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Acronyms

ASEAB	:	Association for Socio-Economic Advancement of Bangladesh
AusAid	:	Australian Agency for International Development
ASA	:	Formerly known as "Association for Social Advancement," now simply "ASA"-an internationally reputed microfinance organization.
BAMWSP	:	Bangladesh Arsenic Mitigation Water Supply Project
BANDHAN	:	A Local NGO
BARD	:	Bangladesh Academy for Rural Development
BASUG-N	:	Bangladesh Support Group-Netherland
BRDTI	:	Bangladesh Rural Development Training Institute
BASA	:	Bangladesh Association for Social Advancement
BCAS	:	Bangladesh Centre for Advanced Studies
BRIF	:	Bangladesh Rural Improvement Foundation
CAP	:	Community Action Plan
CBO	:	Community Based Organization
CDMP	:	Comprehensive Disaster Management Program
CHF	:	Swiss Francs
CLTS	:	Community Led Total Sanitation
CORDAID	:	Catholic Organization for Development Cooperation, Netherland
DAM	:	Dhaka Ahsania Mission
DANIDA	:	Danish International Development Agency
DASCOH	:	Development Association for Self-Reliance, Communication and Health
DFID	:	Department For International Development
DGHS	:	Directorate General of Health Service
DPHE	:	Department of Public Health Engineering
DWA	:	Dutch Wash Alliance, Netherland
EC	:	European Commission
ENDEAVOUR	:	Ensure Development Activities for Vulnerable under Privileged Rural People
GAT	:	Gandhi Ashram Trust
HH	:	Household
HLP	:	Horizontal Learning Program
HP	:	Hope For The Poorest
HTRA	:	Hard to Reach Area
HYSAWA	:	Hygiene, Sanitation and Water Supply
HZ-Canada	:	Hasan Zahid-Canada
INAFI	:	International Network of Alternative Financial Institutions
ISSU-2	:	Institutional Support for Sustainable Sanitation and Urban Environment (Ph-2)
JASUS	:	Joutho Artho Samajik Unnyan Sangstha
JICA	:	Japan International Cooperation Agency
JMP	:	Joint Monitoring Programme
LCG	:	Local Consultative Group
LGD	:	Local Government Division
LGED	:	Local Government Engineering Department
LGSP	:	Local Government Support Project
LGSU	:	Local Government Support Unit
LGTI	:	Local Government Training Institution
MICS	:	Multiple Indicator Cluster Survey
MFI	:	Microfinance Institution
MIS	:	Management Information system
MJSKS	:	Mohideb Jubo Samaj Kallyan Somiti
MoLGRD&C	:	Ministry of Local Government, Rural Development and Cooperatives
NB	:	National Building Institutions (line agencies)

NGO Forum	:	NGO Forum for Drinking Water Supply and Sanitation
NILG	:	National Institute of Local Government
NPAM	:	National Policy for Arsenic Mitigation
NRDS	:	Noakhali Rural Development Society (NRDS)
PKSF	:	Palli Karmo Shayak Foundation
PSU	:	Policy Support Unit
RDA	:	Rural Development Academy
RDRS	:	Rangpur Dinajpur Rural Service
SDC	:	Swiss Agency for Development and Cooperation
SDP	:	Sector Development Plan
SDSD	:	Sustainable Solutions for the Delivery of Safe Drinking Water (SDSD) Project
Sida	:	Swedish International Development Cooperation Agency
TMSS	:	Thengamara Mohila Sabuj Sangha
UP	:	Union Parishad
UNDP	:	United Nations Development Programme
UNICEF	:	United Nations Children Fund
UZP	:	Upazila
USS	:	Udayan Shabolomvi Sangstha
VARD	:	Voluntary Association for Rural Development
VERC	:	Village Education Resource Centre
VSO	:	Voluntary Service Overseas
WASH	:	Water, sanitation and hygiene
WatSan	:	Water Supply and Sanitation
WFP	:	World Food Program
WHO	:	World Health Organization
WSP	:	Water and Sanitation Program of World Bank

Executive Summary

The consumption of unsafe water is a major issue in Bangladesh. In rural areas many populations are dependent on natural sources of water such as rain water and pond water for drinking and household use. Such surface water is often contaminated due to human excreta and industrial pollution. It is estimated that in Bangladesh about 110,000 children under the age of five die each year from water borne diseases attributable to poor sanitation. Groundwater, pumped through deep and shallow tube wells, offers a means of accessing safe sources of drinking water yet the presence of arsenic in groundwater, affecting some 27%¹ of wells, has led to further health problems. Arsenic poisoning can cause a variety of deadly ailments, including skin, lung, bladder, and liver cancers, and can be difficult to detect as it often has no immediate signs. Skin lesions can occur, but often only after many years of poisoning has taken place, and cancers and other diseases developing as a result of arsenic poisoning often do not appear until well over 10 years after the onset of exposure.

In recent years, **initiatives undertaken to tackle these issues are moving towards more locally driven and market-oriented approaches.** These approaches increasingly seek to harness the safe water market system market system ("SWaM System") to improve the safety of water consumption. Innovative models are required in order to achieve sustainable impacts and it is clear that the water, sanitation and hygiene (WASH) sector can be strengthened by learning from innovative market-based approaches to bringing about safe water consumption. Market-based approaches offer a more customer-oriented and responsive means of facilitating development and offer better value for money for development partners and governments. **Harnessing the power of market actors increases the potential scalability of successful interventions** and ensures that impacts can be sustained beyond the duration of any development project. The viability of the commercial model employed in such initiatives is the key to ensuring sustainability of the gains made through development initiatives. Therefore, **an understanding of the various approaches that already exist in practice can inform the refinement and development of improved models and more effective implementa-**

tion. Many existing initiatives could be improved or scaled up through a market based approach.

iDE adapted the renowned Making Markets Work for the Poor (M4P) market development approach into its "Connect 4" conceptual framework of practical and flexible lenses through which ground market development principles in the realities of business, government and development practice.

In the safe water market system, the core market is characterized by five interrelated components that broadly correspond to the supply chain for drinking water. These components are 1) extraction, 2) testing, 3) treatment, 4) transportation, and 5) storage. Accordingly, safe water business models for safe water involve multiple actors, each engaged in one or more of these components. When combined, these organizations and their corresponding components deliver drinking water from surface or groundwater resources to the consumer.

There are a number of key problems that inhibit the delivery of safe water sustainably to BoP market segments in Bangladesh. Some major issues identified include:

- *Consumer-oriented understanding on desirability, feasibility and viability of safe water products and services is low.*
- *Strategic and business planning in long-run, large-scale service delivery is generally low.*
- *High-cost, low-scale solutions predominate service delivery models rather than more cost- and context-appropriate technologies and products.*
- *There are no incentive-driven collaboration spaces for safe water.*

Through systematic analysis of the service delivery models in the Bangladesh safe water market system, the following conclusions can be drawn:

- **Pumps & Harvesting SDMs exhibit both demonstrated scale and high potential, but are an incomplete solution** – testing and treatment are typically unaffiliated with P&H SDMs.
- **Testing SDMs are a critical cluster, particularly in combination with Pumping & Harvesting and Devices, Flasks & Tabs SDMs**, as testing is typically a necessity to ensuring general access to safe water (Pumping & Harvesting), and to a lesser extent understanding which

¹ See: www.sos-arsenic.net

market segments require DFT products and services.

- **Pipes & Taps SDMs offer a complete “turn key” safe water solution, but require significant investments** of capital, human resources, and very long timeframes (more than 10-15 years minimum), particularly given the **weak horizontal scalability** of an individual piped “mini-utility”.
- **Plants & Kiosks SDMs demonstrate moderate potential but weak scale at present;** significant additional RD&D and service delivery piloting is required across both development and private sector actors in the space before the long-run potential of P&K SDMs is better understood.
- **Devices, Flasks & Tabs SDMs demonstrate high conceptual potential but weak scale and potential under existing SDMs.** However, it is likely that increased private sector involvement in DFT SDMs in the near-term will radically improve the potential of this cluster.

Synthesizing the problems and related underlying causes observed in the SWaM System in Bangladesh with the predominant service delivery models utilized enables the identification of thematic patterns of service weaknesses that represent the most important barriers in safe water provision. **The key themes of service weakness in the SWaM System include:**

- *Strategic & Business Planning Services*
- *“Human-Centered” RD&D Consulting Services*
- *Aspirational Marketing Services*
- *Local Service Provider Skills & Capacity Development Services*
- *Incentive-Driven Facilitation & Collaboration Services*

Including broader, more inclusive solutions to access to safe water requires an innovation approach balancing 1) user-centered design (“investing in experimentation that puts the customer at the center”², 2) existing market actors and resources, and 3) aspirational marketing and branding³. Accordingly, iDE proposes the devel-

opment of a “Safe Water Market Platform” (“The SWaMP”) network that draws on the “Innovation as Standard” Connect 4 Lens to create solutions that address the subsector according to the Innovation Pyramid Approach.

SWaMP Network Intervention	Innovation Pyramid Approach: Level	Innovation Pyramid Approach: Objective	Service Delivery Approach (SDA): Success Factors
The Safe Water Market System Platform (“SWaMP”)	Big Bets	Cultivating communication and collaboration skills	Standardization of implementation approaches Political engagement
Horizontal Learning Program (HLP) Linkages	Portfolio of Promising, Midrange Ideas	Forging better connections between innovators and mainstream operations	Capacity support to decentralized government (service authorities) Professionalization of community management
Horizontal Professionalization Program (HPP) Linkages		Forging better connections between innovators and mainstream operations	Post-construction support to service providers
SWaMP Sustainable Match Initiative (“SWaMP SMatch”)	Broad Base of Early-Stage Innovations	Forging better connections between innovators and mainstream operations	Increased recognition and promotion of alternative service provider options
Human-Centered Design Practitioner Learning Program (HCD-PLP)	Broad Base of Early-Stage Innovations	Widening the search for new ideas	Learning and sharing of experience

² Ibid: 39.

³ Polak, Paul. 2012. *Paul Polak, Founder, iDE: At Least a Million*. Huffington Post.

address demand side sustainability from the users' perspective.

1. Introduction

The consumption of unsafe water is a major issue in Bangladesh. In rural areas many populations are dependent on natural sources of water such as rain water and pond water for drinking and household use. Such surface water is often contaminated due to human excreta and industrial pollution. It is estimated that in Bangladesh about 110,000 children under the age of five die each year from water borne diseases attributable to poor sanitation. Groundwater, pumped through deep and shallow tube wells, offers a means of accessing safe sources of drinking water yet the presence of arsenic in groundwater, affecting some 27%⁴ of wells, has led to further health problems. Arsenic poisoning can cause a variety of deadly ailments, including skin, lung, bladder, and liver cancers, and can be difficult to detect as it often has no immediate signs. Skin lesions can occur, but often only after many years of poisoning has taken place, and cancers and other diseases developing as a result of arsenic poisoning often do not appear until well over 10 years after the onset of exposure.

In recent years, **initiatives undertaken to tackle these issues are moving towards more locally driven and market-oriented approaches.** These approaches increasingly seek to harness the safe water market system market system ("SWaM System") to improve the safety of water consumption. There are many **public- and development-sector approaches** to improving the quality of drinking water supplies in Bangladesh at present. These initiatives vary and include a broad range of water issues and solutions such as water access technologies, such as wells, filtration devices, and pay-per-use water testing services and voucher schemes for the development of water infrastructure (such as wells). In recent years some promising models have emerged from **local government institutions (LGIs)** that seek to link private sector provision with public sector oversight. Yet typically these public sector based approaches have struggled to achieve significant levels of scale and sustainability. This is primarily associated with the failure of the public sector to

Such public-private models have realized some success. Bangladesh had achieved 98% access to an improved drinking water source before discounting for arsenic. This was achieved primarily through the extension of low cost hand pumps demonstrated by **development organizations** such as DPHE and UNICEF with scaled-up achieved through harnessing the **both formal private sector**, including national input supply firms, **and private local service providers (LSPs)** comprising of local hardware retailers and dealers, drillers, technicians, plumbers, and mechanics. However, while the informal private sector has contributed enormously to the improvement of access to improved water sources, the quality, sustainability and inclusivity of the water service associated with that access is highly questionable. This can be understood to be primarily associated with a failure to connect public oversight to the private extension of public services.

Such innovative models are required in order to achieve sustainable impacts and it is clear that the water, sanitation and hygiene (WASH) sector can be strengthened by learning from innovative market-based approaches to bringing about safe water consumption. Market-based approaches offer a more customer-oriented and responsive means of facilitating development and offer better value for money for development partners and governments. **Harnessing the power of market actors increases the potential scalability of successful interventions** and ensures that impacts can be sustained beyond the duration of any development project. The viability of the commercial model employed in such initiatives is the key to ensuring sustainability of the gains made through development initiatives. Therefore, **an understanding of the various approaches that already exist in practice can inform the refinement and development of improved models and more effective implementation.** Many existing initiatives could be improved or scaled up through a market based approach.

⁴ See: www.sos-arsenic.net
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2. Study Overview

Accordingly, iDE Bangladesh undertook a study of the Safe Water Market System (“SWaM System”) to investigate the desirability, feasibility and viability of markets-based approaches to expanding safe water service delivery in Bangladesh. In this, iDE examined a combination of the ongoing service delivery models for safe water to base of the pyramid (BoP) markets across the public, private and development sectors in terms of both existing scale and estimated potential, including scalability, sustainability, inclusiveness and return on investment (ROI).

The study opens in Section 3 with an overview of the scope and scale of safe water access in BoP markets both worldwide and in Bangladesh. Section 4 continues with an overview of the study’s Conceptual Framework for Market System Analysis in order to approach the SWaM System from a holistic, markets-based perspective that incorporates the critical roles of the public, private and development sectors in terms of diversifying investments into BoP markets and communities for overall improvements in access to safe water.

Following a summary of the analytical framework of the study in Section 5, a thorough analysis of trends and good practice in the key investment gaps, observable problems and service weaknesses in the existing SWaM System in Bangladesh in Section 6. Ultimately, this analysis results in the identification of key opportunities and identifying entry interventions in Section 7 to provide a broad road map for the expansion and intensification of multi-sector, markets-based service delivery models and greater coordination across the safe water subsector in the future.

2.1. Methodology

iDE’s cross-cutting Innovation & Quality Management (iQ) Team drove the delivery of this study. Within iDE, the iQ Team ensures that technical research and programmatic activities are delivered with the highest quality at all times across all of iDE-B’s programs⁵. Across all of iDE’s

research and implementation activities, iQ delivers ongoing technical assistance and quality management in five key functions: (1) Market Research and Analysis, (2) Knowledge Management & Innovation, (3) Monitoring & Evaluation and (4) Business Process Management.

iDE’s overarching methodology behind the SWaM-System Study was a mixture of workshops, purposive in-depth interviews that inform the development of benchmarks for highly effective models and identified weaknesses in market systems for safe water, grounded in “investigative research and field visits following the leads”. To identify the promising practices and models iDE needed to talk to different public, private and development sector actors.

As a collaborative initiative designed to strengthen the sector as a whole, this study engaged a broad cross-section of stakeholders in the safe water subsector in Bangladesh, including public, private and development sector actors. To do so, iDE conducted a three-phase study. Under Phase 1: national stakeholder workshop was organized by WSP and facilitated by iDE across key stakeholders, which refined the remit and scope of the study and broadly identified existing service delivery models.

However, iDE also assumed that besides the enlisted respondents in the initial phase, there are also other potential market actors and promising business models that might not be identified through the literature review and workshop analysis. Besides, each public, private or development actor has a particular product or service model, has a distinct service/ sales network, a business coverage area and consumers/ beneficiaries under it that can only be identified by following their leads. Phase 2: fieldwork and analysis, enabled greater insight into the identified service delivery models. Through literature review and in-depth engagement with key actors in the subsector to identify the most promising service delivery models at present. Because talking to those actors, their employees, field level workers and customers is equally important to identify promising practices and models and to provide recommendations for development and scale-up of these models, therefore, iDE conducted

⁵ The iQ Unit mainstreams five functions within all iDE-B programs: (1) Knowledge Management & Innovation, (2) Market Research and Analysis, (3) Monitoring & Evaluation and (4) Business Process Management, and (5) Capacity Building & The Safe Water Market System in Bangladesh Connecting Public Goods to Private Delivery through Innovation & Inclusive Business iDE Bangladesh June 2013

Training. Source: iDE. 2012. *iDE-B Strategic and Operational Brief: Innovation and Quality Management (iQ) Unit*. Internal document. Dhaka, Bangladesh.

investigative research and field visits following the leads from previous respondents. While this process involved a number of techniques and tools, the unique and innovative part of the process is its expectations that iQ Team members followed as many leads as possible and triangulated what was learned in order to give the best possible picture of the SWaM-System and identify promising practices and models.

Moreover, once the promising models were identified, this phase enabled the **identification of key problems in the SWaM System, underlying service weaknesses driving those symptomatic problems, and directions in creating intervention options with the greatest likely potential interventions going forward in terms of desirability, feasibility and viability**. This analysis included spotting “win-win-win” arrangements that have been embedded in existing models; finding examples of where the public sector’s role of ensuring equity and internalizing externalities and the private sector’s relative financial viability and demand-responsiveness could be sustainably matched, and where key bottlenecks and blockages exist in the SWaM System. **Finally, this study represents the key deliverable in Phase 3, the reporting phase.**

2.2. Study Objectives

The objectives of the SWaM System study were as follows:

1	Investigate the viability of market based approaches to improving water safety in Bangladesh.
2	Investigate the sustainability, scalability, inclusiveness, and return on investment of different individual water safety models across all sectors through a benchmarking investigative approach.
3	Identifying promising models benchmarked across the major components of safe water supply chains, isolate the strengths of those models, and identify additional the limitations of those models in delivering safe water from extraction through consumption.
4	Propose combinations of promising models that augment

the weaknesses of others in order to recommend several collaborative, cross-sectoral models for more effective safe water extraction, testing, treatment, distribution, and consumption.

5

Identify non-existent components of proposed combinations that will require targeted market development in the future in order to achieve the recommended cross-sectoral market systems for safe water.

2.3. Limitations

Several factors influenced the implementation of the study, and to various extents have affected the scope and depth of the analysis:

- A number of national transportation strikes, or *hartals*, took place during the field work, which required scheduling changes and in some cases meant cancelling certain interviews or focus groups. The study team compensated for these changes as much as possible by selecting alternative interviews in areas where security was not an issue, and conducting interviews by phone, though this was not always possible due to scheduling or connectivity issues.
- Some of the government officials and respondent organization staff with whom the study team sought interviews were not available during the data collection phase and it was not possible to conduct the interviews later.

3. Background

Since 1990, the Millennium Development Goals (MDGs) have aimed for a reduction of the global proportion of people without sustainable access to safe drinking water by half by 2015. Yet inadequate access to safe water remains a critical development challenge. Approximately 43% of the global population, or 2.1 billion people lack access to safe water, disproportionately from lower-income populations in relatively rural and/or remote areas of the developing countries. Further, approximately 884 million people lack access to any form of safe water nearby the household.¹

A lack of safe water significantly contributes to public health burdens that debilitate and/or threaten the lives of millions of people throughout developing countries. Lack of access to safe drinking water contributes to a wide variety of dangerous diarrheal diseases, many of which disproportionately affect the ill and especially children, contributing to the estimated 1.7 million child deaths from diarrhea that occur each year in developing countries⁶. Indeed, diarrheal diseases contribute to nearly one in five child deaths worldwide, representing an estimated 1.5 million children annually, resulting in more deaths than the combined totals from AIDS, measles and malaria².

Even when non-lethal, diseases contracted from unsafe water can measurably reduce the productivity low-income households and communities, whether children or adults, and consequently reduce consumption smoothing ability over time. As a result, unsafe water consumption can constrain broad economic growth and income generation critical to the long-run prosperity of low-income individuals, households, communities, regions, and ultimately countries.

Women and children generally assume a disproportionate burden in the collection and consumption of drinking water in developing countries. Worldwide, over 75% of all low-income households place the burden of water collection

on women and girls⁷. As a result, as many as 200 million hours are spent each day collecting water across the world – a task predominantly required of women and girls⁸. Time spent collecting water carries important opportunity costs – collecting water takes women and girls away from critical activities, including income-generation, education and healthcare.¹⁰

Asia accounts for 69% of the total 2.1 billion people without access to safe water. Rural areas shoulder a disproportionate burden in this lack of access. Over 1.6 billion people in Asia without access to safe water are located in rural areas¹¹.

Managing water resources through sustainable, scalable strategies is one of the most critically pressing challenges in the WASH sector in Bangladesh today. Despite its many rivers and tributaries, freshwater resources in the country are not unlimited, and must be distributed across a diverse set of needs, including irrigation, industry, household uses, and drinking across a population of approximately 150 million people. Most important, approximately 110,000 children under the age of five in Bangladesh die each year from diarrheal diseases attributable to poor water and sanitation conditions¹².

Shortages are a continual reality across millions of individuals throughout the country, as access to appropriate and safe water resources are relatively limited, and service provision is inefficient overall. These challenges are only compounded by the country's relatively high growth rate, pervasive poverty, significant seasonal climatic fluctuations, and rapid urbanization¹³. Consequently,

⁷ WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. (2010). Progress on Sanitation and Drinking-Water, 2010 Update.

⁸ Estimated with data from: WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. (2010). Progress on Sanitation and Drinking-Water, 2010 Update; World Health Organization (WHO). (2004). Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level.

⁹ Estimated with data from: WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. (2010). Progress on Sanitation and Drinking-Water, 2010 Update; World Health Organization (WHO). (2004). Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level.

¹⁰ Water and Sanitation Program (WSP). (2000). Linking Sustainability with Demand, Gender and Poverty: A study in community-managed water supply projects in 15 countries.

¹¹ 2008 data. Joint Monitoring Program: Progress on sanitation and drinking water 2010 update, WHO and UNICEF

¹² WaterAid

¹³ World Bank (2005-12-20). Bangladesh Country Water Resources Strategy (PDF). Retrieved 2008-04-21., p. 1

⁶ Boschi-Pinto, Cynthia, L Velebit, and K Shibuya. 2008. "Estimating child mortality due to diarrhoea in developing countries." *Bulletin of the World Health Organization* 86(9):710–717. Retrieved July 26, 2011 (<http://www.who.int/bulletin/volumes/86/9/07-050054.pdf>).
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water resources in Bangladesh are under continual strain across a variety of subsectors, including drinking water.

3.1. Surface Water & Rainwater

Bangladesh has significant surface water resources, given its geographic position at the mouth of some of the world's largest rivers. Bangladesh receives most of its surface water from the Brahmaputra, Meghna and Ganges river basins originating in India, Nepal and China. The surface water system is over 12,000 sq. km., which is about 18% of the total land area of the country. Renewable water resources within the country total approximately 105 km³ per year, while foreign riverine inflows provide over 1,100 km³ per year.¹⁴ The country's surface water system includes large river networks, large-scale flood plains that are seasonally submerged under water, lakes, numerous *beels* and *hoars*, and 1,288,222 ponds¹⁵ throughout the country's rural villages.

Surface water and rainwater conditions are highly seasonal. During the summer monsoon season, June to October, the country is inundated with surface water. During April and May, however, most of the country experiences an acute dry season. Rainfall varies widely throughout the country, from as low as approximately 1,400 mm in the west to nearly 5,000 mm in the northeast. As with river inflows, rainfall is significantly seasonal, with 90% of the total rainfall occurring between June and September.

3.2. Groundwater

Overall, Bangladesh has the greatest overall dependence on groundwater resources in Asia. Groundwater is critical for irrigation; more than 70% of the country's total irrigated area is drawn from groundwater resources. Further, irrigation for agriculture accounts for 79% of total water usage from groundwater resources.

Groundwater levels appear to have declined rapidly in recent years, leading to widespread

concerns over their sustainability in the face of increasing demand. In the north, approximately 30% of the tube wells have begun to show signs of diminished or inoperative extraction capacity. Critically, there is evidence that these drained resources are not being adequately replenished through seasonal rainfall, and that small rivers, ponds and other resources are drying up as well. Evidence is increasingly suggesting that overly excessive extraction for irrigation is driving these trends.

3.3. Drinking Water

The consumption of unsafe water is a major concern in Bangladesh. Numerous communities are dependent on surface, rainfall and groundwater sources of water for drinking and household needs. By 2004, the proportion of the population with access to an improved water source was estimated at 98%,¹⁶. Yet only 10% of total surface water, 9% of total groundwater resources, and only 2-5% of rainwater resources are utilized for drinking.

Further, while 74-76% of the population has access to arsenic-free drinking water sources, people still face serious issues of microbiological contamination¹⁷. Surface water is typically polluted due to human and animal fecal loads, and industrial pollution, and consequently requires treatment¹⁸. In this light, recent studies have suggested no more that 59% of the population has access to water free from arsenic contamination, microbiological contamination, and unsafe levels of industrial pollutants.

The 59% of the population with access to relatively safe water are largely the beneficiaries of long-term, concerted efforts to proliferate shallow groundwater handpumps. Since the 1970s, Bangladesh has achieved its significant coverage in water supply during the past decades primarily due to the availability of suitable ground water aquifers at shallow depths, and widescale efforts

¹⁶ World Health Organization; UNICEF. "Joint Monitoring Program". Retrieved 2010-10-20.

¹⁷ Minnatullah, Khawaja M. and Orsola-Vidal, "Achieving the Water and Sanitation MDGs in Bangladesh", The World Bank-Water and Sanitation Program for South Asia

¹⁸ Das Gupta, Ashim; Babel, Mukund Singh; Albert, Xavier; Mark, Ole (June 2005). "Water Sector of Bangladesh in the Context of Integrated Water Resources Management: A Review". *Water Resources Development* **21** (2): 385-398. doi:10.1080/07900620500037818., p. 389

¹⁴ World Resources Institute: Water Resources and Freshwater Ecosystems, COUNTRY PROFILE - Bangladesh

¹⁵ BBS 2007

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across the public, private and development sectors to manufacture and distribute tubewell and handpump technologies.

URBAN WATER					
Estimated coverage 2012 update					
Year	Total improved	Piped onto premises	Other improved	Other unimproved	Surface water
1990	87%	26%	61%	13%	0%
1995	87%	25%	62%	13%	0%
2000	86%	23%	63%	14%	0%
2005	85%	21%	64%	15%	0%
2010	85%	20%	65%	15%	0%

RURAL WATER					
Estimated coverage 2012 update					
Year	Total improved	Piped onto premises	Other improved	Other unimproved	Surface water
1990	75%	0%	75%	21%	4%
1995	75%	0%	75%	22%	3%
2000	77%	0%	77%	20%	3%
2005	79%	0%	79%	19%	2%
2010	80%	1%	79%	18%	2%

TOTAL WATER					
Estimated coverage 2012 update					
Year	Total improved	Piped onto premises	Other improved	Other unimproved	Surface water
1990	77%	5%	72%	20%	3%
1995	78%	5%	73%	20%	2%
2000	79%	5%	74%	19%	2%
2005	81%	5%	76%	18%	1%
2010	81%	6%	75%	18%	1%

Figure 1. Drinking Water Trends in Bangladesh, 1990 - 2010¹⁹

Rural water access through hand-pumps from shallow ground water aquifers is based on general coverage level whereby one hand pump serves on average 20 individuals, or roughly about 3 families. As local service providers (LSPs) such as drillers and technicians also emerged through corporate dealer networks and public/development programs to install hand pump tube wells at affordable rates, low-income rural communities were for the first time able to access relatively safe drinking water sources at the village-level.

For decades, conventional wisdom increasingly held that groundwater accessed through hand-pumps and tubewells was a game-changing solution to achieving safe water access throughout Bangladesh. Instead, groundwater extraction generated a complex combination of great success in certain communities but new dangers in others.

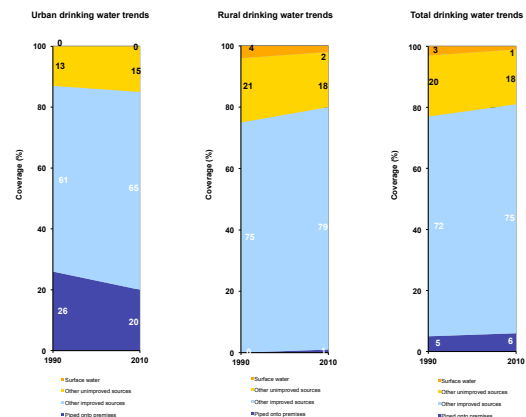


Figure 2. Drinking Water Coverage in Bangladesh, 1990 - 2010²⁰

In 1993, it was discovered that groundwater resources in numerous areas of Bangladesh were significantly contaminated with naturally-occurring arsenic compounds.^{21,22,23} When ingested over long periods of time, ingestion of arsenic causes a number of life-threatening illnesses, including cancers of the lungs, skin, liver, and bladder²⁴. Worse, arsenic poisoning is often asymptomatic, with the afflicted individual unaware until skin lesions develop as long as a decade later²⁵. Though estimates vary, between 29-77 million people are thought to be exposed to this poisoning in total, with approximately 20 million exposed to high levels of the compound^{26,27,28,29}.

²⁰ Estimates for the use of Improved Drinking-Water Sources, Joint Monitoring Programme (JMP) for Water Supply and Sanitation, WHO / UNICEF: 1.

²¹ Das Gupta, Ashim; Babel, Mukund Singh; Albert, Xavier; Mark, Ole (June 2005). "Water Sector of Bangladesh in the Context of Integrated Water Resources Management: A Review". *Water Resources Development* **21** (2): 385-398. doi:10.1080/07900620500037818., p. 389

²² World Bank (2005-12-20). *Bangladesh Country Water Resources Strategy* (PDF). Retrieved 2008-04-21., p. 1

²³ MIT (Massachusetts Institute of Technology), Search for Cleaner Water Causes Major Problems with Arsenic in Bangladesh Public Water Supply in Bangladesh, N.p., n.d. Web, 07 November 2012. <http://web.mit.edu/civenv/html/people/alumni_newsletters/winter_02/art5.htm>

²⁴ WHO

^{25,25} WHO

²⁶ GOB, 2002, Arsenic Mitigation in Bangladesh. An outcome of the International Workshop on Arsenic Mitigation in Bangladesh, Dhaka 14-16 January, 2002

²⁷ Fleck, Fiona, "An Interview with Mahmuder Rahman. Bangladesh's Arsenic Agony", *Bulletin of the World Health Organization* **86.1** (2008): 11-12

²⁸ Smith, Allan H., Allan H.; Lingas, Elena O; Rahman, Mahfuzar (2000). "Contamination of drinking-water by arsenic in Bangladesh: a public health emergency" (PDF). *Bulletin of the World Health Organization* **78** (2): 11-12

¹⁹ Estimates for the use of Improved Drinking-Water Sources, Joint Monitoring Programme (JMP) for Water Supply and Sanitation, WHO / UNICEF: 1.

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Prior to the discovery of the widespread arsenic contamination, rural coverage of groundwater extraction technologies reached 97%. Subsequent investigations found that an estimated 19-27%³⁰ of the total tubewells were extracting contaminated water. Subsequently, coverage using tubewells was scaled back to approximately 74-76% of the population.

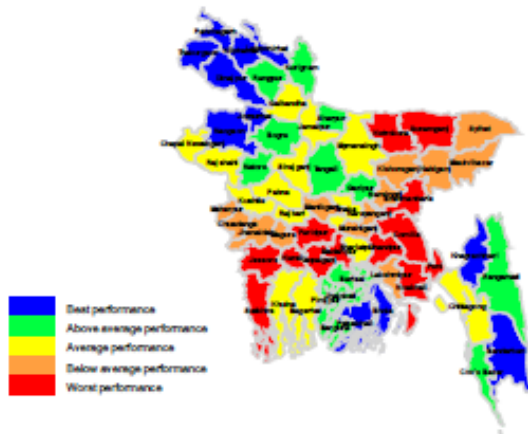


Figure 3. "Arsenic contamination in household drinking water (≥ 50 ppb)"³¹

Urban areas face even greater challenges in securing safe water than rural and peri-urban localities. Urban coverage of water supply overall is much lower than in rural areas. Handpumps remain the predominant technology for access in urban areas as well as rural; only 36% of the total urban population in 102 of the country's 298 municipalities (*pourashavas*) have irregular access to piped water services (2-12 hours per day), and *pourashavas* utilizing only hand pumps average 76% coverage. Even worse, a recent study in Dhaka slums found that "83% of household water samples taken from households...tested positive for *E. coli*."³² In Dhaka, where the municipal service authority DWASA is responsible for water

supply, sewerage and storm water drainage services, only 57% of all households have even irregular access. Unplanned urban development – particularly in low, which represent about 30% of the total population⁸ – combined with rapid urbanization and rampant growth in the industrial sector have generated several crises: increasing pollution of existing water resources and infrastructure, declining ability to adequately service the growing city's population, and insufficient revenue generation and cost recovery across existing users. And concerns about aquifer depletion due to unsustainable extraction volumes are even greater than those concerning rural tube wells, with groundwater levels 50 meters lower than historical levels and further lowering by 2-3 meters annually.^{33,34} As a result, in 2007 the Asian Development Bank predicted significant shortages of water in Dhaka by 2015.³⁵

Health Organization **78** (9): 1093–1103. doi:10.1590/S0042-96862000000900005. PMC 2560840. PMID 11019458. Retrieved 2008-04-25., p. 1093

²⁹ World Health Organization, Fiona (January 2008). "An interview with Mahmuder Rahman Bangladesh's arsenic agony" (PDF). *Bulletin of the World Health Organization (BLT)* **86** (1): 11–12. doi:10.2471/BLT.08.040108. Retrieved 2008-04-25.

³⁰ See: www.sos-arsenic.net

³¹ BBS UNICEF Multiple Indicator Cluster Survey 2009 via Lahiri 2011

³² Luoto, Jill, David Levine, Jeff Albert, and Stephen Luby. 2013. *Nudging to Use: Achieving Safe Water Behaviors in Kenya and Bangladesh*.

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³³ Wadud, Mushfique (15 August 2011). "Dhaka turns to rainwater harvesting to ease water crisis". Alertnet. Retrieved 24 August 2011.

³⁴ Institute for Water Modelling, 2009

³⁵ Asian Development Bank (ADB) (November 2007). *Proposed Loans and Technical Assistance Grant, People's Republic of Bangladesh: Dhaka Water Supply Sector Development Program* (PDF). Retrieved 2008-04-28., p. 34-35

4. Conceptual Framework

iDE adapted the renowned Making Markets Work for the Poor (M4P) market development approach into its “Connect 4” conceptual framework of practical and flexible lenses through which ground market development principles in the realities of business, government and development practice. iDE uses the Connect 4 framework to analyze market systems and develop effective interventions addressing underlying structural service weaknesses therein.

With these broad building blocks, iDE was able to investigate and analyze the SWaM System from a multi-sector perspective that incorporates good practice and constraints across a wide variety of service delivery models and solutions across key stakeholders in Bangladesh.

According to the Connect 4 framework, the SWaM System can be analyzed across the four components through several sub-components that draw on international good practice and cutting-edge theory across a variety of disciplines and approaches.

4.1. The Goal: Bridging the “Valley of Death”

iDE considers the fundamental goal of its work is researching and developing markets-based solutions by understanding and addressing the gap that exists in the market system between public/development sector investments and private sector investments to sustainably reach low-income market segments at scale. While an ideal market system might see public and development investments that are sufficient to comprehensively reach low-income market segments throughout the country, the reality is that additional investment streams that have demonstrated sustainability are an absolute requirement for overall improvements in the market system over the long-run.

The Base of the Pyramid (BoP) defines the four billion people worldwide that live on a daily income below US \$4, or less than \$3,000 in pur-

chasing power parity (PPP) per year³⁶. In other words, the “poor”. Within the BoP, most people lack adequate access to most of their basic needs including food, water, housing, WASH, education, and other healthcare. Health is particular concern in the BoP, as chronic malnutrition and a wide variety of illnesses are endemic across these market segments³⁷.

Increasingly, the public, private and development sectors are understanding that the BoP is more than a definition of the “poor” in markets-based language. Rather than misinterpreting the BoP as passive “poor” people who are perpetually marginalized and un-reached unless through significant public and development sector investments, the BoP contains a rich ecosystem of market actors. BoP people are consumer, producers and businesspeople, regardless of the market system(s) in which they participate. C. K. Prahalad’s *The Fortune at the Bottom of the Pyramid* (2004) first spoke of the BoP as a broad market segment of low-income consumers and/or suppliers with significant potential for market penetration and expansion by large private firms. In total, Prahalad estimated that the BoP represented over \$5 trillion in purchasing power worldwide. Since then, there has been a widespread recognition of the “poor” as critically important market actors, rather than passive recipients of aid and welfare.

Understanding the potential of BoP market segments is critical to re-defining challenges and solutions in market system analysis and solutions ideation. Accepting the persistence of poverty while acknowledging the limitations of traditional modalities of service delivery to BoP market segments through non markets-based approaches has led to widespread interest and attention given to approaching low-income constituencies as the “BoP” rather than the “poor,” thereby granting agency and inclusiveness to those people that public and development programs, and shifting the focus of development efforts on finding ways of doing business that improve the lives

³⁶ Source: The next 4 billion: market size and business strategy at the base of the pyramid, IFC and World Resource Institute, 2007

³⁷ Colophon. 2012. *Inclusive Innovation: Shared value at the Base of the Pyramid*. Three Pilots for Pro-Poor Innovation Consortium.

of low-income people while explicitly including them as market actors.

A key issue is that private and public incentives structures do not align to support markets-based solutions reaching low-income market segments. The World Bank has drawn attention to the period in development investments between the public- and private sectors' involvement when 'promising technologies languish between public and private sector RD&D [Research, Development and Demonstration] efforts'³⁸.

The “Valley of Death” scenario occurs as insufficiencies in public ability to invest and private sector willingness to invest result in a “missing middle” where large numbers of low-income households and communities are excluded from existing investments. Specifically, under the Valley of Death scenario, government-driven investments are insufficient to fully deliver sustainable, scalable solutions to low-income market segments in service delivery within a given market system. Simultaneously, the private sector generally assesses increased and/or intensified involvement in the market system as too risky under existing and projected market dynamics.

Accordingly, this goal of this study fundamentally focuses on addressing the key gaps between inadequate, unsustainable public/development investments toward low-income market segments and un-committed, risk averse private sector investors that have no incentives to increase their penetration and expansion of service delivery to those same low-income market segments.

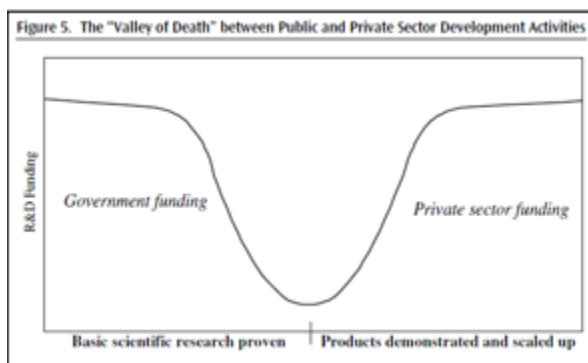


Figure 4. The “Valley of Death”

³⁸ World Bank Working Paper No: 138: Accelerating Clean Energy Technology Research, Development, and Deployment: Lessons from Non-Energy Sectors. World Bank, Washington DC, 2008.

4.2. Challenges: Public Goods/Private Delivery Dynamics

Given the reality that the SWaM System is defined by the “Valley of Death” scenario in which public/development sector investments are not adequate to sustainably deliver services to all BoP individuals, households and communities, and that private investment is critically needed to close the Valley of Death that exists, the private sector presents a clear opportunity for markets-based solutions over the long-run. If properly understood and strategically engaged, the private sector can deliver products and services that benefit low-income market segments in ways that augment or replace ongoing public/development service delivery modalities characterized by insufficiency and/or inefficiency.

Accordingly, iDE begins any market system study with an identification and analysis of the fundamental, structural weaknesses in the delivery of public and/or private goods and services in the system. To do so, the study must “hear” the needs and desires of the market system’s varied stakeholders in terms of 1) the basic elements of a market system, 2) the “target market” of the system from a market development perspective, and 3) the core systemic impediment that prevents all individuals in the “target market” to be sustainably reached.

4.3. Opportunities: Creating “Firm to Farm” Solutions

Once the market system is understood in terms of the dynamics between public goods and available and/or desirable private delivery channels, markets-based solutions can be designed to bridge the systemic weaknesses of the Valley of Death identified across private sector incentives, product offerings, linkages, coordination, distribution, and marketing. This means understanding the incentive structure(s) of key private sector stakeholders, how those incentives align with public- and development-sector counterparts, then crafting strategic, multi-sector partnerships that deliver safe water solutions to BoP market

segments sustainably and at scale. **Subsequently, solutions can be designed in terms of market development interventions that catalyze and facilitate behaviors across public, private and development sector stakeholders for sustainable, inclusive improvements to the market system.**

4.4. The Methods: Innovation as Standard

Finally, once broad “Firm to Farm” markets-based opportunities have been broadly identified, innovative methods of research, development, demonstration, delivery, and commercialization must be created and adopted for actual delivery in the SWaM System as conceptualized. Understanding markets-based strategies is not enough to actually deliver them in the market system. Solutions must be planned and executed with a clear customer orientation at their heart and driven by a clear understanding of all stakeholders' needs and desires. As a result, solutions that are innovative (desirable, feasible and viable to the maximum number of key stakeholders possible), yet tailored to the market system, can be ideated and delivered sustainably and at scale.

Connect 4 Lens	Purpose	Study Objective	Analytical Methods
Bridging the Valley of Death	Identifying gaps in public funding shortfalls and private sector risk profiling in order to develop solutions for increased private investment.	Understanding the Safe Water Market (SWaM) System	Making Markets Work for the Poor (M4P) Approach
			Defining the Base of the Pyramid (BoP)
			The Valley of Death
Public Goods, Private Delivery	Understanding existing and optimal dynamics in private delivery channels as addition and/or substitute for public and development channels.	Identifying Service Delivery Models in Safe Water Provision	Service Delivery Appr
			Service Delivery Models
			SDA Success Factors
			Safe Water Solutions Clusters
Firm to Farm	Determining how private sector delivery channels can most effectively address shortfalls in private sector investment.	Exploring Improved, Markets-Based Solutions for Safe Water Provision	Inclusive Business: Closing the Gaps in SWaM System SDMs
			Lessons from Sanitation Marketing
			Inclusive Business vs. Core Business
Innovation as Standard	Approaching the research, development, demonstration, and commercialization toward increased private sector investment through innovative methods.	Defining Strategic Directions for Safe Water Solutions	Human-Centered Design (HCD) Process
			Marketing & Behavioral Economics
			Innovation Paradigms
			Innovation Pyramid Approach

5. Analytical Framework

Understanding the market system dynamics and trends in the SWaM System from a global perspective is insufficient to investigate the key issues in safe water access in Bangladesh and ideate innovative solutions for high-potential SDMs in the future. Accordingly, iDE combined international learning and good practice with a multi-faceted analytical approach combining broad methodologies iDE employs across a number of subsectors with a SWaM System-specific methodology for maximum contextual returns on the study's investments.

Following careful and comprehensive analysis, iDE organized and analyzed the current state of the SWaM System in Bangladesh, identifying the predominant solutions clusters and multi-sector SDMs therein, pinpointing the major problems in the subsector, and then uncovering the underlying structural causes for these problems. As a result, strong conceptual approaches to improving and optimizing the SWaM System were possible.



Figure 5. Intervention Logic Analysis (ILA) Process

5.1. Engagement

The first step of this study was a rigorous review of existing literature on the relevant water sector and markets with an aim of understanding the relevant sector, actors within it and how they have been performing in national and regional level. Subsequently, as a part of the inception phase of the study, a multi-sector scoping workshop³⁹ was held in October 2012, hosted by the

³⁹ From the private sector, the workshop was attended by the Gazi Group, F Cubed BD, Solar Water Processors Ltd, MAWTS, ALLEN Engineering, Canada Bangladesh Filter Ltd, Proshika and AKK WHB. The public sector was represented by DPHE and Union Parishad. The representatives of the development sector were WSP, WB, NGO Forum for Public Health, UNDP (United Nations Development Programme), WSUP (Water and Sanitation for the Urban Poor), GreenHill, GBUS (Grameen Bohumukhi Unnayan Sangstha), UNICEF, Eau & Vie/Water & Life, UNDP-The Safe Water Market System in Bangladesh Connecting Public Goods to Private Delivery through Innovation & Inclusive Business iDE Bangladesh June 2013

World Bank's Water and Sanitation Program. This phase provided the initial leads into promising areas for research in finding the best practices and promising business models in this study. Overall, this workshop enabled iDE to access water sector stakeholders' perceptions on the different approaches taken by different public, private and development sector actors to provide inclusive, safe water throughout Bangladesh.

From a literature review and the inception work shop, iDE developed a list of potential actors for purposive interviews. Engagement was undertaken with key respondents from November 2012 through March 2013 throughout Bangladesh. This work served to investigate the key intervention areas and provide further information on specific questions tailored to safe water market systems. Representatives from a number of organizations were contacted and **open-ended interviews** were undertaken.

Key stakeholders in the SWaM System engaged are detailed in Annex A.

5.2. Intervention Logic Analysis

iDE's approach to understanding and analyzing markets utilizes an intervention logic framework which seeks to address the underlying causes rather than the symptoms of poverty. The intervention logic serves as a useful analytical framework to understand markets and identify entry points for interventions which focus on strengthening weaknesses in service provision and the enabling environment for a particular market system. The **intervention logic** is a tool developed by iDE which can be used to address the underlying causes rather than the symptoms of poverty. The intervention logic serves as a useful analytical tool to enable the identification of entry points in market systems.

The intervention logic comprises a **seven-stage methodology**. Broadly it can be understood as follows: (1) a problem analysis is undertaken to identify the problems currently in the sector; (2) the underlying causes are identified to each of the identified problems; (3) current service provision is mapped and understood; (4) weaknesses in the services are identified through engage-

UPPR (Urban Partnerships for Poverty Reduction Project), DAM (Dhaka Ahsania Mission), BASA (Bangladesh Association for Social Advancement), MAX Foundation and HLP.

ment with the local private sector and other stakeholders; (5) and the key factors in the enabling environment are identified; (6) interventions are designed to strengthen service market capacity and strengthen the enabling environment for the core service provision; (7) activities are designed to deliver the interventions.

5.3. Safe Water Market Index (“SWaMI”)

To specifically assess the SWaM System, iDE further developed an in-depth benchmarking methodology, dubbed the “Safe Water Markets Index” (SWaMI) to construct a robust index measure of safe water model practices in order to investigate and identify key problems, underlying causes, services, and interventions across key organizations engaged in safe water service delivery across different sectors. Benchmarking through an index significantly increased the comparative and explanatory power of the data collection and analysis process in a variety of market systems, including the SWaM System⁴⁰.

The SWaMI scoring tool was developed to increase the objectivity of what are essentially subjective indicators across the SWaMI framework. In order to calculate the overall SWaMI score, the index was disaggregated into four areas of model effectiveness: 1) Scalability, 2) Sustainability, 3) Inclusiveness, and 4) Return on Investment. These four areas are each sub-divided into three cross-cutting filters: quality, performance and governance. Each filter is comprised of one or several indicators supported by means of verification.

The SWaMI process is detailed in Annex B.

⁴⁰ WSP. 2010. Benchmarking Local Government Performance on Rural Sanitation: Learning from Himachal Pradesh, India. Global Scaling Up Sanitation Project. Learning Note. Water and Sanitation Program. World Bank.
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6. The Safe Water Market System in Bangladesh

In order to fully understand the SWaM System in Bangladesh, it must first be unpacked and framed through 1) core services along the supply chain, and 2) ancillary services related to supporting functions and also systemic rules and regulations. This unpacking enabled detailed identification and analysis of the various service delivery models for safe water present in Bangladesh, and which actors are involved in these models.

6.1. Defining the Safe Water Market System

It is crucial for any study of any market system to have a **clear understanding of the concept of market system thinking**. iDE's understanding of market systems is consistent with the 'Making Markets Work for the Poor' (M4P) approach which exemplifies emerging thinking in enterprise development and is endorsed by the major partners of the Donor Committee for Enterprise Development (DCED). The M4P approach seeks to make markets work more effectively, sustainably and beneficially for poor people. It requires that development agencies and other external actors play a facilitation role in the market system that is temporary and catalytic. M4P proposes that by addressing the underlying causes of weak market performance, interventions can leverage the power of markets to bring about large-scale change.

M4P posits that any market system will not function optimally if the actors have specific problems at any level. The market schematic (see Figure 2 above) presents the market system as comprising three distinct but inter-related areas. These areas comprise:

1. Core Functions are the interactions which satisfy supply and demand which forms the core activity of the market system. This core activity is the space where the main transactions, exchanges of goods, products and services, all take place.

2. Supporting Functions are the basis from which the core activity takes place. It refers to services provision which can range from government provided services such as infrastructure to market provided services such as research and accounting services, technology provision, and legal. Such supporting services are crucial to support the market system as weaknesses in the support services can hinder the growth of businesses in the core service.

3. Rules are the regulatory environment and/ or informal rules of business which affect the core activity. This could include government policies, standards and regulations as it relates to all transaction activities within the market system; also there are informal rules that are determined by social traditions and customs which can affect the core service. It is therefore crucial in to identify inhibitors in the regulatory environment so these can be addressed to support the core activity.



Figure 6. The Market System according to the M4P Approach

As this understanding of the market system posits that the core activity is dependent upon supporting and regulatory services to function, it is important when designing development interventions to identify and address the underlying causes rather than symptoms of market failure. The supporting functions and the rules allow the core value chain to move efficiently. It is thus critically important to work around the supporting functions and/or the rules that allow the products to move efficiently in the value chain. The idea being if some of these functions have lapses and

prove to be ineffective it affects the inputs, production and ultimately the output of the products. Therefore it can be understood that the **underlying causes of the problems are the lack or failure of specific services** to ensure the regular movement of products.

iDE understands the safe water market system as comprising **a core service delivery market housed within three overlapping market subsystems.**

6.1.1. Core Functions

SWaMI Says

The Core Functions of the SWaM System are:

- *Testing*
- *Extraction*
- *Treatment*
- *Transportation*
- *Storage*
- *Consumption*

The SWaM System is foremost a subsector. A subsector is a network of firms that supply raw materials, transform them and distribute finished goods to a particular consumer market. Normally, a subsector is delineated by a particular final product and includes all firms engaged in raw material supply, production, and distribution of that product. In some cases, however, the defining characteristic is a key raw material, with the subsector describing the alternative transformations and distribution systems emanating from it.⁴¹ Subsector research revolves around four principal concepts: verticality, coordination within channels, competition between channels, and leverage⁴².

In the safe water market system, the core market is characterized by five interrelated components that broadly correspond to the supply chain for drinking water. These components are 1) extraction, 2) testing, 3) treatment, 4) transportation, and 5) storage. Accordingly, safe water business

models for safe water involve multiple actors, each engaged in one or more of these components. When combined, these organizations and their corresponding components deliver drinking water from surface or groundwater resources to the consumer.



Figure 7. The SWaM System

One of the most effective frameworks in recent years across the varied spectrum of safe water technologies and products that deliver these core functions are the safe water solutions clusters identified by Hystra et. al. (2011). In a survey of over 150 safe water projects worldwide, the Hystra et. al. report identified four broad clusters of service delivery models and technologies/products: 1) Pumping & Harvesting, 2) Pipes & Taps, 3) Plants & Kiosks, and 4) Devices, Flasks & Tabs. These clusters were developed through examination of the technologies through which safe water services are delivered.

These solutions clusters are a critical lens through which to organize the various service delivery models (SDMs) observed across key stakeholders in Bangladesh. Grouping SDMs in Bangladesh roughly according to the solutions clusters enables simple delineation between broad categories of technological approaches to delivering safe water to BoP consumers in Bangladesh.

⁴¹ Haggblade, Steven J. and Matthew Gamser. 1991. A Field Manual for Subsector Practitioners. GEMINI Publications Series. Development Alternatives Inc. Bethesda, Maryland:2.

⁴² Boomgard, James J.; Davies, Stephen P.; Haggblade, Steven; and Mead, Donald C. 1992. A Subsector Approach to Small Enterprise Promotion and Research. World Development 20(2):199-212.

Solutions Cluster	Definition	Recommended geographic applicability	Recommended density of population
Pumping & Harvesting	Installations for underground water extraction or rainwater collection	Areas where underground water is in principle clean, and where population density is low.	Villages and small towns with less than 2,000 people
Pipes & Taps	Piped-water networks that distribute treated water directly to households, with fee-based usage managed by service authorities or LSPs.	Areas with relatively high population density, such as peri-urban towns or large cities.	Cities with more than 20,000 people
Plants & Kiosks	Small-scale treatment plants for highly polluted and/or brackish water, with water delivery or point of production as differing points of sale.	Areas with relatively high population density and relative-ly polluted and/or brackish water re-sources.	Towns with 2,000 to 20,000 people for peri-urban areas, and cities of more than 20,000 people for urban areas ⁴³
Devices, Flasks & Tabs	Point-of-use (POU) products that enable the household to purify and/or process drinking water in small volumes for consumption.	Areas with relatively higher dispersion of people and few sustainable, central provision infrastructure options.	Villages with less than 2,000 people.

Extraction: "Pumping & Harvesting"

Today, there are approximately 7 million tubewells of various designs and specifications (e.g. hand pump tubewells, deep-set tubewells, and deep tubewells) throughout Bangladesh. Critically, rough estimates indicate that approximately **5.5 million of these pumps (79% of total) are estimated to have been manufactured, distributed, and sold entirely within the private sector**, 1.2 million (17%) through various distribution schemes affiliated with various arms of the Government of Bangladesh (GoB), and only .3 million directly through NGOs and affiliated actors in the development sector.⁴⁴

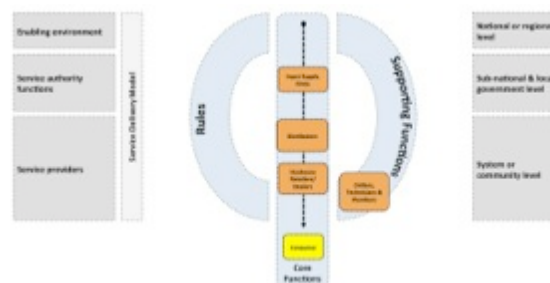


Figure 8. B2C Pumping & Harvesting Service Delivery Model in Bangladesh SWaM System

Hand pumps and tube wells are not without their drawbacks, however. Excessive extraction of water for irrigation combined with under-utilization of surface water and a lack of water recharge has constrained groundwater solutions at large-scale over the long-run⁴⁵. As many as 30% of all tube wells installed have become inoperative over time due to extraction infeasibility as groundwater aquifers become increasingly over-taxed for drinking, household and irrigation needs. Other technical challenges include deeper aquifers in some areas and stone layers between the surface and the aquifer that drive up materials and installation costs considerably.

Alternative extraction solutions to the shallow tubewell and handpump include deep-tube wells (DTW) that carry uncontaminated water, surface water collection, and rainwater harvesting. In terms of prevalence of use, the 2006 Multiple Indicator Cluster Survey found that 55% of all

⁴³ Ibid: 240.

⁴⁴ Estimates for the use of Improved Drinking-Water Sources, Joint Monitoring Programme (JMP) for Water Supply and Sanitation, WHO / UNICEF

⁴⁵ Santanu Lahiri, Mapping the WATSAN Context, Swiss Agency for Development and Cooperation (SDC)

households use arsenic-free tube wells, 21% boil surface water from rivers, ponds, or canals, 5% harvest rainwater, and 2% use surface water in combination with pond sand filters. In Dhaka, 82% of the water supply is arsenic-free tubewell extracted, augmented by three surface water treatment plants.⁴⁶



Figure 9. B2D2C Pumping & Harvesting Service Delivery Model in Bangladesh SWaM System

Testing

Arsenic testing in Bangladesh is delivered through a combination of development- and public sector actors. Under predominant public service delivery models, development organizations provide the majority of funding for LGI-led arsenic screening services provided to consumers. Development programs equip UPs with arsenic testing field kits that enable the UPs to provide pay-for-use arsenic screening services to consumers through a combination of own-purchasing and subsidy provided by the UP. UPs typically charge approximately BDT 50 per test, supporting the UP to purchase the reagent necessary for future arsenic testing. The UPs also promote the service to consumers, keep records of test results and review delivery progress in its monthly meetings.

Alternatively, the development sector independently provides arsenic testing services. In such models, an NGO employs private LSPs who provide a variety of WASH-related services, including arsenic testing. Payment for testing services is a combination of own-purchasing by the consumer and subsidies provided by the NGO and/or GOB. These services are minimally promoted. Further, the model

may crowd-out private LSPs, though the extent to which this may be occurring is unclear.

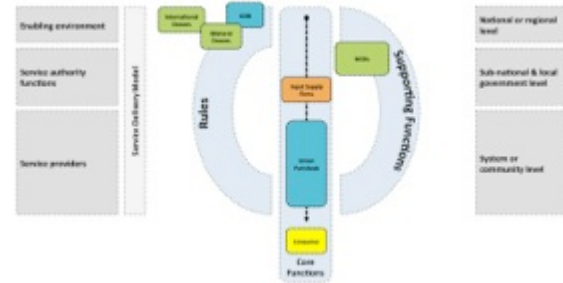


Figure 10. D2G2C Testing Service Delivery Model

Another form of NGO service delivery involves the manufacturing and sale of microbiological and/or arsenic testing kits and/or supporting services by an NGO. The kits are relatively inexpensive, but sold almost exclusively to other development organizations and/or programs, or are both manufactured, distributed and provided directly to consumers. Initial investments by the development actor drive the RD&D of the testing kit technology. But the testing products are typically considered relatively difficult to use for consumers and supporting services, particularly in terms of proper usage and O&M, are either non-existent or are only provided under the auspices and timeframes of specific development projects/programs.

Extraction, Treatment, Storage, & Transportation: "Pipes & Taps"

"Pipes & Taps" solutions center around piped networks that distribute treated water up to home connections. According to a survey from the UNICEF-WHO Joint Monitoring Program, safety of piped-water can range from 39% to 99% (with an average of 89%)⁴⁷.

Hystra (2011) identified two broad types of Pipes & Taps suppliers worldwide: Large utility operators and "Mini-Utilities". Large utility operators are publicly-managed entities or private companies mandated by public authorities. 'Mini-Utilities', on the other hand, are smaller, stand-alone, low-cost networks that can be fed either by a local source of water, or connected to the main water supply, and which distribute water to domestic connections mainly.

⁴⁶ Azharul Haq, Khondaker (June 2006). "Water Management in Dhaka". *Water Resources Development* 22 (2): 291-311. doi:10.1080/07900620600677810., p. 296
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⁴⁷ Ibid: 79.

Donor-funded models in which local government acts as the service provider are prominent in Bangladesh. These models focus donor and NGO resources toward providing financing and technical support to LGs for the installation, operation and maintenance of piped water systems. Under these SDMs, the NGO provides financing to selected UPs to build, operate and maintain piped water networks. Such projects begin with feasibility studies for plant building and financing requirements. Following selection of installation locations, the NGO provides financing to a service-authority level government institution to install the plant and pipe network, from which a consultancy fee is paid. The NGO then develops an installation and O&M plan with the UP. During setting up the pipeline, the SAGI takes recommendations from LGI officials.



Figure 11. D2G2C Pipes & Taps Service Delivery Model in Bangladesh SWaM System

At that point, the NGO also hires a dedicated workforce (1 accountant and 3 community organizers), housed in the UP office, to monitor all project activities collect connection fees and service tariffs. The community organizers assess the local demand, assess households that want to buy the service, map a route of the probable pipeline and share it with the GI charged with plant installation. The NGO provides technical supervision throughout the entire process.

For domestic water supply, water is extracted by DTW and then distributed to households through a piped network (following IWM – Integrated Water Management System). The community organizers assess the local demand, assess households that want to buy the service, map a route of the probable pipeline and share it with the SAGI; it helps the SAGI to design the pipe network easily. In areas where nearest water layer is placed too deep, surface water is treated and pumped

through pipe network. The project has also provided free HTWs to selected households.

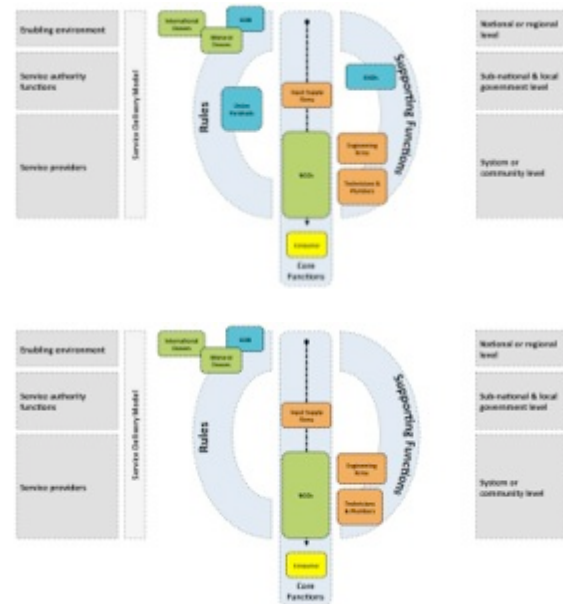


Figure 12. PH/G2D2C & D2C Service Delivery Models in Bangladesh SWaM System

Conversely, there are also models in which the public sector funds NGOs to provide water services. In these models, a SAGI provides interest-free financing and technical support to an NGO or association service provider for piped network access for consumers. The SAGI first solicits interest across any interested NGOs to be involved in the SDM. NGO partners are expected to procure the land for plant installation, select land with relatively good infrastructure and energy access, and demonstrate community support in order to be considered for selection.

Following tendering and selection by the SAGI, the SAGI provides the NGO with a loan to purchase mini-utility piped network infrastructure. This infrastructure typically includes DTWs, buried pipes, an arsenic treatment plant, an overhead tank, and main line for domestic water supply. If an arsenic treatment plant is not necessary, funds for this purpose are instead are used for other network infrastructure. The NGO/association must provide a down payment of 10% of the total project cost at the beginning of the project. The remaining interest-free principal must be repaid within 15 years and the SP will deposit the money to RDA on yearly basis. Throughout service provision, the NGO/association is required to submit

monitoring reports to the SAGI. Yet because the SAGI has not been very strict in collecting yearly installments and has not yet posed any penalty to the defaulters, NGOs/associations appear to have the impression that repayment enforcement is minimal.

The SAGI also contracts a private contractor for plant installation, and provides technical support to the NGO/association needed for extraction point selection, pump and treatment plant construction and major pipe network set up. **No other private firms are involved in this SDM.** Further, the SAGI does not facilitate many linkages between the NGO/association and LGLs such as the UP or Ward WATSAN Committee.

The NGO/association hires typically hires one to two LSP technicians for general operations and maintenance (O&M). These technicians receive training from the SAGI, and subsequently provide on-demand services across the network's customer base. As these LSPs are locals, they are well-positioned to provide quality O&M services, but are typically erratic in terms of both the responsiveness and quality of services rendered. These LSPs often contend that the training they received from the SAGI was not adequate, and only a one-off investment. The SAGI is not involved in O&M beyond training provision. Further, for these LSPs customer numbers are generally too small to generate a reasonable income.

In addition, there have been limited instances of direct B2C water provision through a piped network, in a social business joint venture aimed at establishing piped networks to consumers in arsenic-prone areas. Under this SDM, water is drawn from riverine surface water, filtered using both a sand filter and an activated carbon filter, then chlorinated.



Figure 13. B2C Pipes & Taps Service Delivery Model in Bangladesh SWaM System

Extraction, Treatment, Storage, & Transportation ("Plants & Kiosks")

"Plants & Kiosks" sell treated water to users at a plant or through bottled water distribution. In some instances, they also offer a home delivery service in larger water bottles.

Such solutions in Bangladesh typically involve the pairing of international technology firms with NGOs in Bangladesh who provide bottled water or kiosk water services to BoP consumers on a commercial basis. Under the bottled water SDM, the NGO establishes and operates a small groundwater extraction and treatment plant in arsenic-contaminated areas, installed by a Dhaka-based engineering firm, then bottles the water in two types of bottles (10 liter and 20 liter) for sale at different prices (10 liter – 15 taka; 20 liter – 30 taka; 1.5 taka per liter). Distribution occurs through a home delivery service using vans and/or mini-trucks.

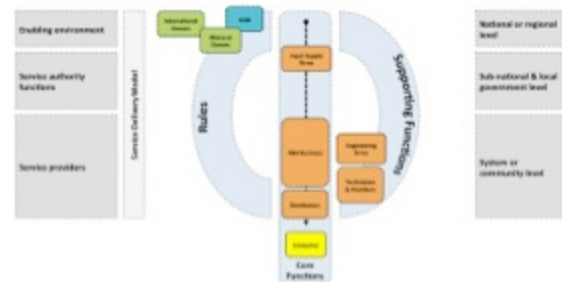


Figure 14. B2C Plants & Kiosks Service Delivery Model in Bangladesh SWaM System

B2C firms are increasingly exploring technical assistance partnerships with the development sector for D2B2C models, and also with the public sector. Partnering with development programs and organizations appears to be a viable means of horizontal scaling by subsidizing the B2C model directly, or by cross-subsidizing fully B2C operations in other areas through development funding.

Major customers under this SDM are hotels, offices and shops. Several LSPs are hired to deliver the service, including technicians, assistants, an accountant and distributors. The price of the bottled water is relatively affordable at approximately 1.5 taka per liter. No bottle or cap manufacturing companies outside Dhaka, however; these inputs must be purchased from firms based

in Dhaka. No proper formal credit service is available for interested distribution LSPs.



Figure 15. B2D2C Plants & Kiosks Service Delivery Model in Bangladesh SWaM System

Marketing is driven by a combination of door-to-door sales supported by local-media channels including posters, miking, leaflet/brochure distribution, and television advertisements. There are no customized services for the especially low-income market segments at present in this SDM.

Regardless of the product offering(s) in this SDM, the plant technology is not available on the market in Bangladesh. Rather, the technology is procured by the NGO directly from an international manufacturer/distributor and installed in the market. Importantly, in areas where arsenic must be filtered, there are considerable challenges at present with disposal. Arsenic treatment plants continually collect and must address arsenic removed from the water product.

Treatment & Storage: “Devices, Flasks & Tabs”

“Devices, Flasks & Tabs” are generally characterized as “household water treatment and storage (HWTS)”, “point of use (POU)” or “self supply” modalities, in which water supply and/or quality is improved through own-purchasing/use by individual households.⁴⁸

In Bangladesh, existing solutions in this cluster involve an NGO that purchases HWTS product(s) from an international private sector supplier, then sells those filters to other NGOs for sale or distribution to consumers. As many as 50,000 units of a specific product have been sold under this model, but predominantly to NGO program benefi-

ciaries rather than open commercial distribution channels.

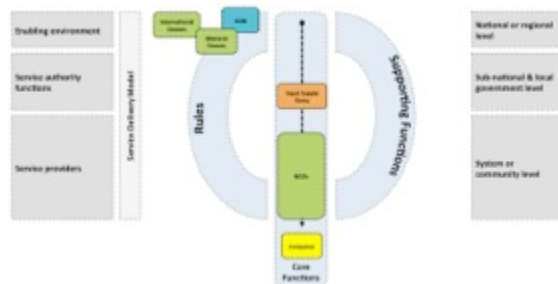


Figure 16. D2C Devices, Flasks & Tabs Service Delivery Model

6.1.2. Supporting Functions

SWaMI Says

Key Supporting Functions of the SWaM System are:

- Finance & asset management
- Operation & maintenance (O&M)
- Skills & capacity development (S&C)

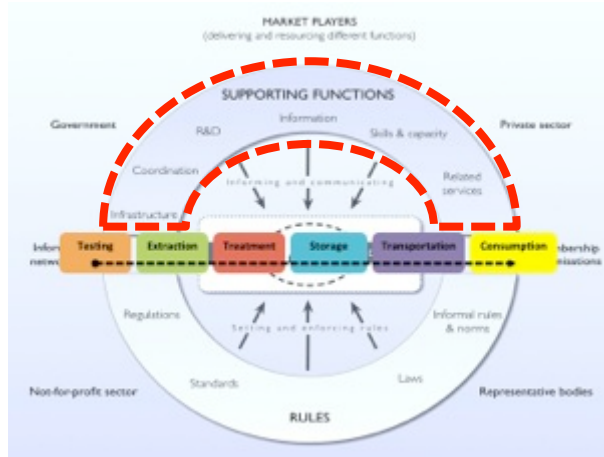


Figure 20. Supporting Functions in the SWaM System

Safe water provision is further influenced by several key supporting functions within the market system. Specifically, 1) finance and asset management, 2) operation and maintenance, and 3) skills and capacity.

Comprehensive assessment of the costs and ap-

⁴⁸ IRC. 2012. *Self Supply: The Case for Leveraging Greater Household Investment in Water Supply*. Triple-S program. The Safe Water Market System in Bangladesh Connecting Public Goods to Private Delivery through Innovation & Inclusive Business iDE Bangladesh June 2013

appropriate financing channels required to deliver effective safe water solutions is a key supporting service. Without knowing what the real costs of an entire life-cycle of a service actually include, an informed debate about who should finance these costs is difficult if not impossible⁴⁹. Asset management planning, in which the full costs of service provision are understood, is generally rare in Bangladesh⁵⁰.

Operation and maintenance (O&M) functions, including replacement of existing technology, infrastructure, and/or service providers, are critical to sustained distribution and uptake of the product.⁵¹ A comprehensive understanding of the entire life cycle of any safe water product or serviced introduced is as necessary as holistic financing.

Even when sourced from a non-contaminated extraction point, drinking water can easily be contaminated during transport, storage and consumption. Michael Kremer, Gates Professor of Developing Studies at Harvard University, explains that, "Even if the water is clean when you get it from the spring, it can become contaminated in storage at home."⁵² Machdara et. al. (2013) found in Ghana that storage is a significant determinant in overall contamination across low-income households⁵³. In Bangladesh, it is estimated that more than 25% of all handpumps are measurably contaminated, leading to the recognition that other water quality issues require immediate attention⁵⁴.

There is now widespread recognition of the importance of O&M over the long-run, regardless of the characteristics of the service delivery model(s) at work. Today, there is widespread global

recognition of the importance of post-construction O&M services. Yet examples of effective O&M service delivery at scale. Few countries demonstrated effective financing and delivery of O&M at large-scale.⁵⁵ **O&M is most relevant to the RD&D and commercialization subsystems.** Within the RD&D subsystem, products designed with context-appropriate features that enable and encourage proper O&M reduces costs to BoP consumers and minimize backlashes that could result from the coercive, unsustainable service delivery models.⁵⁶

Finally, Skills and capacity (S&C) for local service providers (LSPs) are crucial for ensuring safe water solutions can be successfully introduced, adopted and scaled through the SWaM System. S&C is particularly important to the commercialization subsystem. "Professionalization" of relatively informal, low-skilled, small-scale LSPs is increasingly recognized as a critical determinant of sustainable delivery of safe water. In the absence of service providers with the skill sets necessary to deliver relevant O&M services, the sustainability of a safe water value chain is unlikely to be viable over the long-run.

6.1.3. Rules

SWaMI Says

Key Rules of the SWaM System are:

- *Enabling Environment level*
- *Service Authority level*
- *Service Provision level*

Rules in the SWaM System is generally characterized by three levels: 1) enabling environment, 2) service authority, and 3) service provision.

The enabling environment level occurs at the national level, where policies and regulations are formulated. Overall guidance, learning and coordination happen at this level as well. **The service authority level is more concrete planning, asset management, financing, and other supervision of water service provision occurs.** The service authority level is typically at a regional or district

⁴⁹ Lockwood and Smits: 25.

⁵⁰ Lockwood and Smits: 134

⁵¹ Egan LA. The experiences of IDE in the mass marketing of small-scale affordable irrigation devices. In: Paul N, ed. *Irrigation Technology Transfer in Support of Food Security: Water Reports*. No.14. Rome: Food and Agriculture Organization of the United Nations (FAO); 1997.

⁵² Michael Kremer, Jessica Leino, Edward Miguel, and Alix Peterson Zwane, "Spring Cleaning: Rural Water Impacts, Valuation, and Property Rights Institutions," *The Quarterly Journal of Economics* 126, 2011. Via: Ruvinsky, Jessica. Spring Water Protection Improves Health. Stanford Social Innovation Review. Fall 2011.

http://www.ssireview.org/articles/entry/research_spring_water_protection_improves_health

⁵³ E. Machdara, et al. 2013.

⁵⁴ http://www.danidadevforum.um.dk/NR/rdonlyres/850966D6-7006-428C-8BA0-C8FB08D0BA0E/0/CD_SectorCapacityBuilding.pdf. The Safe Water Market System in Bangladesh Connecting Public Goods to Private Delivery through Innovation & Inclusive Business iDE Bangladesh June 2013

⁵⁵ Supporting Rural Water Supply: 144.

⁵⁶ Koopman P. *Life Cycle Considerations*. Pittsburgh: Carnegie Mellon University; 1999.

level. **Finally, the service provision level where the actual service delivery occurs from provider to consumer.** The nature of service provision can vary widely, as described above, and service providers can be from the private, public or development sectors, or a combination thereof.



Figure 21. Rules in the SWaM System

6.1.4. Market Subsystems

Superimposed over the core market are three interrelated subsystems that drive access to safe water: 1) research & development, 2) service delivery, and 3) commercialization. These systems are as follows:

Research, Development and Demonstration (RD&D) is the starting point of any technology, product or business model that needs to be commercialized. However, the effectiveness of research is still a question that needs to be answered. RD&D can be understood as the creation of new and promising technologies and products. There are different approaches that the private and public sector undertake when RD&D are being conducted.

In effect, **service delivery** resembles the technology transfer process, which captures the movement of a technology or business model from one entity to another (Souder et al. 1990; Ramathan, 1994). This movement may involve physical assets, know-how, and technical knowledge and in some situations may be confined to relocating and exchanging of personnel or the movement of a specific set of capabilities.

Commercialization has been generally understood in transactional terms as a process where goods and services regarding technologies can be sustainably sold for payment. However the commercialization process is more than just the selling of goods and/or services. Acquah & Gelaw contend that the sustainability of a product and its contribution to social values in producing self-sufficiency should be taken into consideration when defining commercialization. **Sustainability is central to any understanding of commercialization** as products require evolution (market responsiveness) in order to remain sustainable in a given marketplace. This often requires the interaction of many actors and the support of an institutional framework which can co-evolve with the innovations coming from industry and research.

All three systems must function in combination for effective, sustainable safe water solutions to be delivered at scale.

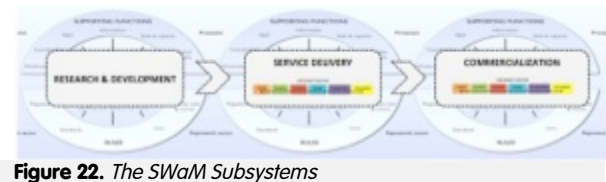


Figure 22. The SWaM Subsystems

6.2. Key Actors in the Safe Water Market System

To understand the overall SWaM System it is useful to understand the key players involved in the system. Due to the number of different public, development and private sector actors involved in the research, development, demonstration, and commercialization of safe water solutions it was not possible to map all individual actors and/or safe water products and services that are generated and distributed through the SWaM System. A thorough investigation of the subsector does enable a broad scoping of the key stakeholders in each sector, however. Accordingly, the public, development and private sectors are each outlined in turn by key stakeholders in the provision of safe water to BoP market segments.

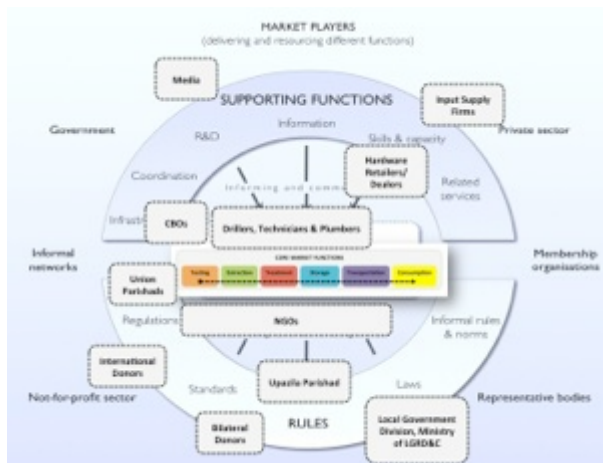


Figure 23. Key Actors in the Bangladesh SWaM System

Service Delivery Approach: Institutional Level	Public Sector	Private Sector	Development Sector
Enabling environment	Local Government Division of Ministry of LGD&C	Media	Multilateral donors Bilateral donors
Service authority functions	Local Government Training Institutions (i.e. NILG, BARD, BARDTI and RDA) Upazila parishad (including Upazila Administration and representatives from line agencies) District Administration (as major role to play for WatSan activities, which are planned and implemented by DPHE) Ward Committees (formal or informal)	International input supply firms Domestic input supply firms	Multilateral donors Bilateral donors Domestic NGOs International NGOs
Service providers	Union Parishad (lowest tier of the elected body including various standing committees)) Communities/Community-Based Organizations/Para Committees/Gram Shavas	Hardware retailers/dealers Drillers Plumbers Technicians Other local service providers	Community-Based Organizations Domestic NGOs International NGOs
End users		BoP Consumers	

6.2.1. Public Sector

The public sector is central to the SWaM System in Bangladesh in the provision of regulatory governance, coordination, and service provision throughout the subsector. Within the SWaM System, The Ministry of Local Government and Rural Development and Cooperatives has remained responsible for a large part of the main implementation and supervision responsibilities regarding public sector SWaM SDMs in the country, mainly through its subordinate departments: (i)

LGD, which does policy formulation and strategic planning for the sector, and monitoring; (ii) DPHE, which is responsible for providing WSS services in areas not served by water and sewerage authorities (Dhaka and Chittagong), and for provision of technical assistance (TA) to local bodies responsible for WSS; (iii) LGED, which is responsible for rural infrastructure and assistance to municipalities, including WSS in some externally supported integrated development projects; (iv) local government institutions such as Union Parishads, Upazila Parishads, and Pourashavas, which are responsible for managing communal WSS systems; and (v) the National Institute for Local Government, which is responsible for much of the capacity development of local bodies. All these institutions rely on funds from the Ministry of Finance, the Planning Commission, and external agencies as well as, in some cases, their own resources and funds donated by international NGOs and the private sector. In the 2000s, some new players arrived on the scene, notably the Bangladesh Municipal Development Fund (BMDf) and the Hygiene, Sanitation and Water Services (HYSAWA) Fund.

The Department of Public Health Engineering (DPHE) has played a critical role in at both the service authority and service provision levels in the SWaM System. Key highlights of its work include the **Arsenic Mitigation Water Supply Project**, a US\$44.4 million credit and implemented from 1998 to 2006 implemented by DPHE with the support of the World Bank. The project aimed at "reducing mortality and morbidity in rural and urban populations caused by arsenic contamination of groundwater using sustainable water supply, health, and water management strategies." In practice, the SDM focused on promoting and distributing deep tubewells as an alternative to shallow tubewells contaminated with arsenic. The project delivered over 9,772 deep tubewells, 300 rainwater harvesting systems and 393 dug wells in more than 1,800 villages, all of which operated and maintained by communities and benefiting between 2 and 2.5 million people.

Another key project delivered by DPHE in collaboration with the World Bank was the **Bangladesh Water Supply Program Project**⁵⁷. Established in 2001, the project aimed to drive sustainable fi-

nancing and service delivery in safe water supply. Under this project, the World Bank contributed US\$40 million to achieve the MDGs in water supply and sanitation in small towns and rural areas. Arsenic mitigation was implemented in arsenic-prone areas, while small-scale LSPs were targeted for development to support sustainability.

The **Rural Development Academy** is a national level Training and Research Institute of Rural Development established in 1974 under the Ministry of Local Government, Rural Development and Co-operatives. The major objectives of the Academy are to (i) offer training to the personnel of different nation building departments and agencies involve in rural development works; (ii) conduct research and action research or pilot experiments in different aspects of rural development; and (iii) offer consultancy services to different national and international agencies as well as NGOs on various rural development issues. So far, RDA has successfully carried out experiments in the field of water resources management and development, especially, in respect of optimum utilization of scarce water resources and has developed a model of multi-purpose use of DTW. The model includes: (i) partial buried pipe irrigation system; (ii) low and medium cost lined channel; (iii) compacted earthen channel; (iv) domestic water supply from irrigation well (v) installation of low-cost DTW with water filtration plants etc. However, before water related activities were confined to specific projects and after the end of a project all the related activities, follow-up and monitoring usually stopped. To overcome this problem, this specialized Centre for Irrigation and Water Management (CIWM) set-up on 2003 under RDA with specific terms of reference. The Centre for Irrigation and Water Management has set-up within Rural development Academy, Bogra, with support facilities available from various Divisions of RDA.

HYSAWA is a multi-donor funding mechanism for large-scale delivery of WASH services in rural Bangladesh. The not-for-profit company was established in 2007 as an autonomous financial institution to mobilize resources and extend financial support to Local Government Institutions from a dedicated HYSAWA. HYSAWA works with LGs and partner organizations to improve the hygiene, sanitation and water supply conditions for communities in rural and peri-urban areas of Bangladesh. Field level operations are imple-

⁵⁷ http://en.wikipedia.org/wiki/Water_supply_and_sanitation_in_Bangladesh#cite_note-12
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mented directly by Union Parishads with support from qualified partner organizations and technical advisors from DPHE.

6.2.2. Development Sector

The development sector has a significant presence in the SWaM System in Bangladesh across multilateral, bilateral, and NGO levels. **The World Bank has long supported development efforts in the SWaM System, through a variety of programs and its ongoing Water and Sanitation Program (WSP).** In addition to programs like the **Arsenic Mitigation Water Supply Project** project and the **Bangladesh Water Supply Program Project**.

WSP is a major player driving improved hygiene and sanitation throughout Bangladesh and the wider developing world. The Water and Sanitation Program for South Asia (WSP-SA) has been supporting government, sector institutions, NGOs, and development partners. This support consists of technical assistance, demonstration projects, upstream project preparation, policy advisory assistance, and improvement of service delivery, sharing research and knowledge that leads to reforms in sector policy and institutions. WSP has conducted a number of projects specifically targeting the SWaM System in Bangladesh, including the Horizontal learning program which seeks to build on the capacity that exists amongst local governments through UP led peer-to-peer learning to replicate good practices. The Horizontal Learning Program is a particularly important program. **A peer-to-peer network for sharing good practice across union parishads, HLP has had considerable success in passing on important lessons, practices, and approaches in safe water access.**

The World Health Organization (WHO) has been supporting a number of ongoing projects that provide assistance with water quality surveillance, provide capacity building for the DPHE and the sector, and reinforce arsenic mitigation programs through research, training, establishment of protocols, laboratories, and information systems, and through provision of monitoring and advisory support.

The Asian Development Bank (ADB) has been supporting the Secondary Towns Infrastructure Development Projects (Phases I and II) and the third Urban Development Project. The municipali-

ties worked with government agencies in implementing the project. Management procedures were established, rules and regulations framed, and key technical, accounting, and management personnel were trained.

The Government of the Netherlands has been focusing on water supply in district towns. The most recent Dutch support, for the 18 District Towns Water Supply and Sanitation Project, focused on water supply, sanitation and drainage, hygiene promotion, and institution building to improve municipal capacity in finance, management, operation and maintenance of water systems, and hygiene promotion.

The Government of Denmark (DANIDA) has been supporting the implementation of the National Policy for Safe Water Supply and Sanitation (1998) through six components: urban water supply in coastal areas; rural water supply in coastal areas; arsenic mitigation in coastal areas; water and sanitation in the three hill districts; training network at BUET; and services for the poor through the NGO Forum. Danida also has two new projects in the final planning stages, which will increase water supply and strengthen institutions in the eight coastal districts.

For the past several years the Japan International Cooperation Agency (JICA) has focused on the provision of arsenic-free drinking water. This work has been conducted primarily in the north of Bangladesh.

UNDP has been implementing a Community-Based Water Supply and Sanitation Project. The project brings together awareness-raising activities with developing community organizations, appropriate technology, and community participation in all stages of service provision and management.

UNICEF's Arsenic mitigation activities of the program includes improving water quality (including arsenic measurement, mitigation and research) to urgently address the problem of arsenic contamination, and the blanket testing of 1,000,000 tube wells in 45 affected upazilas, information and awareness campaigns, equipping zonal laboratories for water quality testing, training staff and providing alternative water technologies to affected communities. The program continues to work closely with the World Bank-supported Bangladesh Arsenic Mitigation and Water Supply

(BAMWSP) project and with other international agencies and NGOs.

A wide variety of NGOs have been working extensively in safe water solutions and to support government efforts in dealing with key challenges such as arsenic contamination. These include the Dhaka Community Hospital, BRAC, the Bangladesh Rural Advancement Committee, the Asian Arsenic Network, Ahsania Mission, Water and Life, Water and Sanitation for the Urban Poor (WSUP), Grameen Bohumukhi Unnayan Sangstha (GBUS), UNDP-UPPR, Bangladesh Association for Social Advancement (BASA), NGO Forum for Drinking Water Supply and Sanitation (NGO Forum), WaterAid and others.

6.2.3. Private Sector

A number of international and domestic firms manufacture and/or distribute safe water technologies and products to public, private and development sector buyers. Lead firms highlighted the importance of producer group and outgrowing schemes to profitably tap into low-income market segments. Yet they are typically unwilling and/or unable to unilaterally establish producer groups at scale. Base of the pyramid outgrowing schemes are rare in Bangladesh at present.

Several public-private partnership pilot programs are underway, but the business case and effectiveness of such schemes is still debatable. Yet such firms in Bangladesh are generally more responsive to demand from rural consumers than they are to supply-side opportunities. Accordingly, building the capacity of private sector organizations, primarily through temporary "smart subsidy" investments of NGO human resources, is likely to generate more inclusive business opportunities, identify ways to reduce risks and investment barriers to entry or intensified penetration by large input suppliers and buyers.

Hardware retailers are a key private LSP category in BoP markets. In general there are three types of local hardware sellers:

- Sanitary hardware sellers (sanitary accessories, pumps, tube wells (hand and deep), pipes)
- General hardware sellers (carpentry related hardware, nails, paint, etc.)

- Those that sell both types of the above mentioned hardware (sanitary and carpentry)

Generally there are 2 to 10 such sellers/ retailers/ dealers in each *upazila*-level bazaar. In each union-level bazaar the number is usually 1 to 4. Most of the upazila level sellers are the appointed dealers/ retailers of different national or regional firms. Those that are not formally enlisted dealers work as retailers of other dealers or do their business independently.

Appointed dealers and retailers usually buy different products from the companies on credit and can pay the cash on weekly, monthly or seasonal basis (depending on mutual relationship and contract between any dealer and company). They also get different types of trainings related to product promotion and marketing. Most of them never had any formal partnership or contract with local government bodies.

Drillers and technicians are private LSPs that provide installation and O&M services. In general these drillers/ technicians can be categorized under three major groups: electricians, technicians that are expert in carpentry and technicians that are expert in sanitary works. In many cases a single technician is an expert of these two or even three areas and sells relevant services. With each of these sellers/ shops one to several drillers/ technician are linked with that provide different types of after sales services.

Drillers/ technicians typically do not receive any salary or any set payment from retailers. Rather, when any of their customers wants any after-sales service or technical service, they link any of their known drillers to that customer. However, in cases where a consumer gets the free after sales service (within the warranty period) from any dealer/ retailer, the appointed technician provides the necessary service to that customer and take the charge from the dealer/ retailer.

In rural areas, most BoP consumers know their local technicians/ drillers and contact them directly if any problems arise in their relevant products, by phone or in person. Often customers directly contact with those drillers and take their service.

6.3. Problems & Underlying Causes

SWaMI Says

Problems in the SWaM System in Bangladesh are driven by four key underlying causes:

- Consumer-oriented understanding on desirability, feasibility and viability of safe water products and services is low.
- Strategic and business planning in long-run, large-scale service delivery is generally low.
- High-cost, low-scale solutions predominate service delivery models rather than more cost- and context-appropriate technologies and products.
- There are no incentive-driven collaboration spaces for safe water.

There are a number of key problems that inhibit the delivery of safe water sustainably to BoP market segments, include increasing urban demand of safe water due to population growth and migration, inequitable service distribution and lack of sufficient service providers in extract, storage, transport, treat, test for safe water, arsenic contamination, weak services in delivering safe water by service providers and lack of business models to run their services in a sustainable manner, lack of sector coordination among different public, private and development agencies who are now working to ensure safe water facilities, etc. Above all, linkages between public, private and development actors are quite weak and in some places, do not even exist. Some major issues identified include:

6.3.1. Consumer-Oriented Understanding on Desirability, Feasibility and Viability of Safe Water Products and Services is Low

1. Lack of awareness about the water quality/harm of drinking impure or contaminated water/ advantage of drinking clean water/ clean water sources plays a major role BoP consumptions of drinking water. Often perception about what their neighbors might think if they buy any water purification device or buy pure water (that they might have contaminated with water related diseases) play crucial roles in building consumers behavioral patterns. Consumers do not want to buy any service/ product if they are not assured

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that they will not get after sales service in the future.

One of the most important impediments in this regard remains a lack of any safe water policies for slums and shanties, in absence of which these communities will remain out of any service provisions, and put Bangladesh off-track in achieving MDG targets in urban water and sanitation. Institutional issues are a major challenge, rather than finance and or technical issues. With highly centralized and top down service delivery, there is little downward accountability among the service providers, specially the centralized agency responsible for the sector.¹⁸

2. Where consumers are exposed to safe water products, satisfaction is often low or uncertain.

Consumers largely relate to water as a product across features including color/turbidity, taste, smell, and temperature⁵⁸. If these features are atypical to the consumer, demonstration is typically needed in order to convince people that water products are necessary and/or desirable⁵⁹.

Further, cost and convenience are critical factors in the value proposition for BoP consumers. Effective technical solutions are irrelevant if the consumer does not have feasible channels to purchase affordable products and services around a solution, particularly in terms of long-term operation and maintenance (O&M)⁶⁰. For examples, in recent test of arsenic filtration products in Bangladesh, 40% of the survey respondents reported about various problems faced with their safe water products, including low rate of water flow, clogging of filter, uncertainty about whether arsenic is being removed to safe limit, high recurring costs, difficulties in maintenance, lack of spare parts availability, lack of service providers, etc.^{21,22}

⁵⁸ Figueroa ME, Kincaid DL. Social, cultural, and behavioral correlates of household water treatment and storage. In: *Managing Water in the Home*. Geneva: World Health Organization; 2006.

Singh N, Bhattacharya P, Jacks G, Gustafsson JE. Women and modern domestic water supply systems: need for a holistic perspective. *Water Resources Management*. 2004;18(3):237–248.

⁵⁹ Jalan J, Somanthan E. *The Importance of Being Informed: Experimental Evidence on the Demand for Environmental Quality*. Discussion paper 04-08. New Delhi: Indian Statistical Institute; 2004. Available at: <http://www.isid.ac.in/~planning/work-ingpapers/dp04-08.pdf>.

⁶⁰ Murcott S. *Implementation, Critical Factors, and Challenges to Scale-Up of Household Drinking Water and Safe Storage Systems*. Cambridge: Massachusetts Institute of Technology (MIT); 2006.

3. Yet supply-side stakeholders typically display a lack of understanding on BoP demand preferences around drinking water. Numerous bilateral agencies, GOB and NGOs are involved in safe water system and activities. But solutions so far have focused mostly on the supply side. Research has mainly been conducted on the engineering aspects of different safe water technologies, to assess whether the technology is effective, and on the hydrological properties of alternative sources of water and their potential to become contaminated in future. The economic, institutional and market based issues of propagating new technologies and approaches to ensure household access to safe drinking water have largely been ignored.^{21,22}

4. Private Sector LSPs have low skills & capacity in actively marketing their services to consumers and suppliers. Drillers and technicians usually do not have any fixed point of business. Some drillers sit in the shops of those sellers, and the others usually sit at tea stalls or other shops at the bazaar. When needed by the sellers or the customers, they directly go to the customers' place and fix the problems.

5. These problems appear to stem from a lack of strategic planning and execution in the marketing of safe water products and services to consumers. Except a few private sector actors, there have been few awareness campaigns or advertisements by the public, private or development sector actors to market their products and services. Literature on this is scarce. However, a study on rural people's willingness to pay for arsenic-free, safe drinking water states that most of the poor people that are aware about the serious health implications of consuming contaminated water were found to be willing to pay (to an extent) for the safe water technologies. The survey data also revealed that, based on considerations of risk and convenience (disregarding capital and recurring costs), the dominant preference was for community-based technologies.²¹

6. Yet even when marketing is carefully approached, its sustainable delivery may be limited under predominant service delivery models in Bangladesh. Most of the development activities so far have been predominantly project based and for the project period. Development partners emphasize capacity building and institutional changes, but there has been lack of presence and activities of financial institutions to support

this form of sustainable marketing strategies to deliver project interventions to extract, store, transport, treat, test safe water by the service provider to establish innovative institutional arrangements and service delivery systems that could clearly define the roles and responsibilities of the user communities, local government institutions, private sectors and bringing them to the forefront of activities related to planning, implementation, and management of water services. Few products introduced have after sales service networks, and have the necessary marketing, promotion and sales departments working for them.^{61,21}

6.3.2. Strategic & Business Planning in Long-Run, Large-Scale Service Delivery is Low

1. Both the public and development sector actors, institutes and organizations involved in safe water supply system lack in efficient service management at the local level. For example, even large WASA (Water & Sanitation Association) is fairly inefficient when it comes to metering, billing and collection, or staffing ratios.⁶²

2. Central government agencies provide services without paying adequate attention to building local institutional capacity for management and there is minimum provision of after sales service facilities. At present, those who set policy and those who provide after sales services are often the same body, which results in centralized and supply-sided service delivery. The lack of clarity of roles and responsibilities of policymakers in government, private and development sectors and their service providers is a major hurdle that must be overcome.⁶³

3. Sustainable service delivery by UPs is questionable. UP staff are generally appointed as O&M service providers only for public or NGO project periods. After these projects end, UP staff are supposed to monitor all the project activities,

⁶¹ Bangladesh Country Water Resources Assistance Strategy, World Bank Development Series, South Asia Region, December 2005

⁶² Urban Sector and Water Supply and Sanitation in Bangladesh, Sector Assistance Program Evaluation, Asian Development Bank, 2009

⁶³ Minnatullah, Khawaja M. and Orsola-Vidal, "Achieving the Water and Sanitation MDGs in Bangladesh", The World Bank-Water and Sanitation Program for South Asia

service provision, maintenance, tariff collection and repair. These functions are reported to be highly difficult to continue, given UPs' limited manpower and preexisting responsibilities across their designated union.

4. Skills & Capacity development for private LSPs exists amongst lead firms but is under-utilized in public and development programs. Most technicians never received any formal or rigorous training. However, different hardware, pump and sanitation lead firms provide technical training to thousands of drillers/ technicians each year. In such training the companies want a list of potential mechanics/ technicians to their enlisted dealers/ retailers. Those dealers/ retailers then select mechanics from their own known mechanics and send a list. However, GoB and development sector engagement with these S&C channels is highly limited. Instead, projects invest their staff with the necessary skillset and provide parallel service channels disconnected from pre-existing LSPs.

5. NGOs increasingly generate profits through safe water service delivery yet there are few plans across involved actors for expansion and investment in water services. Rather, an emphasis is generally on cross-subsidizing other development initiatives such as education or microcredit rather than further focus on the water business. The NGO diversifies revenues through irrigation water provision, as well. Service access is typically less than drinking water supply. Service provision for irrigation is also considered irregular.

6.3.3. High-Cost, Low-Scale Solutions Predominate Service Delivery Models Rather than More Cost- and Context-Appropriate Technologies, Products and Services

1. The SWaM System is dominated by technology firms that manufacture or import different kinds of products including tube wells, hand pumps, submersible pumps, and/or filtration plants but do not have any sales network for their products and sell most or all of their products to GOB (60-70%) and/or NGOs (25-35%) through tendering arrangements. Private customers typically total less than 5% of total sales for these firms. Further, the-

se firms typically do not have any strategic B2B partnerships other than limited installation and/or O&M contractors.

These firms typically do not have proper business plans and lack strong management expertise. Key private sector considerations such as profit maximization, increased ROI, expansion, and penetration are not assessed or projected. There are typically no RD&D activities as well. Though these firms measure performance through profitability, cost concerns across public/development-sector customers typically exert a downward pressure on the quality of the products offered, particularly prior to 2009.

Although they have been involved in manufacturing, importing and assembling different water related products, according to the organization the main goal of this entity is to provide trainings on farm machineries, but not to increase their product or service network and capacity. At present, they do not have any sales networks for their products and mostly sell the manufactured or imported products to GOB or NGOs. Further, there are no marketing or promotional activities for their products.

Further, B2D firms are typically not directly linked to LSPs or end users. Therefore, when a public or development project that has procured from a PH/B2D firm ends, the end users have no established means to engage the firm. However, one firm expressed a general long-term interest in training small entrepreneurs who will be able to test water quality from the firm's product offerings.

2. These solutions are often delivered through unsustainable subsidy-driven service delivery models. At present, in Bangladesh water supply systems are heavily dependent on government subsidies. An analysis of water supply and sanitation in 42 municipalities showed that only 57% of expenditure was billed, and only half of that was collected. This resulted in revenue amounting to only 29% of expenditure.¹⁸ If development and public funding streams are maintained and/or expanded credibly in the long-run, models that utilize such financing arrangement are likely to be relatively sustainable. If these funding streams are reduced or eliminated, however, there is no clear revenue stream for prolonged service provision.

3. NGOs have increasingly aimed to link safe water provision to broader economic development that can transition service provision to fully commercial models in the NGOs/associations no longer require public funding, while consumers are willing and able to pay for water services over the long-run. These activities can take a variety of forms, including:

- Irrigation water supply and management
- Water supply to fishery projects/ initiatives
- Water supply to nurseries
- Water supply to livestock farms
- Agricultural product marketing
- Biogas plant sale
- Local organic fertilizer sale
- Solar energy distribution

However, the NGO/association does not typically want to be involved in more than one or two income generating activities other than the water service, due to a lack of financial or human resources, inexperience, or other risk factors. Some NGOs/associations have explicitly declined additional activities beyond drinking water provision. Further, some NGOs/associations reported that interest earned from microcredit provision is generally not cost-effective.

6.3.4. There are no incentive-driven collaboration spaces for safe water

1. The SWaM System is characterized by ambiguity in terms of arsenic mitigation strategies in particular. Success in providing mitigation options has been limited. Uncertainty about the effectiveness of alternative water supply technology options; inappropriate institutional arrangements; and confusion over the service delivery mechanism inhibit progress on arsenic mitigation (Implementation Plan for Arsenic Mitigation in Bangladesh). An Arsenic Policy Support Unit (APSU) and a National Committee for the Implementation Plan for Arsenic Mitigation (IPAM) was established. However, today the APSU no longer exists and the committee is inactive. The unsustainable nature of the various plans is the reason why arsenic contamination is still very high in Bangladesh.⁶⁴

⁶⁴ Ahmed Feroze, "Arsenic Mitigation in Bangladesh", Harvard.edu. N.p., n.d. Web, 07 November 2012. <http://users.physics.harvard.edu/~wilson/arsenic/conferences/Feroze_Ahmed.html>
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2. Further, there is relatively limited private sector involvement in the SWaM System. Although Bangladesh had already achieved extremely high levels of rural coverage through private sector dissemination of comparatively inexpensive and uncomplicated technologies (mostly hand pump and water storage tank), private sector involvement is still limited in areas like assurance, arsenic mitigation, introduction modern technologies, providing community based services, after sales services, promotional campaigns, etc. have not been covered yet. And also private sector is not that present in GOB or development sector schemes or plans yet.^{65 66}

3. International and domestic private sector firms have trended toward parallel service delivery models. As described above, multinational SMEs are increasingly entering Bangladesh with a variety of innovative safe water products, including small-scale desalination plants, flocculant powders, or arsenic treatment plants. As detailed below, such international firms typically engage the development and/or public sectors as the customers of their products. In other, these firms have chosen to develop their own Demonstration-level pilot business models. Yet cooperation between such international technology providers and domestic private sector is highly limited.

4. These outcomes appear due to an overall lack of incentive-driven collaboration spaces for safe water. There is also lack in sector planning within a holistic approach and mechanisms to facilitate participatory planning at the local level. As a consequence, planning is focused on project based and this suffers from duplication, misplaced priorities, and incoordination among the different government, private and development agencies. Agencies are oriented towards meeting physical targets rather than towards establishing and monitoring processes for reaching goals relating to facility operation, management, utilization, and maintenance. Development interventions are also not justly distributed. For example, there are some areas where more than six development sector organizations are providing

⁶⁵ Junaid Ahmed, B.N. Goldar, Smita Misra, M. Jakaria, Willingness to pay for arsenic-free, safe drinking water in Bangladesh, Water and Sanitation Program, South-Asia, The World Bank, 2003

⁶⁶ Fleck, Fiona, "An Interview with Mahmuder Rahman, Bangladesh's Arsenic Agony", Bulletin of the World Health Organization 86.1 (2008): 11-12

support to the water and sanitation sector, whereas there are many areas where there is little support for water and sanitation interventions.⁶⁷

5. Critically, the lack of incentive-driven collaboration includes an absence of systematic planning for, and creation of, short-term wins. In his work on organizational transformation, John P. Kotter highlighted the importance of demonstrating measurable evidence of change within a relatively short period of time; typically 12 to 24 months⁶⁸. "Without short-term wins, too many people give up or actively join the ranks of those people who have been resisting change." At present, the majority of safe water SDMs have prolonged timeframes with limited planning and monitoring regarding short-term milestones that reinforce SDM modeling, assumptions and resourcing. A lack of short-term objectives limits the ability of existing SDMs to assess the relative potential of the SDM as efficiently as possible, in terms of such indicators as scalability and inclusiveness within time-bound, specific deadlines.

⁶⁷ Santanu Lahiri, Mapping the WATSAN Context, Swiss Agency for Development and Cooperation (SDC)

⁶⁸⁶⁸ Kotter

6.4. Services Delivery Models

The Service Delivery Approach (SDA) is a **conceptual approach taken at sector level to the provision of rural water supply services, which emphasizes the entire life-cycle of a service, consisting of both the hardware (engineering or construction elements) and software required to provide a certain level of access to water.** SDA operates under the assumption that once a water system has been constructed, the service is maintained indefinitely through a planned process of low intensity administration and management, with occasional capital-intensive projects for upgrading and eventual replacement.

When applied in practical terms in any given context, the principles behind the SDA are applied through one or more agreed Service Delivery Models (SDMs), which reflect the realities of that country and the service area. SDMs provide agreed legal and institutional frameworks for delivering a service, including the levels of service and commonly understood and accepted roles for public, private or community actors. In summary, the SDA provides the concept of a full life-cycle way of thinking, whereas the SDM describes the practical implementation of such an SDA.

These SDM analyses enabled multi-dimensional investigation of the various features of each model, including: existing power structures amongst supply chain actors, services that are being offered (either on a pay basis or embedded); whether there are different channels of the movement of the product; and, what the interrelations between the channels (if any) are.

Full details of all service delivery models are outlined in Annex C.

SWaMI Says

- **Pumps & Harvesting SDMs (#1 of 5) exhibit both demonstrated scale and high potential, but are an incomplete solution** – testing and treatment are typically unaffiliated with P&H SDMs.
- **Testing SDMs (#2 of 5) are a critical cluster, particularly in combination with Pumping & Harvesting and Devices, Flasks & Tabs SDMs**, as testing is typically a necessity to ensuring general access to safe water (Pumping & Harvesting), and to a lesser extent understanding which market segments require DFT products and services.
- **Pipes & Taps SDMs (# 3 of 5) offer a complete “turn key” safe water solution, but require significant investments** of capital, human resources, and very long timeframes (more than 10-15 years minimum), particularly given the **weak horizontal scalability** of an individual piped “mini-utility”.
- **Plants & Kiosks SDMs (#3 of 5) demonstrate moderate potential but weak scale at present;** significant additional RD&D and service delivery piloting is required across both development and private sector actors in the space before the long-run potential of P&K SDMs is better understood.
- **Devices, Flasks & Tabs SDMs (#5 of 5) demonstrate high conceptual potential but weak scale and potential under existing SDMs.** However, it is likely that increased private sector involvement in DFT SDMs in the near-term will radically improve the potential of this cluster.

6.5. Service Weaknesses

SWaMI Says

- *Strategic & Business Planning Services*
- *“Human-Centered” RD&D Consulting Services*
- *Aspirational Marketing Services*
- *Local Service Provider Skills & Capacity Development Services*
- *Incentive-Driven Facilitation & Collaboration Services*

Synthesizing the problems and related underlying causes observed in the SWaM System in Bangladesh with the predominant service delivery models utilized enables the identification of thematic patterns of service weaknesses that represent the most important barriers in safe water provision. Identifying these service weaknesses enables the discovery of opportunity areas for interventions and models that most effectively trigger sustainable, scalable, inclusive solutions in the SWaM System. The key themes of service weakness in the SWaM System include:

6.5.1. Strategic & Business Planning Services

Strategic & Business Planning Services are critical for any SDM to sustainably generate revenues and/or access adequate funding for the provision of safe water over the long-run. Crucial to business planning is access to expertise in terms of formulating business case scenarios, particularly in terms of volume versus profit margins on sales.

In Bangladesh, Pipes & Taps and Plants & Kiosks models broadly display the greatest weaknesses in strategic & business planning services. These models are generally highly limited in terms of horizontal scalability given relatively significant initial investment and financing costs. Such models may reach as few as 200-300 households per plant.

More importantly, organizations involved in such SDMs rarely report clear strategic planning and resourcing around such models in order to generate self-sustaining revenue streams in service provision and/or maximize outreach to consumers. Consequently, while proof of concept under the Demonstration subsystem may be achieved, SDMs utilizing these solutions clusters in Bangladesh appear to display limited potential for fea-

sibly and viably expanding safe water access to BoP consumers at scale.

6.5.2. “Human-Centered” RD&D Consulting Services

“Human-Centered” RD&D Consulting Services relate to RD&D. When the solution and SDM(s) selected do not fit the market context, or are not designed with a clear sense of how revenues will be generated and long term O&M will be delivered, the solution is inherently unlikely to yield measurable impacts for BoP consumers. This means RD&D efforts that are not solely focused on engineering solutions, but customer-oriented solutions that have an explicit focus on commercialization in the long-run, regardless of the SDM(s) utilized to do so. RD&D weaknesses appear to have led to misappropriate selection of SDMs in Bangladesh if the overall goal is to provide sustainable, scalable solutions that are also inclusive.

6.5.3. Aspirational Marketing Services

Aspirational Marketing Services offer a possible solution to the scalability weaknesses characterizing most P&T and P&K models in Bangladesh. Generating high demand relatively rapidly may enable such models to achieve high volume, low-margin vertical scaling in existing service delivery areas to generate sustainable revenue streams that encourage more rapid horizontal scaling as well.

Further, aspirational marketing will be critical to sensitizing consumers to DFT solutions, which are relatively unknown but are likely to require proactive purchasing by consumers. In the absence of interest-generating marketing propositions, it is unlikely consumers will adopt DFT solutions at the scales required for sustainable manufacturing, distribution, sales, and after-sales service provision.

6.5.4. Local Service Provider Skills & Capacity Development Services

Local Service Provider Skills & Capacity Development Services are a critical gap between formal stakeholders and local service providers, whether public, private or NGO. All SDMs analyzed require some form of O&M supporting ser-

vice(s) for effective delivery, and the majority require local service providers to do to.

Further, a combination of lead firm input supply and local service providers, whether private or public, appears to be most effective at overcoming barriers to reaching large numbers of consumer households. While NGO-driven service provision can often catalyze the market, private local service provision has been demonstrated to be highly effective in the long-run. Rural entrepreneur LSPs that have invested in assets and technologies, and who are therefore motivated to maintain profitable businesses and attract farmer-clients by offering quality services in the long-run, regardless of NGO service provider presence.

P&H, P&T, P&K, and Testing service delivery models in Bangladesh generally encounter key sustainability issues in terms of long-run O&M by local service providers. LSPs are typically coerced into O&M activities with inadequate incentives offered, or are recruited with one-time and/or inadequate training on O&M. Creating the space for competitive O&M service provision at the level is critical. Further, lead firms and the public sector must actively assist marketing these services to consumers in order to generate demand for these services independent of any public or development sector programs.

Accordingly, a critical need in the SWaM System is channels to improve the skills base of small-scale supporting service actors providing O&M over the long-run. A lack of embedded services provision from better-equipped lead firms, public agencies and development organizations in terms of professionalization for overall sustainability in model delivery is still a considerable problem. Effective models will need to intensively incorporate informal, small-scale LSPs such as drillers and technicians to establish sustainable service delivery models for these actors to market and sell their services.

6.5.5. Incentive-Driven Facilitation & Collaboration Services

Incentive-Driven Facilitation & Collaboration Services represent another key area of service weakness in the research, development and demonstration of safe water solutions in Bangladesh at present. Many of the most persistent

challenges in the SWaM System appear due to a fundamental lack of analysis and communication between existing and/or potential SWaM System stakeholders regarding relative core competencies. Several broad conclusions can be drawn in this regard:

Sector	Core Competencies	Weaknesses
Private (Domestic)	Distribution, Sales, After-Sales, Local Knowledge, established status	RD&D, market research
Private (Intl.)	RD&D, intl. credibility, public relations and advocacy reach	Distribution, Sales, After-Sales, Local Knowledge
Public	Large-scale outreach, significant funding	Technology application, service delivery modeling
Development	Facilitating linkages between other sectors, market research, RD&D, service delivery analysis and modeling	Distribution, Sales, After-Sales

Further, the SWaM System in Bangladesh plainly lacks collaborative spaces and channels through which public, private and development sectors move beyond typical "talk shop" dissemination of learning to instead actively invest in and experiment with innovative, promising new ideas that can be spun from R&D activities into Demonstration-level SDMs, which in turn may be eventually Commercialized. Such collaborative spaces and channels must present clear value propositions to stakeholders from all sectors, providing them with the means to pursue their objectives while mitigating their risks:

Sector	Incentives	Risks
Private (Domestic)	Subsidized RD&D, market penetration/expansion	Wasted RD&D investments
Private (Intl.)	Market penetration with minimal direct investment	Wasted RD&D, Intellectual property theft
Public	Greater outreach with more efficient investments	Political complications
Development	RD&D investment capital, partners that ensure sustainability	Wasted RD&D investments,

politicization of efforts

These are particularly important services for DFT SDMs in Bangladesh, as POU technologies are predominantly procured from international firms by development or public sector organizations rather than domestic private firms. The development of spaces and processes through which different firms can find profitable technology transfer, manufacturing and distribution solutions on POU technologies is likely to significantly increase the feasibility and viability of DFT solutions in BoP market segments, which have the potential to be measurably more cost-effective and scalable than P&T or P&K solutions at present.

These service weaknesses represent the areas of the SWaM System which have the greatest positive impact on SDMs that connect core market functions to necessary supporting functions across the three SWaM subsystems. It is proposed that interventions in these areas can serve to address the underlying causes of the problems and strengthen the SWaM System. The identification of these key service areas allows for the entry points for **interventions to strengthen the SWaM System**, described in the following section.

7. Improving the Safe Water Market System

Understanding innovative solutions and delivery models is critical at the individual program level, but in order to address the underlying structural weaknesses of the entire SWaM System broader modalities of coordination across key stakeholders in the market system are required for long-term strategic directions at scale. Accordingly, a means through which to conceptualize the coordination of an entire ecosystem of innovative solutions and models across stakeholders in the public, private and development sectors is needed.

The preceding analysis indicates that an effective strategy to improve the SWaM System must emphasize simultaneous improvements in SDM ideation and implementation while providing systemic environments that encourage innovation and learning across different solutions clusters and SDMs. Accordingly, the strategy presented herein aims to provide a direction forward in the SWaM System that incorporates these critical considerations in sustainable, scalable manners.

Sustainable improvements in the SWaM System will therefore broadly require the building of two inter-related outcomes. First, further proliferation of public-private partnerships between lead firms

and local NGO service providers, with the support of LGIs, regardless of the specific characteristics of the SDM(s) used, to reduce the risks associated with reaching BoP consumers and generate demand for safe water products and services. Second, the emergence of private local service providers that can eventually assume the roles and functions of local NGO service providers in terms of market linkages and supporting services is a critical need going forward.

Arriving at innovative solutions for safe water requires balancing 1) user-centered design (“investing in experimentation that puts the customer at the center”⁶⁹, 2) existing market actors and resources, and 3) aspirational marketing and branding⁷⁰. The nature of both the product, business model and the user is of critical importance, as different combinations of the two drive different types of change in the market. Generally, innovation- and organizational theory defines four combinations that lead to three kinds of innovation: Incremental, Evolutionary and Revolutionary. While Incremental changes describe existing product offerings interacting with existing users, Evolutionary change accepts that one of these factors already exists, while Revolutionary change is the combination of new products with new users⁷¹. Approaching product innovation in developing country contexts from an evolutionary perspective acknowledges that while revolutionary solutions are tempting, leveraging existing offerings can often increase the cost-effectiveness and feasibility of the solution.

Accordingly, iDE proposes the development of a “Safe Water Market Platform” (“The SWaMP”)

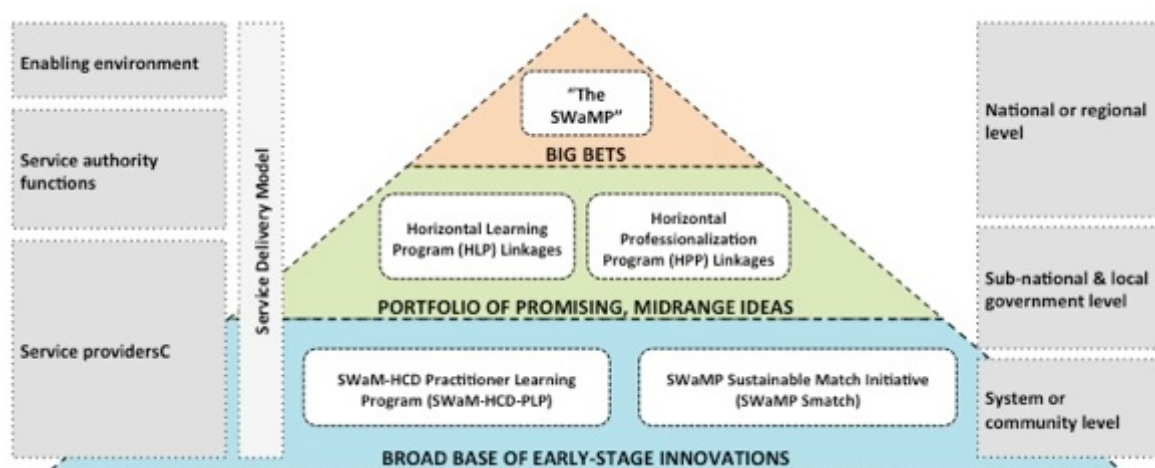


Figure 24. The “SwaMP Network”

network that draws on the “Innovation as Standard” Connect 4 Lens to create solutions that address the subsector according to the Innovation Pyramid Approach.

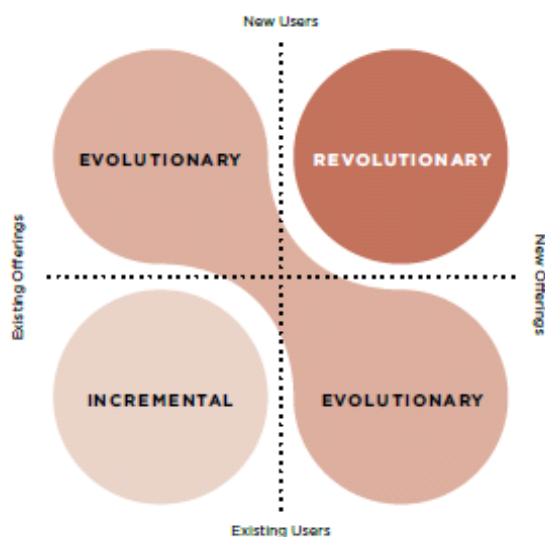


Figure 25. *Innovation has many faces¹*

Each illustrative intervention within the SWaMP Network is outlined below.

SWaMP Network Intervention	Innovation Pyramid Approach: Level	Innovation Pyramid Approach: Objective	Service Delivery Approach (SDA): Success Factors
The Safe Water Market System Platform ("SWaMP")	Big Bets	Cultivating communication and collaboration skills	Standardization of implementation approaches Political engagement
Horizontal Learning Program (HLP) Linkages	Portfolio of Promising, Midrange Ideas	Forging better connections between innovators and mainstream operations	Capacity support to decentralized government (service authorities) Professionalization of community management
Horizontal Professionalization Program (HPP) Linkages		Forging better connections between innovators and mainstream operations	Post-construction support to service providers
SWaMP Sustainable Match Initiative ("SWaMP SMatch")	Broad Base of Early-Stage Innovations	Forging better connections between innovators and mainstream operations	Increased recognition and promotion of alternative service provider options
Human-Centered Design Practitioner Learning Program (HCD-PLP)	Broad Base of Early-Stage Innovations	Widening the search for new ideas	Learning and sharing of experience

7.1. Safe Water Market Platform ("SWaMP")

SWaMP System Intervention	Innovation Pyramid Approach: Level	Innovation Pyramid Approach: Objective	Service Delivery Approach (SDA): Success Factors
The Safe Water Market System Platform ("SWaMP")	Big Bets	Cultivating communication and collaboration skills	Standardization of implementation approaches Political engagement

Understanding innovative solutions and delivery models is critical at the individual program level, but in order to address the underlying structural weaknesses of the entire SWaM System broader modalities of coordination across key stakeholders in the market system are required for long-term strategic directions at scale. Accordingly, a means through which to conceptualize the coordination of an entire ecosystem of innovative solutions and models across stakeholders in the public, private and development sectors is needed.

The Innovation Pyramid Approach (IPA) is a conceptual framework through which do exactly that. Developed in management theory most prominently by Moss Kanter, IPA enables systemic level coordination across various models and solutions in terms of providing a space for innovative new ideas that have the means to increasingly scale-up as they are demonstrated in the market itself. As Moss Kanter describes, IPA in practice involves an organization or group of organizations ordering their different operations/programs whereby "A few big bets at the top that represent clear directions for the future and receive the lion's share of investment; a portfolio of promising midrange ideas pursued by designated teams that develop and test them; and a broad base of early-stage ideas or incremental innovations permitting continuous improvement."⁷² Approaching innovation through the pyramid enables decision-makers in any organization a framework that enables 1) assessment of existing models and solutions, 2) adjust-

ment and careful scaling as early-stage ideas prove their value and require additional resourcing, and 3) delivery at scale of mid-range models and solutions that have demonstrated their large-scale potential. IPA has been demonstrated as effective in a wide range of organizations worldwide, including IBM and Gillette⁷³.

If utilized effectively, IPA can have significant impacts on groupings of stakeholders in a market system. The approach fosters "A culture of innovation grows because everyone can play. While dedicated [organizations] pursue the big projects and temporary [programs] develop midrange ideas, everyone else in the [market system] can be invited to contribute ideas."

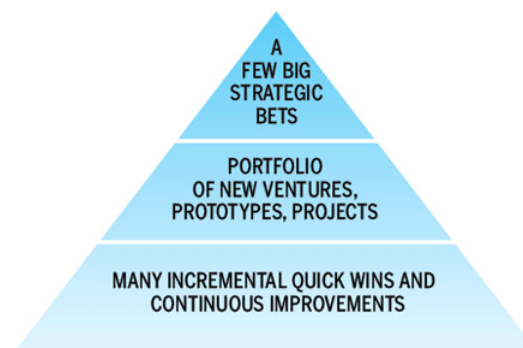


Figure 26. The Innovation Pyramid

Accordingly, the Safe Water Markets Platform ("SWaMP") would provide leadership and coordination in the research, design and commercialization of new and innovative products and models for safe water in Bangladesh. The SWaMP would bring together national and international research and design institutes, local and international development actors, local and international lead firms, LSPs, and WSP. The Platform could act as a "Center for Excellence" in catalyzing multi-sector strategic partnerships of evidence-based modalities and innovations across the wide spectrum of product categories and service delivery models existing and possible throughout contemporary Bangladesh.

Critically, the SWaMP would be an incentive-driven collaborative space in order to ensure it did not become a stagnant learning dissemina-

⁷² Moss Kanter 2006.

⁷³ Moss Kanter 2006.

tion space. To that end, the SWaMP would concentrate resources on establishing goal-oriented prize competitions to its members toward the achievement of ambitious, innovative solutions that could generate scalable, sustainable returns in BoP communities throughout Bangladesh. Such prize-oriented models have been demonstrated throughout the world as a highly effective means to trigger own-investment by key stakeholders in solving critical market system challenges, while still rewarding those that achieve the greatest results with offsets on their investments⁷⁴.

7.2. Human-Centered Design Practitioner Learning Program (“HCD-PLP”)

SWaMP System Intervention	Innovation Pyramid Approach: Level	Innovation Pyramid Approach: Objective	Service Delivery Approach (SDA): Success Factors
Human-Centered Design Practitioner Learning Program (HCD-PLP)	Broad Base of Early-Stage Innovations	Widening the search for new ideas	Learning and sharing of experience

BOP markets are not homogeneous. Gender, income, education, and sociocultural variables can affect what people want and why. For example, women may be more likely than men to understand the implications of drinking unsafe water and to place higher priority on improving water quality and household hygiene because of their household responsibilities.⁷⁵ Accordingly, marketing messages informed by well-known principles from behavioral economics and the psychology of decision-making can, under appropriate circumstances, promote development aims.”

Since most low-income households have no experience with safe water, companies and organizations must be prepared to build a market for a new product category—a process that may require sustained investment over a period of

years. This will require generic messages about the need for and benefits of safe water, in addition to product-specific advertising. Companies may also have to demystify safe water products by explaining how they work and demonstrating their use.

The management world has long recognized the dangers of product and innovation research and development which is scientifically sound yet entirely ungrounded in the consumers’ needs and preferences. As far back as 1960, eminent marketers such as Theodore Levitt realized that in typical RD&D efforts, “What gets shortchanged are the realities of the market. Consumers are unpredictable, varied, fickle, stupid, shortsighted, stubborn, and generally bothersome. This is not what the engineer managers say, but deep down in their consciousness, it is what they believe. And this accounts for their concentration on that they know and what they can control – namely, product research, engineering and production.”⁷⁶

Accordingly, the Human-Centered Design process enables researchers to gain a deep and holistic understanding of the people within the ecosystem of the problem at hand. HCD puts a deep understanding of people, at the heart of the process in designing innovative solutions that are customer-oriented rather than narrowly product-oriented. iDE has been involved with the development and utilization of HCD since the very beginning. HCD methodology is a form of design-based research of the type endorsed by thought leading institutions such as the Stanford Social Innovation Review.”

⁷⁶ Levitt, Theodore. 1960. *Marketing Myopia*. Harvard Business Review. Harvard Business Press. Boston, USA.

⁷⁷ As described by Levitt 1960.

⁷⁸ Through multi-country experience iDE has developed templates and guides that are easily adapted to new country contexts and better facilitate the HCD process. In particular, iDE partnered with the Gates Foundation and IDEO to develop The Human Centered Design Toolkit, a process-oriented manual for NGOs and social enterprises for effective, responsive, sustainable design solutions serving low-income consumers and suppliers. As described by IDEO, “The HCD toolkit has been used by organizations throughout the developing world, including Acumen Fund, AyurVAID, Heifer International, ICRW, IDE, Micro Drip, and VisionSpring,” and has been downloaded over 74,000 times. (Source: <http://www.ideo.com/work/human-centered-design-toolkit/>).

⁷⁹ A recent example is Brown, Tim and Jocelyn Watt. “Design Thinking for Social Innovation.” Stanford Social Innovation Review. Winter 2010.

⁷⁴ The Ansari X-Prize is a renowned example of an efficiency-oriented innovation prize process.

⁷⁵ Serafini M. *Promotion and Microfinance of Kanchan™ Arsenic Filter in Rural Terai Region of Nepal*. Cambridge, MA: Massachusetts Institute of Technology (MIT); 2005. The Safe Water Market System in Bangladesh Connecting Public Goods to Private Delivery through Innovation & Inclusive Business iDE Bangladesh June 2013

This intervention involves the creation of a Human-Centered Design Practioner Learning Program (HCD-PLP) to enable the key stakeholders in the SWaM System to undertake customer-oriented RD&D activities for more sustainable, scalable solutions to be piloted. The HCD-PLP will focus on the RD&D subsystem of the SWaMP System. The PLP will enable explicit and comprehensive investigation and analysis of SWaM solutions and SDMs that take fully incorporate the RD&D, Service Delivery, and Commercialization subsystems, from the very start of research.

7.3. SWaMP Sustainable Match Initiative ("SWaMP SMatch")

SWaMP System Intervention	Innovation Pyramid Approach: Level	Innovation Pyramid Approach: Objective	Service Delivery Approach (SDA): Success Factors
SWaMP Sustainable Match Initiative ("SWaMP SMatch")	Broad Base of Early-Stage Innovations	Forging better connections between innovators and mainstream operations	Increased recognition and promotion of alternative service provider options

Finding sustainable SDMs across multi-sector actors requires systematic means to match effective potential partners across the three SWaM subsystems. A sustainable match frameworks has high potential to do just that⁸⁰. Accordingly, the SWaMP Network would establish an ongoing sustainable match program that would connect international RD&D firms with local distribution and development partners to deliver safe water solutions relatively rapidly and sustainably. Once ideas have been fully demonstrated through the match system, they can be scaled up into the mid-tier of the SWaMP Network.

7.4. Horizontal Learning Program (HLP) Linkages

⁸⁰ BoP Innovation Center, ICCO. 2012. *Matching of Sustainable Approaches for Safe Drinking Water & Sanitation for the BoP and WMO's in Southern Bangladesh*. Study proposal. BoP Innovation Center & ICCO.

SWaMP System Intervention	Innovation Pyramid Approach: Level	Innovation Pyramid Approach: Objective	Service Delivery Approach (SDA): Success Factors
Horizontal Learning Program (HLP) Linkages	Portfolio of Promising, Midrange Ideas	Forging better connections between innovators and mainstream operations	Capacity support to decentralized government (service authorities) Professionalization of community management

The Horizontal Learning Program is one of the strongest institutional approaches to scalable, sustainable safe water provision at present. Accordingly, HLP should be expanded and tied closely to the other SWaMP Network institutions in order to bridge private delivery through markets-based solutions with effective public service provision support.

7.5. Horizontal Professionalization Program ("HPP") Development

SWaMP System Intervention	Innovation Pyramid Approach: Level	Innovation Pyramid Approach: Objective	Service Delivery Approach (SDA): Success Factors
Horizontal Professionalization Program (HPP) Linkages	Portfolio of Promising, Midrange Ideas	Forging better connections between innovators and mainstream operations	Post-construction support to service providers

As technological sophistication increases, and there is a move up the ladder from handpumps to reticulated supplies, there will be a need for more specialist operators. Higher levels of service, better and more competent management, and increased opportunities for revenue collection all point towards a more professionalized service.

Accordingly, a private sector, LSP-oriented counterpart to HLP should be created to bridge the gaps between lead firms and LSPs, improve S&C across a large number of LSPs, and increase the overall likelihood of quality O&M supporting ser-

vices across SDMs implemented in the SWaM System in Bangladesh. This “Horizontal Professionalization Program” would be aimed at developing the capacity of local private sector to ensure the overall quality of safe water SDMs implemented. Like HLP, this network would also ensure strong cross-learning throughout the country, overcoming the scalability challenges typically tied to professionalizing LSPs.

8. Conclusions

The consumption of unsafe water is a major concern in Bangladesh. Furthermore, there are a number of key problems that inhibit the delivery of safe water sustainably to BoP market segments in Bangladesh, including:

- *Consumer-oriented understanding on desirability, feasibility and viability of safe water products and services is low.*
- *Strategic and business planning in long-run, large-scale service delivery is generally low.*
- *High-cost, low-scale solutions predominate service delivery models rather than more cost- and context-appropriate technologies and products.*
- *There are no incentive-driven collaboration spaces for safe water.*

These problems result from key characteristics across service delivery models in safe water:

- **Pumps & Harvesting SDMs exhibit both demonstrated scale and high potential, but are an incomplete solution** – testing and treatment are typically unaffiliated with P&H SDMs.
- **Testing SDMs are a critical cluster, particularly in combination with Pumping & Harvesting and Devices, Flasks & Tabs SDMs**, as testing is typically a necessity to ensuring general access to safe water (Pumping & Harvesting), and to a lesser extent understanding which market segments require DFT products and services.
- **Pipes & Taps SDMs offer a complete “turn key” safe water solution, but require significant investments** of capital, human resources, and very long timeframes (more than 10-15 years minimum), particularly given the **weak horizontal scalability** of an individual piped “mini-utility”.
- **Plants & Kiosks SDMs demonstrate moderate potential but weak scale at present;** significant additional RD&D and service delivery piloting is required across both development and private sec-

tor actors in the space before the long-run potential of P&K SDMs is better understood.

- **Devices, Flasks & Tabs SDMs demonstrate high conceptual potential but weak scale and potential under existing SDMs.** However, it is likely that increased private sector involvement in DFT SDMs in the near-term will radically improve the potential of this cluster.

Including broader, more inclusive solutions to access to safe water requires an innovation approach balancing 1) user-centered design (“investing in experimentation that puts the customer at the center”⁸¹, 2) existing market actors and resources, and 3) aspirational marketing and branding⁸². This approach addresses the key service weaknesses in the SWaM System in Bangladesh:

- *Strategic & Business Planning Services*
- *“Human-Centered” RD&D Consulting Services*
- *Aspirational Marketing Services*
- *Local Service Provider Skills & Capacity Development Services*
- *Incentive-Driven Facilitation & Collaboration Services*

⁸¹ Ibid: 39.

⁸² Polak, Paul. 2012. *Paul Polak, Founder, iDE: At Least a Million.* Huffington Post.
<http://www.businessfightspoverty.org/profiles/blogs/paul-polak-founder-ide-at-least-a-million>

Annex A: List of Respondents by Organization*

Organization Name	Location
AKK WaterHealth Bangladesh	Dhaka
ALEN Engineering	Dhaka
Asia Arsenic Network (AAN)	Jessore
Association for Under-privileged People (AUP)	Manikganj
Bangladesh Association for Social Advancement (BASA)	Dhaka
Broti	Chapainawabganj
Dhaka Ahsania Mission (DAM)	Dhaka
DPHE (District level and Upazila Level)	Bogra, Khulna, Shatkhira, Chapainawabganj, Sirajganj
F CUBED Solar Water Processor Limited	Dhaka
Gazi Group	Dhaka
GIZ	Dhaka
Grameen Bohumukhi Unnayan Sangstha (GBUS)	Chapainawabganj
Grameen Veolia Water	Dhaka
HYSAWA	Khulna
MAWTS Bangladesh	Dhaka
Nabalok	Khulna
NGO Forum	Dhaka
Nirob Drinking Water Pvt. Limited	Rajshahi
Proshikha	Dhaka
RFL-PRAN	Dhaka
Rural Development Association (RDA)	Bogra
Shishir Drinking Water	Chapainawabganj
Shushilon	Khulna
Social Development Organization for Poverty Alleviation (SDOPA)	Sirajganj
Socio-Economic Development Agency (SEDA)	Manikganj
UNDP-UPPR	Dhaka
UNICEF	Dhaka
Union Level WATSAN Committee	Khulna, Manikganj, Satkhira
Union Parishad	Khulna
Water & Sanitation for the Urban Poor (WSUP)	Dhaka
Water Aid	Khulna
Water and Life	Dhaka

***Consumers of different organizations/ water services were also interviewed along with them.**

Annex B: The Safe Water Market Index ("SWaMI")

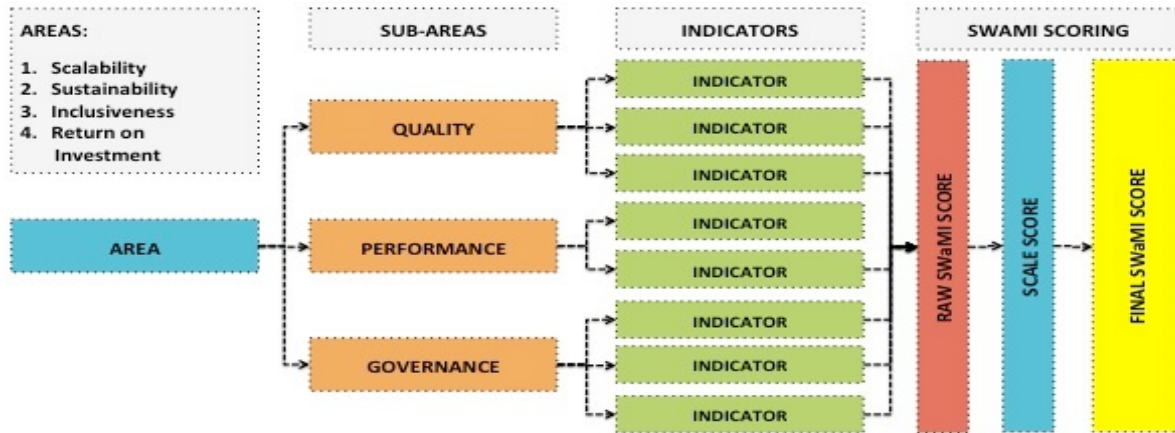


Figure 27. Safe Water Market Index (SWaMI) Benchmarking Process

To specifically assess the SWaM System, iDE further developed an in-depth benchmarking methodology, dubbed the "Safe Water Markets Index" (SWaMI) to construct a robust index measure of safe water model practices in order to investigate and identify key problems, underlying causes, services, and interventions across key organizations engaged in safe water service delivery across different sectors. Benchmarking through an index significantly increased the comparative and explanatory power of the data collection and analysis process in a variety of market systems, including the SWaM System⁸³.

The SWaMI scoring tool was developed to increase the objectivity of what are essentially subjective indicators across the SWaMI framework. In order to calculate the overall SWaMI score, the index was disaggregated into four areas of model effectiveness: 1) Scalability, 2) Sustainability, 3) Inclusiveness, and 4) Return on Investment. These four areas are each sub-divided into three cross-cutting filters: quality, performance and governance. Each filter is comprised of one or several indicators supported by means of verification. The SWaMI process was as follows:

Step 1: Identify broad areas of analysis. The analysis framework was first defined in terms of five broad areas: 1) scale, 2) scalability, 3) sustainability, 4) inclusiveness, and 5) return on investment.

Scale assesses the existing, evidence-based level of outreach for the model under analysis, regardless of the operational modality of implementation/service delivery. Models that reach hundreds of consumers are considered in relation to mid-sized and large-scale models.

Scalability refers to the desirability, feasibility and viability of delivering the model at large scale with the greatest degree of efficiency possible. The SWaMI analysis disaggregated scalability in terms of Gundel, Hancock and Anderson (2001)⁸⁴, who separated "vertical" from "horizontal" scalability, in which "Vertical scalability refers to the institutionalization of the functions and approaches that make sustainability possible; whereas horizontal scaling up refers to the application of these principles in a broader geographical area – what is also called 'scaling out' by some authors, such as Harrington, et al. (2001)."⁸⁵

Sustainability focuses on medium- and long-run operation and maintenance of a given SWaM- SDM follow-

⁸³ WSP. 2010. Benchmarking Local Government Performance on Rural Sanitation: Learning from Himachal Pradesh, India. Global Scaling Up Sanitation Project. Learning Note. Water and Sanitation Program. World Bank.

⁸⁵ Ibid.
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ing the delivery of close-ended RD&D/service delivery/commercialization investments, regardless of the modality (e.g. initiative vs. project vs. program vs. policy). As Lockwood and Smits highlight, in practice, "this definition may be closer to one that simply describes sustainability as 'whether or not something continues to work over time' (Abrams, L.; Palmer, I., and Hart, T. 1998); meaning, in this case, whether or not water continues to flow over time."⁸⁶ Sustainability also factors in performance aspects including functionality (the percentage of water points working at any given time under the service delivery model), and slippage (the percentage of water points with backsliding observed in terms of quality, performance and governance).

Inclusiveness describes the degree to which a given SWaM-SDM conceptualizes, considers, identifies, analyzes, addresses, and includes marginalized and/or disenfranchised BoP market segments, communities, households, and individuals in its strategy. Around 25% of the Bangladesh's total population live below the lower poverty line and are consequently classified as "ultra poor" or "extreme poor"⁸⁷. Extreme poor market segments, and the households therein, typically face a wide variety of chronic stresses and shocks⁸⁸. Reaching these market segments requires highly nuanced and considered strategies and modalities, such as graduation models, particularly when commercialization is addressed. Accordingly, understanding the extent to which a given SWaM-SDM considers and addresses issues of inclusion provide important insights on the balance between economic and social priorities in BoP markets.

Return On Investment fundamentally examines the monetary and non-monetary impacts resulting from a given SWaM-SDM for each unit of tangible and intangible resources invested by all relevant SDM actors across the enabling environment, service authority and service delivery levels as defined by SDA. Researchers such as Fonseca (2011)⁸⁹ have highlighted the importance of estimating and assessing unit costs across capital expenditures (CapEx), O&M, and other forms of investment. SWaM-SDMs that understand and address the unit costs of services throughout the full life-cycle of product/service delivery are likely to have higher potential in terms of the other key areas: scalability, sustainability and inclusiveness.

Step 2: Select sub-areas and indicators For a balanced measurement across inputs, outputs, processes and outcomes, SWaM indicators were drawn from a variety of key sources in global safe water research and service delivery⁹⁰. In particular, indicators were framed to link to key factors in effective SWaM-SDMs identified under SDA previously presented. These indicators were then refined into three broad subareas: 1) quality, 2) performance, and 3) governance:

Quality	The services received by users – usually in terms of quantity, quality, accessibility and reliability over time.
Performance	The performance of service providers or operators – fulfillment of basic technical, financial, management and organization functions necessary to deliver a sustainable service.
Governance	The performance of the service authority – fulfillment of planning, coordination, regulatory and support functions necessary to ensure the establishment and performance of service providers.

⁸⁶ Lockwood and Smits: 23-24

⁸⁷ Based on the cost of basic needs (CBN) method. Source: Bureau of Bangladesh Statistics 2007.

⁸⁸ Uncertainty in securing regular wage employment often pushes male household members to migrate to urban labor markets during lean periods for as much as seven months annually. Single-parent households, especially those headed by women, are disproportionately found in these market segments. The extreme poor usually live in geographically marginal areas (i.e. embankments, khas land, government property) or in highly concentrated settlements. These settlements easily flood with high tides. In addition to such geographically and economically disadvantageous position, the extreme poor also have lower levels of social capital with no forum to claim their rights and move forward out of extreme poverty. Such stresses and shocks can drive extreme poor households to less than 2 meals a day, contributing to the deterioration of nutritional status of women and children.

⁹⁰ Key sources include:

- WSP. 2011. Introduction to Sanitation Marketing.
- Kurtwood and Smits: 140.
- IRC. 2011. *Service Delivery Indicators and Monitoring to Improve Sustainability of Rural Water Supplies*. Triple-S Program.

Safe Water Market System Index (SWaMI) Framework			
Area	Sub-area	Indicator	Standard of Excellence (Score: 5 out of 5)
SCALE	n/a	n/a	Model has evidence-based demonstration of large-scale application to date, regardless of implementation/service delivery model(s).
SCALABILITY	Quality	Promotion and marketing centralized and scalable	SDM has resources, planning and strategies to promote and market the products and services offered at scale.
		Strategic partnerships with scale potential established and maintained	The model can effectively draw from its strategic partnerships across key cross-sector stakeholders for delivery at both vertical and horizontal scale.
		Range of management options set out in clear "business planning" that is differentiated by service levels, technology and types of markets targeted	Clear plans and forecasts are in place to deliver the model at scale in short-, medium-, or long-term. Plans reflect an understanding of market conditions including demand-supply dynamics, research gaps, and risk scenarios. Relevant management provides effective leadership and planning in planning and delivery.
	Performance	Product supply chain centralized for vertical "scaling up"	SDM has ability to supply solutions at scale through value chains, and has ability to maximize saturation in an existing geographic coverage area.
		Mechanisms available for horizontal "scaling out"	SDM has ability to expand to new geographic locations at scale.
	Governance	Strategic planning and water resources planning in relation to model undertaken by relevant service authorities	SDM actors have clear RD&D and strategic planning regarding water resources and area-specific challenges (e.g. arsenic contamination) at horizontal scale.
		Relevant public service authorities have modality to replicate model at scale	Relevant public service authorities, including LGIs, have means and incentives to enable service delivery at scale.

SUSTAINABILITY	Quality	Product offerings commercially desirable (demand-driven), feasible, viable, and focused (evidenced in part by non-beneficiary consumer copying)	The network utilizes a comprehensive and participatory system of planning to define its priorities and organize activities in the short and long term.
		A strong customer value proposition is demonstrated; evidence-based promotional strategies	The network has a clear marketing/promotion/awareness strategy that targets BOP end users.
	Performance	Efforts address full life-cycle of a service delivery (e.g. construction to post-construction, asset management and replacement); functionality levels high; slippage minimal	The model monitors and evaluates its performance on a regular basis and utilizes information to make improvements and ensure accountability.
		Demand-driven, systematic support provided to professionalizing service providers; enables crowding-in of other service providers	The SDM understands the importance of professionalized service providers and provides sustainable mechanisms for these actors to actively market and supply their services, access S&C, and have means to independently be a key component of the SDM over the long-run.
	Governance	Partnerships and agreements effectively implemented and enforced	Strategic partnerships with actors across all sectors, especially LGIs, developed and operationalized for full life-cycle.
		Local government authorities enabled to operate/support necessary functions	LGIs have clear sense of role in the SDM, incentive to adopt that role and the SDM, and resources to do so.
		Harmonization with existing enabling environment structures, technology regulations/certifications, institutions and models	SDM aligns with legal, regulatory and policy-related paradigms promoted and/or supported by GOB, SAGs, and LGIs.

INCLUSIVITY	Quality	Market clearly segmented and targeted	SDM clearly identifies as many segments within the broader BoP market segment, and strategies in place to reach as many segments as possible.
	Performance	Points of sale/use easily accessible to marginalized end user segments	Financial performance measures associated with earned income, the development of operating reserves, administrative efficiency, and overall revenue growth are strong and show positive trends.
	Governance	Provision of smart subsidies and other targeted support to marginalized end user segments where appropriate	Financial administration processes are transparent and provide the necessary level of control to ensure resources are used efficiently and for their intended purpose.
RETURN ON INVESTMENT	Quality	Model demonstrates "internal returns" of profitability or sustainable revenue stream(s)	The model demonstrates clear profitability and/or revenue stream(s) that minimize or eliminate the need for additional external investments in the long-run. Financial planning and appropriate financial performance measures are used to achieve these returns.
	Performance	Model demonstrates "external returns" of measurable positive impacts on end user market infrastructure	Measurable outcomes achievable in areas such as income generation, market linkages, public health, institutional capacity, enabling environment support, etc.

With the selection of SWaMI areas, sub-areas and indicators, the overall SWaMI framework was finalized. This resultant framework is as follows:

Step 3: Select organizations and models. Following development of the SWaMI framework, key stakeholders with representative models in safe water provision throughout Bangladesh⁹¹ were identified and selected for data collection and analysis under the SWaMI process. As described previously, the selection aimed to provide a broad, comprehensive representation of stakeholders across the public, private, and development sectors, including service providers, service authorities and consumers. These models were as follows:

Business to Consumer	B2C	Private firm/LSP supplies product/service to consumer
Business to Business	B2B	Private firm/LSP supplies intermediary product/service to a second firm/LSP prior to sale of final product to consumer
Business to Development	B2D	Private firm/LSP supplies product/service to development organization/program
Government to Consumer	G2C	GOB/LGI supplies product/service to consumer
Government to Development		GOB/LGI supplies product/service to development organization/program
Development to Consumer	D2C	Development organization/program supplies product/service to consumer
Development to Government	D2G	Development organization/program supplies product/service to GOB/LGI

Step 4: Collect data. Through literature review, interviews and observation, the iQ Team investigated the selected stakeholders and their safe water delivery models.

Step 5: Assign scores to each indicator. Following data collection, the iQ Team conducted *post facto* review of each model presented according to the SWaMI indicators. Scores were not intended to indicate how "good" or "bad" a SWaM-SDM is, but rather its generalized level of effectiveness in addressing full

service delivery of safe water solutions. The SWaMI benchmarking methodology utilized a “roll-up calculation” scoring system in which:

- The iQ Team assigned a score to each individual indicator grounded in the means of verification collected and analyzed throughout the study. Each indicator was scored by defining a spectrum of overall effectiveness for the given model, codifying the model's effectiveness in a given indicator from 1 (“lowest demonstrated/potential” practice) to 5 (“highest demonstrated/potential” practice).
- The score of each analysis area was the sum of each of its indicators' scores;
- The raw SWaMI score (between 20 – 100) was the total of the scalability, sustainability, inclusiveness, and ROI areas.
- The final SWaMI score converted the raw SWaMI scores across the four areas excluding scale into proportionate measurements from a scale of 0 to 5, then added the scale area score. These five areas were then averaged for the total SWaMI score, ranging from 0 to 5.
- SWaMI scores were then calculated from several cross-cutting perspectives, including sector (public, private or development) and Hystra solutions clusters.

Step 8: Comparative analysis of SWaMI scores. Using the SWaMI scores across all SWaM-SDMs analyzed, the iQ Team identified the elements, clusters and overall trends in terms of model efficacy and potential across all the SDMs studied.

Annex C: Key Stakeholders in the Bangladesh SWaM System by Sector

Public Sector

SI	Organization	Product Offerings	Testing	Extraction	Treatment	Storage	Transportation
Pumping & Harvesting							
	DPHE	DTWs, handpumps					
Pipes & Taps							
	RDA						
	Union Parishad						
Plants & Kiosks							
	n/a						
Devices, Flasks & Tabs							
	Union Parishad	SODIS					
Testing							
	Union Parishad	Arsenic testing					
	Union Parishad (HLP)						

Development Sector

SI	Organization	Product Offerings	Testing	Extraction	Treatment	Storage	Transportation
Pumping & Harvesting							
	BRAC	DTW, STW, handpumps					
	WaterAid						
	NGO Forum						
	UNICEF						
Pipes & Taps							
	BASA						
	DAM						
	HYSAWA						
	GIZ						
	AUP						
	SDOPA						
	Water & Life						
	UNDP						
	UPPR						

Plants & Kiosks						
GBUS	Bottled water					
Devices, Flasks & Tabs						
PROSHIKA	Arsenic filter					
Testing						
AAN	Arsenic testing					
NGO Forum						
UNICEF						
WSP-HLP						

Private Sector

SI	Organization	Product Offerings	Testing	Extraction	Treatment	Storage	Transportation
Pumping & Harvesting							
	ALEN Engineering	DTW, STW, hand-pumps					
	GAZI Group						
	MAWTS						
	RFL-PRAN						
	Sigma Engineering						
	Local hardware retailers/dealers						
	Local drillers						
	Local technicians						
	Local Plumbers						
Pipes & Taps							
	Grameen-Veolia						
Plants & Kiosks							
	AKKWHB	Bottled water					
	Grameen-Veolia	Bottled water					
Devices, Flasks & Tabs							
	F CUBED BD	SODIS					
Testing							
	n/a						

Annex D: Service Delivery Models in Bangladesh SWaM System

“Pumping & Harvesting” Models

Pumps & Harvesting SDMs exhibit both demonstrated scale and high potential, but are an incomplete solution

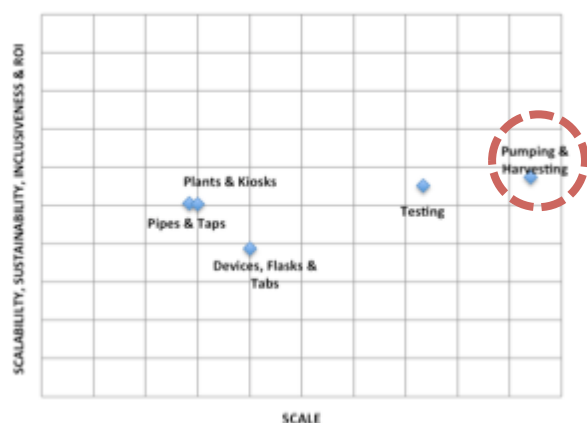


Figure 28. Pumping & Harvesting Cluster in the Bangladesh SWaM System

	SWaMI Rank (1 to 5)
Scale	1
Scalability	1
Sustainability	4
Inclusiveness	2
Return on Investment	3
Total SWaMI Score	1

SWaMI Says

Pumping & Harvesting SDMs represent 30% of all distinct SDMs observed in the Bangladesh SWaM System.

- Large-scale B2C input supply of Pumping & Harvesting solutions are widely available throughout the country.
- Local B2C service providers are well-positioned to provide Pumping & Harvesting products and O&M to BoP consumers.
- Regardless of the scale of B2C-P&H channels, a B2D2C-P&H SDM remains prominent.
- B2D firms are typically not directly linked to LSPs or end users.

Pumping & Harvesting SDMs demonstrate the highest scale on average (SWaMI Rank 1 of 5), due to the strong presence of the private sector in this cluster, including both large-scale lead firms and local service providers, and also due to large-scale development programs concentrating in this cluster.

Pumping & Harvesting SDMs also indicate the highest overall scalability (SWaMI Rank 1 of 5), due to the involvement of both large private manufacturing and distribution networks for product offerings, and the long-term, intensive focus on P&H solutions across the largest-scale development sector actors in the SWaM System.

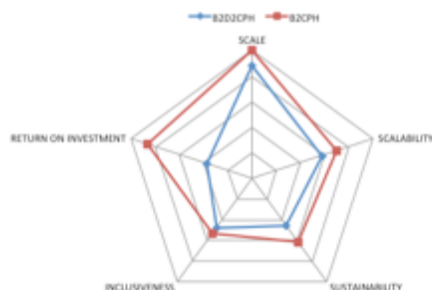


Figure 29. SWaMI Scores by SDM, Pumping & Harvesting Cluster

Sustainability across Pumping & Harvesting SDMs is relatively weak (SWaMI Rank 4 of 5), primarily due to the inability of most P&H SDMs to fully provide safe water, and because O&M in such SDMs varies considerably based on development actors' procurement policies and linkages between lead firms and local service providers in the private sector.

Pumping & Harvesting SDMs demonstrated the highest inclusiveness (SWaMI Rank 1 of 5), likely due to the combination of widespread private service provision, and because of explicit strategies of development programs providing P&H SDMs. **Return on Investment in Pumping & Harvesting SDMs is generally good (SWaMI Rank 2 of 5),** which appears due to fully commercial investments in these solutions, but also because of the relatively low investment costs associated with P&H product offerings in comparison to complex infrastructure necessary for Pipes & Taps or Plants & Kiosks SDMs.

Overall, Pumps & Harvesting SDMs exhibit both demonstrated scale and high potential, but are an incomplete solution – testing and treatment are typically unaffiliated with P&H SDMs.

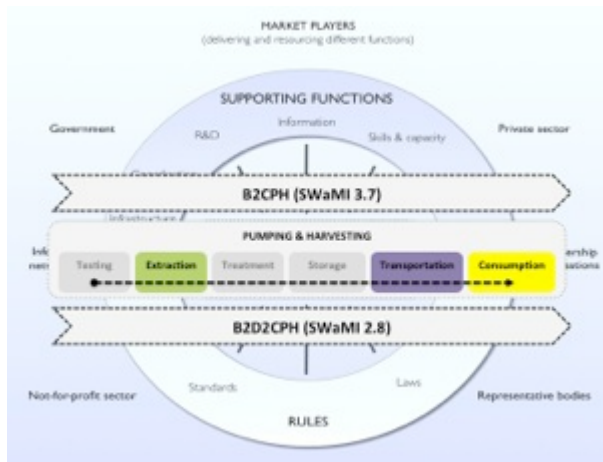


Figure 30. Pumping & Harvesting Service Delivery Models in Bangladesh SWaM System

Large-scale B2C input supply of Pumping & Harvesting solutions are widely available throughout the country. They have sales/ dealer/ retailer network all around the country (in 64 districts). They provide service warranty for their product. Their customers can get after service within 1 to 2 hours after they demand for it. They invest heavily on product promotion and advertisement (electronic and print media; miking, fairs, etc.). They organize regular meetings and conferences with their dealers, retailers and after sales service providers and train/ aware them on different company issues. They have a separate research cell which research on new product inception and product development. **However, the sustainability of these solutions requires systematic, scalable O&M service provision at the local level so that infrastructure does not break or become contaminated over time.**

Local B2C service providers are well-positioned to provide Pumping & Harvesting products and O&M to BoP consumers. Large input supply firms achieve horizontal scale through widespread dealership networks of local hardware retailers; service warranties are standard from dealers. Typically, supporting services such as O&M are then provided by local drillers/technicians with pre-existing commercial and/or social ties to the hardware retailers. Customers can receive after-sales services within 1 to 2 hours after they demand for it. As a result, local service provision to consumers is typically fair to strong.

Financing is moderately available, but because prices of typical product offerings such as

tubewells and handpumps are not that cheap, BOP is not always reached. BoP consumers are not always reached since the price of some of their product offerings are relatively high for some market segments, and they do not provide any credit service or link customers with any financial service providers.

Regardless of the scale of B2C-P&H channels, a B2D2C-P&H SDM remains prominent. Under this SDM, private technology firms manufacture or import different kinds of products including tube wells, hand pumps, submersible pumps, and/or filtration plants. Importantly, these firms do not have any sales network for their products and sell most or all of their products to GOB (60-70%) and/or NGOs (25-35%) through tendering arrangements. Private customers totaling less than 5% of total sales. Further, these firms typically do not have any strategic B2B partnerships other than limited installation and/or O&M contractors.

These firms typically do not have proper business plans and lack strong management expertise. Key private sector considerations such as profit maximization, increased ROI, expansion, and penetration are not assessed or projected. There are typically no RD&D activities as well. Though these firms measure performance through profitability, cost concerns across public/development-sector customers typically exert a downward pressure on the quality of the products offered, particularly prior to 2009. Although they have been involved in manufacturing, importing and assembling different water related products, according to the organization the main goal of this entity is to provide trainings on farm machineries, but not to increase their product or service network and capacity. At present, they do not have any sales networks for their products and mostly sell the manufactured or imported products to GOB or NGOs. Further, there are no marketing or promotional activities for their products. Finally, **B2D firms are typically not directly linked to LSPs or end users.** Therefore, when a public or development project that has procured from a PH/B2D firm ends, the end users have no established means to engage the firm. However, one firm expressed a general long-term interest in training small entrepreneurs who will be able to test water quality from the firm's product offerings.

"Testing" Models

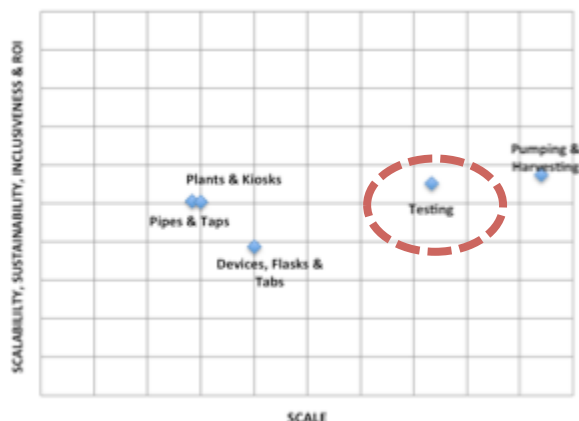


Figure 31. Testing Cluster in the Bangladesh SWaM System

	SWaMI Rank (1 to 5)
Scale	2
Scalability	2
Sustainability	3
Inclusiveness	1
Return on Investment	4
Total SWaMI Score	2

SWaMI Says

Testing SDMs represent 17% of all distinct SDMs observed in the Bangladesh SWaM System.

- Under the D2C-T SDM, the NGO employs LSPs who provide a variety of WASH-related services, including arsenic testing. Payment for testing services is a combination of own-purchasing by the consumer and subsidies provided by the NGO and/or GOB.
- Another form of the D2C-T SDM involves the manufacturing and sale of microbiological and/or arsenic testing kits and/or supporting services by an NGO.
- Under the T/D2G2C SDM, development organizations provide the majority of funding for LGI-led arsenic screening services provided to consumers.
- As service provision is predominantly driven by public financing, the sustainability of this model in the absence of continual development sector presence is unclear.
- Scalability may actually be constrained under this SDM, as it may be crowding-out viable private sector service providers.

Testing SDMs demonstrate relatively strong scale (SWaMI Rank 2 of 5), primarily due to public and development sector SDMs. Private sector involvement in this cluster is limited. **Testing SDMs exhibit good scalability (SWaMI Rank 2 of 5), due**

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primarily to greater public sector interest and established public sector SDMs in this cluster.

Sustainability across Testing SDMs is moderate (SWaMI Rank 3 of 5), due to the long-term commitment of public and development sector service providers, and because of the relatively low investments and skills & capacity required to deliver the service. **Testing SDMs are highly inclusive (SWaMI Rank 1 of 5),** as they typically address communities of consumers, including the lowest market-segments, and because the services are relatively inexpensive.

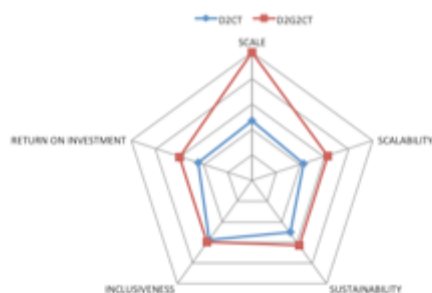


Figure 32. SWaMI Scores by SDM, Testing Cluster

Return on Investment in Testing SDMs is relatively weak (SWaMI Rank 4 of 5), due to the predominance of public and development funding for service delivery, particularly in terms of most services being offered with subsidies.

Overall, Testing SDMs are a critical cluster, particularly in combination with Pumping & Harvesting and Devices, Flasks & Tabs SDMs, as testing is typically a necessity to ensuring general access to safe water (Pumping & Harvesting), and to a lesser extent understanding which market segments require DFT products and services.

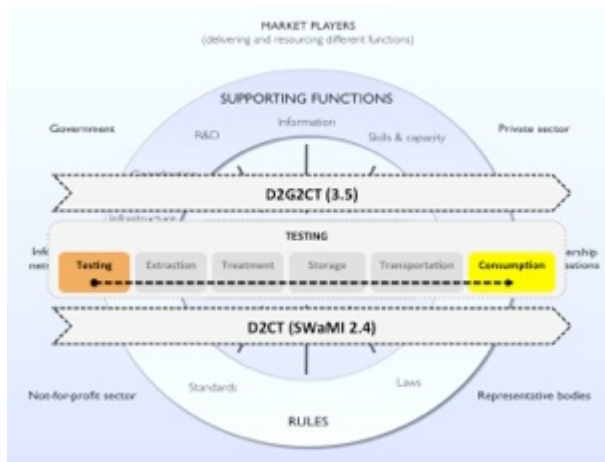


Figure 33. Testing Service Delivery Models in Bangladesh SWaM System

Under the D2C-T SDM, the NGO employs LSPs who provide a variety of WASH-related services, including arsenic testing. Payment for testing services is a combination of own-purchasing by the consumer and subsidies provided by the NGO and/or GOB. These services are minimally promoted. Further, the model may crowd-out private LSPs, though the extent to which this may be occurring is unclear.

Another form of the D2C-T SDM involves the manufacturing and sale of microbiological and/or arsenic testing kits and/or supporting services by an NGO. The kits are relatively inexpensive, but sold almost exclusively to other development organizations and/or programs, or are both manufactured, distributed and provided directly to consumers. Initial investments by the development actor drive the RD&D of the testing kit technology. But the testing products are typically considered relatively difficult to use for consumers and supporting services, particularly in terms of proper usage and O&M, are either non-existent or are only provided under the auspices and timeframes of specific development projects/programs.

Under the T/D2G2C SDM, development organizations provide the majority of funding for LGI-led arsenic screening services provided to consumers. Development programs equip UPs with arsenic testing field kits that enable the UPs to provide pay-for-use arsenic screening services to consumers through a combination of own-purchasing and subsidy provided by the UP. UPs typically charge approximately BDT 50 per test,

supporting the UP to purchase the reagent necessary for future arsenic testing. The UPs also promote the service to consumers, keep records of test results and review delivery progress in its monthly meetings.

As service provision is predominantly driven by public financing, the sustainability of this model in the absence of continual development sector presence is unclear. If development and public funding streams are maintained and/or expanded credibly in the long-run, the SDM is likely to be relatively sustainable. If these funding streams are reduced or eliminated, however, there is no clear revenue stream for prolonged service provision.

However, scalability may actually be constrained under this SDM, as it may be crowding-out viable private sector service providers that could potentially drive both vertical and horizontal scaling. Currently, LGI service providers do not have any financial or intangible incentives to maintain/improve the quality of services offered or to maximize market penetration and/or expansion. Further, UP service provision inherently restricts service provision to the political boundaries of the UP itself, regardless of demand dynamics outside those borders.

“Pipes & Taps” Models

Pipes & Taps SDMs offer a complete “turn key” safe water solution, but require significant investments with weak horizontal scalability

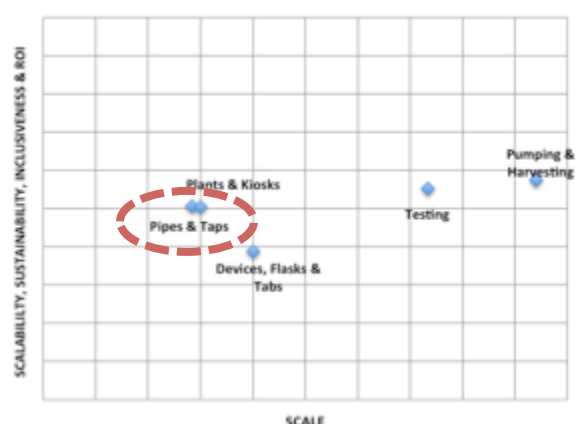


Figure 34. Pipes & Taps Cluster in the Bangladesh SWaM System

	SWaMI Rank (1 to 5)
Scale	5
Scalability	4
Sustainability	1
Inclusiveness	3
Return on Investment	3
Total SWaMI Score	3

SWaMI Says

Pipes & Taps SDMs represent 35% of all distinct SDMs observed in the Bangladesh SWaM System.

- D2G2C-P&T SDMs focus on providing financing and technical support to LGIs for the installation, operation and maintenance of piped water systems.
- Sustainable service delivery by UPs under D2G2C-P&T is questionable.
- The G2D2C model involves a SAGI providing interest-free financing and technical support to an NGO or association service provider for piped network access for consumers.
- The NGO/association generates profits through the SDM, overall, yet there are few plans across involved actors for expansion and investment in water services.
- Horizontal scaling is a significant challenge to this SDM.

Pipes & Taps SDMs demonstrate the lowest scale on average (SWaMI Rank 5 of 5), but are widely adopted in Bangladesh by a variety of organiza-

tions, particularly in PPP SDMs between the public and development sectors.

Pipes & Taps SDMs exhibit weak overall scalability (SWaMI Rank 4 of 5), due primarily to the relatively small numbers of households reached given initial capital investments and enabling environment needs. **Sustainability across Pipes & Taps SDMs is relatively strong (SWaMI Rank 1 of 5)**, due to the long-term commitment of service providers in the cluster, whether NGO, public or private.

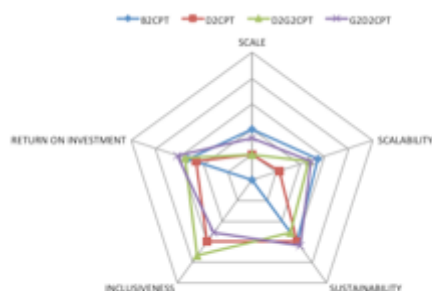


Figure 35. SWaMI Scores by SDM, Pipes & Taps Cluster

Pipes & Taps SDMs can be relatively inclusive (SWaMI Rank 3 of 5), but require carefully planned and resourced financing channels in order to include lower BoP market segments in piped supply, due primarily to prohibitively high connection fees. **Return on Investment in Pipes & Taps SDMs is generally moderate (SWaMI Rank 3 of 5)**, due to the fees generated from tariffs across most SDMs observed in Bangladesh under this cluster.

Overall, Pipes & Taps SDMs offer a complete “turn key” safe water solution, but require significant investments of capital, human resources, and very long timeframes (more than 10-15 years minimum), particularly given the **weak horizontal scalability** of an individual piped “mini-utility”.

D2G2C-P&T SDMs focus on providing financing and technical support to LGIs for the installation, operation and maintenance of piped water systems. Under these SDMs, the NGO provides financing to selected UPs to build, operate and maintain piped water networks. Such projects begin with feasibility studies for plant building and financing requirements. Following selection of installation locations, the NGO provides financing to a service-authority level government institution to install the plant and pipe network, from which

a consultancy fee is paid. The NGO then develops an installation and O&M plan with the UP. During setting up the pipeline, the SAGI takes recommendations from LGI officials.

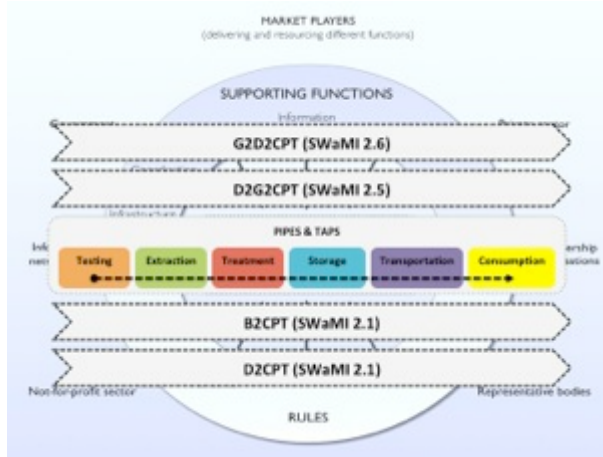


Figure 36. Pipes & Taps Service Delivery Models in Bangladesh SWaM System

At that point, the NGO also hires a dedicated workforce (1 accountant and 3 community organizers), housed in the UP office, to monitor all project activities collect connection fees and service tariffs. The community organizers assess the local demand, assess households that want to buy the service, map a route of the probable pipeline and share it with the GI charged with plant installation. The NGO provides technical supervision throughout the entire process.

Sustainable service delivery by UPs under D2G2C-P&T is questionable. Project staff are appointed only for the project period- 2yrs. After the project ends, UP staffs are supposed to monitor all the project activities, service provision, maintenance, tariff collection and repair. It might be difficult for them with their extremely busy schedule and small manpower. After the project phase-out, UP staffs are expected to monitor all the project activities, service provision, maintenance, tariff collection and repair. However, the UP staffs stated their concern and fear about this fact that how much they will be able to monitor project activities. Because already they have been overburdened with many GOB tasks and according to them it would be really difficult for them to make out extra time for this task.

The G2D2C model involves a SAGI providing interest-free financing and technical support to an

NGO or association service provider for piped network access for consumers. The SAGI first solicits interest across any interested NGOs to be involved in the SDM. NGO partners are expected to procure the land for plant installation, select land with relatively good infrastructure and energy access, and demonstrate community support in areas with at least 500 households in order to be considered for selection.

NGO/association staff play a crucial role in convincing the households to come under their service network, to install pumps on their lands, and also to contribute some amount as the installation money. Recruiting locals as NGO/association staff has both positive and negative impacts. On the positive side, many local people are more interested in adoption because of the local involvement. However, there is some evidence of biased service provision in selecting and engaging customers.

The NGO/association generates profits through the SDM, overall, yet there are few plans across involved actors for expansion and investment in water services. Rather, an emphasis is generally on cross-subsidizing other development initiatives such as education or microcredit rather than further focus on the water business. The NGO/association diversifies revenues through irrigation water provision, as well. Service access is typically less than drinking water supply. Service provision for irrigation is also considered irregular.

Horizontal scaling is a significant challenge to this SDM. Mini-utilities generally reach capacity at around 300 to 500 households, and outreach to new areas requires the full investment to establish and maintain an additional network. Further, horizontal scaling through increased numbers of NGOs/associations is challenging, as many existing organizations do not have the management and resourcing capacity for inclusion in the SDM. Further, the NGO/association typically does not have the capital to invest in additional market research for expansion into new areas.

"Plants & Kiosks" Models

Plants & Kiosks SDMs demonstrate moderate potential but weak scale at present

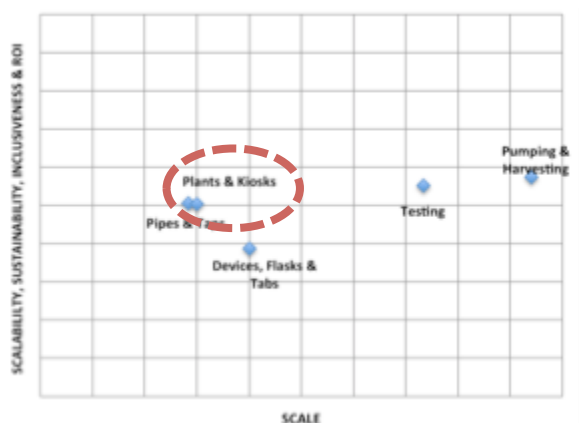


Figure 37. Plants & Kiosks Cluster in the Bangladesh SWaM System

	SWaMI Rank (1 to 5)
Scale	4
Scalability	5
Sustainability	1
Inclusiveness	5
Return on Investment	1
Total SWaMI Score	3

SWaMI Says

Plants & Kiosks SDMs represent 9% of all distinct SDMs observed in the Bangladesh SWaM System.

- Direct B2C water delivery through a P&K SDM remains largely unproven and small-scale.
- Plant establishment remains a key challenge in the B2C-P&K SDM.
- Marketing and promotion under this SDM is generally highly context-specific at the point of sale.
- B2D2C-P&K SDMs pair international technology firms with NGOs in Bangladesh who provide bottled water or kiosk water services to BoP consumers on a commercial basis.
- Regardless of the product offering(s) in this SDM, the plant technology is not available on the market in Bangladesh.
- Regulatory issues are a critical constraint for bottled water SDMs.

Plants & Kiosks SDMs demonstrate weak scale (SWaMI Rank 4 of 5), due primarily to the nascent state of such SDMs and the lack of clarity around effective P&K business cases, regardless of pri-

vate, public or development sector service provision.

Plants & Kiosks SDMs also indicate weak scalability (SWaMI Rank 4 of 5), which appears due to the relatively weak business cases developed under this cluster, driven in large part by the need to balance initial capital investments and O&M related to the plant or kiosk with capacity across extraction, treatment, storage, and transportation.

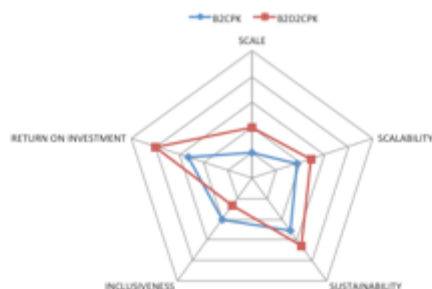


Figure 38. SWaMI Scores by SDM, Plants & Kiosks Cluster

Sustainability across Plants & Kiosks SDMs is relatively high (SWaMI Rank 1 of 5), likely due to increasing private sector involvement in providing fully commercial P&K water products and services, and greater overall flexibility in targeting interested consumers through non-piped transportation channels to the market.

Plants & Kiosks SDMs demonstrate the weakest inclusiveness (SWaMI Rank 5 of 5), which appears due to the relatively high prices of bottled water products typical of P&K SDMs or burdens placed on lower-BoP market segments to bear transportation costs to purchase water from a kiosk. **Return on Investment in Plants & Kiosks SDMs is the strongest (SWaMI Rank 1 of 5)**, which is likely due to the relative predominance of fully commercial or highly commercial actors and SDMs under the cluster.

Overall, Plants & Kiosks SDMs demonstrate moderate potential but weak scale at present; significant additional RD&D and service delivery piloting is required across both development and private sector actors in the space before the long-run potential of P&K SDMs is better understood.

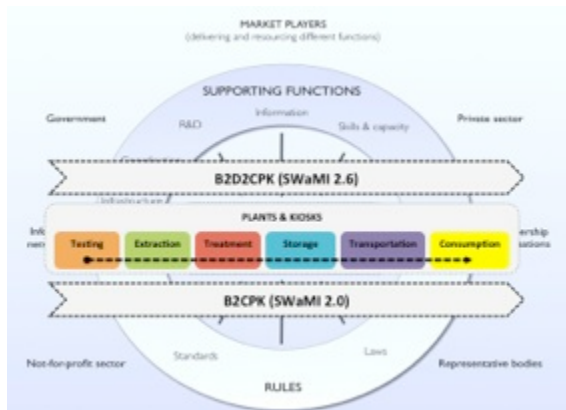


Figure 39. Plants & Kiosks Service Delivery Models in Bangladesh SWaM System

Direct B2C water delivery through a P&K SDM remains largely unproven and small-scale. Like other P&K SDMs in Bangladesh, the model uses small-scale water plants to sell bottled water to surrounding markets. B2C SDMs aim primarily at direct bottled water sales to urban and peri-urban markets, though several firms have expressed medium-term interest in expansion into rural markets as well. At least one firm began in rural markets, but shifted to urban and peri-urban markets as the business case was not strong. **Plant establishment remains a key challenge in the B2C-P&K SDM.** Indifference and/or minimal assistance from LGIs and SAGIs in terms of site selection, utilities access and other forms of in-kind or coordination support significantly limit the ability of B2C-P&K firms to efficiently identify and establish new plants for expansion and/or further market penetration.

Marketing and promotion under this SDM is generally highly context-specific at the point of sale. Sales and distribution staff typically do not have a uniform strategy in terms of value propositions such as taste, appearance, or health. Instead, sales are generally made with a door-to-door mentality in which each potential customer's value proposition(s) are identified over the course of the sales pitch. Marketing and advertising activities also may include community events such as parties and music events in new service areas.

B2C firms are increasingly exploring technical assistance partnerships with the development sector for D2B2C models, and also with the public sector. Partnering with development programs and organizations appears to be a viable means

of horizontal scaling by subsidizing the B2C model directly, or by cross-subsidizing fully B2C operations in other areas through development funding.

B2D2C-P&K SDMs pair international technology firms with NGOs in Bangladesh who provide bottled water or kiosk water services to BoP consumers on a commercial basis. Under the bottled water SDM, the NGO establishes and operates a small groundwater extraction and treatment plant in arsenic-contaminated areas, installed by a Dhaka-based engineering firm, then bottles the water in two types of bottles (10 liter and 20 liter) for sale at different prices (10 liter – 15 taka; 20 liter – 30 taka; 1.5 taka per liter). Distribution occurs through a home delivery service using vans and/or mini-trucks. Regardless of the product offering(s) in this SDM, the plant technology is not available on the market in Bangladesh. Rather, the technology is procured by the NGO directly from an international manufacturer/distributor and installed in the market. Importantly, in areas where arsenic must be filtered, there are considerable challenges at present with disposal. Arsenic treatment plants continually collect and must address arsenic removed from the water product.

Regulatory issues are a critical constraint for bottled water SDMs. Selling water commercially in Bangladesh requires certification and authorization letter from the Department of Environment (DoE). Typically, this is a lengthy and expensive process to get the license which can take as long as 30 months. However, there is evidence across stakeholders that following DoE approval may increase the acceptability and uptake of bottled water service by consumers due to increased trust in the product offerings.

This SDM appears moderately sustainable because it offers home delivery service and favors local employment. The income from water sales helps repaying the NGO's debts, and also can be applied to variable cost/or business expansion. Yet following plant installation and warranty-related O&M services, there are no additional private sector linkages under this SDM. However, financing for horizontal scaling remains an important constraint; at present, this SDM does not have access to financial services for expansion into new geographic areas, which is critical given that initial costs to install the plant are high.

“Devices, Flasks & Tabs” Models

Devices, Flasks & Tabs SDMs demonstrate high conceptual potential but weak scale and potential under existing SDMs.



Figure 40. Devices, Flasks & Tabs Cluster in Bangladesh SWaM System

	SWaMI Rank (1 to 5)
Scale	3
Scalability	3
Sustainability	5
Inclusiveness	4
Return on Investment	5
Total SWaMI Score	5

SWaMI Says

Devices, Flasks & Tabs SDMs represent 9% of all distinct SDMs observed in the Bangladesh SWaM system.

- The B2D2C-DF&T SDM describes an NGO that purchases HWTS product(s) from an international private sector supplier, then sells those filters to other NGOs for sale or distribution to consumers.
- Financing can be a significant hurdle to BoP market penetration depending on the HWTS product offering.
- Marketing and promotion is limited toward consumers; sales are exclusively B2D, or driven by NGO staff to consumers through a project or program.
- Large-scale commercial sale of POU HWTS products is anticipated in the next few years.

Devices, Flasks & Tabs SDMs demonstrate moderate scale (SWaMI Rank 3 of 5), due to moderate distribution across existing, development sector-driven SDMs but an absence of private sectors SDMs.

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Devices, Flasks & Tabs SDMs also indicate moderate scalability (SWaMI Rank 3 of 5), again due to the predominance of development sector-driven service provision at present. However, the introduction of relatively large-scale provision of HWTS products in the near-term by the private sector is likely to dramatically increase the scalability of DFT SDMs in the near future. Large input supply firms that effectively distribute HWTS product offerings to BoP consumers at large-scale through dealer networks have not yet begun to enter DFT markets.

Sustainability across Devices, Flasks & Tabs SDMs is weak (SWaMI Rank 5 of 5), likely due to the need for development actors to directly resource and procure the product offerings delivered through existing SDMs, and the lack of established commercial supply chains for HWTS products. Further, O&M of DFT products, especially filters, is non-existent independent of development sector programs.



Figure 41. SWaMI Scores by SDM, Devices, Flasks & Tabs Cluster

Devices, Flasks & Tabs SDMs demonstrate weak inclusiveness (SWaMI Rank 4 of 5), as development actors procuring and distributing such products have not focused attention and resources toward market segmentation and inclusive targeting in current service delivery. **Return on Investment in Devices, Flasks & Tabs SDMs is also weakest (SWaMI Rank 5 of 5),** as there are no clear channels for O&M, a critical component of DFT solutions, and because DFT products have not been manufactured and/or imported at scale in Bangladesh to date.

Overall, Devices, Flasks & Tabs SDMs demonstrate high conceptual potential but weak scale and potential under existing SDMs. However, it is likely that increased private sector involvement in DFT

SDMs in the near-term will radically improve the potential of this cluster. One of the main advantages of self-supply is that household-owned systems tend to be better maintained than communal systems. For HWTs products, “Once households have invested in a system, they are more likely to keep using it, and to do so correctly and consistently, if it is relatively easy and convenient to operate, maintain, and repair.”⁹² Reasons include the fact that households are more likely to maintain a water system that is also legally their own and that does not require relatively complex CBM arrangements. In addition, the costs for maintaining such systems tend to be lower. Filters typically last 1-2 years, after which they require the replacement of the whole or part of the device. Some models last longer but instead require the filtering cartridge to be replaced more often. Devices typically include a storage container to ensure water remains safe until consumption. **Marketing and behavioral economics plays a particularly important role in POU solutions, as consumer choice is a key determinant of adoption.**

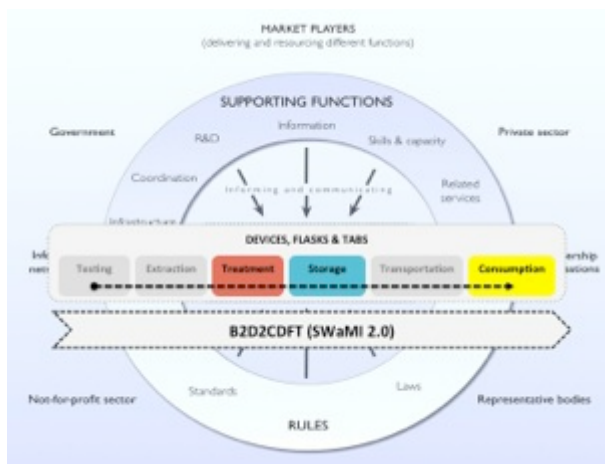


Figure 42. *Devices, Flasks & Tabs Service Delivery Models in Bangladesh SWaM System*

The B2D2C-DF&T SDM describes an NGO that purchases HWTs product(s) from an international private sector supplier, then sells those filters to other NGOs for sale or distribution to consumers. As many as 50,000 units of a specific product have been sold under this model, but predomi-

nantly to NGO program beneficiaries rather than open commercial distribution channels.

Marketing and promotion is limited toward consumers; sales are exclusively B2D, or driven by NGO staff to consumers through a project or program. After sales service is typically poor during active sales and distribution in this SDM, and after a project ends there are no assurances that consumers in that area will have any further access to the product or associated services. LSPs independent of NGO staff are not developed or engaged under this SDM.

This model enables relatively wide horizontal scaling in the short-term, but sustainability is limited due to development channels acting as the only distribution channel. While a sales-driven model generates revenues that reduce cost burdens to production and distribution there is a absence of a proper business plan and motive to increase the business scale to cover larger coverage, to come up with new innovative products, and to invest more on marketing.

Large-scale commercial sale of POU HWTs products is anticipated in the next few years. At least one national conglomerate has a business case under development for a phased roll-out of carbon filters with a plastic housing, beginning with a product offering aimed at middle-income urban consumers, then eventually expanding into BoP rural market segments as well with an affordable, modified product offering. It is anticipated these product offerings will be distributed through existing supply chains, including dealership networks in rural areas.

⁹² Figueroa ME, Kincaid DL. Social, cultural, and behavioral correlates of household water treatment and storage. In: *Managing Water in the Home*. Geneva: World Health Organization; 2006.

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