratio of children of official school age who are enrolled in school to the population of the corresponding official school age. Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music.	School enrollment is expected to be associated with access to safe drinking water, as children are expected to be educated on the effects of unsafe drinking water. The increased awareness in children is anticipated to translate to pressure on the parents to demand safe drinking water provision by the local government.

25.	*Primary education, teachers (Series Code: SE.PRM.TCHR):* Primary education teachers include full-time and part-time teachers.	High number of educators is expected to be associated with access to safe drinking, as children are expected to be educated on the effects of unsafe drinking water. The increased awareness in children is anticipated to translate to pressure on the parents to demand safe drinking water provision by the local government.
26.	*Expenditure on education as % of total government expenditure (%) (Series Code:* SE.XPD.TOTL.GB.ZS*):* General government expenditure on education (current, capital, and transfers) is expressed as a percentage of total general government expenditure on all sectors (including health, education, social services, etc.). It includes expenditure funded by transfers from international sources to government. General government usually refers to local, regional and central governments.	Spillover effects from education to safe drinking water provision are anticipated. There is the short-term effect in increasing awareness in safe drinking water but there is also the long-term effect of supplying people with the proper skillsets for safe drinking water provision.
27.	*Access to electricity (% of population) (Series Code:* EG.ELC.ACCS.ZS*):* Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources.	Access to electricity has a direct effect on safe drinking water provision, as electricity is needed to pump water throughout the distribution system for systems that cannot take advantage of gravity in sloping terrains.
28.	*Electric power consumption (kWh per capita) (Series Code:* EG.USE.ELEC.KH.PC*):* Electric power consumption measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants.	Electrical power consumption is a quasi-indicator of modernization in the country. It is anticipated that there will be an upward pressure in investment in safe drinking water infrastructure, as the country is grasped with modernization trends, of which electricity consumption is an indicator.
29.	*Electricity production from hydroelectric sources (% of total) (Series Code:* EG.ELC.HYRO.ZS*):* Sources of electricity refer to the inputs used to generate electricity.	Hydroelectric facilities create reservoirs as a by-product. This is because electricity is generated by the rotation of turbines from siphoning river water through a sleeve within a dam. The

	Hydropower refers to electricity produced by hydroelectric power plants.	dam creates a reservoir. When reservoirs at positioned in a higher elevation areas, water can be more economically transported to water treatment plants.
30.	*Droughts, floods, extreme temperatures (% of population, average 1990-2009) (Series Code:* EN.CLC.MDAT.ZS*):* Droughts, floods and extreme temperatures is the annual average percentage of the population that is affected by natural disasters classified as either droughts, floods, or extreme temperature events. A drought is an extended period of time characterized by a deficiency in a region's water supply that is the result of constantly below average precipitation. A drought can lead to losses to agriculture, affect inland navigation and hydropower plants, and cause a lack of drinking water and famine. A flood is a significant rise of water level in a stream, lake, reservoir or coastal region. Extreme temperature events are either cold waves or heat waves. A cold wave can be both a prolonged period of excessively cold weather and the sudden invasion of very cold air over a large area. Along with frost it can cause damage to agriculture, infrastructure, and property. A heat wave is a prolonged period of excessively hot and sometimes also humid weather relative to normal climate patterns of a certain region. Population affected is the number of people injured, left homeless or requiring immediate assistance during a period of emergency resulting from a natural disaster; it can also include displaced or evacuated people. Average percentage of population affected is calculated by dividing the sum of total affected for the period	This indicator is anticipated to be directly associated with safe drinking water provision. Droughts and floods make it difficult to control the water quality from water supply systems. Hence, those populations exposed to such natural calamities are not likely to demand investment in safe drinking water infrastructure due to its unreliable quality and service delivery. It is anticipated that the local government would also shy away from such investment due to its potential to be a liability without serviceability.

	stated by the sum of the annual population figures for the period stated.	
31.	*CPIA policy and institutions for environmental sustainability rating (1=low to 6=high) (Series Code:* IQ.CPA.ENVR.XQ*):* Policy and institutions for environmental sustainability assess the extent to which environmental policies foster the protection and sustainable use of natural resources and the management of pollution.	This indicator supposedly would capture whether proper regulations are in place and in operation to prevent exhaustion and deterioration of natural resources. This would be relevant for water supply system infrastructure since deteriorating river water quality would make it more difficult to produce water meeting a certain quality with existing water treatment systems.
32.	*CPIA quality of budgetary and financial management rating (1=low to 6=high) (Series Code:* IQ.CPA.FINQ.XQ*):* Quality of budgetary and financial management assesses the extent to which there is a comprehensive and credible budget linked to policy priorities, effective financial management systems, and timely and accurate accounting and fiscal reporting, including timely and audited public accounts.	This is anticipated to be associated with safe drinking water coverage expansion, as this indicator captures policy implementation. That is, if this indicator is high, it means that policy objectives are likely to be achieved since there would be a dedicated budgetary and financial management plan for program execution to meet the objectives.
33.	*CPIA building human resources rating (1=low to 6=high) (Series Code:* IQ.CPA.HRES.XQ): Building human resources assesses the national policies and public and private sector service delivery that affect the access to and quality of health and education services, including prevention and treatment of HIV/AIDS, tuberculosis, and malaria.	This indicator was included because it emphasizes government prioritization on human resources, particularly the health of the country's labor population. Since the unavailability of safe drinking water undermines any health promotion policies, countries with high building human resources ratings is expected to invest well in safe drinking water infrastructure.
34.	*CPIA quality of public administration rating (1=low to 6=high) (Series Code:* IQ.CPA.PADM.XQ*):* Quality of public administration assesses the extent to which civilian central government staff is structured to design and implement government policy and deliver services effectively.	This indicator measures capacity. A necessary component in effective policy implementation. This indicator should dovetail on education expenditure coupled with tenure of staff. That is, if education expenditure includes career training programs and if tenure reflect on-the-job experience. Capacity is necessary precursor to water supply system infrastructure, as it ensures that the proper schemes are being built and

		operated.
35.	*CPIA equity of public resource use rating (1=low to 6=high) (Series Code:* IQ.CPA.PRES.XQ*):* Equity of public resource use assesses the extent to which the pattern of public expenditures and revenue collection affects the poor and is consistent with national poverty reduction priorities.	This indicator is expected to matter for safe drinking water access, as it is unfathomable to describe a country "equitable" when pockets of population do not have access to safe drinking water. "Unfathomable" because it is a basic need, which left unmet results in exposure to illnesses.
36.	CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high) (Series Code: IQ.CPA.TRAN.XQ)*:* Transparency, accountability, and corruption in the public sector assess the extent to which the executive can be held accountable for its use of funds and for the results of its actions by the electorate and by the legislature and judiciary, and the extent to which public employees within the executive are required to account for administrative decisions, use of resources, and results obtained. The three main dimensions assessed here are the accountability of the executive to oversight institutions and of public employees for their performance, access of civil society to information on public affairs, and state capture by narrow vested interests.	This indicator is deemed relevant to expanding access to safe drinking water, as these factors undermine effectiveness in policy implementation.
37.	Overall level of statistical capacity (scale 0 - 100) (Series Code: IQ.SCI.OVRL): The Statistical Capacity Indicator is a composite score assessing the capacity of a country's statistical system. It is based on a diagnostic framework assessing the following areas: methodology; data sources; and periodicity and timeliness. Countries are scored against 25 criteria in these areas, using publicly available information and/or country input. The overall Statistical Capacity score is then	This indicator is relevant to safe drinking water, as better statistics is needed to formulate accurate and effective policies and programs to meet outstanding social issues.

	calculated as a simple average of all three area scores on a scale of 0-100.	

[a] Variable label, Code, and Definition is reproduced from the World Development Indicators.
Source: World Bank. (2016). *2016 World Development Indicators.* Washington, DC: World Bank.

Having reduced the pool of relevant variables, the next step is to examine data availability. When running regressions, we would need to run regressions for variables examining the same period unless specified otherwise for valid reasons. Data availability for the above variables is as follows:

Table 9: Data Availability

	Outcome Variable	Data Availability
	Improved water source (% of population with access) (Series Code: SH.H2O.SAFE.ZS)	Every year from 1990 to 2015 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1990 (171/214) - 1991 (174/214) - 1992 (187/214) - 1993 (182/214) - 1994 (193/214) - 1995 to 1996 (196/214) - 1997 (197/214) - 1998 (199/214) - 2000 to 2001 (200/214) - 2002 to 2006 (198/214) - 2007 (197/214) - 2008 to 2010 (195/214) - 2011 (196/214) - 2012 (194/214) - 2013 to 2014 (191/214) - 2015 (190/214)

	Explanatory Variables	Data Availability
1.	GDP per capita (constant 2000 US$) (Series Code: NY.GDP.PCAP.CD)	Every year from 1966 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 (114/214) - 1967 (117/214) - 1968 to 1969 (119/214) - 1970 (126/214) - 1971 to 1974 (128/214) - 1975 (130/214) - 1976 (131/214) - 1977 (135/214) - 1978 (133/214) - 1979 (135/214) - 1980 (146/214) - 1981 (149/214) - 1982 (150/214) - 1983 (151/214) - 1984 (152/214) - 1985 (155/214) - 1986 (156/214) - 1987 (160/214) - 1988 (162/214) - 1989 (163/214) - 1990 to 1992 (180/214) - 1993 (182/214) - 1994 (184/214) - 1995 (192/214) - 1996 (193/214) - 1997 (192/214) - 1998 (194/214) - 1998 (195/214) - 2000 to 2003 (198/214) - 2004 to 2005 (199/214) - 2006 (200/214) - 2007 (199/214) - 2008 (197/215) - 2009 to 2011 (196/214) - 2012 (194/214) - 2013 (193/214) - 2014 (185/214)
2.	Population, total	Every year from 1966 to 2014 with the

	(Series Code: SP.POP.TOTL)	following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 to 1977 (211/214) - 1977 (212/214) - 1978 to 1989 (211/214) - 1990 to 1991 (213/214) - 1992 to 1994 (212/214) - 1995 to 1997 (213/214) - 1998 to 2014 (214/214)
3.	Population in urban agglomerations of more than 1 million (% of population) (Series Code: EN.URB.MCTY.TL.ZS)	Every year from 1966 to 2014 with following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 to 1977 (113/214) - 1977 (114/214) - 1978 to 1989 (113/214) - 1990 to 1991 (114/214) - 1992 to 1994 (113/214) - 1995 to 2015 (114/214)[60]
4.	Land area (sq. km) (Series Code: AG.LND.TOTL.K2)	Every year from 1966 to 2015 with following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 to 1976 (207/214) - 1977 (208/214) - 1978 to 1990 (207/214) - 1991 to 1999 (211/214) - 2000 to 2014 (213/214) - 2015 (207/214)
5.	Renewable internal freshwater resources per capita (cubic meters) (Series Code: ER.H2O.INTR.PC)	Observations only available in the following years with number of country cases in brackets: - 1967 (151/214) - 1972 (151/214) - 1977 (151/214) - 1982 (151/214) - 1987 (151/214) - 1992 (173/214) - 1997 (178/214)

[60] Strangely the dataset had the 2015 figures for this indicator while the 2015 figures for total population was not available.

		- 2002 (180/214) - 2007 (181/214) - 2012 (181/214) - 2014 (181/214)
6.	Annual freshwater withdrawals, total (billion cubic meters) (Series Code: ER.H2O.FWTL.K3)	Observations only available in the following years with number of country cases in brackets: - 1967 (1/214) - 1972 (7/214) - 1977 (20/214) - 1982 (36/214) - 1987 (62/214) - 1992 (60/214) - 1997 (71/214) - 2002 (129/214) - 2007 (108/214) - 2012 (63/214) - 2014 (176/214)
7.	Annual freshwater withdrawals, domestic (% of total freshwater withdrawal) (Series Code: ER.H2O.FWDM.ZS)	Observations only available in the following years with number of country cases in brackets: - 1967 (1/214) - 1972 (6/214) - 1977 (11/214) - 1982 (16/214) - 1987 (43/214) - 1992 (54/214) - 1997 (59/214) - 2002 (129/214) - 2007 (107/214) - 2012 (60/214) - 2014 (177/214)
8.	Public and Publicly Guaranteed, official creditors (Debt Outstanding and Disbursed, current US$) (Series Code: DT.DOD.OFFT.CD)	Every year from 1970 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1970 (82/214) - 1971 (84/214) - 1972 to 1976 (86/214) - 1977 (88/214) - 1978 to 1980 (89/214) - 1981 to 1983 (98/214) - 1984 (99/214) - 1985 to 1988 (100/214)

		- 1989 to 1990 (101/214) - 1991 (102/214) - 1992 (110/214) - 1993 (115/214) - 1994 to 1998 (117/214) - 1999 to 2005 (118/214) - 2006 to 2008 (119/214) - 2009 to 2014 (120/214)
9.	Net official development assistance and official aid (current US$) (Series Code: DT.ODA.ALLD.CD)	Every year from 1966 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 (123/214) - 1967 (124/214) - 1968 (120/214) - 1969 (122/214) - 1970 (120/214) - 1971 to 1972 (122/214) - 1973 (129/214) - 1974 (133/214) - 1975 (136/214) - 1976 (135/214) - 1977 (136/214) - 1978 (137/214) - 1979 to 1982 (138/214) - 1980 (139/214) - 1981 (137/214) - 1982 (139/214) - 1983 (141/214) - 1984 (140/214) - 1985 (142/214) - 1986 (141/214) - 1987 (151/214) - 1988 (160/214) - 1989 (168/214) - 1990 (171/214) - 1994 to 2000 (173/214) - 2001 to 2002 (172/214) - 2003 to 2004 (173/214) - 2005 to 2007 (144/214) - 2008 (143/214) - 2009 (144/214) - 2010 (143/214) - 2011 (141/214)

		- 2012 to 2013 (140/214) - 2014 (139/214)
10.	Investment in water and sanitation with private participation (current US$) (Series Code: IE.PPI.WATR.CD)	Every year from 1991 to 2015 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1991 (2/214) - 1992 (5/214) - 1993 to 1994 (7/214) - 1995 to 1996 (11/214) - 1997 (13/214) - 1998 (12/214) - 1999 to 2000 (17/214) - 2001 (24/214) - 2002 to 2003 (17/214) - 2004 (16/214) - 2005 (20/214) - 2006 (13/214) - 2007 (16/214) - 2008 (13/214) - 2009 to 2010 (8/214) - 2011 (7/214) - 2012 (13/214) - 2013 (7/214) - 2014 to 2015 (5/214)
11.	Public and Publicly Guaranteed, commercial banks (Debt Outstanding and Distributed, current US$) (Series Code: DT.DOD.PCBK.CD)	Every year from 1970 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1970 (82/214) - 1971 (84/214) - 1972 to 1976 (86/214) - 1977 (88/214) - 1978 to 1980 (89/214) - 1981 to 1983 (98/214) - 1984 (99/214) - 1985 to 1988 (100/214) - 1989 to 1990 (101/214) - 1991 (102/214) - 1992 (110/214) - 1993 (115/214) - 1994 to 1998 (117/214) - 1999 to 2005 (118/214) - 2006 to 2008 (119/214)

		- 2009 to 2014 (120/214)
12.	External debt stocks, public and publicly guaranteed (PPG) (DOD, current US$) (Series Code: DT.DOD.DPPG.CD)	Every year from 1970 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1970 (82/214) - 1971 (84/214) - 1972 to 1976 (86/214) - 1977 (88/214) - 1978 to 1980 (89/214) - 1981 to 1983 (98/214) - 1984 (99/214) - 1985 to 1988 (100/214) - 1989 to 1990 (101/214) - 1991 (102/214) - 1992 (110/214) - 1993 (115/214) - 1994 to 1998 (117/214) - 1999 to 2005 (118/214) - 2006 to 2008 (119/214) - 2009 to 2014 (120/214)
13.	Foreign direct investment, net (BoP, current US$) (Series Code: BN.KLT.DINV.CD)	Every year from 1966 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 (2/214) - 1967 (3/214) - 1968 to 1969 (5/214) - 1970 (11/214) - 1971 (15/214) - 1972 to 1973 (16/214) - 1974 (22/214) - 1975 (41/214) - 1976 (58/214) - 1977 (79/214) - 1978 (84/214) - 1979 to 1980 (85/214) - 1981 (86/214) - 1982 (90/214) - 1983 (94/214) - 1984 (95/214) - 1985 (96/214) - 1986 (98/214) - 1987 to 1988 (101/214)

		- 1989 (104/214) - 1990 (105/214) - 1991 (110/214) - 1992 (117/214) - 1993 to 1994 (126/214) - 1995 (130/214) - 1996 (133/214) - 1997 to 1998 (135/214) - 1999 (137/214) - 2000 (138/214) - 2001 (137/214) - 2002 (141/214) - 2003 (145/214) - 2004 (147/214) - 2005 (172/214) - 2006 (175/214) - 2007 to 2008 (177/214) - 2009 to 2010 (178/214) - 2011 (177/214) - 2012 (176/214) - 2013 (172/214) - 2014 (142/214)
14.	Improved sanitation facilities (% of population with access) (Series Code: SH.STA.ACSN)	Every year from 1990 to 2015 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1990 (162/214) - 1991 (166/214) - 1992 (173/214) - 1993 (175/214) - 1994 (188/214) - 1995 (192/214) - 1996 (193/214) - 1997 (195/214) - 1998 to 1999 (197/214) - 2000 to 2006 (199/214) - 2007 (198/214) - 2008 to 2010 (194/214) - 2011 (195/214) - 2012 (193/214) - 2013 (192/214) - 2014 (191/214) - 2015 (190/214)
15.	Number of under-five deaths	Every year from 1966 to 2015 with the

	(Series Code: SH.DTH.MORT)	following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 (119/214) - 1967 (123/214) - 1968 (128/214) - 1969 (135/214) - 1970 (139/214) - 1971 (143/214) - 1972 to 1973 (146/214) - 1974 (149/214) - 1975 (154/214) - 1976 (156/214) - 1977 (158/214) - 1978 (161/214) - 1979 (165/214) - 1980 (168/214) - 1981 (174/214) - 1982 (176/214) - 1983 (179/214) - 1984 (185/214) - 1985 (186/214) - 1986 to 1988 (189/214) - 1989 (190/214) - 1990 to 2015 (192/214)
16.	Health expenditure, public (% of government expenditure) (Series Code: SH.CPD.PCAP)	Every year from 1995 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1995 (183/214) - 1996 to 1997 (184/214) - 1998 to 1999 (185/214) - 2000 to 2001 (186/214) - 2002 to 2004 (187/214) - 2005 to 2011 (188/214) - 2012 to 2014 (189/214)
17.	Births attended by skilled health staff (% of total) (Series Code: SH.STA.BRTC.ZS)	Every year from 1984 to 2015 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1984 (2/214) - 1985 (1/214) - 1986 (11/214) - 1987 (17/214)

		- 1988 (8/214) - 1989 (32/214) - 1990 (39/214) - 1991 (37/214) - 1992 (42/214) - 1993 (43/214) - 1994 (41/214) - 1995 (59/214) - 1996 (50/214) - 1997 (52/214) - 1998 (66/214) - 1999 (60/214) - 2000 (100/214) - 2001 (58/214) - 2002 (67/214) - 2003 (73/214) - 2004 (71/214) - 2005 (67/214) - 2006 (84/214) - 2007 (65/214) - 2008 (54/214) - 2009 (48/214) - 2010 (65/214) - 2011 (45/214) - 2012 (49/214) - 2013 (37/214) - 2014 (32/214) - 2015 (2/214)
18.	Community health workers (per 1,000 people) (Series Code: SH.MED.CMHW.P3)	Every year from 1990 to 2013 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1990 to 1991 (2/214) - 1992 to 1993 (3/214) - 1994 (2/214) - 1995 (3/214) - 1996 (5/214) - 1997 (4/214) - 1998 to 1999 (6/214) - 2000 (11/214) - 2001 (9/214) - 2002 (6/214) - 2003 (7/214) - 2004 (42/214)

		- 2005 (8/214) - 2006 (5/214) - 2007 (11/214) - 2008 (18/214) - 2009 (12/214) - 2010 (11/214) - 2011 (3/214) - 2012 (2/214) - 2013 (1/214)
19.	Nurses and midwives (per 1,000 people) (Series Code: SH.MED.NUMW.P3)	Every year from 1990 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1990 (16/214) - 1991 (14/214) - 1992 (15/214) - 1993 (13/214) - 1994 (14/214) - 1995 (22/214) - 1996 (19/214) - 1997 (28/214) - 1998 (31/214) - 1999 (34/214) - 2000 (49/214) - 2001 (42/214) - 2002 (45/214) - 2003 (50/214) - 2004 (96/214) - 2005 (65/214) - 2006 (89/214) - 2007 (87/214) - 2008 (99/214) - 2009 (89/214) - 2010 (149/214) - 2011 (70/214) - 2012 (52/214) - 2013 (27/214) - 2014 (1/214)
20.	Physicians (per 1,000 people) (Series Code: SH.MED.PHYS.ZS)	Every year from 1966 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 (19/214) - 1967 to 1969 (17/214)

		- 1970 (148/214) - 1971 (29/214) - 1972 (25/214) - 1973 (27/214) - 1974 (24/214) - 1975 (88/214) - 1976 (29/214) - 1977 (30/214) - 1978 (29/214) - 1979 (38/214) - 1980 (102/214) - 1981 (113/214) - 1982 (63/214) - 1983 (55/214) - 1984 (94/214) - 1985 (91/214) - 1986 (84/214) - 1987 (67/214) - 1988 (78/214) - 1989 (83/214) - 1990 (141/214) - 1991 (91/214) - 1992 (92/214) - 1993 (115/214) - 1994 (88/214) - 1995 (128/214) - 1996 (105/214) - 1997 (114/214) - 1998 to 1999 (96/214) - 2000 (108/214) - 2001 (99/214) - 2002 (81/214) - 2003 (79/214) - 2004 (104/214) - 2005 (73/214) - 2006 (95/214) - 2007 (96/214) - 2008 (109/214) - 2009 (99/214) - 2010 (154/214) - 2011 (75/214) - 2012 (62/214) - 2013 (32/214) - 2014 (1/214)

21.	Researchers in R&D (per million people) (Series Code: SP.POP.TECH.RD.P6)	Every year from 1996 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1996 (39/214) - 1997 (47/214) - 1998 (50/214) - 1999 to 2000 (51/214) - 2001 (58/214) - 2002 (62/214) - 2003 (66/214) - 2004 (64/214) - 2005 (69/214) - 2006 (65/214) - 2007 (74/214) - 2008 to 2009 (75/214) - 2010 (79/214) - 2011 (77/214) - 2012 (66/214) - 2013 (50/214) - 2014 (1/214)
22.	Technicians in R&D (per million people) (Series Code: SP.POP.TECH.RD.P6)	Every year from 1996 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1996 (30/214) - 1997 (33/214) - 1998 (37/214) - 1999 (36/214) - 2000 (35/214) - 2001 (39/214) - 2002 (42/214) - 2003 (47/214) - 2004 (46/214) - 2005 to 2006 (54/214) - 2007 (65/214) - 2008 (61/214) - 2009 (60/214) - 2010 (65/214) - 2011 (66/214) - 2012 (47/214) - 2013 (32/214) - 2014 (1/214)
23.	Research and development expenditure	Every year from 1996 to 2014 with the

	(% of GDP) (Series Code: GB.XPD.RSDV.GD.ZS)	following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1996 (54/214) - 1997 (71/214) - 1998 (67/214) - 1999 (68/214) - 2000 (71/214) - 2001 (81/214) - 2002 (91/214) - 2003 (88/214) - 2004 (89/214) - 2005 (86/214) - 2006 (81/214) - 2007 (92/214) - 2008 (93/214) - 2009 (92/214) - 2010 (90/214) - 2011 (88/214) - 2012 (75/214) - 2013 (61/214) - 2014 (2/214)
24.	School enrollment, primary (% net) (Series Code: SE.PRM.NENR)	Every year from 1970 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1970 (16/214) - 1971 (50/214) - 1972 to 1973 (54/214) - 1974 (50/214) - 1975 (48/214) - 1976 (54/214) - 1977 (60/214) - 1978 (64/214) - 1979 (63/214) - 1980 (58/214) - 1981 (69/214) - 1982 (67/214) - 1983 to 1985 (71/214) - 1986 (75/214) - 1987 to 1988 (69/214) - 1989 (63/214) - 1990 (65/214) - 1991 (62/214)

		- 1992 (66/214) - 1993 (64/214) - 1994 (77/214) - 1995 (73/214) - 1996 (75/214) - 1997 (62/214) - 1998 (69/214) - 1999 (119/214) - 2000 (121/214) - 2001 (113/214) - 2002 (121/214) - 2003 (122/214) - 2004 (119/214) - 2005 (129/214) - 2006 (124/214) - 2007 (130/214) - 2008 (129/214) - 2009 (134/214) - 2010 (126/214) - 2011 (124/214) - 2012 (125/214) - 2013 (114/214) - 2014 (70/214)
25.	Primary education, teachers (Series Code: SE.PRM.TCHR)	Every year from 1970 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1970 (37/214) - 1971 (124/214) - 1972 (122/214) - 1973 (110/214) - 1974 (108/214) - 1975 (116/214) - 1976 (124/214) - 1977 (118/214) - 1978 (113/214) - 1979 (112/214) - 1980 (108/214) - 1981 (124/214) - 1982 (116/214) - 1983 (118/214) - 1984 (123/214) - 1985 (114/214) - 1986 (122/214)

		- 1987 (113/214) - 1988 (110/214) - 1989 (114/214) - 1990 (110/214) - 1991 (123/214) - 1992 (119/214) - 1993 (117/214) - 1994 (125/214) - 1995 (114/214) - 1996 (109/214) - 1997 (93/214) - 1998 (71/214) - 1999 (150/214) - 2000 (141/214) - 2001 (147/214) - 2002 (145/214) - 2003 (138/214) - 2004 (136/214) - 2005 (133/214) - 2006 (132/214) - 2007 (147/214) - 2008 (144/214) - 2009 (143/214) - 2010 (138/214) - 2011 (143/214) - 2012 (138/214) - 2013 (127/214) - 2014 (87/214)
26.	Expenditure on education as % of total government expenditure (%) (Series Code: SE.XPD.TOTL.GB.ZS)	Prior to 1997, only Australia reported this figure in 1995. However, after 1997, it was reported every year up to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1995 (1/214) - 1997 (22/214) - 1998 (77/214) - 1999 (101/214) - 2000 (113/214) - 2001 (108/214) - 2002 (118/214) - 2003 (105/214) - 2004 (117/214) - 2005 (106/214)

		- 2006 to 2007 (105/214) - 2008 (116/214) - 2009 (113/214) - 2010 (120/214) - 2011 (107/214) - 2012 (86/214) - 2013 (61/214) - 2014 (34/214)
27.	Access to electricity (% of population) (Series Code: EG.ELC.ACCS.ZS)	Observations only available in the following years with number of country cases in brackets: - 1990 (212/214) - 2000 (212/214) - 2010 (212/214) - 2012 (212/214)
28.	Electric power consumption (kWh per capita) (Series Code: EG.USE.ELEC.KH.PC)	Every year from 1966 to 2013 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 to 1970 (26/214) - 1971 to 1972 (110/214) - 1973 to 1977 (111/214) - 1978 to 1980 (110/214) - 1981 to 1983 (111/214) - 1984 to 1989 (112/214) - 1990 (132/214) - 1991 to 1993 (133/214) - 1994 (134/214) - 1995 (135/214) - 1996 to 1999 (136/214) - 2000 (138/214) - 2001 to 2004 (137/214) - 2005 (138/214) - 2006 to 2007 (139/214) - 2008 to 2011 (138/214) - 2012 to 2013 (139/214)
29.	Electricity production from hydroelectric sources (% of total) (Series Code: EG.ELC.HYRO.ZS)	Every year from 1966 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 1966 to 1970 (26/214) - 1971 to 1972 (110/214) - 1973 to 1976 (111/214) - 1977 (112/214)

		- 1978 to 1980 (111/214) - 1981 to 1984 (112/214) - 1985 to 1989 (113/214) - 1990 (133/214) - 1991 (134/214) - 1992 to 1994 (135/214) - 1995 to 1999 (135/214) - 2000 to 2004 (138/214) - 2005 to 2011 (139/214) - 2012 to 2013 (140/214) - 2014 (34/214)
30.	Droughts, floods, extreme temperatures (% of population, average 1990-2009) (Series Code: EN.CLC.MDAT.ZS)	Only observations for 2009 were reported. Observations cover 168 countries out of possible 214 countries.
31.	CPIA policy and institutions for environmental sustainability rating (1=low to 6=high) (Series Code: IQ.CPA.ENVR.XQ)	Every year from 2005 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 2005 (76/214) - 2006 (78/214) - 2007 to 2008 (75/214) - 2009 to 2010 (77/214) - 2011 (78/214) - 2012 (80/214) - 2013 (81/214) - 2014 (76/214)
32.	CPIA quality of budgetary and financial management rating (1=low to 6=high) (Series Code: IQ.CPA.FINQ.XQ)	Every year from 2005 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 2005 (76/214) - 2006 (78/214) - 2007 to 2008 (75/214) - 2009 to 2010 (77/214) - 2011 (78/214) - 2012 (80/214) - 2013 (81/214) - 2014 (76/214)
33.	CPIA building human resources rating (1=low to 6=high) (Series Code: IQ.CPA.HRES.XQ)	Every year from 2005 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 2005 (76/214) - 2006 (78/214)

		- 2007 to 2008 (75/214) - 2009 to 2010 (77/214) - 2011 (78/214) - 2012 (80/214) - 2013 (81/214) - 2014 (76/214)
34.	CPIA quality of public administration rating (1=low to 6=high) (Series Code: IQ.CPA.PADM.XQ)	Every year from 2005 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 2005 (76/214) - 2006 (78/214) - 2007 to 2008 (75/214) - 2009 to 2010 (77/214) - 2011 (78/214) - 2012 (80/214) - 2013 (81/214) - 2014 (76/214)
35.	CPIA equity of public resource use rating (1=low to 6=high) (Series Code: IQ.CPA.PRES.XQ)	Every year from 2005 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 2005 (76/214) - 2006 (78/214) - 2007 to 2008 (75/214) - 2009 to 2010 (77/214) - 2011 (78/214) - 2012 (80/214) - 2013 (81/214) - 2014 (76/214)
36.	CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high) (Series Code: IQ.CPA.TRAN.XQ)	Every year from 2005 to 2014 with the following trends in the countries reporting to the dataset out of total number of countries in the dataset: - 2005 (76/214) - 2006 (78/214) - 2007 to 2008 (75/214) - 2009 to 2010 (77/214) - 2011 (78/214) - 2012 (80/214) - 2013 (81/214) - 2014 (76/214)
37.	Overall level of statistical capacity (scale 0 - 100)	Every year from 2004 to 2015 with the following trends in the countries

	(Series Code: IQ.SCI.OVRL)	reporting to the dataset out of total number of countries in the dataset: - 2004 (114/214) - 2005 to 2008 (141/214) - 2009 to 2012 (142/214) - 2013 to 2015 (145/214)

Source: World Bank. (2016). *2016 World Development Indicators.* Washington, DC: World Bank.

Upon checking data availability, we see that although data has been compared for all the variables, they are not collected across the same time span. For example, observations for "improved water source access" variable were collected from 1990 to 2015 yet observations for "overall level of statistical capacity" variable were collected only from 2004. This denies us from performing regressions on the two variables prior to 2004 because there are no recorded observations for the "statistical capacity variable". Given that we are interested in identifying and testing the causal factors behind the longitudinal change in the dependent variable, we would not be able to use the "statistical capacity variable" since the longitudinal changes in the "statistical capacity" variable only covers 2004 to 2015. Thus, it would be invalid to assume that changes in the "statistical capacity" variable between those years are responsible for longitudinal changes in the dependent variable from 1990 to 2015.

To avoid invalid regressions, we drop all the explanatory variables that do not have data points starting from 1990. Also, factoring in robustness factors, we drop all variables with less than 30 cases. As a result, the following variables are dropped:

Table 10: Variables that were dropped because they had less than 30 cases

	Dropped Explanatory Variables	Details
1.	Investment in water and sanitation with private participation (current US$) (Series Code: IE.PPI.WATR.CD)	Observations were collected starting 1991 with few countries reporting. The max number of countries reporting this indicator was 24 in 2001. The average countries reporting between 1991 and 2015 was 11.64. Thus, given the later starting date in reporting coupled with few countries reporting, the variable was dropped.
2.	Health expenditure, public (% of government expenditure) (Series Code: SH.CPD.PCAP)	Observations were collected starting 1995. Given the later starting date in reporting, the variable was dropped.
3.	Researchers in R&D (per million people) (Series Code: SP.POP.TECH.RD.P6)	Observations were collected starting 1996. Given the later starting date in reporting, the variable was dropped.
4.	Technicians in R&D (per million people) (Series Code: SP.POP.TECH.RD.P6)	Observations were collected starting 1996. Given the later starting date in reporting, the variable was dropped.
5.	Research and development expenditure (% of GDP) (Series Code: GB.XPD.RSDV.GD.ZS)	Observations were collected starting 1996. Given the later starting date in reporting, the variable was dropped.
6.	Expenditure on education as % of total government expenditure (%) (Series Code: SE.XPD.TOTL.GB.ZS)	Observations were collected starting 1995. Given the later starting date in reporting, the variable was dropped.
7.	Droughts, floods, extreme temperatures (% of population, average 1990-2009) (Series Code: EN.CLC.MDAT.ZS)	Observations were collected for 2009. Given the single year reporting, the variable was dropped.
8.	CPIA policy and institutions for environmental sustainability rating (1=low to 6=high) (Series Code: IQ.CPA.ENVR.XQ)	Observations were collected starting 2005. Given the later starting date in reporting, the variable was dropped.
9.	CPIA quality of budgetary and financial management rating (1=low to 6=high) (Series Code: IQ.CPA.FINQ.XQ)	Observations were collected starting 2005. Given the later starting date in reporting, the variable was dropped.
10.	CPIA building human resources rating (1=low to 6=high) (Series Code: IQ.CPA.HRES.XQ)	Observations were collected starting 2005. Given the later starting date in reporting, the variable was dropped.
11.	CPIA quality of public administration rating (1=low to 6=high) (Series Code: IQ.CPA.PADM.XQ)	Observations were collected starting 2005. Given the later starting date in reporting, the variable was dropped.
12.	CPIA equity of public resource use	Observations were collected starting

	rating (1=low to 6=high) (Series Code: IQ.CPA.PRES.XQ)	2005. Given the later starting date in reporting, the variable was dropped.
13.	CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high) (Series Code: IQ.CPA.TRAN.XQ)	Observations were collected starting 2005. Given the later starting date in reporting, the variable was dropped.
14.	Overall level of statistical capacity (scale 0 - 100) (Series Code: IQ.SCI.OVRL)	Observations were collected starting 2004. Given the later starting date in reporting, the variable was dropped.

Source: World Bank. (2016). *2016 World Development Indicators.* Washington, DC: World Bank.

This leaves us with 23 explanatory variables. This still is unmanageable since the permutation of all possible paths constructed from the variables is 2.58×10^{22}. In the effort to reduce the number of variables, two additional processes are taken. First, we check whether we can eliminate more variables that will undermine the strength of statistical analysis. This is done by checking how many observations survive for the explanatory variable after having removed the countries that do not have any variation in the dependent variable. If the surviving observations fall below 30, the variable becomes a candidate for elimination.

To start the process, we first need to determine our time frame for variance. That is, we could either choose a 10-year span, 15-year span, 20-year span, or 25-year span.[61] Since we wish to run the dataset with the greatest number of cases, we calculate how many valid observations each time span holds. That is, from each time period, we only

[61] A 5-year span was not included, as it was deemed to short. That is, a minimum of 10 years is considered a reference point to capture policy development and implementation along with complementary institutional evolutions.

count countries with no missing data points for the two reference years to calculate the difference and the difference cannot be 0. The results are displayed in the table below.

Table 11: Optimizing for maximum number of observations

Time Span	Number of surviving countries with observations
1990 to 2000	125
1990 to 2005	135
1990 to 2010	139
1990 to 2015	135

Source: World Bank. (2016). *2016 World Development Indicators.* Washington, DC: World Bank.

As a result of the calculations, we see that the time span between 1990 and 2010 gives us the greatest number of surviving observations. We then use this time frame to see how many countries has corresponding observations for the remaining 23 variables. Two figures were calculated. First, we counted the number of countries with observations recorded for the two years at each end. Then we subtracted all those countries that did not register to having a valid observation in the dependent variable. In other words, only those countries with variation in the outcome variable were included in the count. The results are in the table below.

Table 12: Filtering on valid observations in the outcome variable

	Explanatory Variables	Number of countries with observations in 1990 and 2010 (a)	Of (a), counting only those countries with valid observations in

			the outcome variable
1.	GDP per capita (constant 2000 US$) (Series Code: NY.GDP.PCAP.CD)	176	121
2.	Population, total (Series Code: SP.POP.TOTL)	213	139
3.	Population in urban agglomerations of more than 1 million (% of population) (Series Code: EN.URB.MCTY.TL.ZS)	114	84
4.	Land area (sq. km) (Series Code: AG.LND.TOTL.K2)	207	135
5.	Renewable internal freshwater resources per capita (cubic meters) (Series Code: ER.H2O.INTR.PC)	0	0
6.	Annual freshwater withdrawals, total (billion cubic meters) (Series Code: ER.H2O.FWTL.K3)	0	0
7.	Annual freshwater withdrawals, domestic (% of total freshwater withdrawal) (Series Code: ER.H2O.FWDM.ZS)	0	0
8.	Public and Publicly Guaranteed, official creditors (Debt Outstanding and Disbursed, current US$) (Series Code: DT.DOD.OFFT.CD)	101	89
9.	Net official development assistance and official aid (current US$) (Series Code: DT.ODA.ALLD.CD)	123	102
10.	Public and Publicly Guaranteed, commercial banks (Debt Outstanding and Distributed, current US$) (Series Code: DT.DOD.PCBK.CD)	101	89
11.	External debt stocks, public and publicly guaranteed (PPG) (DOD, current US$) (Series Code: DT.DOD.DPPG.CD)	101	89
12.	Foreign direct investment, net (BoP, current US$) (Series Code: BN.KLT.DINV.CD)	100	73

13.	Improved sanitation facilities (% of population with access) (Series Code: SH.STA.ACSN)	161	125
14.	Number of under-five deaths (Series Code: SH.DTH.MORT)	192	135
15.	Births attended by skilled health staff (% of total) (Series Code: SH.STA.BRTC.ZS)	23	20
16.	Community health workers (per 1,000 people) (Series Code: SH.MED.CMHW.P3)	1	1
17.	Nurses and midwives (per 1,000 people) (Series Code: SH.MED.NUMW.P3)	14	12
18.	Physicians (per 1,000 people) (Series Code: SH.MED.PHYS.ZS)	109	77
19.	School enrollment, primary (% net) (Series Code: SE.PRM.NENR)	48	31
20.	Primary education, teachers (Series Code: SE.PRM.TCHR)	80	61
21.	Access to electricity (% of population) (Series Code: EG.ELC.ACCS.ZS)	212	138
22.	Electric power consumption (kWh per capita) (Series Code: EG.USE.ELEC.KH.PC)	132	94
23.	Electricity production from hydroelectric sources (% of total) (Series Code: EG.ELC.HYRO.ZS)	133	95

Source: World Bank. (2016). *2016 World Development Indicators.* Washington, DC: World Bank.

By performing these calculations, 6 additional variables get dropped. 1 additional variable is on the borderline with 31 observations and whether this variable gets dropped or not depends on the total number of countries that are reporting on all remaining 18 variables (17 explanatory variables plus 1 outcome variable). If the total number of

countries reporting on all 18 variables is capped at 31 then we would compare this with the total number of countries reporting on 17 variables minus the borderline variable. If the observations jump beyond 31 with slight impact on variation captured by the regression model, we would then drop the borderline variable.

As we check the number of countries that report across all 18 variables, we find it only adds up to 6 countries. This is a problem since it would be too small of a dataset to extend any generalizations. Thus, we move on to drop the "School enrollment" variable with only 31 countries reporting both 1990 and 2010 figures. By doing this, the number of countries increases to 15. Although better, it is still too few cases. Thus, we then drop the next variable with the fewest countries reporting both 1990 and 2010 figures. This is the number of primary teachers with 61 countries reporting. Doing so, the pool increases to 20 but still too few countries. Thus, we then drop the next variable with the fewest countries reporting. This is the Foreign Direct Investment variable with 73 countries reporting. By dropping it, we see the pool expand a bit further to 26. Better but still too few. We then drop the next variable with the fewest countries reporting. This is the number of physicians variable with 77 countries reporting. This brings up the pool of countries reporting on all remaining figures to 45. Given we set the threshold at 30, we stop dropping any more variables. As a result, we have 13 explanatory variables remaining.

We run regressions with the 13 explanatory variables. It results in the following model.

Table 13: Model Summary with 13 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.585[a]	.343	.067	10.32537

a. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Access to electricity, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Population in urban agglomerations of more than 1 million, Improved sanitation facilities, Total population, Electric power consumption, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Land area, Number of under-five deaths.

Table 14: ANOVA with 13 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1721.812	13	132.447	1.242	.298[b]
Residual	3305.011	31	106.613		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Access to electricity, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Population in urban agglomerations of more than 1 million, Improved sanitation facilities, Total population, Electric power consumption, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Land area, Number of under-five deaths.

Table 15: Coefficients of 13 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	7.375	5.285		1.396	.173
GDP per capita	-.002	.001	-.348	-1.206	.237
Total population	-1.53E-7	.000	-.861	-1.269	.214
Pop urban agg > 1 mil.	.412	.464	.149	.888	.381
Land area	-7.83E-7	.000	-.135	-.403	.690
DOD PPG official creditors	-5.81E-10	.000	-.586	-1.733	.093
Net ODA and official aid	2.09E-10	.000	.245	1.431	.162
DOD PPG comm. banks	.270	.000	-.313	-1.071	.292
External debt stocks	2.09E-10	.000	.376	1.246	.222
Improved sanitation	.270	.183	.255	1.473	.151
Number of 5> deaths	-4.15E-5	.000	-1.278	-1.726	.094
Access to electricity	.076	.186	.073	.407	.687
Elec. power consumption	.002	.004	.135	.559	.580

Hydroelectric sources	-.081	.097	-.135	-.831	.412

a. Dependent Variable: Access to Improved Water Sources

As the model shows, the F-statistics test for the model is not statistically significant. Upon checking the significance levels for the t-test for the components, we find components that are not statistically significant. Therefore, we engage in step-wise regressions where we drop additional components and redo the calculations. We first drop the most non-significant component: the *land area* variable. Following the drop of the component, we result in the following statistics.

Table 16: Model Summary with 12 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.582[a]	.339	.091	10.18929

a. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Access to electricity, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Population in urban agglomerations of more than 1 million, Improved sanitation facilities, Total population, Electric power consumption, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 17: ANOVA with 12 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1704.532	12	142.044	1.368	.231[b]
Residual	3322.291	32	103.822		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Access to electricity, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Population in urban agglomerations of more than 1 million, Improved sanitation facilities, Total population, Electric power

consumption, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 18: Coefficients of 12 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	6.485	4.737		1.369	.181
GDP per capita	-.002	.001	-.346	-1.214	.234
Total population	-1473E-7	.000	-.829	-1.247	.222
Pop urban agg > 1 mil.	.355	.436	.128	.815	.421
DOD PPG official creditors	-6.133E-10	.000	-.618	-1.907	.065
Net ODA and official aid	2.002E-9	.000	.235	1.407	.169
DOD PPG comm. banks	-3.689E-10	.000	-.234	-1.101	.279
External debt stocks	2.003E-10	.000	.361	1.221	.231
Improved sanitation	.282	.178	.267	1.583	.123
Number of 5> deaths	-3.946E-5	.000	-1.217	-1.701	.099
Access to electricity	.105	.168	.102	.627	.535
Elec. power consumption	.002	.004	.130	.544	.590
Hydroelectric sources	-.091	.092	-.153	-.994	.328

a. Dependent Variable: Access to Improved Water Sources

The regression model is still not significant. Thus, the next variable with the highest significance level is dropped. This is the *Electric power consumption* variable. Upon dropping the variable, we get the following regression calculations from the remaining variables.

Table 19: Model Summary with 11 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.577[a]	.333	.111	10.07997

a. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Access to electricity, Outstanding and distributed public and publicly guaranteed

debt from commercial banks, Net official development assistance and official aid, Population in urban agglomerations of more than 1 million, Improved sanitation facilities, Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 20: ANOVA with 11 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1673.831	11	152.166	1.498	.179[b]
Residual	3352.992	33	101.606		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Access to electricity, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Population in urban agglomerations of more than 1 million, Improved sanitation facilities, Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 21: Coefficients of 11 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	6.759	4.660		1.451	.156
GDP per capita	-.001	.001	-.260	-1.107	.276
Total population	-1.643E-7	.000	-.924	-1.456	.155
Pop urban agg > 1 mil.	.359	.431	.129	.831	.412
DOD PPG official creditors	-6.100E-10	.000	-.615	-1.918	.064
Net ODA and official aid	1.891E-9	.000	.222	1.357	.184
DOD PPG comm. banks	-3.342E-10	.000	-.212	-1.027	.312
External debt stocks	2.016E-10	.000	.363	1.243	.223
Improved sanitation	.286	.176	.270	1.622	.114
Number of 5> deaths	-4.342E-5	.000	-1.339	-1.993	.055
Access to electricity	.100	.166	.096	.602	.551
Hydroelectric sources	-.087	.091	-.146	-.960	.344

a. Dependent Variable: Access to Improved Water Sources.

The regression model is still not significant. Thus, the next variable with the highest significance level is dropped. This is the *Access to electricity* variable. Upon dropping the variable, we get the following regression calculations from the remaining variables.

Table 22: Model Summary with 10 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.571[a]	.326	.127	9.98510

a. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Population in urban agglomerations of more than 1 million, Improved sanitation facilities, Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 23: ANOVA with 10 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1636.950	10	163.695	1.642	.137[b]
Residual	3389.873	34	99.702		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Population in urban agglomerations of more than 1 million, Improved sanitation facilities, Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 24: Coefficients of 10 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	8.335	3.821		2.182	.036
GDP per capita	-.002	.001	-.310	-1.425	.163
Total population	-1.611E-	.000	-0.906	-1.444	.158

Pop urban agg > 1 mil.	.363	.427	.131	.848	.402
DOD PPG official creditors	-6.007E-10	.000	-.606	-1.909	.065
Net ODA and official aid	1.840E-9	.000	.216	1.336	.191
DOD PPG comm. banks	-3.489E-10	.000	-.221	-1.085	.285
External debt stocks	2.106E-10	.000	.390	1.316	.197
Improved sanitation	.292	.174	.276	1.679	.102
Number of 5> deaths	-4.273E-5	.000	-1.318	-1.983	.056
Hydroelectric sources	-.092	.089	-.154	-1.028	.311

a. Dependent Variable: Access to Improved Water Sources.

The regression model is still not significant. Thus, the next variable with the highest significance level is dropped. This is the *Population in urban agglomerations of more than 1 million* variable with significance level at 0.402. Upon dropping the variable, we get the following regression calculations from the remaining variables.

Table 25: Model Summary with 9 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.558[a]	.311	.134	9.94502

a. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Improved sanitation facilities, Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 26: ANOVA with 9 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1565.205	9	173.912	1.758	.112[b]
Residual	3461.618	35	98.903		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Outstanding and distributed public and publicly guaranteed debt from commercial banks, Net official development assistance and official aid, Improved sanitation facilities, Total population,

GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 27: Coefficients of 9 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	8.788	3.768		2.333	.026
GDP per capita	-.001	.001	-.277	-1.298	.203
Total population	-1.695E-7	.000	-.954	-1.531	.135
DOD PPG official creditors	-5.900E-10	.000	-.595	-1.884	.068
Net ODA and official aid	1.874E-9	.000	.220	1.366	.181
DOD PPG comm. banks	-3.205E-10	.000	-.203	-1.006	.321
External debt stocks	2.103E-10	.000	.379	1.320	.196
Improved sanitation	.306	.173	.289	1.774	.085
Number of 5> deaths	-4.469E-5	.000	-1.378	-2.094	.044
Hydroelectric sources	-.104	.088	-.175	-1.187	.243

a. Dependent Variable: Access to Improved Water Sources.

The regression model is still not significant. Thus, the next variable with the highest significance level is dropped. This is the *Outstanding and distributed public and publicly guaranteed debt from commercial banks* variable with significance level at 0.321. Upon dropping the variable, we get the following regression calculations from the remaining variables.

Table 28: Model Summary with 8 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.540[a]	.291	.134	9.94681

a. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Net official development assistance and official aid, Improved sanitation facilities,

Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 29: ANOVA with 8 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1465.016	8	183.127	1.851	.099[b]
Residual	3561.807	36	98.939		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Electricity production from hydroelectric sources, External debt stocks, public and publicly guaranteed, Net official development assistance and official aid, Improved sanitation facilities, Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 30: Coefficients of 8 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	7.899	3.663		2.156	.038
GDP per capita	-.001	.001	-.156	-.884	.383
Total population	-1.486E-7	.000	-.836	-1.366	.180
DOD PPG official creditors	-4.195E-10	.000	-.423	-1.593	.120
Net ODA and official aid	1.978E-9	.000	.232	1.445	.157
External debt stocks	1.038E-10	.000	.187	.871	.390
Improved sanitation	.295	.172	.278	1.710	.096
Number of 5> deaths	-4.092E-5	.000	-1.262	-1.947	.059
Hydroelectric sources	-.100	.088	-.168	-1.141	.261

a. Dependent Variable: Access to Improved Water Sources.

The regression model is still not significant. Thus, the next variable with the highest significance level is dropped. This is the *External debt stocks* variable with significance level at 0.390. Upon dropping the variable, we get the following regression calculations from the remaining variables.

Table 31: Model Summary with 7 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.526[a]	.277	.140	9.91429

a. Predictors: (Constant), Electricity production from hydroelectric sources, public and publicly guaranteed, Net official development assistance and official aid, Improved sanitation facilities, Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 32: ANOVA with 7 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1389.976	7	198.568	2.020	.078[b]
Residual	3636.848	37	98.293		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Electricity production from hydroelectric sources, public and publicly guaranteed, Net official development assistance and official aid, Improved sanitation facilities, Total population, GDP per capita, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 33: Coefficients of 7 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	7.127	3.543		2.012	.052
GDP per capita	.000	.001	-.076	-.508	.614
Total population	-1.326E-7	.000	-.746	-1.240	.223
DOD PPG official creditors	-3.013E-10	.000	-.304	-1.339	.189
Net ODA and official aid	2.027E-9	.000	.238	1.488	.145
Improved sanitation	.309	.171	.292	1.808	.079
Number of 5> deaths	-3.744E-5	.000	-1.154	-1.821	.077
Hydroelectric sources	-.092	.087	-.155	-1.061	.296

a. Dependent Variable: Access to Improved Water Sources.

The regression model is still not significant. Thus, the next variable with the highest significance level is dropped. This is the *GDP per capita* variable with

significance level at 0.614. Upon dropping the variable, we get the following regression calculations from the remaining variables.

Table 34: Model Summary with 6 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.521[a]	.271	.156	9.81706

a. Predictors: (Constant), Electricity production from hydroelectric sources, public and publicly guaranteed, Net official development assistance and official aid, Improved sanitation facilities, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 35: ANOVA with 6 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1364.588	6	227.431	2.360	.049[b]
Residual	3662.235	38	96.375		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Electricity production from hydroelectric sources, public and publicly guaranteed, Net official development assistance and official aid, Improved sanitation facilities, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 36: Coefficients of 6 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	6.115	2.902		2.107	.042
Total population	-1.318E-7	.000	-.741	-1.246	.221
DOD PPG official creditors	-3.235E-10	.000	-.326	-1.480	.147
Net ODA and official aid	2.181E-9	.000	.256	1.658	.105
Improved sanitation	.323	.167	.305	1.929	.061
Number of 5> deaths	-3.774E-5	.000	-1.164	-1.854	.072
Hydroelectric sources	-.086	.085	-.144	-1.006	.321

a. Dependent Variable: Access to Improved Water Sources.

Although the model is significant with 6 explanatory variables remaining, none of the predictor variables are significant. Thus, further reduction is done on the explanatory variable side. The *Electricity production from hydroelectric sources* variable with significance level of 0.321 is dropped.

Table 37: Model Summary with 5 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.502[a]	.252	.156	9.81852

a. Predictors: (Constant), Public and publicly guaranteed net official development assistance and official aid, Improved sanitation facilities, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 38: ANOVA with 5 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1267.096	5	253.419	2.638	.038[b]
Residual	3759.728	39	96.403		
Total	5026.823	44			

a. Dependent Variable: Access to Improved Water Sources

b. Predictors: (Constant), Public and publicly guaranteed net official development assistance and official aid, Improved sanitation facilities, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 39: Coefficients of 5 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	6.581	2.865		2.297	.027
Total population	-1.235E-7	.000	-.695	-1.171	.249
DOD PPG official creditors	-3.330E-10	.000	-.336	-1.525	.135
Net ODA and official aid	2.100E-9	.000	.246	1.599	.118
Improved sanitation	.362	.163	.342	2.225	.032
Number of 5> deaths	-3.596E-5	.000	-1.109	-1.773	.084

a. Dependent Variable: Access to Improved Water Sources.

Of the five remaining variables, only the improved sanitation variable is significant. However, given the model is still significant and still serves as a better predictor of the variation in the dependent variable than the best guess of the dependent variable without the variable, which would be the average of the dependent variable.

Subsequently, regression models are run with all remaining variables as the dependent variable, except for the *Total population* variable. This is because we treat it as an exogenous variable. That is, we treat population variation as an act of nature. Hence, it would be treated as a variable that cannot be explained by other variables.

Debt outstanding and disbursed public and publicly guaranteed debt from official creditors is the first dependent variable in which all other independent variable are employed to predict. The results are as follows:

Table 40: Model Summary with 4 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.777[a]	.604	.565	7.1087E+9

a. Predictors: (Constant), Improved sanitation facilities, Total population, Public and publicly guaranteed net official development assistance and official aid, Number of under-five deaths.

Table 41: ANOVA with 4 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3.089E+21	4	7.722E+20	15.281	.000[b]
Residual	2.021E+21	40	5.053E+19		
Total	5.110E+21	44			

a. Dependent Variable: Debt outstanding and disbursed public and publicly guaranteed debt from official creditors

b. Predictors: (Constant), Improved sanitation facilities, Total population, Public and publicly guaranteed net official development assistance and official aid, Number of under-five deaths.

Table 42: Coefficients of 4 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	-6.083E+8	2.072E+9		-.294	.771
Total population	-35.651	76.173	-.199	-.468	.642
Net ODA and official aid	-.988	.938	-.115	-1.053	.299
Improved sanitation	244779925	111228518	.229	2.201	.034
Number of 5> deaths	-28305.24	13984.871	-.866	-2.024	.050

a. Dependent Variable: Debt outstanding and disbursed public and publicly guaranteed debt from official creditors.

The model is statistically significant with two significant variables. Thus, we do run any more regressions with this dependent variable. Instead, *Public and publicly guaranteed net official development assistance and official aid* variable is replaced into the dependent variable to run a subsequent regression analysis. The results of the regression are as follows:

Table 43: Model Summary with 4 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.438[a]	.192	.111	1.1823E+9

a. Predictors: (Constant), Improved sanitation facilities, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 44: ANOVA with 4 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1.328E+19	4	3.321E+18	2.375	.068[b]
Residual	5.592E+19	40	1.398E+18		
Total	6.920E+19	44			

a. Dependent Variable: Public and publicly guaranteed net official development assistance and official aid
b. Predictors: (Constant), Improved sanitation facilities, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 45: Coefficients of 4 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	-14404547	345006704		-.042	.967
Total population	30.599	11.747	1.467	2.605	.013
DOD PPG official creditors	-.027	.026	-.235	-1.053	.299
Improved sanitation	4983581.84	19571854.7	.040	.255	.800
Number of 5> deaths	4866.364	2317.82	1.279	2.100	.042

a. Dependent Variable: Public and publicly guaranteed net official development assistance and official aid.

The model is not significant. Thus, we drop the variable with the largest significance level figure, which is the *Improve sanitation* variable. We then rerun the regression.

Table 46: Model Summary with 3 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.437[a]	.191	.131	1.1688E+9

a. Predictors: (Constant), Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 47: ANOVA with 3 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1.319E+19	3	4.397E+18	3.219	.032[b]
Residual	5.601E+19	41	1.366E+18		
Total	6.920E+19	44			

a. Dependent Variable: Public and publicly guaranteed net official development assistance and official aid
b. Predictors: (Constant), Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 48: Coefficients of 3 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	52767821.8	219794389		.240	.811
Total population	30.112	11.457	1.444	2.628	.012
DOD PPG official creditors	4800.898	2277.094	1.262	2.108	.041
Number of 5> deaths	-.025	.024	-.216	-1.038	.305

a. Dependent Variable: Public and publicly guaranteed net official development assistance and official aid.

The model is significance so we do not perform any more regressions using the same dependent variable. Instead, it is replaced with the next endogenous *Improved sanitation access* variable. The regression results are as follows:

Table 49: Model Summary with 4 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.434[a]	.188	.107	9.54395

a. Predictors: (Constant), Public and publicly guaranteed net official development assistance and official aid, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 50: ANOVA with 4 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	845.137	4	211.284	2.320	.073[b]
Residual	3643.482	40	91.087		
Total	4488.619	44			

a. Dependent Variable: Improved sanitation facilities

b. Predictors: (Constant), Public and publicly guaranteed net official development assistance and official aid, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 51: Coefficients of 4 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	13.462	1.796		7.495	.000
Total population	-1.074E-7	.000	-.639	-1.062	.295
DOD PPG official creditors	-1.470E-5	.000	.471	2.201	.034
Net ODA and official aid	4.412E-10	.000	.040	.255	.800
Number of 5> deaths	3.247E-10	.000	-.479	-.751	.457

a. Dependent Variable: Improved sanitation facilities.

The model does not register to be significant. Thus, the variable with the highest significance level is dropped. The regression is then run again without the *Public and publicly guaranteed net official development assistance and official aid* variable.

Table 52: Model Summary with 3 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.432[a]	.187	.127	9.43448

a. Predictors: (Constant), Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 53: ANOVA with 3 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	839.231	3	279.744	3.143	.035[b]
Residual	3649.388	41	89.009		
Total	4488.619	44			

a. Dependent Variable: Improved sanitation facilities

b. Predictors: (Constant), Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Number of under-five deaths.

Table 54: Coefficients of 3 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	13.479	1.774		7.597	.000
Total population	-9.764E-8	.000	-.581	-1.056	.297
DOD PPG official creditors	4.330E-10	.000	.462	2.214	.032
Number of 5> deaths	-1.314E-5	.000	-.429	-.715	.479

a. Dependent Variable: Improved sanitation facilities.

The model is significant. Thus, no additional regressions are run on this dependent variable. Instead, it is replaced with *Number of under-five deaths* variable for a different regression analysis. The results are as follows:

Table 55: Model Summary with 4 Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.975[a]	.951	.946	76547.5584

a. Predictors: (Constant), Public and publicly guaranteed net official development assistance and official aid, Improved sanitation facilities, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors.

Table 56: ANOVA with 4 Independent Variables[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	4.544E+12	4	1.136E+12	193.892	.000[b]
Residual	2.344E+11	40	5.860E+9		
Total	4.779E+12				

a. Dependent Variable: Number of under-five deaths

b. Predictors: (Constant), Public and publicly guaranteed net official development assistance and official aid, Improved sanitation facilities, Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors.

Table 57: Coefficients of 4 Independent Variables in the Model[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	50568.817	20857.011		2.425	.020
Total population	-.005	.000	-.897	-18.303	.000
DOD PPG official creditors	-3.282E-6	.000	-.107	-2.024	.050
Net ODA and official aid	2.040E-5	.000	.078	2.100	.042
Improved sanitation	-945.331	1259.318	-.029	-.751	.457

a. Dependent Variable: Number of under-five deaths.

The model is significant. Therefore, no additional modifications are needed to the model.

With the additional regressions, the path analysis could now be constructed from all the models registering significant values. Once again, this is interpreted as the models being mathematically better predictors, as total errors reduced by employing the model for predictors is unlikely to be witnessed by chance. That is, the chance that guessing will produced less overall error than the model is less than 5%.

As for whether the path analysis model is a better candidate in depicting the relationship between the variables, standard beta products of all possible pathways from the exogenous variable to the dependent variable are added up and comparing it with the correlation figure between the two variables. For this model, if the standard beta product additions results in a larger figure than 0.222 that is the correlation figure between the exogenous variable of total population and the dependent variable of access to improved water sources, then we know we have a good fit.

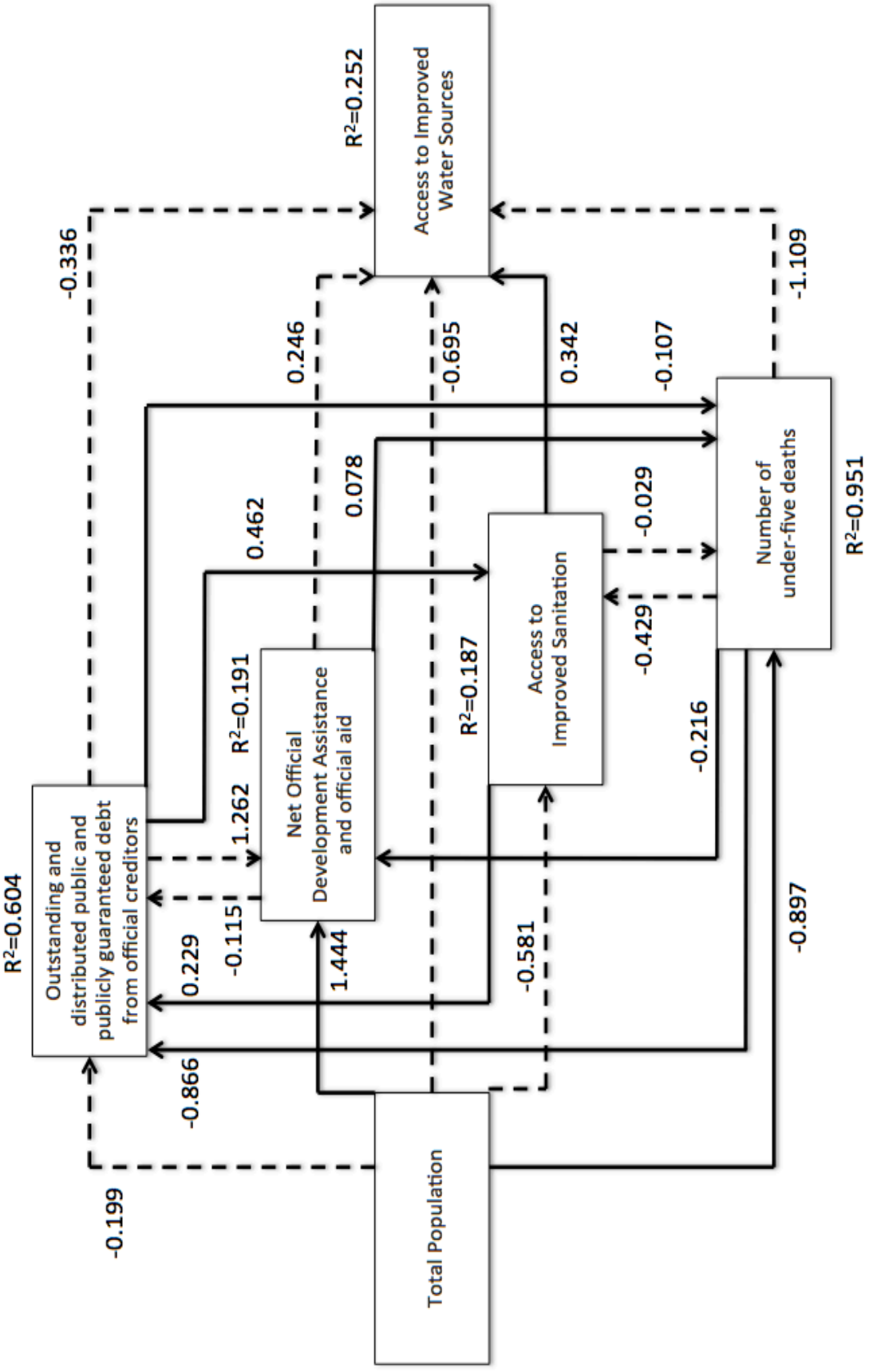


Figure 20: Path Analysis Results for Access to Improved Water Sources

The calculations for the pathways are as follows:

Table 58: Calculation of coefficients for the pathways

A = Total Population
B = Public and publicly guaranteed debt from official creditors = B
C = Net ODA and official aid
D = Access to Improved Sanitation
E = Number of under-five deaths
F = Access to Improved Water Sources

Standard Betas for All Non-Recursive Pathways					Product
AF	-0.695 (AF)				-0.695
ABF	-0.199 (AB)	-0.336 (BF)			0.067
ACF	1.444 (AC)	0.246 (CF)			0.355
ADF	-0.581 (AD)	0.342 (DF)			-0.199
AEF	-0.897 (AE)	-1.109 (EF)			0.995
ABCF	-0.199 (AB)	1.262 (BC)	0.246 (CF)		-0.062
ABDF	-0.199 (AB)	0.462 (BD)	0.342 (DF)		-0.031
ABEF	-0.199 (AB)	-0.107 (BE)	-1.109 (EF)		-0.024
ACBF	1.444 (AC)	-0.115 (CB)	-0.336 (BF)		0.056
ACDF	1.444 (AC)	X (CD)	0.342 (DF)		No path
ACEF	1.444 (AC)	0.078 (CE)	-1.109 (EF)		-0.125
ADBF	-0.581 (AD)	0.229 (DB)	-0.336 (BF)		0.045
ADCF	-0.581 (AD)	X (DC)	0.246 (CF)		No path
ADEF	-0.581 (AD)	-0.029 (DE)	-1.109 (EF)		-0.019
AEBF	-0.897 (AE)	-0.866 (EB)	-0.336 (BF)		-0.261
AECF	-0.897 (AE)	-0.216 (EC)	0.246 (CF)		0.048
AEDF	-0.897 (AE)	-0.429 (ED)	0.342 (DF)		0.132
ABCDF	-0.199 (AB)	1.262 (BC)	X (CD)	0.342 (DF)	No path
ABCEF	-0.199 (AB)	1.262 (BC)	0.078 (CE)	-1.109 (EF)	0.022
ABDCF	-0.199 (AB)	0.462 (BD)	X (DC)	0.246 (CF)	No path
ABDEF	-0.199 (AB)	0.462 (BD)	-0.029 (DE)	-1.109 (EF)	-0.003
ABECF	-0.199 (AB)	0.246 (BE)	-0.216 (EC)	0.246 (CF)	0.003
ABEDF	-0.199 (AB)	0.246 (BE)	-0.429 (ED)	0.342 (DF)	0.007
ACBDF	1.444 (AB)	-0.115 (CB)	0.462 (BD)	0.342 (DF)	-0.026
ACBEF	1.444 (AB)	-0.115 (CB)	-0.107 (BE)	-1.109 (EF)	-0.020
ACDBF	1.444 (AB)	X (CD)	0.229 (DB)	-0.336 (BF)	No path
ACDEF	1.444 (AB)	X (CD)	-0.429 (DE)	-1.109 (EF)	No path
ACEBF	1.444 (AB)	0.078 (CE)	-0.866 (EB)	-0.336 (BF)	0.033
ACEDF	1.444 (AB)	0.078 (CE)	-0.429 (ED)	0.342 (DF)	-0.017
ADBCF	-0.581 (AD)	0.229 (DB)	1.262 (BC)	0.246 (CF)	-0.041

ADBEF	-0.581 (AD)	0.229 (DB)	-0.107 (BE)	-1.109 (EF)	-0.016
ADCBF	-0.581 (AD)	X (DC)	-0.115 (CB)	-0.336 (BF)	No path
ADCEF	-0.581 (AD)	X (DC	0.078 (CE)	-1.109 (EF)	No path
ADEBF	-0.581 (AD)	-0.029 (DE)	-0.866 (EB)	-0.336 (BF)	0.005
ADECF	-0.581 (AD)	-0.029 (DE)	-0.216 (EC)	0.246 (CF)	-0.001
AEBCF	-0.897 (AE)	-0.866 (EB)	1.262 (BC)	0.246 (CF)	0.241
AEBDF	-0.897 (AE)	-0.866 (EB)	0.462 (BD)	0.342 (DF)	0.123
AECBF	-0.897 (AE)	-0.216 (EC)	-0.115 (CB)	-0.336 (BF)	0.007
AECDF	-0.897 (AE)	-0.216 (EC)	X (CD	0.342(DF)	No path
AEDBF	-0.897 (AE)	-0.429 (ED)	0.229 (DB)	-0.336 (BF)	-0.030
AEDCF	-0.897 (AE)	-0.429 (ED)	X (DC)	0.246 (CF)	No path
				Total:	0.569

The total sum of standard beta products for all non-recursive pathways is 0.569. It is larger than the correlation of 0.222 between the exogenous and dependent variable. This indicates the path analysis model is a good fit.

Findings from Quantitative Analysis

From analyzing the quantitative data form the World Bank, we are able to mathematically derive the relationships between the five explanatory variables and the outcome variable of interest. The relationships are mathematically deduced with the understanding that the inter-variable relationships built on the calculated results of multiple regression models will produce statistically prediction results than the best stable guess of the dependent variable, which is its average. From this mathematic logic, we able to say that the five explanatory variables help capture around 25% of the total variance in the dependent variable. The remaining 75% of variation is not yet explained

by the model and thus, required further exploration of other explanation beyond the five variables.

The usefulness of the quantitative analysis is that it helps narrow and confirm the explanatory variables from a selected pool of variables. From the results, we are able to confirm *Total population, Outstanding and distributed public and publicly guaranteed debt from official creditors, Net official development assistance and official aid, Access to improved sanitation,* and *Number of under-five deaths* variables help predict the movements in *Access to Improved Water Resource* variable.[62] The path analysis informs us that the variation in the explanatory variables themselves can be explained by other variables in the model. *Guaranteed debt from official creditors* variable variation can be explained by *Total population, Net official development assistance and official aid, Access to Improved Sanitation,* and *Number of under-five deaths* variable. This equally applies to the other endogenous explanatory variables as well. There is one exception. From the calculations, there is no mathematically derived relationship between *Net Official Development Assistance and official aid* variable and *Access to Improved Sanitation* variable. This is noted and all standard beta calculations for non-recursive pathways possibilities including the direct path between the two variables are noted.

[62] The negative relationship between *Outstanding and distributed public and publicly guaranteed debt from official creditors* and *Access to Improved Water Resources* is negative indirect relationship. "Indirect" in the sense that the regression model that includes the variable is significant but it alone is not a significant predictor variable. As for the negative relationship, it means that access to improved water resources by the population increases as the country's official debt stock goes down. This is because the *Outstanding and distributed public and publicly guarantee debt from official creditors* is a variable calculated from the 20-year difference.

The extent of interpretation and utility of the path analysis model is in it applicability in devising how *Access to Improved Water Sources* figures can be increased. The model shows that increases in *Net official development assistance and official aid* and *Access to Improved Sanitation* will increase *Access to Improved Water Sources* whereas increases in the other three variables result in lower coverage rates in improved water sources. As for how *Net official development assistance and official aid* figures and *Access to Improved Sanitation* figures could be increased, they also could be strategically manipulated, at least mathematically based on this model, by movements in the other variables that help predict the variations in the two variables. Hence, the greatest utility in the quantitative analysis is in being able to quantify mathematically the predictive relationship between the outcome and explanatory variables.

Do they corroborate?

The question then becomes how well the two results corroborate with each other. Recognizing that both methods are focused on understanding and explaining variation in the dependent variable, the results should resemble each other. If not then we need to thoroughly examine and explain why they are so different.

The results from the two analyses are different in presentation due their respective research designs and analytical methods. Upon a cursory examination of the final results side-by-side, it may lead to a hasty conclusion on favoring one result over the other. This is simply a wrong conclusion as it fails to see the complementary aspects of the two analyses performed on the same dependent variable. The quantitative method helps

confirm that certain variables matter. We may even be able to think in terms of taking action resulting in movements in the explanatory variables that would later percolate to movements in the dependent variable. However, the quantitative analysis demonstrates that the model may include mathematically precise calculations yet too broad in variable definition. That is, due to the inherent broad variable construction, building a mathematical model with aims in prediction is imprecise. For example, from the quantitative analysis, evidence shows that only official development assistance and official aid for water infrastructure matters. The impact of assistance and aid in other sectors is unclear. Hence, precise calculations of the regression relationship between the two variables need to be interpreted with caution.

The qualitative analyses results help us refine the broad relationship uncovered from the quantitative analyses results. From the qualitative research, we know not all access to improved sanitation is related water supply systems. The most basic sanitation facilities of pit latrines do not rely in flowing water such as pour flush latrines. We also know that the directionality of the relationship between sanitation and water is reverse. That is, water availability improves access to sanitation. We also know that both figures are affected by public housing policies, which is a variable unexplored in the quantitative model.

The quantitative analysis also serves to refine our understanding of certain explanations as well. From the results, we see that publicly guaranteed debt from official creditors has an inverse relationship with access to improved water sources. This is contrary to the some of the qualitative analyses findings. Evidence from the qualitative

analyses shows that multilateral financial institutions lending helps expand access to improved water sources. The quantitative model points otherwise. A potential explanation is that countries with better-managed debt are more capable of expanding water access coverage. A proposition the qualitative research evidence supports in light of comparing Indonesia with South Korea. Both countries borrowed for infrastructure but have very different results in terms of water access provision.

On the question on whether the results of the two methods corroborate, it is a tentative "yes". They corroborate in the sense that they do not contradict each other. However, they differ in the level of precision, comprehensiveness, and generalizability. They are complementary in the sense that as a pair, they improve our understanding of the mechanics of safe drinking water expansion than when employed alone.

Limitations and Future Research Agenda

There are outstanding issues on this research that contribute to limitations in interpretation of the research findings. As for qualitative research, more work needs to be done on exploring explanations behind timing. That is, events have been chronologically mapped and their significance was identified and confirmed by interviews. However, the question on why that particular event occurred at that particular time in that particular country and not in another country in a similar time period needs to be examined more thoroughly. More data needs to be collected on this front.

On quantitative research results, a more complicated path analysis needs to be constructed and tested. With the quantitative evidence abound, work can be undertaken

to redefine variables to refine causality models. The latter would involve testing the models in countries that still lack wide access to improved water sources. By doing so, we should be able to increase R^2 of our dependent variable.

Limitations are the result of, 1) the lingering messiness from the abundant data on water that was retrieved, and 2) the inherent broad definition of variable ebbing precise calculations from quantitative analysis. The reiterative process of running both qualitative and quantitative analyses side-by-side can fix both limitations. The process should also involve the repetitive checks with our theories; a process that starts off with examining how this particular research helps advance the relevant theories in the respective fields of public administration and comparative politics. The following chapter opens that discussion.

Discussion

How does the research findings advance the conglomerate work in the academic community? In this chapter, the results are discussed in relation to the implementation theories in public administration and the theories of the state in comparative politics. The two sub-fields were selected out of other sub-fields in Political Science due to their relevance to the research question. Implementation theory is relevant because the outcomes we are interested in are shared policy goals of the examined countries. Because the desired outcome is shared across all countries and the law of physics behind safe drinking water engineering is valid irrespective of location, the question can be distilled down to why do we see different implementation results in different countries. Why was Indonesia able to supply piped water services to only 20% of its population while Malaysia was already providing piped water services to 97% of its population by 2005? The uncovered explanations and their implications to theory are discussed in this chapter.

Before entering discussions on theoretical implications, a discussion on research methodology needs to be explored first. This is because the research question has been studied employing two different methods due to different types of retrieved data. Thus,

how the two methods complement each other in improving our understanding of the variation in the dependent variable has to be discussed and explored.

It is followed by a discussion on the implications of the findings on public administration scholarship. More specifically, it asks, "how do the findings contribute to our understanding on implementation?" "Implementation" here is defined as the package of activities taking place between Government intentions and actual results. The core question being, "does implementation for access to safe drinking water expansion policies differ from what is known on implementation so far?" These questions are addressed by reviewing the implementation theories along with a discussion on how well the findings validate them.

The section is then followed by a discussion on the implications of the findings on theories of the state in comparative politics. Theories of the state are relevant to this research, as the scholarship examines how both international and domestic forces impact the development of state institutions. Although freshwater is a pure public good since its origins are rainfalls, the state is involved in its treatment and distribution through regulations and mobilization of public resources. Water infrastructures and the utilities responsible for its operation are typically under the ownership of the central and local government. Thus, developing water supply systems are products of deliberate collective actions involving a pubic deliberation process. Public entities, may it be in the form of politically elected leadership's development visions or quasi-permanent ministry actions, are involved and responsible for their development. However, those involved are varied in organizational composition, authority, and performance across different countries. To

what extent can we explain the differences among political direction and state apparatus structure and action among the interested countries needs to be answered before we can start investing to what extent does these attributes are responsible for variation in access to safe drinking water performance across different countries. In answering these inquiries, we examine how well the theories in comparative politics equip us with the analytical lens and how well are the theories are supported by the collected data? Upon closer examination, the theoretical frameworks leave things to be desired. Hence, we pose and explore how they could it be improved.

Implications to Research Methodology

To clarify how this particular research contributes to research methodology discussions, it is imperative to first review the genealogy of the methodological debate. That is, what is research methodology and how did the discussions evolve over time? Research methodology refers to the process the researcher adheres to in going about searching for answers to the research question. It refers to the "how" research is done. Because research conclusions are products of the research process, the process selected by the researcher is often the point of contention when criticizing the validity and replicability of the researcher's findings.

Recognizing scientific inquiry is to pursue a clearer understanding of causal mechanisms operating of our environment, may it be natural or social, the ideal research method to study causality is the Experimental method (Gerring, 2001). This is where the researcher has full control over all factors responsible for variation in the dependent

variable. Thus, the causal effect of a specific factor on the dependent variable can be studied by keeping all other factors constant and only altering the specific factor and measuring the changes in the outcome. Experimental method is employed in the pure sciences where the environment could be controlled by being cognizant of the critical physical laws affecting the variation of interest. Experimental method is like cooking where outcome in taste and texture can be deliberately determined by the cook who exercises total control over what ingredients are to be used. That is, more stringent control within experiments allows us to reach more reliable results on causality by reiterative tests and validations.

Unfortunately, control over our subject matter is something that is frequently absent in the social sciences. This is because social science inquiries involve investigating fellow human beings and past events. Thus, the inability to control fellow human beings combined with the inability to travel back in time forces the social science researcher to develop methods to work around these missing controls. The methods developed and employed in absence of direct control by the researcher over the investigative setting are grouped under Non-Experimental research methods. They include Single Case Studies, Multi-case Studies, and Large-N studies (Collier, 1993; Lijphart, 1971). Large-N studies are interchangeably termed statistical studies due to their reliance on the subfield of mathematics analyzing probabilities.

It is not strange to see single case studies research method employed in political science research. This is because the unit of analysis in political science is often a country. Hence, detailed studies on certain pivotal events in the country are relevant

research questions for the field. And also using single case studies as a research method is perfectly valid. For example, the subfield of American Politics is entirely dedicated to the study of just the US. And as such, Allison's *Essence of Decision* is a very good example of a single case study (1971). In single case studies, intra-country variation in space and time along with counterfactuals are utilized to reach causal inference conclusions.[63] In the subfield of comparative politics, a key research agenda is to understand the different development trajectory of countries. Hence, multi-case studies are employed where refinements to the method is propelled by a dedicated discussion under a different title of "comparative method" (Lijphart, 1971; 1975). When statistical figures are available, Large-N studies employing statistics is often used a method of scientific inquiry.

The polemic surrounding non-experimental methods in political science is often between single case studies and Large-N studies. This is also reframed into discussions between areas studies and comparative studies (Bates, 1997). The debate between the two can be framed as debate over validity and reliability. Single case studies' position is that in order to reach a valid conclusion on causal inference all possible explanations should be exhausted. To achieve this, it required an in-depth understanding of the case to draw valid sequences of the causal process operating in the country. This involves including and examining the qualitative data: data that cannot be quantified. They argue

[63] Pundits argue that geography based intra-country variation should be classified as multi-case studies since the unit-of-analysis is no longer the country but different regional and local governments. As for longitudinal intra-country variation, the term diachronic comparative analysis is interchangeably used. Counterfactuals refer to developing parallel hypothetical alternative scenarios under hypothetical alternative conditions.

Large-N studies compromise this by omitting or failing to include the crucial intervening variables operating in a particular country. A good example is leaders since there are no two identical heads of state yet they leave signature imprints on the country's developmental trajectory.

Large-N/Statistical studies argue that the reliability of findings depends on replication. Reliability of the findings is improved, as the modeled associative relationships hold even with the increase in additional observations and as peer researchers confirm the same findings as they replicate the research. The replication effort is facilitated with the development and sharing of quantitative datasets. Scholars of Large-N/Statistical studies argue that case study researchers fail to make their research findings replicable and thus, generalizable. A critique that is responded by the qualitative researchers with a push for greater transparency in lieu of perfect replicability and the counterargument that you cannot generalize when you have not properly deduced causal inferences, which is unobservable without emerging oneself to the local environment.

This research bridges the two sides by performing the two methods side-by-side on the same dependent variable. For qualitative research, data in the form of interviews and archival documents were explored. Not everything could be quantified such as the details of policy designs and evolutions in legislations regulating institutions. Hence, to harness the insights these types of observations possess, case studies developed from these qualitative data was deemed necessary. Given the research question examines the past, utilizing all surviving information was an important objective, including those that may not be comparable with other countries in their original presentation.

Large-N/Statistical research method was performed to confirm hypothetical relationships via probabilistic significance.[64] The dataset is available for replication and verification of results. Although the results could be replicated, there is a noticeable compromise in validity due to having to work with predetermined variable set. That is, there was no control over variable construction. The only control was in variable selection. Hence, the results had to interpreted carefully with this handicap in mind. This brings us back to the question on how research methodology matters.

Acknowledging the strengths and weaknesses associated with cases studies and large-N studies, the best alternative was to conduct both. Although different data types are utilized, the causal inference conclusions should be the same since the dependent variable is identical. In performing the two research designs, we see limitations to the statistical analyses due to having to drop many of the variables deemed important. Furthermore, the resulting path analyses model required findings from the case studies to better inform the specifics behind the confirmed relationships. In the opposite direction, the path analyses further confirmed the relationships extracted from the case studies, although the confirmation of a lot more associations were desired. The complementary results in form and their implications, demonstrating how different research methods may highlight different aspects in causal inference on the same dependent variable.

[64] "Significance" refers to the result where the outcome is so unlikely by chance that it is not too far fetched in assuming there is an underlying reason behind the occurrence of such rare outcome. The threshold in registering the result as an unlikely outcome is arbitrarily set, but with consensus among the scientific community, at 5% of all possible outcomes.

Upon detailed process-tracing of the critical factors responsible for performance variation among the case studies along with quantitative model development from available quantitative dataset, we realize the following implications on research methodology:

1) Detailed conceptualization matters when studying the variation for a multidimensional dependent variable. Without properly unpacking the variable, researcher bias on observations tend to drive towards easily falsifiable associative conclusions.
2) When path-dependent intervening variable omissions pervade the quantitative dataset, statistical findings carry inherent blind spots that persist to be unnoticed without complementary in-depth process-tracing case study.
3) The research process employed in this research opens the discussion on how best to incorporate "sequential intervening variables" in comparative country studies, especially when the complexity of sequential nature makes them difficult for comparison.

These implications matter because they are closely linked with the generalizability the research findings. The quantitative data analysis is touted for its generalizability. However, from this research, that depends on how valid and precise the variables are constructed. The way too broad definition of variables may help increase observations yet the catchall definitions prevent us from reaching any precise conclusions

on the relationships between the variables. Calculated associations are tentative with reservations on permissible interpretations. This is the situation where broad associative factors may be mathematically calculated but yet the factors themselves cannot serve as blueprints to constructing a basic water supply system that is being able to deliver clean water. Details matter and this is what are often lost in broad development dataset such as the World Bank Development Indicators.

This is not to say the quantitative methods are flawed when examining water supply policies. Rather the research findings demonstrate that through qualitative research of process-tracing, we are able to complement quantitative research findings by identifying conditions and triggers. Mathematically calculated associations fails to capture these causal mechanism operating in water policy.

Implications to Political Science Theories

So how does the content of the findings contribute to the political science scholarship? How does this research further enrich the public administration literature? And how does it further enrich the comparative politics literature? These questions are addressed in the following sections.

Public Administration Scholarship

Before jumping into the implications of the findings to the implementation theory models developed within the field of the public administration, it is necessary to briefly cover its genealogy of the theories. This is to prevent any misunderstanding in assuming

that public administration and implementation are the same. A common misunderstanding that stems from assuming public administration is all about implementation. It is not. To articulate why, it requires a brief overview of the developments within public administration.

The origin of public administration as a separate academic field of study within the United States is attributed to Woodrow Wilson and his article, "The Study of Public Administration" (1887). In his article, he calls for the separation of politics and administration along with the professionalization of the American Government. His article was in response to prevent political interference in administration, as it is likely to result in inefficiency and corruption (Hill & Hupe, 2002, p. 30). The origins of his perspective have been attributed to his admiration of the efficient operation of the Prussian Government. Yet, he was not advocating to imitate the Prussian Government as they had efficiency but lacked democratic spirit.

> *... Prussia's particular system of administration would quite suffocate us. It is better to be untrained and free than to be servile and systematic. Still there is no denying that it would be better yet to be free in spirit and proficient in practice* (Wilson, 1887, p. 207).

The balancing act of maintaining democratic values while maintaining efficiency in Government operations lies at the core of American public administration scholarship. A balancing act that is made difficult as the prior requires the attentiveness to popular

sentiment where the latter undoubtedly requires professional judgment. The tides and ebbs of administrative reforms in reflection of constant adjustments in this balance due to shifting political winds in United States history are traced in Light's *Tides of Reform* (Light, 1997). The reason why the origin of American public administration scholarship is mentioned is to demonstrate the roots of Anglo-American public administration scholarship where the balance of bureaucratic effective and democratic responsiveness lies at its heart. Paradigm shifts towards New Public Management and New Governance are reflective of the different modes to achieve the balance between the two key tenets in public administration.[65] The origins and evolutions of implementation theory in the Anglo-American tradition do not wander far from this intellectual heritage.

The separation of politics and administration followed by the call for a dedicated study on the latter would naturally assume the study of implementation to have taken place, despite "implementation" as a conceptual term may have not been used at the onset. However, implementation scholars argue that it has not been given the full attention that it warrants. Hill explains that this may be more circumstantial due to the evolutionary path in sociology of knowledge in public administration prior to 1970s (Hill & Hupe, 2002). He notes that the politics and administration dichotomy advocated by Wilson did not take place, as Wilson's position was being too ideal in trying to separate

[65] New Public Management reforms advocate hands-on professional management, explicit standards and measures for performance, managing by results, value for money, marketization, contracting out and quasi-markets, service delivery, and citizen choice. New Public Governance emphasize hands-off steering, working with networks, and negotiating beliefs and exchanging resources (Rhodes, 2016).

administration from politics because the American executive by design was not permitted for this separation in the Madisonian tradition.

> *Fearful of the oppressive potential of centralized power, the Founding Fathers devised a political system to prevent factions from overrunning minorities that makes such collective action nearly impossible. The separation of powers, the federalist structure of government, and the different constituencies of elected officials served to institutionalize a system of check and balances designed to guard against the worst abuses of power. While this system has been fairly successful in stymieing serious threats to democratic rule, it has also been the source of institutional incapacity* (Ferman, 1990, p. 40).

Thus, implementation as a dedicated area of study was overshadowed and assumed to be absorbed in the greater question of studying the democracy-bureaucracy nexus. Thus, we have to ask the question why "implementation" was hailed as a new investigative subject in the 1970s despite it being naturally studied when researching administration. This is attributed to various factors. First, it was being assumed to be absorbed in the "larger" question of democracy and bureaucracy. Thus, it was being under-investigated by failing to give it a dedicated focus. Second, the public administration scholarship in the 1960s was assuming implementation for granted, which was convenient since graining access to the inner operations of the bureaucratic organization was difficult.

[I]t is perhaps true that until the end of the 1960s there has been a tendency to take it for granted that political mandates were clear and that administrators would do that what their political bosses demanded of them. In formal statements of constitutional law, implementers, like civil servants, have often been entirely ignored. Furthermore the neglect of the examination of administrative process can be partly attributed to the difficulties involved in looking into the 'black box', after parliamentary process, particularly in a secretive administrative culture like the British one (Hill & Hupe, 2002, p. 42)

As a result, when Pressman and Wildavsky provided a detailed examination of the implementation process and its failure, it sparked a dedicated call to studying "implementation" in the 1970s.[66] Investigative inquiries into the "black box" resulted in a more refined definition of "implementation". Mazimanian and Sabatier, recognized as key contributors to the scholarship, defines implementation as follows:

Implementation is the carrying out of a basic policy decision, usually incorporated in a statute but which can also take the form of important executive orders or court decisions. Ideally, that decision identifies the problem(s) to be addressed, stipulates the objective(s) to be pursued, and in a variety of ways,

[66] The pundits on implementation scholarship critique that "implementation" was never a lost subject unlike Hargrove's critique of the "missing link" in the study of the policy process (1975). Rather it was studied under other subject titles such as organizational theory and institutional theory, where the distinction between the two are attributed to the latter's permeability to the human social constructs external to the original organizational designs (Selznick, 1957, p.5).

> *'structures' the implementation process. The process normally runs through a number of stages beginning with the passage of the basic statute, followed by the policy outputs (decisions) of the implementing agencies, the compliance of target groups with those decisions, the actual impacts – both intended and unintended – of those outputs, the perceived impacts of agency decision, and finally, important revisions (or attempted revisions) in the basic statute* (Mazmanian & Sabatier, 1983, pp. 20-1).

Implementation therefore is context and content specific.

> *For implementation theory and research,* [public policies are expected to retain a purposive character and this] *means that contextualization is important: 'implementation' is always connected to specific policies as particular responses to specific problems in society* (Hill & Hupe, 2002, p. 5)

The context and content specificity of implementation is accurate description of implementation, as local organizational capacity is a large factor in the calculus of assessing whether delegation and authorizing discretion is likely to uphold and realize the policy objectives. For water infrastructure that requires professional knowledge on water supply systems and their integration with urban planning and water resources, delegation will only work when delegation will still ensure coordination among disparate yet relevant parties and when discretion will ensure professional judgment to be properly

applied without delay for speedy progress on fulfilling policy goals. These questions fall into the "implementation" realm as statues may prescribe responsibilities to executive bodies and dictate desired policy outcomes yet it does not mean executive bodies are willing and able to carry out the responsibilities and the statutes may not be detailed, nor desire to be, to allow professional judgments to be exercise by the professionals at the front-lines who have greater access to necessary on-site details.

Despite the importance of specificity implied in the implementation scholarship, normative findings were extracted and encapsulated in various implementation models. These reflected the generalizable attributes present in programs with good implementation records. What these were and whether they are valid in the case in the expansion of access to safe drinking water are examined.

Pressman and Wildavsky recommend paying attention to two critical bottlenecks in implementation. They are delays due to multiple veto points and lack of direct means for execution (Pressman & Wildavsky, 1984, pp. 145-6). Thus, the prediction of the distribution of the cases is where low coverage countries would exhibit more veto points and lack of direct means for execution. In the case of Indonesia, this is the case whereby direct means of execution was unavailable due to the weak local government capacity in constructing water supply systems. This was exacerbated with the local government unwilling to adsorb the technical recommendations by the central government following the political atmosphere to distance themselves from the previous authoritarian regime.

A constrained relationship between the two tiers of government was due to the outstanding debt issue, which was a legacy of the previous regime that continued to be

unresolved due to the local governments' position of not wanting to pledge any guarantees for additional financing from the Ministry of Finance. Local governments exercised deliberate reservations to aligning their water development policies to central government recommendations after fiscal decentralization because they could do so and also by disowning the problem due to the legacy financial mismanagement problems plaguing the local water supply systems. With decentralization, vetos were exercised without clear capacity building efforts at the local level.[67]

Although an important factor in explaining variation in the dependent variable, increased veto points from decentralization cannot be the sole reason behind the inter-country variation. This is because decentralization did not only happen in Indonesia. It occurred in Vietnam as well. Thus, broadly defined decentralization is insufficient as an explanation. Upon reviewing the collected data, although Vietnam decentralized, it did not lead to fragmentation of decision-making away from the central government. That is, decentralization has formally increased veto points. However, the consequences of exercising them were very different. The democratic transition in Indonesia resulted in the increase of veto points from almost no veto points to multiple veto points with few penalties that can be imposed by the central government for failure in compliance to central government policies. In Vietnam, the central government-local government leadership alignment due to a single political party and heavy reliance on central government funds rarely saw the splintering of local government from the Central

[67] USAID's PDAM assessment program helped improve the management of water utilities. However, improvements were not seen all across the entire pool of PDAMs.

Government. That is, Vietnam may have had multiple veto points by rule like Indonesia, but unlike Indonesia rarely was it invoked. In Indonesia, multiple veto points were actually being invoked as a result of central government-local government leadership misalignment and with local infrastructure projects being more reliant on local government funds.

Vietnam was different because it decentralized under the context of central government-local government leadership alignment from its unperturbed single-party Government. In Vietnam, it was administrative decentralization and not fiscal decentralization. Thus, decentralization was translated to local People Party Committee giving approvals to expedite work on projects. In Vietnam, the local government directly submitted funding requests for urban water supply systems to the Ministry of Investment and Planning following decentralization. For rural water supply system, it requested the assistance from Ministry of Agriculture and Rural Development, which held the pooled funds for rural water supply system development under a dedicate National Target Program.

As for Malaysia, Singapore, and South Korea, we see this pattern of minimizing the exercise of veto points holding. Veto points were actively removed in the case of Malaysia with the establishment of the National and Regional Operation Rooms. Singapore and South Korea removed veto points for land development with the passing of Land Accommodation Laws. In all three cases, direct means for execution was secured with the central government assuming the primary responsibility of water supply system development. In terms of hypotheses testing of Pressman and Wildavsky's, the

case studies hold them to be valid with a extra caveat: formal veto points may expand but their exercise may be suppressed by strong central-local political alignment and heavy reliant of local government on central government transfers. That is, not only does it support the hypothesis but it also adds a layer of detail on how this is translated in the realm of increasing access to improved water sources in these countries.

Mazmanian and Sabatier expand the pool of relevant explanatory variables. They provided a detailed schematic of the various factors critical to successful implementation of policy. They hypothesize three critical clusters of factors to exert influence on the progression of the implementation process. These are *Tractability of the Problem, Ability of Statute to Structure Implementation,* and *Nonstatutory Variables Affecting Implementation*. In the top-down approach to implementation, they argue if these factors are anticipated and controlled by the policy designers, implementation will occur smoothly. To make their model more applicable, they provide a list of question for which the policy designers should go through (Mazmanian & Sabatier, Implementation of Public Policy: A Framework of Analysis, 1981, pp. 25-30). How they apply to the five case studies are discussed below:

Statutory Design Questions

1. *Are the statutory objectives precise and, if multiple, clearly ranked in importance? Moreover, if the statute is assigned to an existing agency, does it indicate the relative priority of these new objectives in the totality of the agency's programs?*

a. Indonesia: Indonesia's Water Resources Development Law (Law 11/1974) loosely discusses waterworks development but clearly without a specific coverage rate and clearly a lower priority to water resource development. The latter focusing mainly on irrigation water supply development. Water is not even discussed in the landmark Regional Administration Law (Law 22/1999) and the Fiscal Decentralization Law (Law 25/1999) despite them specifically mentioning natural resource development of oil and forestry. Water Supply responsibility is assigned to Department of Human Settlements within the Ministry of Public Works. However, the priority in the Ministry of Public Works is in water resource development.

b. Vietnam: objectives and prioritization is clear with a specified target of coverage promulgated by the Prime Minister. Local governments are responsible for urban water supply system development with coordination with Ministry of Investment and Finance. As for rural water supply system development, the responsibility is assigned to Ministry of Agriculture and Rural Development under the National Target Program.

c. Malaysia: objectives are precise in improving the livelihood of rural populations to enjoy the same social amenities as the urban population, which includes access to safe drinking water. Prioritization was established by creating a separate Environmental Engineering Unit within the Ministry of Health to provide dedicate staff and budget to this cause.

d. Singapore: statutory objectives were precise was the country prioritized water resource independence and housing of its citizens. In the process, previous statutory boards were dismantled and replaced with a stronger statutory entity in charge of executing Singapore's development vision.

e. South Korea: Objectives are precise in statutes. However, the statutes do not clarify the relative importance of the vis-à-vis other functions delegated to the agency.

2. *Does the statute actually incorporate a valid causal theory?*

***** Upon examination of evidence, a simple "yes" or "no" answer would be imprecise. This is because the term "valid causal theory" is ambiguous. There are multiple components to water supply system development and access expansion in both technical and financial aspects. Hence, partial valid causal theories are included in a single statute but it would be incorrect to register the statute to include a complete valid causal theory for water access expansion. For example, Article 7 of Vietnam's 1989 Law of Health Protection for the People makes explicit that the agencies and water supply enterprises ensure the upkeep of water hygiene standards to protect people's health. The causal theory is valid, as it is based on information, education, and communication. However, this statute does not include any details on the reach of agencies and water supply enterprises. That is, the causal theory is valid yet partial. This is what is

often the case requiring reform. Applying the minimal criteria, all countries register as "Yes".

a. Indonesia: Yes, valid causal theories are in place. The theories are often imported with the assistance of international organizations, as was in the case ADB sector report in 1995.

b. Vietnam: Yes, valid causal theories are in place. Beyond specialized statutes, sector strategies are formulate with implementation steps, as in the case of the *National Rural Clean Water Supply and Sanitation Strategy up to Year 2020.*

c. Malaysia: Yes, valid causal theories are in place. Beyond specialized statutes, the Development Plans incorporate how water supply investment and development will take place.

d. Singapore: Yes, valid causal theories are in place. Beyond specialized statutes, Singapore approaches expansion to access to safe water with other infrastructure development plans such as housing development.

e. South Korea: Yes, valid causal theories are in place. Korea by process breaks down the duties and tasks among different Ministries. That is, the implementation of the Law is put in motion by developing Ministerial Decrees with specific instructions to the organization and staff on how the Law enforced.

3. *Does the statute provide sufficient financial resources to the implementing institutions to enable them to conduct the necessary technical analyses, to*

apply the general objectives to thousands of specific cases, and to monitor target group compliance?

a. Indonesia: No. Financial resources were a bottleneck. Financial resources were being mismanaged by not being ring-fenced from local government finances. Article 79 in Regional Administrative Law (Law 22/1999) specifically states that regional revenues comprise of enterprises owned by the region, which are utilities. Hence, "sufficient" here is a conditional term. "Sufficient" on paper may not be adequate in actual operations due to unclear separation of accounts within the local government finances. Target group compliance is a recent development with the creation of BPPSPAM.

b. Vietnam: No. Although progress is noted, there is still shortage of funds. Particularly in the rural water supply development program, it is predominantly reliant on donor and MFI funds. However, close monitoring took place in the rural sector through the series of NTPs.

c. Malaysia: Yes. Dedicated financial commitments to water supply development were made explicit in the Development Plans.

d. Singapore: Yes. Cost-recovery principle was adhered to from the beginning with Public Utilities Board registering continuous profits, which demonstrates cost-recovery in practice.

e. South Korea: Yes. However, unlike Malaysia that dedicated significant domestic funds to its water supply system development, South Korea

relied on external aid organizations for low-cost loans in their water supply development. These included ADB, IBRD, and bilateral loans from USAID and OECF.

4. *Does the statute minimize the number of veto points within and among implementing institutions and does it provide sufficient sanctions and inducements to enable supportive officials to overcome resistance among their colleagues and among target groups? If dealing with a regulatory function, does it provide for tax breaks or other forms of compensation to members of target groups who are particularly hard-hit by adjudicatory decisions?*
   a. Indonesia: No. The veto points are increased with fiscal and administrative decentralization. Tax break data is not available. However, it is known that significant arrears were accumulated from the public sector not paying the utilities for their water use. It made cost-recovery operation difficult for utilities.
   b. Vietnam: Yes. Veto points are minimized. However, the collective donor community involved in funding the NTP program exercises veto to ensure technical assistance is timely supplied to prevent delays in implementation.
   c. Malaysia: Yes. Operation Rooms are setup to remove veto points that may cause delay.
   d. Singapore: Yes. Veto points are actively removed by clear messaging of prioritization of projects by the Prime Minister.

e. South Korea: Yes. Veto points are removed by top-down administration coupled with the central government controlling inter-government transfers necessary for project implementation.

5. *Are the decision rules contained in the statute consistent with statutory objectives? For example, do they place the burden of proof on target groups? Do they give as much authority as possible within implementing institutions to those officials most likely to support statutory objectives? Do they make the granting of permits or licenses contingent on specific findings consistent with statutory objectives?*

   a. Indonesia: No. Implementation authority is dispersed and exacerbated with administrative splintering following the fall of Suharto's authoritarian regime.

   b. Vietnam: Yes. Implementing institutions are endowed with authority to support statutory objectives prioritized by the Prime Minister.

   c. Malaysia: Yes. Implementing institutions are endowed with authority to support statutory objectives prioritized by the Prime Minister.

   d. Singapore: Yes. Implementing institutions are endowed with authority to support statutory objectives prioritized by the Prime Minister.

   e. South Korea: Yes. Implementing institutions are endowed with authority to support statutory objectives prioritized by the President.

6. *Does the statute assign the responsibility for implementation to institutions (agencies) that are strongly supportive of its objectives and likely to grant the*

program high priority? Specifically, is it possible to create a new agency to administer the program or else to assign it to a prestigious existing agency that supports the objectives and is looking for a new program?

a. Indonesia: No. At the central government-level, water supply system development is handled by the Department of Human Settlements within the Ministry of Public Works. However, during fiscal decentralization, their project implementation relied on local government funding that did not prioritize water supply system development due to dire financial circumstances already being faced by the water utilities.

b. Vietnam: Yes. A dedicated program was setup and led by the Ministry of Agriculture and Rural Development.

c. Malaysia: Yes. An Environmental Health and Engineering Unit was setup within the Ministry of Health to dedicate resources and strengthen staff capacity dedicated to rural water supply development.

d. Singapore: Yes. Public Utilities Board was dedicated to the water supply system development. Water resources and water supply development was prioritized by the Prime Minister due to Singapore's reliance of the resources to Malaysia.

e. South Korea: Yes. Korea Water Corporation, a state-owned enterprise overseen by the Ministry of Construction, was setup to development water resources and water supply system development.

7. *Does the statute maximize the opportunities for supporters external to the implementing agencies to participate actively in the implementation process? Specifically, does it provide standing for supporters to actively intervene in agency proceedings and to appeal agency decisions to the courts? Does the statute provide for evaluation studies by prestigious independent organizations to monitor the extent to which agency decisions and the impacts of those decisions are consistent with statutory objectives? Finally, is it possible to somehow centralize legislative oversight in the hands of supportive legislators?*
    a. Indonesia: No. Local government shields itself from external input even from the central government.
    b. Vietnam: Yes. Donors participate actively in the implementation process.
    c. Malaysia: Yes. The Prime Minister explicitly makes it a priority to engage in feasibility studies to acquire external loans.
    d. Singapore: No. Implementation process was domestically controlled.
    e. South Korea: Yes. A series of the development loans were utilized to encourage foreign engagement. Interaction and intervention of foreign agents were encouraged not only for the funds but also to promote technology transfer to a weak capacity public sector.
8. *What is the probability that changes in socioeconomic conditions or in technology during the foreseeable future are likely to undermine political support for statutory objectives? If the achievement of those objectives is*

contingent on technological innovation, what steps does the statute take to foster such progress?

a. Indonesia: High. Political support was already eroded with de-prioritization.

b. Vietnam: Low. Water supply systems in states with rapid economic development are in place. As for the poor states, they rely on central government transfers for water supply system development.

c. Malaysia: Low. Water supply coverage is high. Hence, people are accustomed to the service. Thus, its discontinuation is likely to cause political dissatisfaction.

d. Singapore: Low. Water supply coverage is high. Hence, people are accustomed to the service. Thus, its discontinuation is likely to cause political dissatisfaction.

e. South Korea: Low. Water supply coverage is high. Hence, people are accustomed to the service. Thus, its discontinuation is likely to cause political dissatisfaction.

9. *What can be done to counter the short issue-attention span of the mass media and the general public? In particular, is it possible to convince some of the more important media to hire specialist reporters to cover the general issue addressed by the statute?*

   * Media reports were not actively collected. News coverage from South Korea and Singapore were collected but not at a level to be comfortable in

identifying when exactly interest in certain statutes dissipated. However, it is known that media coverage took on key water projects as the sites were visited by the Heads of State and covered by media. As for Indonesia, Vietnam, and Malaysia was not collected. However, we know from data that Vietnam and Malaysia was active in promoting information, communication, and education activities among the general population. In Vietnam, local organizations such as the Women's Union were utilized whereas in Malaysia, the staffs of the rural health care centers were utilized. As for Indonesia, it is unclear whether a continuously awareness activity on safe drinking water took place. Based on field visits, no awareness activities were noted in the slums of Jakarta and in Ambon.

a. Indonesia: Unclear. There is an absence of evidence in support of continuously media attention or awareness activities. However, during interviews, the most recent Head of State, President Joko Widodo, is campaigning 100-0-100: 100% clean drinking water access, 0% lving in slums, and 100% access to good sanitation.

b. Vietnam: Prime Minister prioritizes water supply coverage during the New Year speech. Prioritization is communicated through local organizations supported by the Government.

c. Malaysia: Prime Minister visited the regional Operation Rooms. IEC activities were executed through extended reach of the health care centers.

d. Singapore: Prime Minister visited the sites. IEC activities were promoted in the community centers within the residential estates.

e. South Korea: President visited the sites.

10. *What steps can be taken to activate any latent supportive constituencies and to assure that supportive groups have the necessary staff and other resources to monitor and to actively participate in the implementation process?*

a. Indonesia: Investment in awareness activities is crucial. As for support on staff and resources to monitor and participate in the implementation, it could start by broadening BPPSPAM's capacity to engaged in training and secondments to poorly performing utilities. As for monitoring, expanded partnerships with local on-the-ground community based organizations would be a constructive step.

b. Vietnam: A dedicated National Target Program equipped with dedicated resources assured that supportive groups have the necessary staff and other resources. In Vietnam, this particular aspect takes on a different interpretation since there are no social organizations that are not registered to the state. That is, unlike the pluralistic traditions of the US, the Vietnam Government regulates and provides direct budgetary support to all social organizations.

c. Malaysia: The logistical aspects to reach the more dispersed rural community was addressed by basing awareness and water supply system

development activities off of rural government offices that were established with central government funds.

d. Singapore: Because water access was incorporated in the housing policy in urban Singapore, there was no need to activate any latent support. The support in the form of squatter population's voluntary migration to Housing and Development Board units was promoted by low cost of home ownership and proximity of the units to employment areas.

e. South Korea: Latent supportive constituencies in the rural areas were activated with support and resources from the central government. The New Village Movement mobilized community participation in village beautification projects where needed technical support was met through the cooperation between the New Village Movement heads and the central government representatives. The latter mostly from the Ministry of Interior. The Ministry of Interior representatives would then coordinate with other ministries to mobilize support to the villages. As a part of the New Village Movement, rural water supply systems were developed before it was replaced with extended pipe systems from the urban treatment plants.

11. *What can be done to assure that legislative and executive sovereigns who support the statute will actively monitor and intervene in the implementation process? In particular, is anyone available to serve as a "fixer" and does he have the staff and other resources to do so effectively? Moreover, what can*

be done to assure that subsequent legislation in policy areas relevant to the statute does not undermine statutory objectives and that attempts to revise the statute do not emasculate it?

a. Indonesia: Although water supply systems were actively built during Suharto's regime, its operation was not closely monitored. BPPSPAM, the monitoring agency, only came about in 2005.

b. Vietnam: Progress was monitored closed by donor communities, especially as they were providing the funds for the continuation of the program.

c. Malaysia: Prime Minister Razak setup the Operation Room to actively monitor the progress of development projects.

d. Singapore: Prime Minister Lee Kwan Yew was known for his obsession with progress. He directly received reports on progress where he would be actively engaged in removing bottlenecks.

e. South Korea: President Park Chung Hee received direct reports from the implementing staff in front of cabinet members. In the case of the New Village Movement, farmers were invited to the Presidential residence once a month to report progress in front of cabinet members. It allowed a close monitoring of how directives were being implemented.

12. *Can anything be done to appoint implementing officials who are not only committed to the achievement of statutory objectives but also have above-average managerial and political skills?*

a. Indonesia: Water Boards were created. However, the main challenge is in prioritization of water supply system development by the local governments. A prioritization that needs to happen on investment budget, dedicated professionalized staff, and political mobilization to partner with adjacent administrative bodies.

b. Vietnam: This was achieved by setting up the NTP Office within the Ministry of Agriculture and Rural Development.

c. Malaysia: This was achieved by establishing a direct reporting line between the development officers and the Prime Minister.

d. Singapore: This was achieved by Lim Kim San heading HDB and later the Ministry of National Development. He was Prime Minister Lee Kwan Yew's trusted senior group.

e. South Korea: The President of Korea appoints 250 head posts during his/her inauguration. This is align the public administrative body with the direction of the Head of State. The above average managerial and political skills is in-part secured by the high-level (level-5) civil service examinations that selects the brightest students and training them as dedicated managers in administration.

Critical Conditions Questions

7. *The enabling legislation or other legal directive mandates policy objectives which are clear and consistent (or at least provides substantive criteria for resolving goal conflicts).*

    a. Indonesia: It is unclear whether this exists. During a field visit, it was mentioned that a master plan discussion was on-going for 2 years without a clear resolution and project initiation date in the future.

    b. Vietnam: Legislation for water supply system development is clear. However, how well it is tied with other complementary developments is unclear. That is, how well the water infrastructure legislations are tied with housing developments or take into consideration of the urbanizing population is unclear. As for the whether legislations are consistent with other legislation, it is of lesser concern in Vietnam, as the country's legislation references all affecting legislation during the drafting and promulgating process of any legal documents.

    c. Malaysia: Legislations are consistent, as the larger picture of the national development is incorporated in the Development Plans. That is, consistency among government entity operations is tied together with the Development Plans.

    d. Singapore: Legislation is clear and consistent, as the Ministries report on the passed legislations impacting their operations within their

Annual Reports. This is a cumulative process whereby past legislation and their amendments are explicitly traced.

e. South Korea: Legislations are clear and consistent with other legislation, as there is a progress where statutes are reviewed during the legislative process to avoid conflict with existing laws.

8. *The enabling legislation incorporates a sound theory identifying the principal factors and causal linkages affecting policy objectives, and gives implementation officials sufficient jurisdiction over target groups and other points of leverage to attain, at least potentially, the desired goals.*

    a. Indonesia: On paper, "yes". But to what extent it actually gets implemented is a different matter. This is evidenced by the clear identification of various problems facing the water sector. However, those identifies problems are still outstanding even in the near past. Also, implementation responsibility has shifted over time from the central to the local government. However, during the shift, the central government ability to intervene implementation at the local level has been eroded due to lack of any independent funding from the central government.

    b. Vietnam: Yes. Dedicated investment in water supply systems are prioritized.

    c. Malaysia: Yes. Dedicated investment in water supply systems are prioritized.

d. Singapore: Yes. Although it is incorporated within a complementary goal of moving citizens into housing equipped with modern water and sanitation.

e. South Korea: Yes. Resources are mobilized for feasibility studies on water infrastructure.

9. *The enabling legislation structures the implementation process so as to maximize the probability that implementing officials and target groups will perform as desired.*

    a. Indonesia: No. The extent in which legislation structure the implementation process is unclear.

    b. Vietnam: Yes. There is supporting evidence that legislation structures the implementation process.

    c. Malaysia: Unclear. There is a strategy but the extent of legislation structures the implementation process is unclear.

    d. Singapore: Unclear. There is a strategy but the extent of legislation structures the implementation process is unclear.

    e. South Korea: Yes. There is supporting evidence that legislation structures the implementation process.

10. *The leaders of the implementing agency possess substantial managerial and political skill and are committed to statutory goals.*

    a. Indonesia: Unclear with given evidence.

b. Vietnam: Yes. The implementing agency is the local government and they are committed to meeting the goals set by the central government.

c. Malaysia: Yes. It is built by design for development officers to exercise significant discretion in removing implementation delay.

d. Singapore: Yes. Lim Kim San as the head of Housing and Development Board and later the Minister of National Development exhibits substantial managerial and political skill to fulfill statutory goals.

e. South Korea: Unclear. However, it is clear that legislation provides clear details on the authorities imbued to implementation agency heads to exercise discretion for implementation.

11. The program is actively supported by organized constituency groups and by a few key legislators (or a chief executive) throughout the implementation process, with the courts being neutral or supportive.

a. Indonesia: Although there are organized constituency groups in the form of Community Based Organization being involved in the rural water supply development, they are not involved in the larger water supply networks. It is unknown whether there are any organized constituency groups for the latter. Key legislators pushing for implementation is unknown as well.

b. Vietnam: Organized constituency groups are available. However, they are not independent from the state, unlike groups in advanced

industrialized and democratic nations with pluralistic composition in policy implementation. The organizations in Vietnam are organized under the Vietnam Fatherland Front and are responsible for promoting awareness. National goals are shared, especially those promulgated by the Prime Minister. Water access is one of the key goals. Thus, there is active support.

c. Malaysia: It is unclear to whether there were organized constituency groups supporting water supply system expansion. But what is known is that the Prime Minister was active in promoting health in the rural areas. Water and sanitation was part of this goal. The attention to rural areas is attributed to the political leaderships' efforts to garner the support of rural Malay constituents, especially after the racial riots in 1969, as they comprise the majority of the Malaysian population.

d. Singapore: Organized constituency groups did exist in Singapore. However, it revolved around the estates where events with the representative members of Parliament were organized. The events were informative and to gain further support on public health campaigns initiated by the Prime Minister.

e. South Korea: Organized constituency groups did exist but it was in the form of village communities. Villagers were encouraged to congregate and to reach decisions on communal projects. Central government agencies supported these projects. However, there is

evidence of notable legislator leading the efforts in implementation. This is most likely attributed to a stricter separation of administration from the legislative functions in Korea. That is, administration law amendments do not originate from the legislative body but by the ministries responsible for implementation.

12. *The relative priority of statutory objectives is not undermined over time by the emergence of conflicting public policies or by changes in relevant socioeconomic conditions that undermine the statute's causal theory or political support*.

    a. Indonesia: The biggest change in Indonesia was the fall of Suharto's regime and the rapid fiscal and administrative decentralization. The inability of the central government to demand compliance to the local governments deterred the implementation of national policies.

    b. Vietnam: There was no threat in implementing the water policies.

    c. Malaysia: There was no threat in implementing the water policies.

    d. Singapore: There was no threat in implementing the water policies.

    e. South Korea: There was no threat in implementing the water policies.

The following table helps visualize the evidence-based responses to Mazmanian and Sabatier's series of questions.

Table 59: Simplified Results from applying Mazmanian and Sabatier Framework to the Case Studies

	Statutory Design												Critical Conditions					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Indonesia																		
Vietnam																		
Malaysia																		
Singapore																		
South Korea																		

Legend:
- Evidence suggest the absence of bottleneck
- Unclear or uncertain due to lack of evidence or ambiguity in evidence
- Evidence suggest the presence of bottleneck

There are a couple of takeaways from imposing Mazmanian and Sabatier's framework to the case studies. First, the application of the framework does show that the poorly performing case study of Indonesia has greater implementation difficulties. It identifies the outstanding issues that need to be resolved at the statutory design stages. It also is informative in identifying the critical conditions important for the implementation of the statutes.

Despite the utility of the framework in helping us identify the potential bottlenecks, it suffers from several crucial weaknesses, at least in employing the framework to identify implementation bottlenecks in the expansion of safe drinking water. First, the number of statutes relevant for the expansion of safe drinking water is more than one. Within the water sector, multiple statutes are linked with expansion of safe drinking water. Then there are statutes in other complementary sectors such as housing, health, education, etc. There are statutes that apply broadly to all sectors that are relevant to expansion in water access such as public finance statutes issued by the Ministry of

Finance along with decentralization statutes. Multiple statutes and their implementation along with their complementary effects on expanding access to safe drinking water is not fully captured by the Mazmanian and Sabatier's framework due to its emphasis on singular legislation and its implementation.

Second, Mazmanian and Sabatier's framework is built on top of a democratic and pluralistic tradition. It assumes the independence of media and social organizations. It also assumes legislators' reelection prospects are based on their responses to constituent demands. This is because it assumes eloping their participation will improve accountability that translates to more successful statute implementation. Media and social organizations are not necessary independent due to the different regime types among the case studies. Social organizations do not flourish independently in countries due to limited resources and restraints in social mobilization. Legislators may have greater affinity to party lines rather than constituents, especially in single party regimes and weak electoral competition. Thus, legislators face stiffer competition in nomination rather than constituent approval. These aspects and their impact on implementation would not have been identified when solely relying on Mazmanian and Sabatier's model.

The reason why Mazmanian and Sabatier's framework was applied to the cases was to determine how well the top-down orientated implementation theory help in causal inference behind the variation in the dependent variable. Mazmanian and Sabatier is recognized as a seminal work in the top-down approach of implementation where implementation bottleneck could be removed and delay prevented by policy designers (Hill & Hupe, Implementing Public Policy: Governance in Theory and in Practice, 2002;

Winter S. C., Implementation, 2012). Other scholars applying the top-down approach are Van Meter and Van Horn (1975), Bardach (1977), and Hogwood and Gunn (1984).

Van Meter and Van Horn advocates two dimensions are crucial for successful implementation: amount of change sought and goal consensus (1975). Accordingly, policies designed for small changes and high goal consensus are most likely to be successfully implemented. The implementation process is also a product of six process-oriented variables: 1) policy standards and objectives, 2) resources and incentives, 3) quality of inter-organizational relationships; 4) characteristics of the implementation agencies, 5) economic, social, and political environment, and 6) disposition or response of implementers (1975, p. 464-472). Bardarch emphasizes the need for scenario writing process and paying attention to fixing the game (1977) in light of conflicts in inter-organizational settings. Scenario writing applies to structuring the sequence of implementation games that will have to be played in order to achieve desired results. Fixing the game applies to rearranging if necessary the parameters of the game in order to achieve desired results in the interactions. Hogwood and Gunn (1984) list 10 preventive measures that should be taken by policy makers to prevent implementation failure. They are: 1) circumstances external to the implementing agency do not impose crippling constraints, 2) adequate time and sufficient resources are made available to the program, 3) required combination of resource are available at each stage in the implementation process, 4) policy is based upon a valid theory of cause and effect, 5) relationship between cause and effect is direct with few intervening links, 6) a single agency is responsible for implementation and does not depend upon other agencies for success, 7)

there is a complete understanding of, and agreement upon, the objectives to be achieve, and these conditions persist throughout the implementation process, 8) specify in complete detail and sequence the tasks to be performed by each participant in the implementation process, 9) ensure perfect communication and coordination among various elements involved in the program, and 10) those of authority can demand and obtain perfect obedience (Hogwood and Gun, 1984, p. 199-206).

The common basis of the top-down implementation scholars differ from their counterparts in the "bottom-up" cohort by emphasizing change inducing agents, i.e. those able to improve implementation's probability of success in attaining policy goals, are senior-level policy makers with greater creative room for policy modification and improvements. It takes the approach the failure by legislators to design statutes in anticipation of down-stream bottlenecks is the main reason for implementation failure.

However, this approach is contested on two fronts. First, its does not take into account the behavioral routines adopted by "street-level bureaucrats" in adjusting to the multitude of demands under limited resources (Lipskey, 1980).[68] Implementation is stymied not entirely due to poorly articulated statute objectives and implementation actors but in part due to the coping activities demonstrated by the frontline civil servants

[68] Lipsky notes in the 30th year edition that the 1980 book was written at a time of the civil rights movement in the United States. The movement was aimed to achieve social and political equity for African-Americans and a looming question was how to achieve equal rights in the government administration populated by Caucasian workers. Upon examination, Lipsky noted that the performance of critical public services was not the product of racism, personal attitudes, or indifference but of those of 'the predictable consequences of the structure of particular kinds of publics sector work' (2010, p. 212-3).

in their constrained resource environment. Winter provides a succinct summary of the street-level bureaucracy actions (1990).

> *A typical response to the conflict they experience is to employ a number of conscious or subconscious coping strategies. Street-level bureaucrats will use tricks such as limiting information about services, making clients wait, making access difficult, and imposing a variety of other psychological costs on clients. A slightly different kind of coping strategy is to concentrate on a limited number of selected clients, types of programs, and solutions* (Winter S., 1990, p. 31 in summary of Weatherly & Lipsky, 1977).

> *Policy failure comes from several sources; it is due as much to inadequate problem definition or policy design as it is to administrative misfeasance, malfeasance, or nonfeasance. Moreover, administrative failures may now be seen as stemming from the inattention paid by legislators to program constraints during policy design. Problems, or failures, in implementation, therefore, are as much a consequence of flaws in the policy formulation process and in the environment in which implementation takes place as they are due to specific problems of administration per se* (Palumbo & Calista, 1990, p. 6).

The relevance of the bottom-up approach to the case studies is evident in the constraints faced by the local governments. For example, in efforts to acquire external

financing, local government needed to conduct feasibility studies. However, as evident from South Korea's case, it was evident that this capacity did not exist. Hence, local governments required assistance from the central government in the form of secondments and training. In Malaysia and Singapore's case, hiring and training staff to implement policy was a recognized crucial impediment to policy implementation. Simply, there were not enough people at the implementation stages to carry out policy. Education institutions were not producing enough graduates to meet demand and the graduates that were being produced were not ready for the job. Hence, in-house training courses were developed along with collaborative efforts to acquire staff early.

The insights offered by bottom-up approach are the result of its attention to the day-to-day operational constraints within the bureaucracy. That is, it focuses on the receivership end of public service. Elmore further supports this approach by advocating "backward mapping" (1979).

> *The logic of backward mapping is, in all-important respects, the opposite of forward mapping. It begins not at the top of the implementation process but at the last possible stage, the point at which administrative actions intersect private choices. It begins not with a statement of intent, but with a statement of the specific behavior at the lowest level of the implementation process that generates the need for a policy. Only after that behavior is described does the analysis presume to state and objective; the objective is first stated as a set of organizational operations and then as a set of effects, or outcomes, that will result*

from these operations. Having established a relatively precise target at the lowest level of the system, the analysis backs up through the structure of implementing agencies, asking at each level two questions: What is the ability of this unit to affect the behavior that is the target of the policy? And what resources does this unit require in order to have that effect? In the final stages of analysis the analyst or policymaker describes a policy that directly resources at the organizational units likely to have the greatest effect (Elmore R. F., 1979, p. 604).

For the purposes of our research, the bottom-up approach emphasizes the much-needed attention to capacity: the ability of the organization to carry out its tasked functions. The questions that are posed from this approach on access to water are to ask whether residents of the particular jurisdiction have access and if not, what methods would be most suitable in providing access. Service options range from covered wells to delivery of treated water via piped network. Different options require different requisites. The bottom-up approach pushes us to consider whether all needs are met to expand access.

The bottom-up approach is an insightful alternative framework. However, it suffers from the identical flaws as the top-down approach in that it does not adequately take in consideration complementary statutes and it coordination. The logic of bottom-up approach is that it relies on behavioral approach to understand why the staffs at the front lines fail to effectively implement public policy. The emphasis on single statute implementation fails to identify and adopt multi-sector institutional reforms such as that

seen in Malaysia where the rural water supply system development was moved from the Ministry of Public Works to the Ministry of Health to harness synergies. Malaysia's case was not a case of problems in statue design but rather it was a problem of resources constraints and prioritization. The bottom-up approach permits us to identify this problem and suggest hiring more staff and devoting additional dedicated resources. The reliance of the bottom-up approach helps optimize intra-organization operations.

The capacity concern takes on deeper discussion in the following generation of implementation scholars. Goggins and colleagues (Goggin, Bowman, Lester, & O'Toole, Jr., 1990) placed capacity at the heart of their Communication Model of Intergovernmental Policy Implementation. The model is built on the premise that implementation depends on the interpretation at play that is a function of local circumstances, particularly capacity constraining factors. Hence, it attempts to the bridge the top-down and bottom-up approaches within implementation research. In their attempt to tie the two, they employ interpretation as the common currency.

> *Therein lies the key to implementation's variability. Interpretation is a function of* context*. Therefore, a single message, such as a federal statute, may be interpreted differently in different states. Even within a single state, the pluralistic and interactive nature of local-level policy adoption makes the probability of multiple, conflicting messages high. State-level implementation is correctly conceptualized as the sorting and interpreting of messages by recipients in contextually different settings. The result is a decision that determines the style*

that implementation takes (Goggin, Bowman, Lester, & O'Toole, Jr., 1990, p. 33 with original italics in normal font).

In other words, even though the objective conditions may be identical in state X and state Y, the implementation decision may vary. This variance is a function of the manner in which decision makers interpret the information that they are receiving. Interpretation is related to characteristics internal the decision makers (such as their psychological predisposition) and external to them (such as interpersonal relations among politicians and representatives of organized interests). This is a little recognized but powerful part of the implementation process (Goggin, Bowman, Lester, & O'Toole, Jr., 1990, p. 38).

Their framework adds another dimension to the implementation theory, which is the flexibility of interpretation of central government statutes. Although their framework is seen as an advance in implementation theory in the US setting, its applicability to foreign settings is questionable because the local government's flexibility in compliance of central government statutes may not necessary be an optimizing effort. This is more the case especially for policy implementation that by design requires significant investment that cannot be entirely funded by the provinces and when the local government does not possess the technical capacity. Thus, the proposed benefit of the Communication Model to other countries is questionable.

> *The Communications Model is also capable of specifying the conditions under which various state implementation decisions and actions about the timing of implementation and change in program form and content during implementation are likely to occur* (Goggin, Bowman, Lester, & O'Toole, Jr., 1990, p. 172).

This is because at the provincial levels the ability to exercise optimizing discretion is just not there. For countries with weak local government public finances with heavy reliance on central government funds, interpretation assumes little role as implementation is resource-wise tied to the compliance of the central government's statutes. From our cases, central government statutes are implemented when there is a greater reliance on its resources. Discretionary interpretation is the product of fiscal independence. For Indonesia, collected evidence points more to the latter, as Governors and Mayors were able to exercise discretion in prioritization of local government projects due to the fiscal decentralization. Decentralization also occurred in Vietnam but implementation in policies expanding access to water continue and this may be due the continued reliance on fiscally weak provinces to rely on central government transfers for water supply development projects.

The most recent implementation model is the Integrated Implementation Model by Winter (1990; 2012). The model is comprised of two dependent variables: one being the outputs of implementers and the other outcomes targeted by policy objectives. They are products of the policy formulation process, organization and inter-organizational implementation behavior, street-level bureaucratic behavior, and response by target

groups and other changes in society (Winter, 1990, p. 20). Similar to the other implementation frameworks that were reviewed, implementation is an independent product of cascading stages following policy formulation and design. The distinction between the latter two is where the first is more preoccupied with the political processes whereas the later is more focused on goals, instruments, and designation of the implementing organization.[69] The implementation process is mainly comprised of staff behaviors and resource dependencies among networks. Management is separated out in the diagram but it is inter-connected with staff behavior and resource management.

The Integrated Implementation Model differs from the previous theories in its separation in policy formulation and policy design along with incorporating target group response.[70] Although the policy formulation and design separation cannot be attributed to Winter alone, as Linder and Peters (Linder & Peters, 1984; 1990) have written substantially on the subject, incorporating it into an implementation model help theoretically integrate the distinction between the two that has been made clear by the later studies in the field. The model is different from other models, as it adds further weight to the importance of target-group responses as a change agent in implementation. Unintended target-groups responses that hamper effective implementation are those such as passivity by the intended target population and failing to take advantage by inaction or nonparticipation for social programs targeted for them. That is, they may have the right

[69] Insightful resource on policy formulation would be Conlan, Posner, and Beam (2014). Additional resources on policy design and instruments are Salamon (2002), Eliadis, Hill, and Howlett (2005), and Howlett (2011). Separating out the policy design from policy formulation stage is a later development of Winter's, as the separation is not represented in his 1990 book chapter but appears in his 2012 book chapter (Winter 1990, 2012).

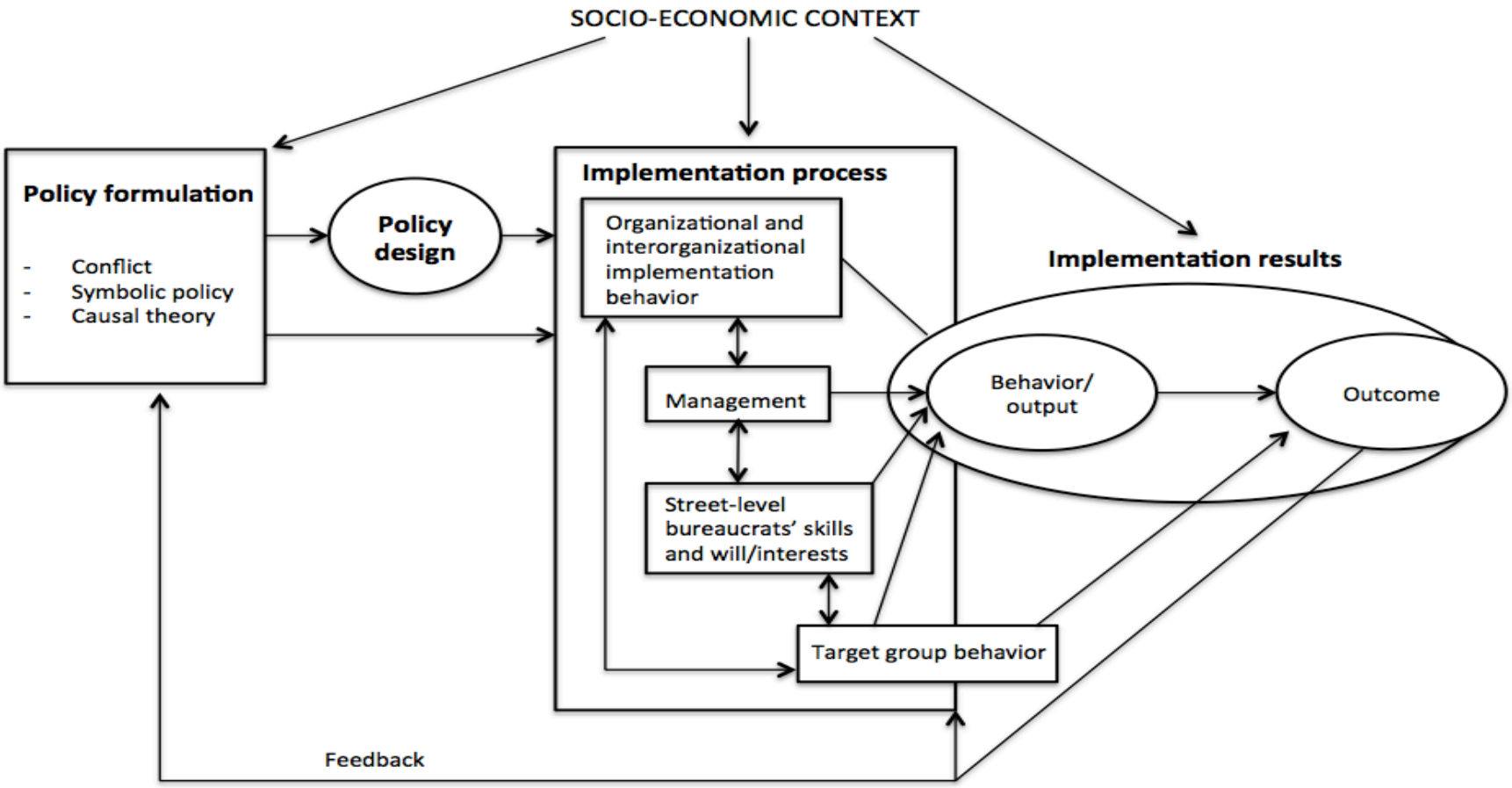


Figure 21: Integrated Implementation Model

Source: Winter, Soren. (1990). "Integrating Implementation Research." In Dennis J. Palumbo and Donald J. Calista (Eds), *Implementation and the Policy Process.* New York: Greenwood Press, pp.19-38; Winter, Soren. (Ed.) (2012). "Implementation." In B.Guy Peters and Jon Pierre, *The SAGE Handbook of Public Administration.* 2nd Ed. Thousand Oaks, CA: Sage Publications, Inc., pp. 255-64.

to services but either may be unaware of such a program or deliberately shy away from Government interaction due to stigmatization or fear. These aspects along with street-level bureaucrats behaviors that is unaccounted for during policy design are two advancements in the field that are incorporated in the Integrated Implementation Model.

Recognizing and assuming Winter's model is the cumulative product of developments in the field of implementation theory, the question then is how well do the findings fit into the various components comprising the model? By populating the component table with the case study observations, we find that it encapsulates the descriptions of the critical components associated with expanding access to water. The model helps identify potential bottlenecks like other implementation models. However, the model fails to capture why certain countries hold certain initial conditions. That is, why was Vietnam more receptive to foreign input in water supply system development more than Indonesia? Especially so when Vietnam is a single party government whereas Indonesia was rapidly blossoming as a democratic government? How come despite the proximity of Indonesia, Singapore, and Malaysia, why do we see such different institutional trajectories? That is, the initial conditions of statutory development and the socio-economic context needs to be further explored, as we see that the cases all start from very different initial conditions and their trajectories of political and institutional development vary significantly. These important features matter in water because water programs just cannot be transferred, as it is dependent on other developments in the country.

This research contributes to the implementation theory scholarship by pointing out the main weakness in the framework lies in its inability to assess whether the initial local conditions can be altered. For example, how could you improve water program implementation in Indonesia where Governors and Mayors prioritize other visually noticeable public projects? Policies may be formulated and designed but how do you get organizations to endorse them, prioritize them, and resource them when the organization is impervious to external input? That is, what is there to do when organizations are fine with poor implementation performance? Implementation theory is weak on these points and any future implementation model needs to incorporate this aspect. This leads us to examine whether other subfields in political science could offer additional insights on this matter.

Table 60: Fitting the Case Studies in the Integrated Implementation Model

	Indonesia	Vietnam	Malaysia	Singapore	South Korea
Policy Formulation	Sector policies are developed in response to assessment reports by international organizations. This is the due to the low prioritization of water supply infrastructure. The priority of water sector policy is historically on irrigation systems (Law 5/1960 and Law 11/1974)	Communist Party of Vietnam explicitly states protection of health is the responsibility of the state. Bilateral funds are used to formulate long-term policy.	Policy formulation is anchored on the Development Plans where investment in water supply system development is explicit.	Policy arises from Prime Minister Lee Kwan Yew of People's Action Party promising to move people to improved housing units.	Policies are formulated in conjunction with the economic development plans where water resources and water supply are assigned high priorities.
Policy Design	MoPW involved in water supply system development. However, project funding is no longer centrally governed as result of administrative and fiscal decentralization. (Law 22/1999 and Law 25/1999). PDAMs are responsible for O&M. BPPSPAM was later setup to monitor PDAM performance. CBO involvement is encouraged and supported.	State-owned utilities are responsible for urban water sector where financial assistance is directly required by the local government to the Ministry of Planning and Investment. Rural water supply is developed via NTP initiatives with MARD taking lead role but working in partnership with MoH and MoE.	Ministry of Public Works is responsible for urban sector. Water supply investment projects leveraging foreign sources of finance were prioritized. Rural water supply development is assigned to the Environmental Health and Engineering Unit within the Ministry of Health under the Environmental Sanitation Program.	Public Utilities Board is responsible for water service. Service coverage and network expansion is tied together with land development and urban planning. Housing is undeniably a complementing development, as the Government becomes actively involved in its construction.	Water resource development is delegated to Korea Water Corporation. Urban water supply system development is catalyzed with the use of foreign finance, particularly from ADB, IBRD, OECF, and USAID. Rural water supply systems were built during the New Village Movement.

Organization and Inter-organizational implementation behavior	MoPW is the main technical agency. However, it loses leverage vis-à-vis local government as the latter hold discretion and deliberation in project funding.	SOEs act independently working directly with MPI. MARD is the main vehicle for rural water supply development.	MoPW works with FELDA to supply water for rural land development projects in addition to developing urban water supply systems. MoH integrated rural water supply system development within their rural healthcare center programs.	PUB works in close coordination with Housing and Development Board. They are both under the Ministry of National Development. Lim Kim San having served both HDB and Minister of National Development and improved coordination and cooperation.	Cooperation among organizations is explicitly outlined in the Law-Presidential Decree-Ministerial Decree arrangement. Furthermore, they are anchored on long-term development plans. Central government plays a crucial role in coordination with their leverage in intergovernmental transfers.
Management	PDAM benchmarking exercise starts in 2005 with the creation of BPPSPAM. Data on performance are reported starting 2007.	A joint donor group conducts management review at the end of each NTP phase. It reviews and suggests managerial reform to the program.	Reports on progress are routinized with the setup of the Operations Room at the central and local government levels. Developments on federal programs are updated and monitored in the Operation Rooms and reflected in annual reports that percolate to the subsequent national development plans.	Reports on progress are regular. Results are reflected in annual reports. Also, direct leadership involvement in monitoring and oversight is pervasive during project implementation.	Detailed reports are produced of progress, although a lot of them have been deliberately lost to shield against retaliatory politics. Among surviving documentation, management was keen on developing detailed indicators of progress.

Street-level bureaucrats' skills and will/interest	Street-level bureaucrat's skills have been noted as much to be desired. However, they are shielded from removal due to pervasive legacies of the electoral spoils system. That is, utility managers are of political appointees often unequipped with technical training.	Street-level bureaucrat's skills have been noted as much to be desired. However, skills are being transferred and quality been overseen with continued involvement in developmental project by the engineers in the government.	Street-level bureaucrat's skills were improved through central government-led training programs. As for encouraging willingness, the Prime Minister frequently address the civil service and visited provincial offices to monitor progress.	Street-level bureaucrat's skills were improved via training. Instilling pride and raising the salaries of the public servants promoted willingness.	Multiple training programs were developed to improve the skillset of bureaucrats. Involvement in externally funded projects with foreign technicians aided the skillset development of local bureaucrats.
Target group behavior	Although piped water supply coverage is still much to be desired, there is little demonstration. People became accustomed to alternative means, which they do not need to pay for.	Piped water supply coverage in the urban areas is high. However, production capacity is still a challenge with most houses not receiving 24/7 water supply. Demand exists but no demonstrations.	As people acquired convenient access to piped water services, water usage increased.	As people acquired convenient access to piped water services, water usage increased.	As people acquired convenient access to piped water services, water usage increased.
Behavior/Output	Outputs are access to improved water sources with piped water supply as the most desired means.	Outputs are access to improved water sources with piped water supply as the most desired means.	Outputs are access to improved water sources with piped water supply as the most desired means.	Outputs are access to improved water sources with piped water supply as the most desired means.	Outputs are access to improved water sources with piped water supply as the most desired means.

Outcome	Prevention from waterborne diseases.	Prevention from waterborne diseases.	Prevention from waterborne diseases.	Prevention from waterborne diseases.	Prevention from waterborne diseases.
Feedback	Weak feedback due to the previously identified issues still having to be addressed later in the future.	Feedback is externally enforced.	Feedback is systematic with mid-term reviews serving to adjust projections.	Feedback is systematic with progress made transparent with annual reviews along with future actions.	Feedback is systematic. The time gap between amendments to decrees becomes shorter and shorter with time.
Socio-Economic Context	Fall of Suharto's authoritarian regime is a game changer affecting the composition of national and regional leadership as well as the working relationship between administrative bodies.	Economic reforms under *Do Moi* open Vietnam to external inputs and resources. Keen receptivity to foreign technical inputs and absorbing them domestically rapidly strengthens the technical capacity of the country.	Racial riots in the 1960s catalyze a reexamination of policies to alleviate rural poverty. This includes investing into rural infrastructure for development, which accelerates rural water supply coverage.	Water resource dependency on Malaysia forces the Singapore Government led by the Prime Minister to actively seek water sufficiency for its population. Encouraging migration and homeownership for national security considerations also propelled to be actively involved in public housing.	The general population accepted concentration of power in the central government due the looming national security threat of North Korea.

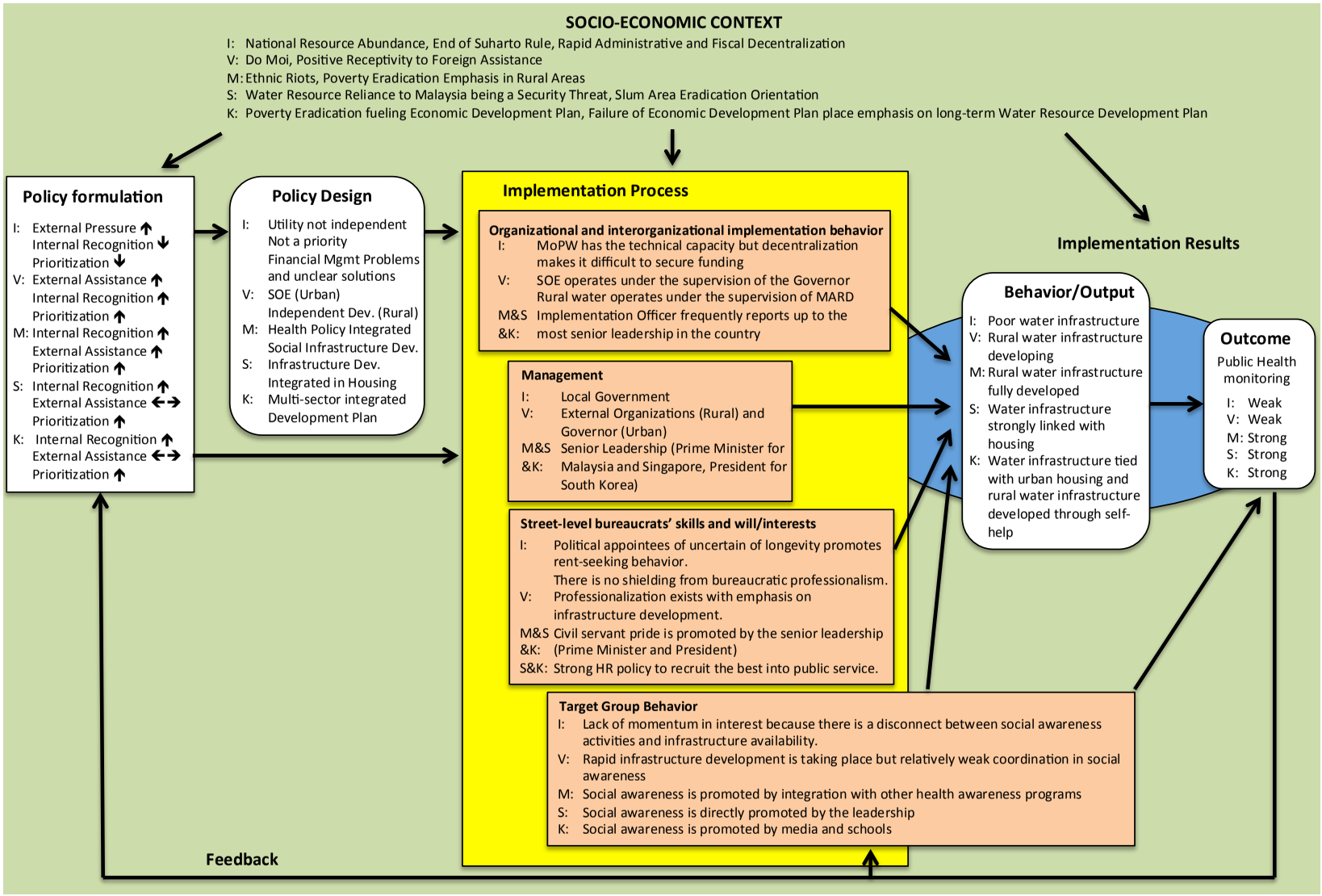


Figure 22: Integrated Implementation Framework applied to the case studies

Comparative Politics Scholarship

Comparative politics scholarship is another subfield in political science to explore possible explanations behind the variations in our interested outcome. Comparative politics involves examining more broadly defined political, social, and economic variables in search of social variations in different countries. Hence, approaching our inquiry from a comparative politics perspective, explanations behind variations are explored employing concepts developed from capturing relevant political, social, and economic attributes.

Of most conspicuous or commonly associated with comparative politics is the influence of different political systems. The preeminent inquiry within comparative politics is variation in political systems and its imprint on society, as demonstrated in Lijphart's study where even majoritarian and consensus models of democracy leads to different Government performances (Lijphart, 1999).[72] From the comparative politics scholarship, a common choice of explanatory variable to test in explaining variation to access in safe drinking water among different countries would be to the regime-type of the country. This is in turn because regime-type helps define and explain the variants in the rules on how leaders are selected and what authorities they are able to exercise within the leadership role. The ideal type democracy would describe a country where legislators

[72] Another good demonstration of studies focusing on this research is Przeworski, Alvarez, Cheibub, and Limongi where they test the Lipset's hypothesis on the associative relationship between democracy and development (2000). Their study refutes the existing paradigm that democracy leads to economic development. Also, although some studies treats regime-type as an explanatory variable, the reverse is also a focus of inquiry as well where regime-type is studied as a dependent variable (Moore, Jr., 1966; Huntington, 1991).

are selected based on free-and-fair elections won by popular vote.[73] In Dictatorships or Authoritarian regimes, the selection process of legislators is less free-and-fair where the dictator is able to serve as a strong gatekeeper in deciding who gets to be on the ballot papers in the case elections take place or if elections are suspended then he/she directly appoints the legislator.[74]

Although regime-type is common variable, it is not applied in our research in safe drinking water variation. This is not because it is not relevant but rather regime is better reflected in the types of state that emerges in the case study countries. The state typology embodies the affects of regimes. That is, in tracing the reason behind the variation in safe drinking water coverage performance among countries, whether the state is able to formulate and implement water-related policies is more relevant as an explanation than the typology of the process over electoral systems. This is not to disregard the importance of electoral systems but collected evidence demonstrates that investigating the research question by focusing on the state is a more convincing method in building explanatory linkages than tracing election results when electoral winners and their relation to water policy is unclear.[75]

[73] A detailed typology of democratic regimes is not explored here. This is deliberate. This is because regime types are coarse means in condensing the activities of relevant actors in the delivery of safe drinking water in the case countries.

[74] Although the term "legislator" used here is typically associated with the connotation of elected politicians working in the legislative body such as Congress or Parliament, the term here is used in denotative sense and refers to those with law-making abilities. Thus, in this denotative sense, it includes executive appointees who also draft and enforce regulations, as in the case of Vietnam and South Korea.

[75] The key reason why this was the case was because none of the interviewees mentioned names of specific politicians but focused on policy eras with added descriptions on the policy eras link to particular Heads of State.

The "state" scholarship within comparative politics is a natural place to anchor the research question, as policy implementation is often folded into the broader conceptualization of the "state". However, for clarification, the "state" is a broader conceptualization than a single Government agency. It refers to the set of institutions that is able to exercise legitimate force within a bound territory (Weber, 1921). Later scholars, further elaborate on the definition of the "state". Hall and Ikenberry elaborates:

> *A composite definition would include three elements. First, the state is a set of institutions; these are manned by the state's own personnel. The state's most important institution is that of the means of violence and coercion. Second, these institutions are at the center of a geographically bounded territory, usually referred to as a society. Crucially, the state looks inwards to its national society and outwards to larger societies in which it must make its way; its behavior in one area can often only be explained by its activities in the other. Third, the state monopolizes rule making within its territory. This tends towards the creation of a common political culture shared by all citizens* (Hall & Ikenberry, 1989, p. 2)

Following the definition, the state literature applies to our research question because we are interested in the public entities responsible for formulating and implementing safe drinking water policy. We are interested in variation witnessed across different countries in expanding access to safe drinking among their citizens. We are interested in the importance of the rules and their associated processes that are necessary

to expand coverage of safe drinking water. Hence, the state literature is a natural anchoring place within comparative politics for the research question, as it will help in identifying the critical explanatory variables behind the variation in the outcome. The state, however, is approached differently than in public administration. This is because the state in comparative politics is looking at the aggregate set of institutions embodied with the legitimatized authority to impress upon society its agglomerated set of decisions.

The importance of the state as a conceptual variable became pronounced in comparative politics in the 1980s as a result of recognizing the autonomy of bureaucratic institutions.[76] Previously, the state in pluralistic democratic setting, particularly in the US, was treated as "a vector diagram in which a series of pressures are brought to bear on the state, which then moves in the direction it is pushed by the strongest societal forces (Krasner, 1978, p. 26)."[77] That is, the state was treated as if it had no autonomy and was easily malleable to social forces.[78] The emphasis on the state as a critical explanatory variable particularly came to the fore with emerging works on the developmental state in the 1980s and 1990s where the state apparatus was seen as crucial explanatory variables responsible for rapid industrialization in the East Asian countries (Chalmers, 1982; Deyo, 1987; Amsden, 1989; Wade, 1990; Evans P. , 1995).

[76] Although the state as a conceptual variable was more widely used in the 1980s onward, the call for its use and refinement was much earlier by Nettl (1968).

[77] Krasner is quoted for his clarity on the treatment of the state in previous literature. He does not treat the state as such in his study and this comment here is extracted to lament the weak treatment of the state in previous literature. This quote is also drawn and used by Hall in *Comparative Politics* article "Policy Paradigms, Social Learning, and the State (1993)."

[78] In a previous parallel development in public administration, studies on routine building and rigidity in organizations that were impervious to external pressures existed (Crozier, 1964; Kaufman, 1967).

For the purposes of this research, four key scholars' works were particularly relevant the succinctly defining the explanations behind access to water variation. They were Migdal (1988; 2009), Johnson (1982; 1999), Scott (1998), and Herbst (2000). This is particularly due to their contributions in advancing the study of state in a developing country context.[79] Migdal's study open up the reality that the state does not exert uncontested authority of control within a territory. That is, states are not all-powerful in dictating control over society and compete for social control. State is one of many institutions vying for social control in a geographically bounded country. Strong states are not a given even in countries with colonial legacies. That is, the process in which colonial rule was established matter in what type of state emerges after the end of colonial rule. Migdal contrast Sierra Leone with Israel to demonstrate this aspect. The British colonized both Sierra Leone and Israel but by different means. In Sierra Leone, the British forge alliances with the tribal leadership and relied on them to exert control whereas in Israel, the British established a centralized agency that would directly intervene to establish control.

Migdal's strong society and weak state theoretical framework is relevant for research on safe drinking water, as it questions the ability of the central government's state apparatus in guiding or even dictating the development of safe drinking water

[79] The term "Third World Countries" is often used to denote countries that are still in the lower rungs of economic development in the world economy. This research uses "developing countries" in its place. This is deliberate as the use of the term "Third World Countries" is used more in the peripheral context of Wallerstein's World Systems Theory (1974). Given that the theory is out of fashion due to the rise of New Industrial Countries, the term attributed to late industrialized countries in East Asia, the non-associated term to the World Systems Theory of "developing countries" is chosen to depict the pool of countries.

systems in areas away from the country's capital. It questions whether central government policies are doomed for implementation at the onset due to structural weak state conditions possibly pervasive in the country. That is, in areas where central government has no authority in areas of country, it does not matter how technically sound policies emanating from the central government ministries are, as it would fall on deaf ears. Hence, it suggests another crucial condition at play that will affect water policy implementation.

The theoretical framework is also relevant since all the case study countries include in the research were once colonized and only gained independence following the end of WWII. Migdal suggest that a closer examination on how colonial rule was established is necessary to determined whether the developmental paralysis of strong societies and weak states is likely to be present. According to Midgal's theory, there are one necessary condition and four sufficient conditions that need to be satisfied in order for a strong state to emerge. The necessary condition is the severe social disruption and dislocation. The sufficient conditions are favorable historical moment, international or domestic military threat, autonomous professionalized bureaucracy, and availability of a skilled top leader. The strong state is desirable because the opposite, the weak state, finds it difficult to extract local resources and employ them for broader state interests.

The interesting point, or the challenging issue, of applying Migdal's theory is that all five case studies are broadly classified as strong states, as they all satisfy his

conditions for the emergence of the strong state.[80] Indonesia was a likely contender for the weak state categorization, as cities rooted during the Dutch colonial period were port cities mainly used for extraction and did not project authority beyond plantation estates. The Dutch forged delegated relationships with the sultans of Lombok and Bali. For these reasons, it was initially suspected of weak state and strong society circumstantial conditions. However, following Suharto's rise to power by usurping the Head of State role from Sukarno, Indonesia is categorized as a strong state as he ruled through the military that exercising sovereignty of violence in the country. The military were meshed in politics, as officers were absorbed in the Golkar Political Party that was headed by Suharto. They then were "elected" into Gubernatorial and Mayoral positions across the country. Hence, further solidifying the projection of central authority in the provinces. Thus, it has been categorized as a strong state with the solidification of the unitary state.

Vietnam, Malaysia, Singapore, and South Korea are all categorized to possess strong states due to the high capacity of by central government institutions to impress their will within their geographical borders. Vietnam is categorized as a strong state due to the effective of Communist Party of Vietnam to impress their resolutions onto various outlets of society. Malaysia is categorized as a strong state due to the effectiveness of impressing United Malays National Organization Party led Development Plans within their borders. Singapore is a strong state with it People Action Party's dominant rule on changing both landscape and social behaviors of its citizens. South Korea

[80] Despite the common misunderstanding, Indonesia is described as a strong state by an esteemed Indonesian scholar Crouch (1998).

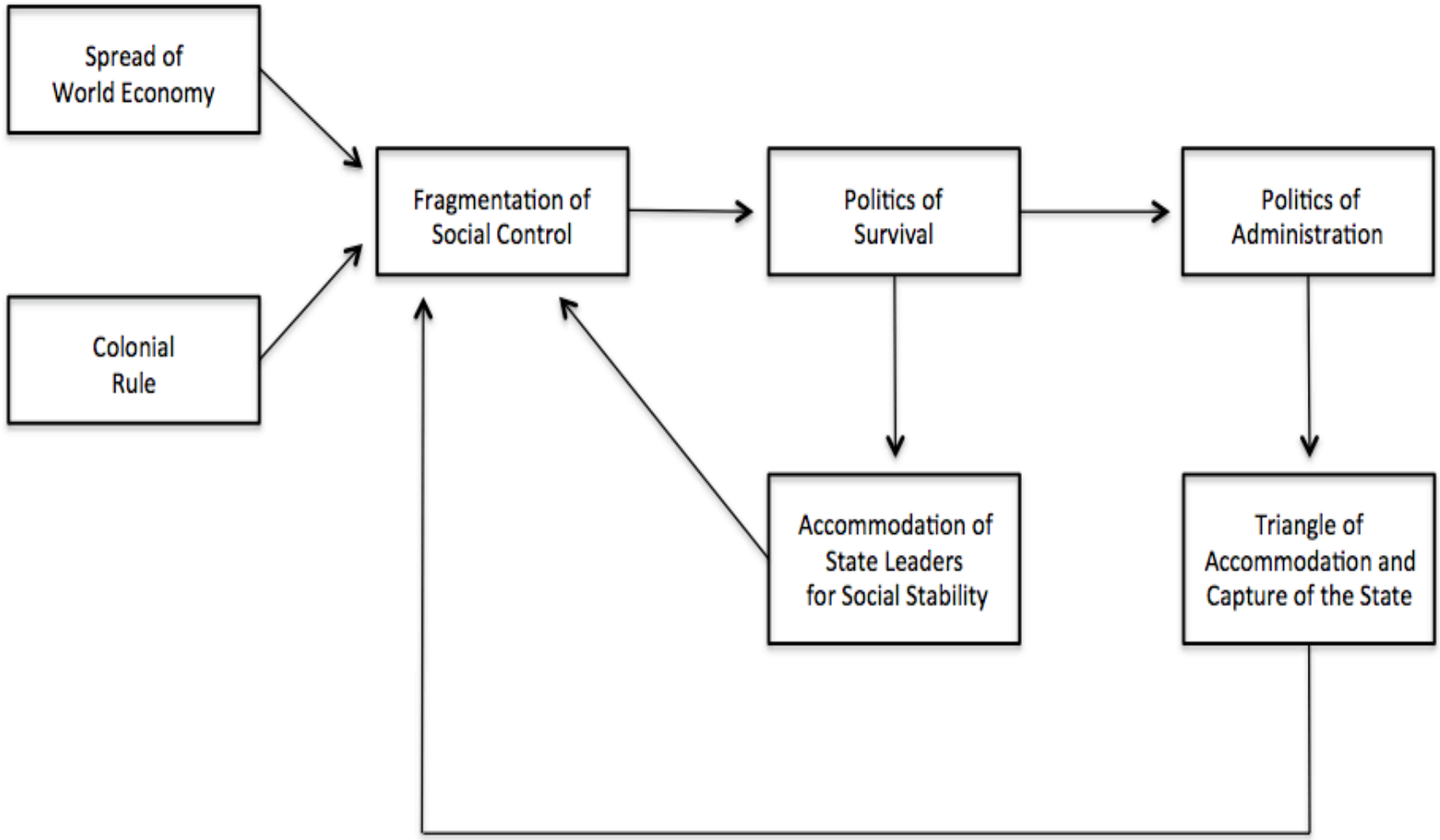


Figure 23: An Interactive Model of Relations between Weak Third World States and Their Societies
Source: Midgal, Joel S. (1988). *Strong Societies and Weak States: State-Society Relations and State Capabilities in the Third World.* Princeton, NJ: Princeton University Press, p.268

cultured in a strong state with it highly centralized political apparatus solidified during President Park's dictatorship. These categorizations do wax and wane with time, as in the case of Indonesia with big-bang decentralization following the fall of Suharto (Pratikno, 2005; Hidayat, 2005; Butt, 2010).[81] Vietnam is also now being challenged on its status as a strong state due to internal scuffles (Koh, 2001; Thayer, 2016).

Because there is no variation, the broad application of the strong state-weak state concept does not add value in enriching the explanation behind the variation in outcome. However, the enrichment to our understanding by Migdal's framework lies in the factors that sustain the weak state-strong society relationship. The fragmentation of social control and the politics of accommodation help explain why Indonesia experiences difficulty in when implement central government driven water infrastructure policies at the local level. That is the logic of fragmented control behind the strong society and weak state argument still holds across the case studies. This is despite the homogeneity in the organizational and functional form of state institutions.

> *Numerous state bureaus, from agricultural extension to child welfare, have plugged into international agencies. Those international connections have made related state agencies in different countries look remarkably similar, even if their effectiveness differs substantially from state to state. Membership in an international organization, such as the World Health Organization, has shaped*

[81] These references on Indonesia do not explicitly use the term "strong" or "weak" state but rather detail the autonomy granted to the local governments and how the delegated authority to the local government has led to enlarged flexibility to forge state-society relationships based on local interests without the censorship or agenda setting intervention by the central government.

> *states' data collection (in fact, it has demanded data collection as a central activity), procedures, base of knowledge, and approaches to their subject of concern. The effect, at least on the surface, has been a worldwide homogenization of practices, norms, and technical expertise. Little states, big states, they all look remarkably alike, even if some are much more effective than others in putting these international norms to work in the domestic environment* (Migdal, 1998, p. 16).

Despite the similarities in state form, fragmentation in control still exists. But upon closer investigation, the fragmentation is not between the state and society but within the formal organization of the state. The state can no longer, and should not, be treated as a unitary unit but should be recognized as a conglomerate of potentially disjointed units that loses their cohesiveness by formal yet centrifugal forces within the state. That is, the state as a formal entity may ubiquitously exist in all corners of the country's territorial boundary yet its policies are disjointed due to formalized dis-coordination from receded authority by the central government. More specifically, the Department of Public Works are present in all regencies yet their performances vary widely. Thus, Migdal's work applies to this research in not necessary the categorization of weak state and strong states but in his underlying logic of fragmented social control where local electorates choose not to enforce compliance and in his clarity in describing under what circumstances that condition is likely to persist. This is seen in the Indonesia and is in contrast to other country case studies.

Johnson's relevance to this research is because his concept of the developmental state applies to the case studies. The developmental state is a sub-categorization of a strong state. The other sub-categorization of a strong state is the predatory state. His research asks why East Asian authoritarian countries did not end up with predatory states. The states in these countries instead of taking on a predatory behavior assumed the pivotal role in promoting economic development by closely coordinating with private sector actors. The developmental states of Japan, Korea, and Taiwan possessed to have both bureaucratic autonomy and strong partnership arrangements with the private sector (Öniş, 1991). Despite the strong authority concentrated in the central state institutions, the state was not predatory and hence legitimized their intervention authority. The state prioritized development and legitimized their inventions in both economic and social realms in light of the changing developmental goals to economically enrich the country. Johnson elaborates on the aspect of legitimized intervention of the development state in this later writings:

> *The leaders of the developmental state do enjoy legitimacy in the sense that their claim to political power is based on some source of authority above and beyond themselves. They differ in this sense from authoritarian rulers whose continued rule depends on their monopoly of force remaining a genuine monopoly. The source of authority in the developmental state is not one of Weber's "holy trinity" of traditional, rational-legal, and charismatic sources of authority. It is, rather, revolutionary authority: the authority of a people committed to the transformation*

of their social, political, or economic order. Legitimation occurs from the state's achievements, not from the way it came to power (Johnson, 1999, p. 53).

The key distinguishing attribute of the developmental state that makes it different from authoritarian predatory state is greater legitimacy over its intervention. The state apparatus' core function is not of oppression and submission to extract resources for the enrichment of the few but rather through its process gives arise to and broadens the middle class. It includes skillful intervention to aid and support domestic industries to navigate dynamic world economic trade. This does not mean the state owns the industry but rather works in tandem with industry. The "development state" concept matters to this research, as the set of legitimized interventions by the state includes water resource development policies. In literature, countries of "development state" are predicted catalyze economic growth. That is, it explains why countries are able to develop faster than other countries. However, upon closer examination of the process involved in the state solidifying its position as a development, it cannot be explained without discussing the series of state interventions involving water infrastructure. This research builds on and improves our understanding on how development state arises and by digging deeper into the inter-linkage between water access expansion and legitimacy as possible drivers behind the establishment of the development state. This starts by being aware of the characteristics of the developmental state. To what extent the concept of the

development state helps explain the variation in expansion of coverage in safe drinking water has to be seen.[82]

The developmental state concept fits well with observations on those countries that have expanded access to safe drinking water rapidly. Malaysia, Singapore, and South Korea were developmental states as the government were actively setting targets and managing the administrative bodies to meet them. Target setting and engaging in administrative reforms is also evident in Vietnam. The question then is whether observations on Indonesia fit the developmental state. The short answer is "no," because legitimacy during Suharto's regime was maintained by expanding the military's penetration into politics under the "dual function" of military. Then the question is whether the developmental state was necessary for expansion of safe drinking water. Based on what was observed, this is not necessarily the case. Upon closer examination, the successful countries acted like a developmental state but impact on water infrastructure really is more closely associated with developmental policies incorporating investment in water supply system not only for the urban areas but also for the rural population: a key difference in equality that we see between Indonesia and the other countries. This difference supplies a convincing explanation on why strong states under authoritarian regimes had such different outcomes in solidifying state presence and compliance within their borders. Indonesia invested in water supply system development

[82] At the onset, the developmental state concept is relevant at least for one of the case studies, South Korea, as it is well recognized as a developmental state similar to Japan. Amsden (1989) and Woo (1991) are two key scholars who have researched the role of the developmental state of South Korea. For our research, we will examine to what extent the developmental state mattered for expanding safe drinking water, which is often categorized as a social infrastructure and therefore deprioritized in investment.

during Suharto's regime. However, the beneficiaries were limited to the areas where piped water networks were properly operating within the urban boundaries. In Malaysia and South Korea, rural village populations were mobilized to engage and participate in improving the water and sanitation circumstances of their areas through self-help cooperative activities, as seen in the "gotong-royong" activities and the "New Village Movement" in South Korea.

The reason why Scott's theory is another good candidate in our search for existing explanatory theories to encapsulate the observations is because Scott places emphasis on the leading role of Government in modernizing the country by employing planning institutions. This is appropriate because all countries in our cases do start with that assumption; more so, because water infrastructure investment and development is seen as prerogative domain of Government. Now given not all our cases are successful, it pushes us to explore explanations behind why some case studies ended up as poor performers. This brings us to Scott.

Scott takes an opposing view of Johnson through his work in *Seeing Like the State* (1998). He notes that the authoritarian experiments in high modernism have led to wasteful use in resources and greater misery. Resources are wasted as mètis, which refers to the "wide array of practical skills and acquired intelligence in responding to a constantly changing natural and human environment," is unharnessed and misery is planted by coercing populations to fit in standardized measurements (Scott, 1998). Social engineering experiments stunting productivity growth and in process causing misery is likely to occur when four conditions are present. They are:

> *I shall argue that the most tragic episodes of state-initiated social engineering originate in a pernicious combination of four elements. All four are necessary for a full-fledged disaster. The first element is the administrative ordering of society ... The second element is what I call a high-modernist ideology. ... The third element is an authoritarian state that is willing and able to use the full weight of its coercive power to bring these high-modernist designs into being. ... A fourth is closely linked to the third: a prostrate civil society that lacks the capacity to resist these plans* (Scott, 1998, pp. 4-5).

Administrative ordering refers to the standardized indexing instruments used by the state. Due to its raison d'être, it is high on legibility and simplification. These include "the creation of permanent last names, the standardization of weights and measures, the establishment of cadastral surveys and population registers, the invention of freehold tenure, the standardization of language and legal discourse, the design of cities, and the organization of transport (Scott, 1998, p. 2)." Scott notes that this simplification is a problem.

High-modernist ideology refers to arrogant and unsound faith on the deliberate comprehensive planning of human settlement and production. Although it is founded on the belief of scientific progress, it is different from practicing science. Scott elaborates on the difference as follows:

> *High modernism must not be confused with scientific practice. It was fundamentally, as the term "ideology" implies, a faith that borrowed, as it were, the legitimacy of science and technology. It was, accordingly, uncritical, unskeptical, and thus unscientifically optimistic about the possibilities for the comprehensive planning of human settlement and production* (Scott, 1998, p. 4).

Scott cautions against a coerced top-down approach because it is flawed on two points. First, simplified legibility is incomplete in capturing valuable localized and often tacit knowledge. That is, by imposing and employing simplified standards are unfit in capturing the rich ecological and cultural diversity. Second, the belief that social engineering is actually something that can be perfected is unsound and dangerous. That is, any unrestrained actions stemming from this belief causes greater hardships.

Scott's antithesis on the instrumentality of the state to ameliorate human conditions is relevant for our research on safe drinking water since it predicts that efforts to expand safe drinking water access via state intervention could potentially exacerbate circumstances of the targeted population. That is, state interventions of good intentions do not always live up to its original objectives. Hence, people could be worse off due to interventions.

As for our research, its relevance is in whether Scott's explanation of failure also could be generalized to safe drinking water. Indonesia seemed to fit the bill. This is because high modernist approach has taken root in Indonesia during Sukarno's rule in the 1950s (Vickers, 2013). This modernization wave also endorsed and supported by

Suharto. The result in the water sector led to massive enlargement of water treatment capacity all across Indonesia during his time. However, the problem was this was mired in nepotism, corruption, and weak technical oversight, resulting in systems unable to serve the entire population in its coverage area. Technical specifications were not transparent to the public and public consultation was not engaged. When technical information on utility was later collected for utility performance assessment, the incorrect formulation to assess performance was applied as in the case where utilities with no debt were in better position than those in debt. This is a misunderstanding of debt use in utilities because all utilities should have debt to expand coverage and connections to strengthen their revenue position. That is, utilities with no debt and low coverage are *less* desirable than utilities with debt and high coverage.[83] This is where the standard measurement concerns raised by Scott does come to fore, as these incorrect evaluations serve as justifications in central government aid to the local utilities. Furthermore, utilities encountered cash flow difficulties during the rainy season where people used collected free rainwater and moved away from paid piped water use. This was possible due to the local practical knowledge predating the construction of piped water systems. Thus, validating Scott's concern.

[83] This is not to say racking up large amounts of debt is desirable. In all cases, limiting serviceable debt amounts based on revenue flow without creating cash-flow crisis is crucial. The point is that debt is cheaper form of finance than equity. For details on financing arrangement in infrastructure, World Bank's *PPP Reference Guide* is useful (2015). For basics of financial modeling, Benninga's finance principle books are helpful guides (2011, 2014). In short, the basic notion is that because equity underwrites debt, it is entitled to a higher internal rate of return (IRR). Also, because equity is tied longer to the project, it assumes a greater risk as well. Hence, the premium on the investment is a justification of this as well.

The key concern behind Scott's logic of authoritarian experiment on high modernity creating inefficiency and misery is that it is not generalizable to a neighboring country. Malaysia is as diverse geographically and ethnically as Indonesia. Vietnam has an ethnically heterogeneous population as well. Thus, these countries are likely candidates of poor social outcome, as the mètis spread across diverse geographies and cultures would have been lost during standardization and imposition of authoritarian state will.

However, there is something amiss in imposing Scott's theory to our case studies at least in the safe drinking water frontier. These countries exhibited very different outcomes in safe drinking water coverage. Based on observations the opposite version is true. There was large discrepancy in administrative capacity at the local level between Indonesia and Malaysia at least for water supply development. Water supply development in Malaysia relied on central government funding with larger roles in Ministry of Health that was entirely run by the central government. In Indonesia's case, this was not the case. Water supply development project funds required local government commitment, a commitment that did not materialized due the poor financial health of the utilities and other political priorities. That is, we see a paradox. The presence of greater central government led to better coverage and improved access to safe drinking water.

Also, tracing the history of Singapore and examining how it increased coverage of safe drinking water, leaving populations alone, particularly the squatter populations, it is doubtful whether it would have led to the alleviation of the human condition. Scott

theory draws a naïve pastoral picture on the unsanitary and unhygienic environment squatters are left to culture. The question whether Singapore would have been better off leaving the squatter population as is, is farcical when posed to the modern Singaporean. As they say in Chinese, "good medicine tastes bitter." That is, a change for the better often requires drastic reform.

The last singled out significant researcher on the state who is relevant to our study is Herbst (2000). He offers explanations for state failure in Africa. That is, traces state failure to the different historical paths in statecraft between Africa versus Europe. History combined with post-WWII conditions of not having to secure their borders due to international arbitrage organizations permitted African nations to not focus on developing effective institutions that could exert authority in all corners of their country. The conditions shaped the incentives facing African leaders and in turn help explain why African states are as they are, which are failed states.

Unlike Europe, African countries did not have to fight for control over land. Labor and minerals has been the valuable commodity and not the produce grown from the land. Boundaries were fixed and did not have be fought over with the establishment of the United Nations, a war arbitration institution. Thus, negating the need to grow bureaucracies to defend the borders. This condition is very much different from the conditions leading to state development in Europe (Tilly, 1990).

This along with the colonial legacy of where capitals were located near or on ports, as colonizers were interested in extraction rather than governance, made it costly to later project power in remote parts of the country. That is, infrastructures were not in

place to reach outer low population density areas and there was little incentive to later invest in those areas, as land was not the scarce commodity in Africa. The lack in existential threat combined with the economic disincentive to invest in outer lands away from the capital resulted in weak capacity states poor in its ability to improve human conditions for their citizens.

Herbst's explanation on the poor governance functions of the states in Africa is relevant for the safe drinking water question, as it points to deeper rooted obstacles. That is, the aspect Herbst has pointed to is not something that can be addressed by a change of policy. According to his logic, there are systematic disincentives in place preventing the strengthening of the state to effectively deliver public services to its citizens away from the capital. These states do not have the forces in play to promote the growth of an effective state presence in the peripheral regions devoid of valuable extractable resources. The application of Herbst's explanation on poorly functioning states is also relevant to the study in access to safe drinking water for we should expect similar conditions and factors at play for those making poor progress in expansion of safe drinking water.

Herbst's theory applies well to Indonesia, as Jakarta and other major cities in the archipelago are port cities established during the colonial era. Outer lands from the capital were underdeveloped unless it was rich in natural resources such as oil. Land was more valuable than Africa, as spice trade requires plantations. However, it does not apply uniformly across all islands, since colonial presence on the larger islands of Kalimantan and Papua were limited. Borders remained the same after independence dis-incentivizing growing effective institutions in the border areas. The colonial government

engaged in predatory policies to source merchandise for European trade. And hence, the independent Indonesian Government tended to concentrate development in Java, which till this day houses close to two-thirds of Indonesia's population.

The problem though of fully validating Herbst's theory is due to Malaysia. Malaysia shares a similar history, although under British colonial rule rather than the Dutch. However, in expanding access to safe drinking water, it has an entirely different record. Social infrastructure was invested and developed in remote parts of the country. Although Malaysia had more fertile soil than Africa, yet it was not fully cultivated as vast part of rural Malaysia remain as jungles, as evident in provinces of Sarawak and Sabah.

So returning back to our initial questions: first, which of these theories help explain the variation that we are seeing, and; second, how does this research contribute to comparative politics? On the first question, the research takes a deeper look into the operations of the state with a focus on water supply systems. And by doing so, it is clear that the historical circumstances affecting state formulation and development matters. This was prominently evident in South Korea with investments in water infrastructure funded by the US, Japan, Germany, and multilateral financial institutions. That is, external resources fueled the growth of the state apparatus. In the case of the US investments, it resulted from the US security interests in the region. As for Singapore, the strengthening of the state institution on water infrastructure was primarily prioritized due to Singapore dependency on water with hostile Malaysia; a charismatic Lee Kwan Yew established state authority and legitimized state intervention due to this threat. It provided the impetus but then it was enabled by also the political vision to providing

public housing to the masses also to congeal nationalism through property ownership. An urban planning approach that also is traced to the influences of the state leaders on their British education and the on-going of urban planning of London during the rebuilding of the city from WWII damages.

State effectiveness was fueled by domestic contingencies. This was the case in Malaysia where the racial riots of 1969 triggered and bolstered rural development policies to further garner political support of the majority Malays in the rural areas. State institutions increased their physical presence with the expansion of rural community health centers that served as a platform of government interaction with the remote communities and also to harbor sanitary engineers when constructing water supply systems. In Vietnam, the failure of economic policies and the opening up to foreign assistance following *do moi*, is indispensible in understanding the water policy formulation and implementation in the country. In South Korea, the failure of the first 5-year Economic Development Plan due to water resources pushed the country to formulating the 10-Year Water Resource Development Plans as part of the Land Development Plan. Laws were passed to develop multiple purpose dams and to bind localities to develop piped waterworks plans.

It is undeniable that the historical circumstances and developments of the state played a crucial role in water infrastructure development. The passing and exercising of land accommodation laws to strengthen eminent domain claims by the state was a requisite to developing infrastructure. Yet, upon closer inspection, state apparatuses for

water infrastructure policy manifest in different forms and functions. This was demonstrated in the public administration scholarship section.

Then how does this research contributed to comparative politics scholarship? It contributes by first disaggregating the state. By disaggregating the state, greater insight is lent on how and why states fall into different categorizations of the failed state, the weak state, the predatory state, and the developmental state. The historical conditions giving rise to these categories of states are informative but the bigger and more important question is whether they can change. Whether they can change in the short amount of time for countries to meet the Sustainable Development Goal Number 6 of universal access. If not, than how can we formulate both international and domestic policies to work around the structurally imposed handicap? This research explores the first steps in that direction by separating out the structural limitations and conditional limitations clarified by the state literature from what can be deliberated.

A Synthesis Theory of State and Implementation

If a synthesis theory of state and implementation on water access is developed, what would it look like? From reviewed state literature, certain historical factors were catalytic. For Korea, it was the security situation and the subsequent Vietnam War that enabled the influx of infrastructure funds in the country. However, it was not only the funds that were important but how the funds were utilized in the country. Public private cooperation was encouraged where the former enabled the later. Yet, for water infrastructure, this translated to constructing multi-purpose dams for reservoirs to

stabilized water resources to industrial complexes. Structurally advantages conditions were harnessed and molded by institutions shaped by the leadership's vision. A vision that was nested in the greater security and poverty alleviation agendas of the country.

In Singapore, the geo-economic advantage of being a port city worked into its advantage of stabilizing fiscal conditions. However, an efficient and effective building of state institutions with these resources needed to take place due to the precarious water security situation. The land development of Singapore was put under the strong control of Government with the passing the Land Accommodation Law along with rapidly construction and provision of housing units for the poor by a Government agency.

Malaysia was also in a gifted situation with rich natural resources that continued to be available for exploitation even after the departure of the British. According to traditional state theories, Malaysia's access to water performance is puzzling since its circumstances would have likely led to the growth of a predatory state. More so, since most of the provinces are still ruled by the Sultans in a legacy arrangement built into the constitution during the formation of the country. Yet, the country was able to increase its water coverage throughout the country. Evidence points to the racial riots and the emphasis on rural development. It also points to the strengthening of central government physical presence by emphasizing government service delivery to the remote areas. This was the vision developed by Prime Minister Razak early on and developing appropriate institutions to implement the policies.

In Vietnam's case, the failure of economic policy and improved receptivity of foreign technical assistance proved catalytic. A strong state was already in place with the

Communist Party of Vietnam. And this strong state was instrumental in central-local government communication and mobilization of foreign technical assistance and loans. Also the legalistic approach of state institution building in Vietnam guaranteed that centrally directive orders would be delivered and executed by the localities.

In Indonesia, the abundant natural resources and the strong military presence in the political system gave rise to a strong state. However, the state was not threatened to develop its institutions to rapidly expand water infrastructure. It did not assume an export-oriented economic development strategy that required stabilizing water supply like Korea. It did not have to concentrate on water security due to its reliance on a neighboring hostile country like Singapore. It did not have to appease the rural populations by promising to deliver equal Government services, as authoritarian prerogative included the deployment and appointment of military personnel to the regions. Indonesia was not like Vietnam where economic crisis resulted in greater receptivity to foreign assistance and balancing this intervention in a still strongly unified state. Indonesia, rather, splintered following the economic crisis resulting in localized and isolated whirlwinds with little room and know-how on melting foreign intervention to assist in developing and improving social infrastructure delivery.

Historical circumstances matter. But circumstances alone do not fully capture the choice set parameters to exercise willful deliberation. Just like Singapore's early efficiency improvements in linking water infrastructure development with road construction cannot be explained without elaborating on the role of Lim Kim San where he ordered that roads are not flipped frequently to lay pipes but planning be done ahead

so that the excavation of roads be kept to a minimum. Deliberation is and can be institutionalized as in the case of Korea where water infrastructure development policies were established early and its adherence monitored closely. This was the case also in Malaysia with the establishment of the Operation Rooms. Vietnam also institutionalizes its deliberations, even for foreign assistance as seen in the case of detailed Ministry of Finance circular on how ADB funds for the water supply development in the cities should be utilized.

Establishing learning in implementation strengthens the state. Yet learning alone does not guarantee change. Change involves key state actors equipped with resources both internal and external to steer. The components relevant to steering for water policy to expand access to water has been compiled and consolidated in the Synthesis State-Implementation Framework is presented below. It is a step towards responding to the latest call on integrating the state into public management (Milward, et al., 2016).

The State-Implementation Synthesis Framework for catalyzing rapid expansion in access to safe drinking water brings together the various identified critical components. The framework builds upon the implementation literature but tailors it to the variation in access to safe drinking water. Policy formulation and policy design is more detailed. Implementation is broken down into construction and O&M. Urban and rural differences are highlighted with institutional arrangements that were effective carry out implementation in the different areas. The importance of monitoring implementation results and improving upon the policy formulation, design, and implementation cycle is emphasized. The framework has identified deliberate factors outside of engineering solutions and scientific tests on water quality that

dominates the literature on safe drinking water. That is, to catalyze access to safe drinking water, the factors included in the framework needs to be accounted for in order for unobstructed implementation in expanding coverage.

The framework builds on implementation and thus, do have an implementation focus. However, it brings in previous unaccounted and overlooked factors in the traditional implementation literature in public administration. These are the role of international engagements in policy formulation, design, and troubleshooting during implementation. How they matter and how they can play a constructive role in the catalytic process has not been mapped out in reference to implementation at least for water. This is what is presented. This is another deliberating factor that was unaddressed in the previous implementation literature.

The question then is how well does this framework incorporate the insights from the state literature in comparative politics. The comparative politics literature is important because it pushes us to think in the direction of separating the structural and environmental constraints outside of deliberation. That is, we need to answer whether there are structural impediments that will hamper, or accelerate, performance outside of thoughtful deliberation. Certain accelerating factors were identified. These include increasing state presence through complementary health and education institutions help. The increase in public health awareness reach of health and education institutions helps by legitimizing state inventions. It permits the growth bureaucratic autonomy through professionalization and capacity through trained staffing. This coupled by housing of responsibilities in effective and efficient institutional arrangements further improve stabilizes and thus ensures longevity of those institutions for uninterrupted incremental coverage. These attributes enable the state to both increase its

coverage and legitimize its intervention. Legitimacy is further rooted when leaders communicate that these interventions are for the benefit of the people and where citizens become beneficiaries. That is, the successful implementation in expansion of safe drinking describes the pathway to a developmental state. The framework captures how the case countries were able to move towards developmental state and not towards a failed, weak, or predatory state. The framework incorporates also factors that are outside of policy deliberations. These include external engagements, as these are products of incentives facing the external actors. Geopolitical circumstances may help galvanize and thus facilitate legitimacy of interventions as leaders justify them against a common enemy or precarious circumstances of the country. The framework still helps us wrap our heads around these non-deliberate factors. This is because the framework only helps map what factors were critical and how they were successfully designed. It does not tell us why these factors and their relationships are absent. To better understand why additional case countries with poor water coverage histories need to be added and researched. This is the future agenda following this research.

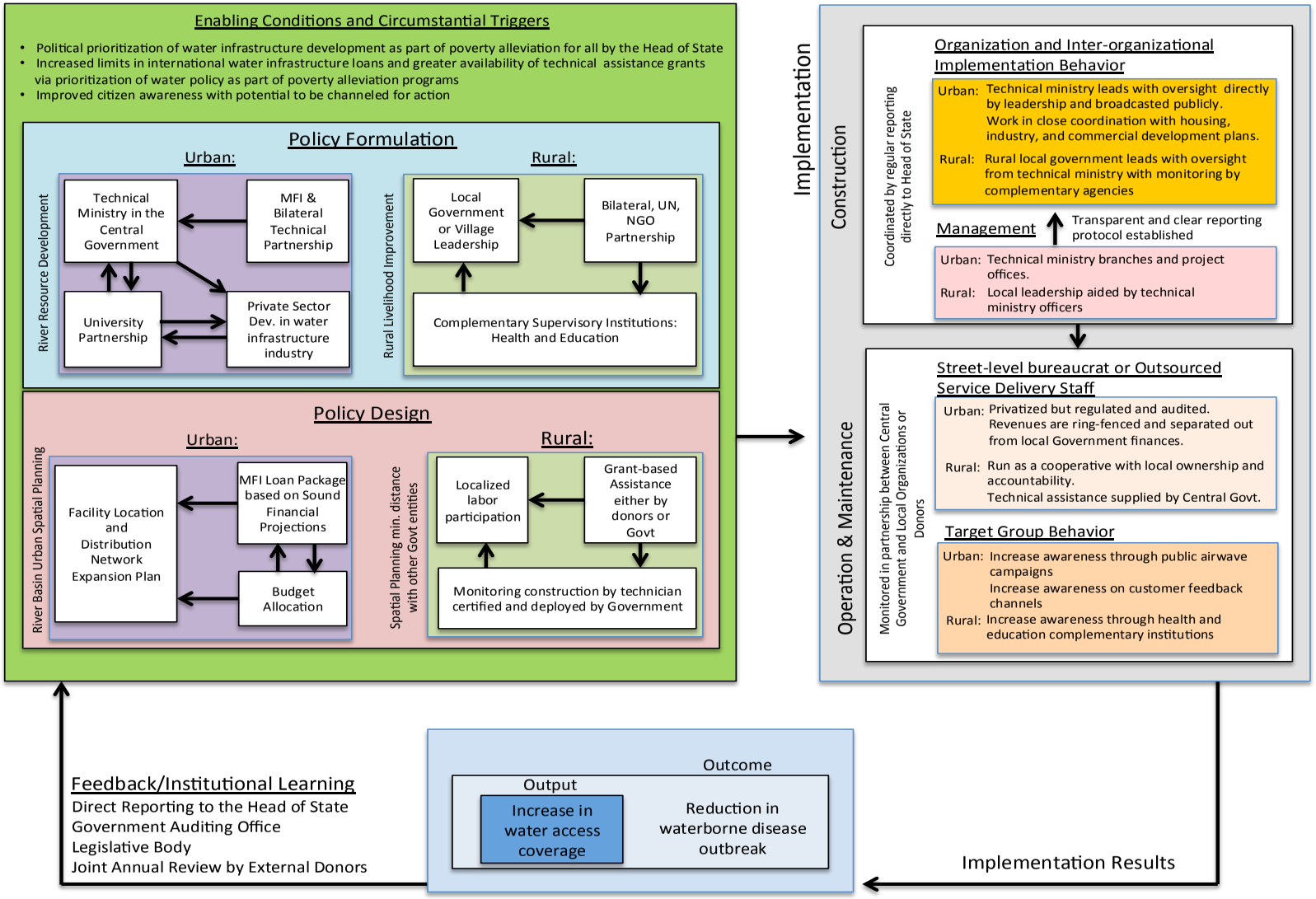


Figure 24: State-Implementation Synthesis Framework for Catalyzing Rapid Expansion in Access to Safe Drinking Water

Conclusion

How do we explain variation in access to safe drinking water across different countries? We started out the research to answer this relatively straightforward question. The process involved visiting the field and seeking out policy-makers responsible for water policy and excavating surviving documentations in government libraries, national archives, and old bookstores. This was all done in parallel to a quantitative data analysis to see what stationary research, i.e. non-field based research, would produce as explanations. If the results from the two sets of the analysis were identical, it would indicate that fieldwork is redundant since we end up with the same results. Why spend time and money on fieldwork when the same conclusions could be reached by investigating collected data. However, what we find is that the different modes of inquiry leads to different results. There were clear limitations to what can be explained by non-fieldwork based statistical models. This was demonstrated through this research.

As the evidence were gathered and pieced together in the search of causal mechanisms, with an emphasis on adhering to association, temporal order, and elimination of alternative explanations when tracing the longitudinal variations in the case study countries, the question was then what theories and frameworks from public administration and comparative politics are most suited in capturing and modeling the

collected sets of evidence. In this inquiry, we juxtaposed the evidences with theoretical frameworks from implementation scholarship and state scholarship from comparative politics. The former lends analytical lens in identifying what can possibly go wrong and for what reasons between policy formulation and policy results. The latter expands the set of critical factors by nesting the policy into the broader universe of international affairs and historical structures. As the consolidation of evidence demonstrates in the previous chapters, if a more satisfactory explanation behind the variation is to be developed, a merge between the two streams of scholarship needs to occur.

On a theoretical level, a framework to merge the two streams of scholarship is what is attempted here working off the foundations provided by implementation scholarship. Implementation scholarship serves a preferred foundation because it disaggregates the state to components and processes that are more closely relevant to the dependent variable. The disaggregation serves the purpose of better identifying the critical components and their interlocked linkages. The policy formulation, design, implementation, and results components of the policy implementation process serve to anchor and organize the evidence. Although useful in consolidating various collected evidence, upon closer examination of the mechanism distilled in our case studies, we see that the process itself also combines a dynamic mix of deliberation and discipline.[84] Understanding politics and institutions lies at the heart of understanding the dynamics of deliberation and discipline impacting water access provision. The flexibility of deliberation may exercised by the most senior leadership where they are able to

[84] Discipline here refers to adhering to directives in a timely and responsive manner.

institutionalize their ideas without much political pushback or at the agency level as witnessed in the case of international assistance informing policy reforms. Deliberation also occurs at the more localized tiers of Government, as in the case of where local governments' are flexible in prioritizing infrastructure investment budgets in a decentralized context.

Discipline is cultured with institutions. Institutions embody structures erected from mandates and internal circulars. The question then being why do all the countries' performances differ since all the countries have water supply responsibilities housed in agencies? They differ because discipline throughout the body of institutions comprising the state is not always shielded or reliably enforced among the institutions. Some are permeable to political pressures as in the case of approving and living with sub-par construction quality and lackadaisical in upholding retraceability as such in the case where the local government staff cannot locate blueprints of water distribution networks necessary in proper operation and maintenance.[85]

The political influence on institutions is a double-edge sword in the sense that it can be both undermining and uplifting factor. A situation that is well represented in the case studies as all heads of state left lasting imprints to public institutions in their respective countries. President Suharto in Indonesia and President Park of South Korea may appear to be similar as they both had military backgrounds. However, they ended up nurturing very different institutions and institutional cultures in their respective countries.

[85] Retraceability here means that the thought process and the analysis based on collected evidence can be empirically traced. This is in lieu of satisfying the replication criteria of quantitative or statistical studies in qualitative studies.

President Suharto permitted the local construction projects to be pervious to local political pressures whereas President Park was adamant that things get built according to plan with the scarce resources dedicated to it. President Park backed his threats by routinely visiting the finished construction sites to visually inspect quality himself along with establishing responsive and routine reporting. For example, during the New Village Movement, he invited a rural farmer couple to report to him during a Cabinet meeting every month. During this interaction, he would open discussions and get Ministers involved on hearing their ideas and reports on policies that were aimed to alleviate the farmer's poor livelihood conditions. Similarly, Prime Minister Lee Kwan Yew of Singapore also actively visited the finished project sites in his country shaking hands and listening to the beneficiary citizens. Also in a similar light, Prime Minister Razak of Malaysia ordered the creation of Operation Rooms in the provinces and districts to continuously monitor progress. Although authoritarian, the results of demanding and exercising compliance within the state of Abdul Razak Hussein, Lee Kwan Yew, and Park Chung Hee, were egalitarian by improving the living conditions of all, whereby this was not the case for Suharto.

Discipline within institutions is structured through written laws, internal circulars, and standard operating procedures. This is evident upon examining the set of ministerial decrees in all the countries that details the authorities and tasks granted to the agency. However, upon closer examination, the variation in detail of responsibilities and tasks range among the countries. That is, although bureaucracy structures among the countries share a resemblance, upon closer examination they are not identical. Just like all cars

have four wheels but there is a clear difference between a Porsche and Saturn, we see institutions appearing to be same but operating and performing very differently. Statutes structuring organizations are more detailed and updated more frequently in the case of South Korea; it serves as evidence of a self-improving feedback loop in operation. For example, Water Supply and Waterworks Installation Laws were reformed or updated 14 times in South Korea between 1990 and 2010; Water Supply and Waterworks Installation Presidential Decrees were reformed or updated 13 times in the same period; and Water Supply and Waterworks Installation Implementation Orders were reformed and update 11 times. However, in Indonesia, an overarching detailed framework dedicated to residential water supply system development occurs with Government Regulation 15 in 2005. Prior to that period, residential water supply development is integrated yet dwarfed in Government Regulations covering irrigation water supply development.[86] The noticeable consequence from the divergent operations of these agencies involved in water supply development is the latter's relative limited capacity in self-correcting behavior. When juxtaposed with the Integrated Implementation Model, the feedback loop is less visible in Indonesia's case relative to other country cases. Statutory evolution is questionable with the larger looming question of why. Hence, the question of whether

[86] This should not be interpreted as a lack in water supply system development. Indonesia was actively involved in water supply system development early in their post-colonial years where at the end of Pelita III in 1983, 150 BPAMs were formed throughout Indonesia (Ministry of Public Works, 2005). It just means that regulatory developments did not evolve with the water supply system construction. That is, prior to the 2004 Government Regulation, most of the efforts were expended on constructing systems rather than developing institutions to sustain and improve coverage of those systems.

constructive and active discipline is taking place where knowledge and experience is combined to produce permanent records and guidelines is hazy at best.

So how does catalytic deliberation and discipline that is conducive to expanding access to safe drinking water come about? Based on the case studies, the critical factors are: political factors contributing to water policy prioritization, specific institutional arrangements for water policy implementation, complementary non-water sector policy development, and international engagement and leverage. That is, evidence support these factors that are not included in the World Development Indicators to be critical in constructing a more convincing explanation behind the variation based on the collected evidence.

Policies to promote access to drinking water supply are prioritized when heads of state make explicit links with safe drinking water with poverty eradication and alleviation policies in public. It galvanizes accountability both within the ranks of public servants and the public. It also places the responsibility of demystifying the implementation bottlenecks upon the heads of state. That is, since they are publicly behind water prioritization, they are incentivized to seek and remove obstacles in policy implementation. If utilities are financially unviable due to low water tariffs, it is pointed out. If water charges are imposed unfairly across all users due to improperly functioning water meters, it is pointed out. If water supply systems are not getting built according to original blueprints, the heads of state calls attention to why. Prioritization by the heads of states also means publicly pooled resources, both in financial resources and staff, are dedicated to the problem.

As for specific institutional arrangements that are conducive to effective water policy implementation, the evidence points to separating out rural water supply from urban water supply is more effective. Urban and rural separation is due to different set of challenges that must be addressed by the handling institution. Urban systems are typically surface water treated and distributed via piped networks. Water source availability and acquisition is critical since the system requires greater amount of water intake. Hence, reservoir construction is required. Rural water supply systems are smaller in scale where groundwater is tapped and held in water tanks prior to distribution. Urban and rural division is also useful financially since urban water users are more varied. This permits cross-subsidization across industrial, commercial, and residential customers. This is often used to make water for the poor affordable by spread the cost across the heavy users. This flexibility is often not available for rural water supply systems where tariffs that can be charged has to be smaller to get people to use treated water. The cross-subsidization in isolated rural water supply systems are difficult as fewer people are connected. This in turns result in cheaper and typically less complicated technology employing systems to be built. This is permissive as the intake water source is typically less polluted in rural areas.

Another reason behind the split is because if merged and handled by a single agency, urban systems are prioritized. Staffs, especially the engineers, gravitate to work on urban systems as they occupy a larger budget since they are larger systems. This occurs between water resources and resident water supply as well. Whereas from the case studies, it demonstrates separating out irrigation water supply development from

commercial and residential water supply development permits greater attention to be paid to the latter. This is because water security projects, flood prevention/mitigation projects, and irrigation water supply projects are larger water-based projects than residential water supply projects. Hence, institutional arrangements should be designed in light of potential resource constraints when pooled with other competing projects.

Expansion in access to water is also catalyzed when coupled with complementary non-water sector policy developments. For the urban sector, it works best when coupled with housing policies; particularly the low-income housing policies that are actively intervened by the public sector; a necessity as private sector supply alone do not match demand for low-income groups in a developing country context. This is witnessed in Singapore and South Korea where the Government actively involved itself in the low-income housing sector, as private sector attention was oriented towards supplying the higher income housing market as it generated greater surpluses. The critical development seen in these countries was that the housing market propelled residential water infrastructure development. In Korea's case, Korea experienced a civil riot as the squatter population was migrated to the newly constructed housing units in outer city limits of Seoul. The reason was that the housing units were not connected to basic infrastructure. This event became an institutional learning opportunity whereby all housing projects then forth had to be connected to water supply infrastructure prior to accepting tenants. Singapore's case was similar whereby the newly created Housing and Development Board rapidly constructed public housing units to move squatters into improved hygienic and sanitary environments. This linkage propelled the residential

water supply developments in the urban areas, as residential water supply development is a pre-requisite to housing estate developments.

As for rural residential water supply developments, it is catalyzed when coupled with rural health and livelihood improvement programs. Malaysia demonstrates the effectiveness of this coupling, as sanitation engineers responsible for water supply development utilize the rural community healthcare centers as their platform to travel and work with remote populations. In rural communities where water resources are abundant in nature, health awareness of clean water first needs to be promoted. Hence, this is best done when coupled with rural health staff, as they are in frequent contact with the rural population. The health awareness is a prerequisite in converting the rural population to accept the transition to treated water supply systems.[87] In the case of Korea, rural water supply development in the 1970s was nested in the rural beautification program titled, New Village Movement. In a 10-year period between 1970 and 1980, 28,130 villages out of 32,624 villages constructed potable water supply facilities (Ministry of Interior, 1980). Coupling water supply development with complementary non-water sector policy development is catalytic because it adds another dimension of accountability toward progress. Even in countries where democracy and citizen participation is marginal.

International engagement and leverage is catalytic to expanding access to safe drinking water. However, the type and method of international engagement and leverage

[87] Although it might seem strange that people would be hesitant to change to clean water, studies have shown that rural population who were not accustomed to treated water prefer rainwater. The main reason being cited was that they do not like the smell of chlorine in the water (Mahe, 2010). Hence, just setting up the system for clean water cannot be interpreted as people immediately shifting over to its use from their traditional sources of water.

needs to be further specified. This is to prevent the lumping of all international engagement into one basket. That is, not all international engagement and leverages are beneficial to the water sector, as in the case where the economic crisis in the East and Southeast Asia was disruptive to the water sector rather than catalytic. The catalytic international engagements and leverages are the loans and technical assistance specifically designed for the sector. Multilateral financial institutional loans were beneficial to the sector although some more than others. The "some more than others" is the importance piece of explanation in the variation in performance.

An exemplary example is in Vietnam where the financial donors collaborated by coordinating through the joint annual reviews. By pooling their resources together and urging the Government to take the necessary reforms for the optimal use of donor funds, they were able to create a greater leverage. On the other hand, Indonesia is a case where donor funds were less effective in totality because they lacked coordination with each other outside of their specifically funded projects; a coordination diaspora that is more acutely felt given the decentralization transitions in the archipelago. Thus, the local interests ossified through political and administrative decentralization along with strained central-local finance over water utilities arrears.

In addition to multilateral financial institution and bilateral loan, international technical assistance of various forms serves as catalysts. Technical assistance helps establish foundations during pilot initiatives. These foundations are crucial when scaling initiative nationally. Technical assistance catalytic to the residential water supply sector is not only geared toward public sector organizations. Rather the more successful cases,

as we see in Korea, is when private sector joint ventures are formed to encourage the growth of domestic supply on crucial water supply construction materials such as pipes. These in turn permits the involvement of domestic private sector in material supply for large infrastructure projects; a supply line development that also cumulates in new products through local research and development. A path-dependent process, which later cumulates, in international lending infrastructure projects are procured mainly by the domestic private suppliers. There is a multiplier effect when this ecosystem is established. The technical assistance that sows the seeds for this ecosystem serves as catalysts in expansion of safe drinking water coverage.

Significance and Implications

So what is the significance of this research? The research is significant because it address a very important question on why we still have 663 million people without safe drinking water. The current challenge is approached from engineering, financial, or health perspectives. That is, recommendations range from building the engineering structures, putting in the finance investments, or building awareness programs to change behaviors. The political and administrative attributes are often overlooked and by doing so, there is an under-examination of studying whether they matter. This is what has been examined. From the collected evidence, we clearly demonstrate their importance and their impacts. Therefore, more research needs to take place on these aspects. Without accounting for these aspects, we cannot explain the differences in performances over coverage expansion in the case studies.

The implications are numerous. On the practitioner side, the research permits in-country staff who might not be familiar with the importance of political and institutional factors to start opening that dialogue. It provides an anchor for discussion and engagement by pulling in specific examples from other countries. Although a copy-and-paste is ill-advised, but by bringing in factual details from other countries serves as a platform to address and even avert potential bottlenecks in implementation.

The implications on scholarship are multi-fold. The research serves as a good example of the importance of methodology since it demonstrates how two different results can be reached through different methods. In this research, fieldwork was indispensible since it permitted the absorption of how local practitioners identified and approached the problem. By engaging with multiple practitioners stretching across Governments, International Organizations, and Social Organizations, this research hopes to have provided a wider perspective. Just like the blind men and their fragmented description of the elephant, different experts from different organizations provided a different angle to the same problem. By doing so and consolidating all the evidence, it is assumed that the logical analogy that the law of large numbers holds true. That is, given everyone is explaining the longitudinal changes in water coverage in the same country, their explanations should complement with each other. This assumption was upheld to be true, as the interview pool was expanded.

This fieldwork element and the qualitative data analysis is indispensible not only because it provides a richer explanation based on in-depth details but because it also propels scholarship in uncovering missing intervening variables. From the side-by-side

comparison of results, we see that a lot of the important critical components to the country's explanation behind their expansion of water coverage were not even included in the initial World Development Indicators. Hence, it demonstrated that the World Development Indicators has limited applicability to the research question at hand. Another way to put this is that it helps us understand why we are having such a difficult time in tackling this very basic fundamental needs question. We are not approaching the question and the challenge in the correct manner. This leads us to the next implication on political science scholarship.

The Discussion Chapter digs into how well public administration and particularly the theoretical frameworks in implementation scholarship aids our understanding of the sector. Juxtaposing the collected evidence with the frameworks, we see they offer better conceptual fittings. That is, while we found confusion and ambiguity in where the collective evidence would fit among the World Development Indicators dataset, we had less difficulty in fitting the evidence in the theoretical frameworks.

Although a better nesting ground for the collective evidence, the implementation frameworks suffered shortcomings. First, they were mainly of single statute orientation. Thus, complementary policies that helped catalyze construction of the water infrastructure were in their blind spot. Second, the feedback loop needs to be developed with greater fidelity. Feedback loops do happen in all countries but the frequency of the intervals in which feedback loops happen is more important. Between 1990 and 2010, Water Supply and Waterworks Installation Laws in South Korea were reformed or update 14 times demonstrating implementation and feedback in action. The feedback is in full

cycle on average 1.4 years. Third, implementation theory is weak in integrating international influences and historical legacies. In the countries that we examined, water sector developments cannot be explained without accounting for international influences, particularly international aid in form of low-interest loans and technical assistance grants. Also, historical legacies matter, as legal developments in the case study countries were all affected by their colonial histories.

The latter is where comparative politics scholarship, and especially the theories of the state provide greater insight. International forces and how domestic state-society structures affect state development is a focal point of inquiry among the state scholars. State scholars provide valuable insights on the conditions leading to strong states versus weak states. Migdal and Herbst provide insights on the conditions of weak states and failed states, respectively. Weak states emerge when the states share social control and exist in circumstances of accommodation with strong societal groups. Failed states emerge when state formulation history does not require it to build effective bureaucracies to exert total control over land. This is relevant to our study since these would be exogenous conditions and policy implementation failure in these states would not be due to policy design but due to insurmountable predating local conditions and relationships. That is, although the State-Implementation Synthesis Framework models the catalytic components based on evidence, the framework does not explain why this particular arrangement is difficult to deliberate in poor coverage countries. That is, questions on why decentralization led to different results in different countries, why certain countries were able to better link policy domains, and why government institutions were setup in

rural areas require examination of factors outside of traditional implementation frameworks. The scope and method of decentralization differed across different countries, where in the case of Indonesia, parliament quickly passed decentralization laws during the Suharto fall from power following the Indonesia's financial crisis. These laws were difficult to retract and that granted enormous authority to the local electoral bodies. This affected implementation of central government statutes as the central government lost their leverage to coerce compliance on local governments.

Countries were able to better link policy domains because they were all components within poverty eradication initiatives led by the government. Housing, health, education, and water infrastructure were integrated and monitored by the Head of State. Because the Head of State took direct responsibility and demanded accountability, these complementary policy domains were forced to effectively integrate. Collaboration was extorted from non-cooperative agencies by the threat to report non-compliance to Head of State led initiatives. Given that the Head of State welded uncontested authority, or were perceived to be, to remove and appoint cabinet members or ministers, none of the heads of public organizations wanted to be singled out for non-cooperative and non-contributing member to the leader's initiatives. When the leader's initiative is poverty eradication that includes a component of access to safe drinking water, it is well integrated with other policy domains.

The investment to increase government presence in rural areas can be better understood in the Government-Regime-State framework than implementation. It increased physical presence undoubted enabled implementation, as most conspicuously

seen in Malaysia's case, where the rural water supply program used rural healthcare centers to house their sanitary engineers. The Government's investment in rural healthcare centers was not a product of anticipated use to facilitate the rural water supply program but it certainly did play an enabling role in implementation.

The descriptions above tend to support the need for a strong state with leverage in favor of the more technical central institutions. However, this reductionist conclusion is neither accurate nor helpful in the cause of expanding coverage. Indonesia had a strong state where Suharto led military exercised monopoly of violence in the country. Yet, piped water provision only covers 1/5 of the population. Squatter settlers live in slums of described by poor environmental health conditions where people wash dishes in surface water exposed to landfills.

This demonstrates that effective bureaucracies that categorize strong state does not necessary mean that it will employ them to improve the living conditions of the masses. Scholars Scott and Johnson enlighten us in better conceptualizing different manifestations of strong states. Scott's study demonstrates how exercise of authority of strong states could lead to awry results. Misery and hardship is imposed along with loss of valuable productive knowledge. States being able to execute bad decisions is leaves people worse off than before. Authoritarian social experiments in pursuit of high modernity delivered the opposite results in improving the human condition. Johnson's study on the other hand uncovers how strong state capacity could accelerate development and where the fruits of economic development are shared more equally. This was

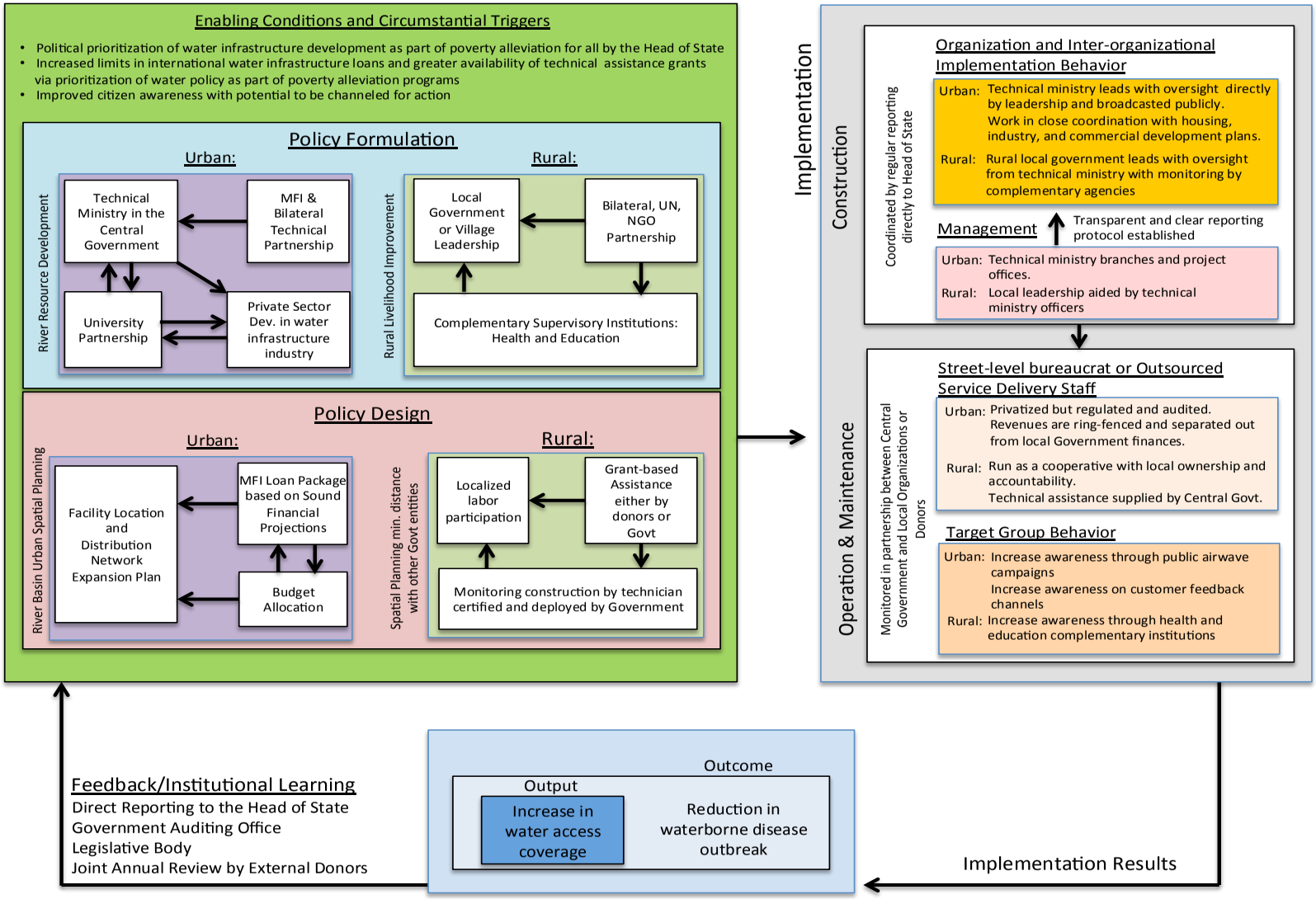


Figure 25: State-Implementation Synthesis Framework for Catalyzing Rapid Expansion in Access to Safe Drinking Water

demonstrated in the East Asian countries of late industrialization.[88] The developmental states are countries where the state apparatus possessed high capacity in policy implementation and greater autonomy in policy formulation. They forge private sector partnerships and nurtured their growth both domestically and internationally by developing pro-private sector growth policies. The strengthening of the state was resourced by international events such as the US providing large sums of investments to South Korea in result of security interests during the Cold War.

The state literature provides an overarching overview of events and conditions behind lasting structures. However, because the state folds all the public institutions into a single conceptual variable, there are clear limitations in separating out their analytical relevance to the research question on water access. The impact of state development and their respective state categorizations only becomes clear when the state is disaggregated. This concern is not new, as scholars of the state have been urging future scholars to disaggregate the state (Migdal, 1994; Fukuyama, 2004). The state has to be disaggregated to better capture how structure has lasting impact on its future operations.

The two streams of scholarship were merged to create a synthesis framework. The merge was necessary to better construct the explanatory causal model applicable to the case studies. The implementation scholarship brings the breakdown of components relevant to policy execution whereas the state scholarship carries with it the richer analyses on how international influences and historical legacies structure the state-society

[88] Although Johnson focuses on Japan, he is used here to epitomize the group of scholars who study developmental state. The Discussion chapter covers the pool of authors in greater detail.

relationships and those within them. The richness of the two scholarships brings to the fore the importance of political and institutional factors crucial to capturing and understanding why we see variation across different countries. The greater question is then why are we not studying water from this vantage point; a future research agenda should broaden the investigations beyond the five cases examined here.

Limitations

The greatest limitation of this research is time and length of documentation space. In the process of this research, couple more datasets that were collected during the fieldwork were unused. These include the local utility dataset of Indonesia; the 300+ utilities data that was collected for 2008-2010. Then there is the IBNET utility dataset from a World Bank colleague. Then there is the USAID Demographics and Health Survey dataset. These dataset along with additional referrals that were untapped has to be reserved for further study. Additional statistical analyses could be performed on these datasets to further confirm the explanations. These results can then be compared to existing and further enriched qualitative data that are and can be collected from the field. These are future research agendas.

Focusing just on this study, the limitation is that we are only looking at 5 countries in-depth. Since most criticism on in-depth qualitative data analyses is their generalizability, it would serve for the betterment of scientific inquiry if more cases were included. However, what is uncovered is that the in-depth 5-country study provides a richer and more convincing presentation of the causal mechanism at play in the water

sector of these countries than the quantitative analysis from the World Development Indicators. Although this research cannot claim to be perfect, it at least can claim to be a little closer to identifying the causal mechanism behind the variation in access to water behind these countries.

Future Research Agendas Generated by This Study

This research started off asking why 663 million people still do not have access to safe drinking water. It then asked to what extent do political and institutional factors matter in safe drinking water provision. A more simplified question reducing it to whether these factors even matter at all. The search for answers has led to seeking out those responsible for water policy in these countries. In-country interviews were conducted with both still working in the sector and those who have retired. Interview contents were triangulated to double-check for their veracity; this involved heading to archival libraries to dig for past documented data.

As a result, the political and institutional factors in the variation exhibited among the case studies were clear. The myriad and rich evidence were consolidated by building upon the insights of past scholars of public administration and comparative politics. This has led to the development of the synthesis framework. The framework incorporates the influences of international organizations and foreign governments on policy formulation and design. The framework also separates out urban from rural as requirements to build water infrastructure for the disparate populations differ. A separation between construction and operation & maintenance is highlighted as their requirements differ.

Also, in this the latter case, the end-user interacts with the latter, as end-user is not called to be involved in construction. The feedback loops description is enriched by who should be involved in the feedback and to whom it should be reported. The learning loop is indispensible in both strengthening the state and having the state develop effectiveness in expanding coverage in access.

Whether the framework is applicable beyond the 5-countries is a future research agenda. Additional countries should help build upon and refine the existing framework. They would help further identify and clarify the impact of politics and institutions on water access variation. It requires additional work but it will only help sharpen our investigative inquisition in searching and removing obstacles to help the 663 million without access and those with access but of poor quality service move towards a better life; a life with safe and convenient access to safe water.

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