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Working Paper

A literature review evaluating new approaches to resolving the sanitation challenge in developing Asia

ADB Working Paper Series, No. 976

Provided in Cooperation with:

Asian Development Bank Institute (ADBI), Tokyo

Suggested Citation: Kelkar, Vedanti; Seetharam, K. E. (2019) : A literature review evaluating new approaches to resolving the sanitation challenge in developing Asia, ADB Working Paper Series, No. 976, Asian Development Bank Institute (ADBI), Tokyo

This Version is available at:

<https://hdl.handle.net/10419/222743>

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ADB Working Paper Series

A LITERATURE REVIEW EVALUATING NEW APPROACHES TO RESOLVING THE SANITATION CHALLENGE IN DEVELOPING ASIA

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No. 976
July 2019

Asian Development Bank Institute

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Suggested citation:

Kelkar, V. and KE Seetha Ram. 2019. A Literature Review Evaluating New Approaches to Resolving the Sanitation Challenge in Developing Asia. ADBI Working Paper 976. Tokyo: Asian Development Bank Institute. Available: <https://www.adb.org/publications/evaluating-new-approaches-resolving-sanitation-challenge-developing-asia>.

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Abstract

Evidence shows that there are numerous socioeconomic and environmental benefits from improved sanitation; conversely, numerous studies have explored the lack of access to basic sanitation and its negative impact on gross domestic product (GDP). This paper establishes the positive impacts on GDP from investment in sanitation and emphasizes how it can regenerate countries. As the backdrop of this idea, this paper combines and analyzes supporting evidence through an extensive literature review to show that a new way of thinking informed by a comprehensive understanding of the historical issues faced must be adopted to address the sanitation challenge. This paper emphasizes decentralization, technological standardization, innovative financing, cost-recovery mechanisms and the potential of socioeconomic spillover effects as tools to revitalize the sanitation sector. It further elaborates on the significance of hybrid governance and institutional mechanisms, including state and non-state actors, to collectively contribute toward achieving total sanitation coverage in developing Asian countries. The paper shares the message that the benefits of wastewater management are far-reaching and conveys the importance of decision makers prioritizing this sector. The paper concludes that achieving replicability and scalability requires dedicated political will and visionary leadership.

Keywords: Sanitation, Asia, GDP, FSM, leadership, governance, innovative solutions, scalability, replicability

JEL Classification: A13, Q53, L3, O18

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1. INTRODUCTION

Water and sanitation are core targets of the Sustainable Development Goals (SDGs) and the UN's 2030 agenda. SDG 6's focus on clean water and sanitation clearly outlines the urgent need to adapt and develop innovative solutions. Sanitation has been a consistently challenging development goal, with over 1.7 million people in the Asia and the Pacific having no access to safe sanitation, 780 million still practicing open defecation, and 80% of wastewater being disposed without appropriate treatment. As Asia is witnessing rapid urbanization, provision of safe sanitation remains crucial. It is estimated that 57% of urban dwellers lack access to toilets that provide a full sanitation service chain, including containment, treatment, and end-use treatment and disposal (Asian Development Bank 2016).

There are numerous socioeconomic and environmental benefits from improved sanitation including a lowered disease burden, improved nutrition, increased literacy and safety for girls and women, reduced stunting, improved quality of life, healthier living environments, increased job opportunities and wages, and improved regional competitiveness (World Bank 2007). Experts have unanimously emphasized the need to attract attention to the impacts of lack of sanitation on the nation's gross domestic product (GDP). The idea that a dollar invested in sanitation can yield at least a fivefold return in increased productivity is representative of a larger potential economic impact in the case of countries such as Cambodia, Indonesia, the Philippines, and Viet Nam, where an estimated loss of \$9 billion annually results in a 2% GDP loss (World Bank 2007). A substantial part of these setbacks also arises from the resulting health-related economic impacts such as was seen with the Ebola crisis in West Africa. Globally, poor sanitation resulted in a loss of about \$222.9 billion in 2015, with Asia and the Pacific continually suffering the greatest losses at 1.1% of total GDP, typically stemming from India, with almost 5.2% of its GDP (Lixil, Oxford Economics, Water Aid 2016).

Though studies of sanitation have consistently focused on regions where it is persistently lacking, resulting policy recommendations have not driven governments to prioritize improvements and investments. Globally, sanitation has consistently lagged water supply, but some Asian countries have shown remarkable progress with impressive coverage rates over the years. Specifically, in Southeast and East Asia, there has been a marginal rise in basic sanitation services. Globally, from 2000 to 2015, basic sanitation increased by an annual incremental average of 0.63% in comparison with basic drinking water services. Southeast and East Asia's 77% coverage rate is higher than Central and South Asia's 50% rate (WHO, JMP, UNICEF 2017), but it was not always this positive. In 1990, only 25% of Southeast Asia had access to improved sanitation, but access incrementally increased to more than 45% by 2012.

This indicates that sanitation improvements gained substantial momentum in Southeast and East Asia over the years. As Asia has rapidly progressed and urbanized over the past decade, countries in Southeast and East Asia have been at the helm of economic development; as a result, the correlation between sanitation improvements and a nation's GDP growth has begun attracting attention.

While the literature has often described lack of sanitation as a cause of losses that negatively impact GDP, the reverse has also been true. Countries such as Japan, the Republic of Korea, Malaysia, and Thailand are examples of success achieved through governments prioritizing sanitation in the formative years of nation-building that contributed to GDP growth. While the authors do not intend to claim causality, they urge that a deeper understanding of the positive impact of sanitation improvements on GDP

can shift points of view and perceptions of sanitation investments as an economic generation model as opposed to an economic drain.

Table 1 details the comparative sanitation coverage to GDP per capita scenarios of Japan, the Republic of Korea, and Thailand. Although the understanding of sanitation coverage is not universal, the numbers in Table 1 represent components such as latrine access, sewer network coverage, and access to wastewater treatment, in the form of overall sanitation coverage in the countries. On the other hand, Table 2 describes the sanitary growth profile of only Malaysia through total latrine coverage and rural latrine coverage from 1961 to 2011.

Table 1: Comparative Sanitation Coverage and GDP/Capita of Countries

Year	Japan ^a		Republic of Korea ^b		Thailand ^c	
	Sanitation Coverage (%)	GDP/Capita (\$)	Sanitation Coverage (%)	GDP/Capita (\$)	Sanitation coverage (%)	GDP/Capita (\$)
1961	20	563.59	Data unavailable	93.8	0	107.5
1966	48	1,058.50		133.45	5	161
1971	78	2,260.38		300.77	15	194.25
1976	89	5,171.04		830.7	34	391.48
1981	100	10,331.74		1,870.339	41	720.9
1986	100	17,079.6		2,803.37	45	813.2
1991	100	28,874.36	35.7	7,523.48	71	1,715.63
1996	100	38,436.93	52.6	13,137.9	97	3,042.9
2001	100	33,846.47	73.2	11,252.9	100	1,893.14
2006	100	35,433.99	85.5	20,888.38	100	3,368.95
2011	100	48,168	90.9	24,079.8	100	5,491.16

GDP = gross domestic product.

a. Otaki, Y., M. Otaki, and O. Sakura, Water Systems and Urban Sanitation: A Historical Comparison of Tokyo and Singapore.

b. Korea Water and Wastewater Works Association, Transformation of Water Sector (1960–2012).

c. Punpeng, T. (Dept. of Health, Ministry of Public Health), Conference Presentation, East-Asia Ministerial Conference on Sanitation and Hygiene.

Source: World Development Indicators.

Table 2: Malaysia Sanitary Growth Profile

	1961	1968	1971	1981	1991	2001	2011
GDP/ Capita (\$)	234.92		357.66	1,774.74	2,440.59	4,045.17	9,071.36
Total Latrine Coverage (%)		4.5	63.1				
Rural Latrine Coverage (%)	12		40	80	90	98	100

GDP = gross domestic product.

Source: World Development Indicators, Water Aid, and UNDP Malaysia Country Team Report (2005).

In Thailand, where sanitation coverage grew from 45% to 71% until 1991 and GDP grew from 1961 to 2001, the country successfully achieved total sanitation coverage similar to other developing countries at the time, such as Japan and the Republic of Korea. In the Republic of Korea and Malaysia, the governments also took strategic steps to achieve total sanitation, although the data are unavailable. In the Republic of Korea, the development of the water and sanitation sectors was consistently linked to economic growth (Korea Water and WasteWater Works Association n.d.), leading to the effective utilization of official development assistance (ODA). Additionally, when some of these countries prioritized investments in sanitation, their GDPs were lower than those of sub-Saharan African countries, as shown in Table 3, though a vision enabled financial investments from various sources.

Table 3: Progress of GDP to Sanitation Coverage

Country	GDP/Capita (\$) in 1960	Sanitation Coverage Rate (%) in 2015
Republic of Korea	158.23	100
Ghana	182.97	14.28
Liberia	170.03	16.89
Senegal	247.23	48
Zambia	234.166	31.11
Zimbabwe	280.99	38.59

GDP = gross domestic product.

Source: WHO-JMP/World Bank Data, Water Aid (January 2018).

Developing Asian countries today resemble the GDP per capita of countries like the Republic of Korea and Malaysia from the 1960s, yet they have not been able to achieve comparative levels of sanitation coverage. For example, India's GDP per capita in 2018 was \$1,977.29, but sanitation coverage was low. Following the implementation of the Swachh Bharat Campaign, safe sanitation coverage in rural India has reached above 90%. In 1991, when Thailand's GDP per capita was \$1,715.63, its total sanitation coverage was 71%, indicating that higher GDP per capita may not directly correlate and that countries that invested in sanitation improvements and succeeded in greater coverage were not as wealthy when they started.

It is important to understand that today's developing countries face increasing challenges and complexities with regard to urban sprawl, rapid urbanization, and formation of informal settlements. It may be significant for sector experts to explore the idea that sanitation coverage may be linked to GDP growth and a myriad of policy reforms are needed to engender a new way of thinking about sanitation improvements and economic prosperity. Another dimension to sanitation implementation involves donor aid, ODA, and their effective allocations. "Asian countries have been able to receive substantial donor aid to develop the Water, Sanitation and Hygiene (WASH) sector. ODA to countries like the People's Republic of China, India, and Turkey consists of loans that have financial grants of at least 25%. Yet, sanitation and water consisted of only 1% of the GDP for the countries in 2008-2009" (OECD 2011). In the case of Indonesia, "2.3% of GDP was lost due to lack of sanitation which is 20 times higher than the required investments" (Water and Sanitation Program – East Asia and the Pacific (WSP-EAP) 2007).

1.1 Socioeconomic Spillover Effects from Improved Sanitation

Understanding the wider impact of aid disbursements is essential to cultivating the socioeconomic spillover effects from improved sanitation. Until now, the emphasis has been on direct impacts from sanitation interventions; very few studies have documented the larger benefits that can be seen over a longer period in terms of higher literacy, better job opportunities, increased health and business opportunities, and all-round well-being. With development aid projects, negative outcomes related to community benefits and socioeconomic profits have resulted in a pessimistic atmosphere within donor agencies toward the continued success of investment in sanitation sector development and its impact on the end-use consumer. A study by Clarke, Feeny, and Donnelly (2014) argued that aid projects in the WASH sector should not only be assessed by their immediate benefit to their targeted community, but also their lasting impact, that is, their sustainability. Through an appreciative inquiry, their study found that although one in 27 water and sanitation projects in Pacific countries could be considered sustainable through direct impact, while benefits persisted by way of enhanced community health in 22 projects. This reframing of the term sustainability to include persistent benefits can provide an accurate assessment of an aid's project value.

Public investment portfolios assess projects based on their immediate impacts and full-cost recovery; traditional measures are unable to capture the wider impact of many projects, which adds to the perception of failure. But, the above findings support our argument that while immediate impacts from sanitation must be assessed, the greater value of investment in the projects is through the long-term spillovers, resulting in greater sustainability and returns from the investment through diverse avenues that, while not exactly associated with full-cost recovery, provide larger benefits to governing bodies.

Box 1: Philippines Case, Dumaguete Fecal Sludge Management Plant

In early 2000, the city of Dumaguete in the Philippines faced tremendous contamination from uncollected and untreated wastewater leading to pollution of the city's bay and groundwater. A fecal sludge management (FSM) program was established in 2006 through which the city invested in a \$500,000 on-site sewage treatment facility. Following deployment of the facility, the city witnessed improvements in health, the environment, and the economy. The investment was fully recovered in 8 years through a sewage tariff that consisted of each household paying \$1 per month for the local government to empty the septic tanks every 5 years. Now that the initial investment has been recovered, the plant has been generating revenue for the city's employment program, infrastructure, health services, and education. The implementation of this project also leads to the overall economic growth of the city through growth in industries, tourism, livelihood, productivity and property values. The success of the Dumaguete city FSM program has been documented extensively by the Asian Development Bank Institute (ADBInstitute 2018).

Therefore, the question remains why, despite receiving high ODA, countries in South Asia are unable to effectively prioritize and allocate financial resources toward improved sanitation.

For policy makers to view sanitation in the purview of economic development and specifically GDP growth, several innovative strategies are needed. The forthcoming sections of this paper will analyze the components of the sanitation sector from a new perspective and present successful country cases. The overall motivation of the paper is the redefinition of the way sanitation can contribute to economic development.

2. LITERATURE REVIEW

Developing Asian economies are facing complex challenges. The sanitation systems in rapidly urbanizing areas of economically progressive countries are beginning to crumble as they expand, resulting in inequalities in provision and regulation (K. Anderson 2016). This literature review proposes a new way of thinking about sanitation by presenting historical trajectories, global scenarios, innovative system approaches through decentralization, current implementations, financing and revenue mechanisms, and political leadership as a catalyst to integrate processes.

2.1 Historical References of Sanitation Provision and Its Present-Day Relevance

Throughout history, sanitation practices have evolved from place to place and within civilizations. In the Indus valley, Mesopotamia, Babylon, and Greek civilizations and the Western Han Dynasty, domestic sanitation has been continually explored and innovated, from cesspools to disposal on unpaved streets, open pits, etc. (Cooper 2001). Acquiring water and addressing sanitation has been a continuous challenge for humans. Following positive historical developments, sanitation implementation, especially in Europe after the collapse of the Roman Empire, underwent a dark period where disposal of waste happened primarily on open streets (Cooper 2001). In other circumstances, “the improper disposal of human waste through groundwater led to devastating outbreaks of cholera and typhoid” (Domenech 2011; Geels 2005).

Historical data are a powerful tool for understanding the growth patterns of the sector and formulating informed decisions for the future. In this vein, Lofrano and Brown (2010) described the evolution of wastewater management through the ages and its impacts on future policies. A key fact to emerge was that, throughout history, while European cities were innovating and adapting new technologies to manage waste disposal, the direction was not always positive. According to Lofrano and Brown, toward the end of the 19th century, “only half of the Italian communities had access to drinking water and over 77% were not connected to any kind of sewers despite a previously well-developed sewer system” (G.Lofrano 2010, page 5258, para 5). Major changes were seen only at the end of the 19th century and at the beginning of the Industrial Revolution, when the significance of water and sanitation was understood for the economic and social development of communities.

To varying degrees, these circumstances reflect and resemble the situation witnessed over the past 3 decades in developing Asia. In the case of India, 80% of wastewater is disposed of without treatment and returns to the natural ecosystem of the oceans and other water bodies. This has enormous negative health and environment impacts, thus challenging the economic and social security of vulnerable populations.

2.2 Present Global Scenario: System Failures, Inability to Invest in the Sector, and Unwillingness of Decision-Makers to Make Changes

At present, Asia's developing economies have been adopting a centralized model of sanitation implementation focused on sewer networks. While this is the general scenario, there are exceptions. In India, only one-third of the population is connected to a sewer network; many people use on-site systems in informal settlements and rural areas where safe disposal and treatment of waste is costly and difficult, often leading to mismanagement and contamination of surrounding areas. The concept of investing in wastewater treatment and other operation- and maintenance-related engagements has been generally conservative; investment in small- and medium-size cities in middle- and low-income countries is a challenge due to lower revenues, whereas even in high-income countries like Sweden, smaller urban centers are closing treatment plants and building costly pipelines (K. Anderson 2016).

It has been identified that poor sanitation systems are particularly linked to institutional and governance failures (see Araral and Yu 2013). For example, water and sanitation receive a mere 6.1% in development aid in comparison to other sectors such as health, education, transport, energy, and agriculture. Serious health risks related to open defecation and dysfunctional sanitation systems have not provided strong enough motivation for reform, and lack of consumer knowledge extends beyond health risks, loss of environment, and ecology due to contamination of groundwater by poorly disposed and untreated fecal sludge (K. Anderson 2016).

Adequate funding for the comprehensive development of sanitation has been a constant challenge. This is coupled with the issues related to prioritization of the sector by central and provincial governments. As already discussed, historically, there has not been much focus on wastewater or fecal sludge management due to a lack of awareness of its benefits. The water supply sector, on the other hand, has consistently gathered more attention in comparison to the sanitation sector. With this understanding and knowledge, and for the holistic growth of sanitation provision, it is important to address the key issues faced by the sector. This involves a change in the perceived ideas of the best way to implement sanitation, either in networked or non-networked forms, and innovation toward more flexible approaches and greater technological know-how on innovative strategies, followed by the financial and profit mechanisms that help innovations thrive.

2.3 Decentralization, Technological Standardization, and Community Engagement

Until the 1990s, water supply was largely controlled by public organizations and municipalities (Domenech 2011; Kallis 2003), but in the past few years, water services around the world are gradually being privatized (Domenech 2011; Araral 2010). In terms of sanitation, the governance structure largely remains public due to the use of the centralized model associated with sewer network-based systems. However, this model is heavily cost-intensive and time-consuming due to its propensity to employ large-scale, city-wide sanitation projects. This implementation template has resulted in slow steps toward solving sanitation problems in comparison to the faster rate of urbanization and informal growth in developing Asian countries, leading to use of unregulated, on-site collection and disposal techniques, especially in informal and peri-urban areas.

In the past decade, decentralized on-site sanitation measures have been increasingly adopted by private waste collection and disposal companies, NGOs, and communities. Several small community- and town-level projects have been successful due to the use of decentralized mechanisms, despite inadequate state funding. It has been noted that the benefits of decentralization are far-reaching in terms of access to informal areas, ability to make improvements as per local contexts, affordability due to low-cost, small-scale systems, and multi-stakeholder approaches.

Box 2: Japan's *Johkasou* System Case

In Japan, a combination approach has been administered to tackle sanitation provision effectively. Along with the networked system in cities, the *Johkasou* system (Packaged Wastewater Treatment Plant) is implemented for sludge collection and wastewater treatment in rural areas and independently owned houses. Policies in Japan allocated financial resources and developed regulatory systems for system operation and maintenance. Through diverse avenues such as national subsidies, local government bonds, and landowner and user charges, financial resources for the system's functioning and sustenance have been assembled. As in developing countries, Japan also faces challenges in securing land for sludge disposal and landfills, and usually transports sludge to treatment plants (Asian Development Bank 2016).

Despite these successful examples, the governance and institutional and regulatory frameworks of decentralization have not been widely discussed or understood in the right spirit (see Araral 2009 for a review). One of the primary concerns to emerge from the application of decentralization is the variety of technologies and products available in the market. Several industries, research institutes, social innovators, and NGOs are developing non-networked sewer solutions. At fragmented levels, they are successful, but they fail to reach the wider realm of sanitation practice. Diversity of technology also leads to difficulty in comparison. For more effective implementation and understanding, standardization could resolve technological varieties and guarantee the systems on health and environment indicators (Starkl 2015).

While standardization has been proposed for decentralized systems, it could also slow implementation and make existing applications redundant. Jack Sim, founder of the World Toilet Organization, expressed in a seminar at the ADB Institute in July 2018 that a successful way to implement FSM and manage wastewater treatment was to allow stakeholders to implement the technology available to them, as opposed to introducing a standardized technology alien to the region. This may prove cost-effective, less time-consuming, and give autonomy for a more regionally contextual growth (Sim 2018). These discussions must be carried out at multiple levels within country contexts to create an ecosystem for all-around sanitation coverage.

As decentralization is followed by standardization, it is also followed by community engagement. Especially in the decentralized sanitation solutions market, social innovation has catalyzed ways to address problems. It is significant to understand that, "social innovation is a key technology enabler, it has also provided traction for the community to engage and cooperate with each other to implement effective solutions" (McGranahan and Miltin 2016). Further, the same study argues that, "in deprived settings the key to sanitary improvements lies in meeting the institutional challenges posed by the need for local collective action, coproduction, affordability and housing security." Analyzing two successful community-driven projects—Orangi Pilot Project and the Indian Alliance in Karachi and Mumbai—McGranahan and Miltin found that social innovation through technology can simplify sanitation solutions through low-cost

products that, with the help of communities, can convince government officials and politicians to develop such projects.

Ultimately, to foster replicability and scalability, the implementation of decentralized approaches combined with evaluating the need for standardization and inclusion of communities may prove to be an effective way forward.

2.4 Transformations in Innovative Financing Mechanisms for Decentralized Approaches, Hybrid Institutional, and Governance Structures

One often-stated concern regarding sanitation is the slow rate of return in related investments and the dependence on “full-cost pricing” through large-scale technological solutions. “The approaches by neo-classical economists in determining the revenue theories associated with sanitation have led to use of limited, high-cost intensive investment mechanisms making the sectoral investments complex. Their policies have largely focused on service provision from the government, financing services through user charges, and not from tax revenues and full-cost recovery based on the user pays principle” (K.Abesurya 2008). These findings strongly support our argument on multiple levels: that the broader ideological inclination in the sanitation sector has been on building large-scale, sophisticated, and costly infrastructure in comparison to decentralized measures and alternate revenue mechanisms like user taxes. It is also essential to explore the notion of establishing “sustainable thinking in economic thinking” (Abesurya 2008) by enabling decentralized and distributed options regionally.

Currently, decentralized systems are widely implemented through public-private partnership mechanisms and non-governmental organizations in sanitation-related projects in developing countries, predominantly in South Asia. Yet, these interventions are limited to a few motivated and passionate individuals or groups. Decentralization is usually considered to be more costly due to its misrepresentation of sunk costs and a lack of consideration of avoided costs (Domenech 2011; Fane and Mitchell 2006). For the decentralized sanitation sector to grow, innovative and diverse financing mechanisms are required to help advance the pace toward safe sanitation access and treatment. It is also essential to understand that not all regions and communities are dealing with the same set of problems and that every region and sub-region will need tailor-made financial, institutional, and governance measures to tackle individual problems.

The potential of microfinance loans for decentralized sanitation systems in developing countries has often been addressed. Governments and policy makers have often refuted that microfinance loans for the water and sanitation sectors are too much of a financial risk and put great pressure on households (Pories 2015). In fact, conventional models of financial institutions developing loan portfolios for designing and constructing household-level water and sanitation facilities are not yielding the desired results. This is supported by Pories’ 2015 study, which calculated the time spent by the members of a household to collect water and travel for open defecation. Data collected through the study show that households that took loans to construct water and sanitation facilities gained newly freed time for income-generating activities, with women being the most economically active. Of the women studied, 17.4% were able to work additional hours and 6.1% entered the workforce for the first time. Therefore, while governments argue that investment in sanitation is expensive, the rate of return is low. While increased tariffs can put greater pressures on households through microfinance loans, Pories’ 2015 study

supports the argument that, even though the initial investment in sanitation-related infrastructure may be steep, it allows people to save time and enables greater income generation, thereby increasing consumers' ability to pay additional tariffs.

This indicates that, “innovative non-traditional financing mechanisms like micro-loans for consumptive purposes in the sanitation sector may not be as risky as assumed and in fact generating additional income for households” (Pories 2015). Through regulated policy frameworks, such innovations can cultivate decentralized systems that eventually benefit communities, facilitating not only economic development, but the general well-being of populations.

The governance and institutional structures for sanitation projects are also concerning. Until recently, public organizations were the sole providers of the most basic consumer utilities, such as water, sanitation and transport. In recent years, several non-state actors, especially in developing countries like India, Bangladesh, Nepal, and some African countries have strongly invested for the betterment of the sector. However, scholars and analysts have yet to acknowledge the combination of state and non-state providers prevalent in the sector and identify their role through a regulatory mechanism (A.E.Post 2017). The involvement of non-state actors is already prevalent where decentralized approaches are being implemented. It is, therefore, significant that developing countries are already using hybrid unregulated systems for service delivery. However, service provision in the water and sanitation sectors has largely been a public engagement and has been heavily associated with the politics of user charges and effects on the fate of regimes, where the overall sentiment has been protective. With the advent of NGOs, private company providers for FSM, and social enterprises working in the sector, service provision has been highly fragmented and unregulated, resulting in a lack of organized replicability and scalability. This situation has helped to resolve issues in some regions sector-wise but has not addressed the larger sanitation issue. Therefore, it is imperative that government and sector specialists look at regulatory mechanisms to amalgamate this hybrid model of state and non-state actors to effectively work together.

2.5 Political Will as the Key Driver in Prioritizing Sanitation and the Role of Data in Evidence-Based Decision-Making

In light of the initial observations presented in this paper concerning country comparisons of sanitation coverage and GDP, the trajectories of Malaysia and the Republic of Korea are highly remarkable. In the case of the Republic of Korea, the water and sanitation sectors were continuously linked to industrial and economic growth, thereby creating long-term momentum for them to grow through robust institutional mechanisms (Korea Water and WasteWater Works Association n.d.). Creating an enabling platform for sanitation has highlighted the prescient understanding and analysis of governments that had the ability and the inclination to prioritize sanitation as a means to larger economic regeneration.

The global political understanding of sanitation has been that it is a by-product of economic growth, with a micro-level reliance on the concept that greater household income leads to better sanitation (Water Aid n.d.). In both the Republic of Korea and Malaysia, studies have indicated the opposite: that sanitation was prioritized from the beginning so that cities, towns, and regions could become self-sustained corridors. For both countries, sanitation was included in the early development plans, with leaders and institutions playing a central role in the development of the sector. Leaders in Malaysia, from 1955 onward, included and linked sanitation with economic development. Rural sanitation was of key importance, with an emphasis on donor and development aid to focus on money-earning, health, happiness, and social-

development projects (Water Aid n.d.). This was accomplished by making rural development central to the policy framework and limiting rural-to-urban migration by creating self-sustained and comfortable living environments in rural areas.

One of the primary tasks was the provision of basic services such as water supply, sanitation, electricity and transport. The prime minister and the chief ministers in Malaysia reiterated the importance of safe sanitation and made it central to all the decision-making for development. The larger consensus within the sanitation sector has relied on the idea that it is the result of development efforts, rather than the key mechanism for it. This is supported by the beliefs that countries need to reach a certain GDP landmark to be able to attain complete sanitation coverage and that community-based initiatives and behavioral change are key to the sanitation revolution (Water Aid n.d.). Table 1 challenges these beliefs. It is evident that when the countries reached a nominal 40% sanitation coverage, the GDP subsequently inflected over a medium- to long-term period. Table 1 also demonstrates how some countries, like Japan, the Republic of Korea, and Thailand emphasized sanitation long before economic development.

The Water Aid report on Malaysia's rural sanitation program describes how it was integrated into its poverty eradication programs. The Rural Environmental Sanitation Program was designed to improve the well-being of those in impoverished areas and the Rural Development Program resettled people into more productive lands equipped with improved sanitation facilities. These reforms tackled sanitation early on, with institutions and organizations improving over time. Improvement was possible because senior leadership prioritized sanitation in their broader agenda of national and rural development. The Malaysian case strongly supports the argument that facilitating access to sanitation in rural areas was not something completely left to individuals and communities but was actively pursued by the government through donor and development aid.

It is essential to understand that countries whose governments prioritized sanitation by strategic planning, supported by strong leadership and political will, created a chain of institutional and governance structures that effectively mitigated the sanitation challenge early on with low financial investments, also coupled with lack of returns on primary expenditures but eventually receiving high returns over time. In the present scenario, it is essential that community-oriented and multi-stakeholder approaches be combined with a consistent political will and related governance mechanisms.

As a final point, it is essential to grasp that to tailor any action toward innovative solutions to leverage the sanitation sector, informed understanding of basic realities is required. There is a need for an evidence-based approach to make appropriate sanitation improvements. One of the pressing needs in the sector has been the lack of regular and accurate data collection efforts. The development of the WASH sector has been viewed as either involving appropriate infrastructure provision or encompassing financial allocation, budgeting, and resource management. We observe that to make further improvements in sanitation, resource allocation, and associated decision-making, it is important that a data-driven approach is undertaken.

3. CONCLUSION

Throughout history, the importance of wastewater management has not been accurately understood, particularly regarding its economic benefits. Life in many countries has carried on without sanitation, despite knowledge of the benefits that come from decentralized systems for small populations instead of large treatment plants. Sanitation

tariffs have consistently focused on full-cost recovery and, thus, on large-scale technological solutions, while not entirely considering the potential from tax revenues stemming from the “user pays” principle. This paper has combined and analyzed available literature and presented a new way to think about the sanitation challenge. Using decentralized and distributed options, tailor-made solutions must be devised according to local contexts using innovative financing mechanisms. Standardization of available technologies with adequate community participation is critical to resolving issues on a region-by-region basis. With growing demands from urbanization and migration, it is imperative that a hybrid governance model be adopted, including state and non-state actors, to collectively contribute toward implementation of sanitation projects at various scales. Consequently, it is significant to understand that access to improved sanitation and wastewater management has benefits that greatly counter the negative effects of a lack thereof on gender, education, and GDP. The spillover effects from sanitation lie beyond the periphery of its immediate impacts and concurrently result in greater economic prosperity and social well-being over a long period of time, resulting in a sustainable environment. Ultimately, this paper emphasizes that countries need to immediately prioritize and invest in sanitation through dedicated political will, evidence-based decision making and government support, driven by the understanding of the far-reaching spillovers from decentralized and community-driven projects required to replicate and scale.

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ANNEX: GENERIC DATA ON URBAN SANITATION-RELATED VARIABLES IN THE GIVEN COUNTRIES

GDP per capita (current US\$)						
Country	1960	1965	1970	1975	1980	1985
Bangladesh	88.69	105.79	138.25	272.75	222.63	239.04
Bhutan	..	..	..	..	331.53	368.63
Cambodia	111.34	134.30	102.70	..	..	..
PRC	89.52	98.49	113.16	178.34	194.80	294.46
India	81.28	118.06	111.26	156.38	263.84	293.49
Indonesia	..	..	84.84	248.12	523.25	550.32
Japan	479.00	919.78	2,027.07	4,635.12	9,416.63	11,599.74
Korea, Rep. of	158.24	108.70	279.13	615.20	1,704.47	2,457.33
Malaysia	234.92	310.33	357.66	764.56	1,774.74	2,000.15
Nepal	50.52	67.37	72.18	118.25	130.58	156.66
Sri Lanka	142.78	152.85	183.93	275.63	267.67	369.50
Singapore	427.88	516.29	925.29	2,489.78	4,926.96	6,995.10
Thailand	100.77	137.92	192.13	351.55	682.77	747.49
Viet Nam	..	..	..	..	..	230.87
Country	1990	1995	2000	2005	2010	2015
Bangladesh	297.57	319.61	405.60	484.16	757.67	1,210.16
Bhutan	557.97	588.59	765.86	1,247.06	2,178.92	2,615.31
Cambodia	..	323.01	300.69	474.22	785.69	1,163.19
PRC	317.88	609.66	959.37	1,753.42	4,560.51	8,069.21
India	363.96	370.10	438.86	707.01	1,345.77	1,596.47
Indonesia	622.87	1,092.70	830.58	1,342.54	3,113.48	3,336.11
Japan	25,417.28	43,440.37	38,532.04	37,217.65	44,507.68	34,474.14
Korea, Rep. of	6,516.31	12,332.98	11,947.58	18,639.52	22,086.95	27,105.08
Malaysia	2,440.59	4,328.00	4,045.17	5,593.82	9,071.36	9,648.55
Nepal	193.48	205.69	231.43	317.09	592.18	747.16
Sri Lanka	463.51	714.07	869.50	1,250.03	2,808.43	3,891.66
Singapore	11,864.28	24,936.83	23,792.61	29,869.85	46,569.68	53,629.74
Thailand	1,508.29	2,845.41	2,007.56	2,893.65	5,075.30	5,814.86
Viet Nam	94.88	275.75	388.27	683.60	1,310.37	2,065.17

continued on next page

Annex *table continued*

People using at least basic sanitation services (% of population)						
Country	1960	1965	1970	1975	1980	1985
Bangladesh
Bhutan
Cambodia
PRC
India
Indonesia
Japan
Korea, Rep. of
Malaysia
Nepal
Sri Lanka
Singapore
Thailand
Viet Nam
Country	1990	1995	2000	2005	2010	2015
Bangladesh	25.35	32.72	39.93	46.92
Bhutan	53.19	56.76	60.00	62.87
Cambodia	12.26	24.37	36.52	48.83
PRC	60.58	65.15	70.14	75.04
India	21.68	29.22	36.72	44.15
Indonesia	44.24	52.59	60.49	67.89
Japan	99.98	99.99	99.99	100.00
Korea, Rep. of	100.00	100.00	100.00	99.89
Malaysia	96.78	97.88	98.87	99.57
Nepal	19.19	28.38	37.35	46.13
Sri Lanka	85.38	88.56	91.75	94.21
Singapore	100.00	100.00	100.00	100.00
Thailand	94.87	94.96	95.00	95.01
Viet Nam	53.40	62.01	70.31	78.24

continued on next page

Annex *table continued*

People using safely managed sanitation services (% of population)						
Country	1960	1965	1970	1975	1980	1985
Bangladesh
Bhutan
Cambodia
PRC
India
Indonesia
Japan
Korea, Rep. of
Malaysia
Nepal
Sri Lanka
Singapore
Thailand
Viet Nam
Country	1990	1995	2000	2005	2010	2015
Bangladesh
Bhutan
Cambodia
PRC	29.06	35.35	46.63	59.69
India
Indonesia
Japan	98.21	99.01	99.60	99.80
Korea, Rep. of	85.64	89.95	94.38	98.46
Malaysia	78.06	79.50	80.84	81.93
Nepal
Sri Lanka
Singapore	100.00	100.00	100.00	100.00
Thailand
Viet Nam

continued on next page

Annex *table continued*

Tuberculosis case detection rate (% , all forms)						
Country	1960	1965	1970	1975	1980	1985
Bangladesh
Bhutan
Cambodia
PRC
India
Indonesia
Japan
Korea, Rep. of
Malaysia
Nepal
Sri Lanka
Singapore
Thailand
Viet Nam
Country	1990	1995	2000	2005	2010	2015
Bangladesh	26	39	46	58
Bhutan	80	80	80	80
Cambodia	27	52	65	62
PRC	33	74	87	87
India	37	36	44	59
Indonesia	8.9	26	30	32
Japan	87	87	87	87
Korea, Rep. of	94	94	94	94
Malaysia	87	87	87	87
Nepal	76	80	80	74
Sri Lanka	68	73	74	69
Singapore	87	87	87	87
Thailand	22	40	55	53
Viet Nam	57	64	71	79

continued on next page

Annex *table continued*

Incidence of malaria (per 1,000 population at risk)						
Country	1960	1965	1970	1975	1980	1985
Bangladesh
Bhutan
Cambodia
PRC
India
Indonesia
Japan
Korea, Rep. of
Malaysia
Nepal
Sri Lanka
Singapore
Thailand
Viet Nam
Country	1990	1995	2000	2005	2010	2015
Bangladesh	12.50	12.60	8.60	0.80
Bhutan	26.40	7.00	1.50	0.10
Cambodia	207.00	48.70	20.50	13.00
PRC	0.10	0.10	0.02	0.00
India	42.70	48.10	33.10	18.60
Indonesia	99.00	119.10	129.20	26.10
Japan
Korea, Rep. of	2.80	0.90	0.80	0.80
Malaysia	16.30	6.20	6.50	1.90
Nepal	18.30	12.50	5.40	3.30
Sri Lanka	107.00	0.80	0.30	0.00
Singapore
Thailand	11.90	6.40	6.30	2.70
Viet Nam	6.30	1.20	0.70	0.30

continued on next page

Annex *table continued*

Improved sanitation facilities (% of population with access)						
Country	1960	1965	1970	1975	1980	1985
Bangladesh	..	..	..	..	..	..
Bhutan	..	..	..	..	..	..
Cambodia	..	..	..	..	..	..
PRC	..	..	..	..	..	..
India	..	..	..	..	..	..
Indonesia	..	..	..	..	..	..
Japan	..	..	..	..	..	..
Korea, Rep. of	..	..	..	..	..	..
Malaysia	..	..	..	..	..	..
Nepal	..	..	..	..	..	..
Sri Lanka	..	..	..	..	..	..
Singapore	..	..	..	..	..	..
Thailand	..	..	..	..	..	..
Viet Nam	..	..	..	..	..	..
Country	1990	1995	2000	2005	2010	2015
Bangladesh	34.40	40.00	45.40	50.70	55.80	60.60
Bhutan	18.90	23.60	31.00	39.00	46.80	50.40
Cambodia	2.90	7.70	16.30	24.90	33.60	42.40
PRC	47.50	53.20	58.80	64.90	70.80	76.50
India	16.80	20.80	25.60	30.60	35.50	39.60
Indonesia	35.20	41.00	47.10	52.10	57.00	60.80
Japan	100.00	100.00	100.00	100.00	100.00	100.00
Korea, Rep. of	100.00	100.00	100.00	100.00	100.00	100.00
Malaysia	86.20	88.80	91.20	93.40	95.40	96.00
Nepal	4.50	13.10	21.70	29.90	37.90	45.80
Sri Lanka	70.70	76.00	81.20	86.40	91.70	95.10
Singapore	99.20	99.40	99.70	100.00	100.00	100.00
Thailand	86.90	89.10	91.30	93.20	93.30	93.00
Viet Nam	36.20	44.60	52.90	61.40	69.70	78.00

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Annex *table continued*

Public-Private partnerships investment in water and sanitation (current US\$)				
Country	1960	1965	1970	1975
Bangladesh
Bhutan
Cambodia
PRC
India
Indonesia
Japan
Korea, Rep. of
Malaysia
Nepal
Sri Lanka
Singapore
Thailand
Viet Nam
Country	1980	1985	1990	1995
Bangladesh
Bhutan
Cambodia
PRC	150,000,000.00
India
Indonesia	200,000,000.00
Japan
Korea, Rep. of
Malaysia	10,000,000.00
Nepal
Sri Lanka
Singapore
Thailand	160,000,000.00
Viet Nam
Country	2000	2005	2010	2015
Bangladesh
Bhutan
Cambodia
PRC	72,400,000.00	1,007,319,000.00	123,700,000.00	774,050,000.00
India	18,500,000.00
Indonesia
Japan
Korea, Rep. of
Malaysia	3,964,800,000.00	..	..	..
Nepal
Sri Lanka
Singapore
Thailand	8,800,000.00	241,600,000.00	..	..
Viet Nam	20,000,000.00	92,000,000.00	..	..

continued on next page

Annex table continued

Investment in water and sanitation with private participation (current US\$)				
Country	1960	1965	1970	1975
Bangladesh
Bhutan
Cambodia
PRC
India
Indonesia
Japan
Korea, Rep. of
Malaysia
Nepal
Sri Lanka
Singapore
Thailand
Viet Nam
Country	1980	1985	1990	1995
Bangladesh
Bhutan
Cambodia
PRC	\$150,000,000.00
India
Indonesia	\$200,000,000.00
Japan
Korea, Rep. of
Malaysia	\$10,000,000.00
Nepal
Sri Lanka
Singapore
Thailand	\$160,000,000.00
Viet Nam
Country	2000	2005	2010	2015
Bangladesh
Bhutan
Cambodia
PRC	\$72,400,000.00	\$1,007,319,000.00	\$639,700,000.00	\$774,050,000.00
India	\$18,500,000.00
Indonesia
Japan
Korea, Rep. of
Malaysia	\$3,964,800,000.00	..	..	..
Nepal
Sri Lanka
Singapore
Thailand	\$8,800,000.00	\$241,600,000.00	..	..
Viet Nam	\$20,000,000.00	\$92,000,000.00	..	..

continued on next page

Annex *table continued*

Incidence of tuberculosis (per 100,000 people)						
Country	1960	1965	1970	1975	1980	1985
Bangladesh
Bhutan
Cambodia
PRC
India
Indonesia
Japan
Korea, Rep. of
Malaysia
Nepal
Sri Lanka
Singapore
Thailand
Viet Nam
Country	1990	1995	2000	2005	2010	2015
Bangladesh	221	221	221	221
Bhutan	249	192	225	153
Cambodia	575	511	436	368
PRC	109	92	77	66
India	289	279	247	217
Indonesia	449	437	415	395
Japan	36	24	20	16
Korea, Rep. of	49	94	95	79
Malaysia	75	69	76	88
Nepal	163	163	163	156
Sri Lanka	66	66	66	65
Singapore	51	35	35	45
Thailand	241	224	181	172
Viet Nam	197	176	155	137

continued on next page

Annex *table continued*

People practicing open defecation (% of population)						
Country	1960	1965	1970	1975	1980	1985
Bangladesh
Bhutan
Cambodia
PRC
India
Indonesia
Japan
Korea, Rep. of
Malaysia
Nepal
Sri Lanka
Singapore
Thailand
Viet Nam
Country	1990	1995	2000	2005	2010	2015
Bangladesh	34.00	..	18.36	11.91	5.79	0.11
Bhutan	11.48	7.37	2.70	0.00
Cambodia	82.73	68.73	54.71	40.57
PRC	2.38	2.21	1.83	1.51
India	65.97	57.21	48.49	39.84
Indonesia	32.16	25.17	18.59	12.45
Japan	0.00	0.00	0.00	0.00
Korea, Rep. of	0.00	0.00	0.00	0.00
Malaysia	1.61	1.04	0.55	0.35
Nepal	64.60	52.76	41.20	29.83
Sri Lanka	0.00	2.67	2.67	2.65
Singapore	0.00	0.00	0.00	0.00
Thailand	1.01	0.74	0.49	0.27
Viet Nam	6.30	1.20	0.70	0.30

Source: World Bank, World Development Indicators.