FINANCING MECHANISMS FOR WASTEWATER AND SANITATION

ASIAN DEVELOPMENT BANK

50 YEARS

ADB

FINANCING MECHANISMS FOR WASTEWATER AND SANITATION

ASIAN DEVELOPMENT BANK

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ABBREVIATIONS

ADB	Asian Development Bank
BOT	build–operate–transfer
BPL	below-poverty-line
BWD	Baliwag Water District
CDM	Clean Development Mechanism
CER	certified emission reduction
DCWD	Dumaguete City Water District
GHG	greenhouse gas
GPOBA	Global Partnership on Output-based Aid
KREDIT	KREDIT Microfinance Institution (Cambodia)
LGU	local government unit
MFI	microfinance institution
NGO	nongovernment organization
NWSDB	National Water Supply and Drainage Board
O&M	operation and maintenance
OBA	output-based aid
PPP	public–private partnership
SFRC	Sewerage Finance Research Committee
TNUIFSL	Tamil Nadu Urban Infrastructure Financial Services Limited
TSC	total sanitation campaign
TUFIDCO	Tamil Nadu Infrastructure Development Corporation
USAID	United States Agency for International Development
WSP	Water and Sanitation Program (World Bank)
WUSC	water users and sanitation committee

BACKGROUND

Local or city governments are generally responsible for implementing wastewater and sanitation projects, which unfortunately, are less prominent and therefore viewed as less politically attractive compared with other infrastructure projects such as roads and water supply. Innovative financing should therefore be adopted to encourage local governments to implement wastewater and sanitation projects. Subsidies or grants from the national government or from donor institutions are important elements that will ensure the implementation of these projects.

In the Philippines, the national government instituted the National Sewerage and Septage Management Program (NSSMP) as mandated by the Clean Water Act of 2004, to encourage local government units (LGUs) to implement sewerage and sanitation projects. The national government, through the Department of Public Works and Highways, can provide subsidy of up to 40% of the total cost of sewerage projects of highly urbanized cities. However, as of this writing, there are no takers yet of the NSSMP subsidy among the LGUs. The reasons for the nonavailment of the subsidy include the (i) absence of feasibility studies, (ii) delay in the passage of local ordinance that would support the sewerage project, and (iii) preference of LGUs to implement septage projects which are less costly compared with sewerage systems. The NSSMP guidelines are currently being reviewed by oversight agencies with proposed revisions to allow provision of subsidy (i) not only for sewerage projects but also for septage projects, and (ii) directly to water districts rather than through the LGUs.

This report compiles the financing mechanisms utilized in the implementation of wastewater and sanitation projects in various countries. It aims to examine how these projects were financed and thus, provide insights into possible financing approaches that can be replicated, not only in the Philippines but in other countries as well.

Objective of This Report

This compilation of financing mechanisms is intended to serve as a guide for government and/or city planners and utility managers in developing their own wastewater and sanitation projects. Specifically, the financing flowcharts should help them visualize the flow of funds and identify possible sources of funding, including grants and loans. It is also envisioned that the examples of financing mechanisms can help cities identify the business models that they can adopt given their specific circumstances.

Financing Mechanisms Reviewed

Financing sewerage and sanitation projects can be in several forms. In Kitakyushu, Japan, the central government provided subsidy to the city government in the construction of sewer lines and wastewater treatment plants. In Alandur, India, the municipality worked with a private sector partner in constructing and operating a sewerage treatment plant. In Dumaguete City, Philippines, the city government and the water district collaborated in constructing and operating the septage treatment plant and in the purchase of desludging trucks. In Baliwag, Philippines, the water district implemented a septage management project on its own, with the local government's role limited to providing the regulatory regime and support to the advocacy campaign. In Kinoya, Fiji, methane generated by the anaerobic decomposition of organic matter in sludge of a sewerage treatment plant is recovered and earns certified emission reduction (CER) credits that result in increased revenues to the national government from the sale of CERs. Various approaches in financing on-site sanitation are also being utilized.

In Viet Nam, a sanitation revolving fund was set up to provide loans to low-income households for building on-site sanitation facilities. In Cambodia, microfinance loans for sanitation were piloted to address the challenge of reaching low-income households with improved sanitation solutions. In Maharashtra, India, sanitation campaign and awareness activities, which are conducted to generate demand and village-level mobilization, are combined with small hardware subsidies for the poorest households and monetary rewards for villages that achieve overall cleanliness. In Sri Lanka, subsidy and output-based aid (OBA) are utilized with the aim of increasing household access to sanitation. In Cambodia, the national biodigester program employs subsidy and carbon credits to encourage the use of biodigesters among farming communities. In Nepal, an OBA scheme uses performance-based grants to support the delivery of basic services to poor households that have traditionally been left out or provided with poor quality service. Table 1 shows a summary of financing mechanisms adopted by the countries.

The financing mechanisms can be grouped into several categories, including subsidies and/or grants, public–private partnerships (PPP), OBA, carbon credits, microfinancing and/or revolving funds, and partnerships. The following describes the nature of each financing category.

Subsidies and/or Grants. Subsidies and grants are important features in most of the financing mechanisms since they provide viability gap funding. Without subsidies and grants, most projects would not be financially viable and would never get to the implementation stage. Subsidies and grants may come from the national government (e.g., Kitakyushu Wastewater Project, Alandur Sewerage Project, and the community-led total sanitation in Maharashtra) and from the local government (e.g., Kitakyushu Wastewater Project). Donor institutions also provide funding to ramp up investments in wastewater and sanitation [e.g., Global Partnership on Output-Based Aid (GPOBA) in increasing household access to sanitation in Sri Lanka] or through technical assistance in the conduct of feasibility studies [e.g., United States Agency for International Development (USAID)-funded Philippine Water Revolving Fund feasibility studies for the Dumaguete and Baliwag septage management projects].

Table 1: Summary of Financing Mechanisms

Project	Country	Financing Mechanism
Subsidy		
1 Kitakyushu Wastewater Management Project	Japan	City government financing (bonds and general account) with subsidy from central government and beneficiary contribution
2 Maharashtra Community-led Total Sanitation	India	Central government-financed sanitation awareness campaign with hardware subsidies for poor households
Public–Private Partnership		
3 Alandur Sewerage Project	India	Loans and grants for sewer lines; public–private partnership for sewerage treatment plant
Output-Based Aid		
4 Increasing Household Access to Domestic Sanitation in Greater Colombo	Sri Lanka	Subsidy and output-based aid
5 Output-based Aid for Sanitation	Nepal	Performance-based grants for construction of household latrines
Carbon Credits		
6 Kinoya Sewerage Treatment Plant	Fiji	Carbon credits
7 National Biodigester Program	Cambodia	Subsidy and carbon credits
Microfinance		
8 Sanitation Revolving Fund	Viet Nam	Revolving fund managed by the Women's Union
9 Microfinance Loans for Sanitation	Cambodia	Microfinance loans managed by microfinance institutions
Partnership		
10 Dumaguete Septage Management Project	Philippines	Collaboration between local government and water utility
11 Water District Septage Management Project	Philippines	Water utility-led septage management project

Source: ADB. 2015.

Public–Private Partnership. The Alandur Sewerage Project is an example of a successful PPP project in the sanitation sector wherein the city government funded the sewerage network through loans and grants while the private sector partner [build–operate–transfer (BOT) operator] funded the construction of the sewerage treatment plant.

Output-based Aid. Performance-based subsidies are disbursed based on the delivery of pre-agreed outputs and after an independent verification. This ensures that facilities are constructed according to specifications and based on the desired quality. OBA schemes are shown in the OBA for sanitation in Nepal and in increasing household access to domestic sanitation in Sri Lanka.

Carbon Credits. Carbon financing provides additional revenues that can enhance the financial viability of sanitation and wastewater projects. Examples of additional revenues from carbon credits are the Kinoya Sewerage Treatment Plant in Fiji and the National Biodigester Program in Cambodia.

Microfinance and/or Revolving Funds. Microfinance loans are provided to finance the construction of sanitation facilities at the household level (e.g., toilets, connection to sewers, etc.) that are otherwise not covered in the bigger sanitation or wastewater projects. The targets of microfinance are usually the low-income households that have no access to sanitation facilities. Examples of microfinance are in Cambodia, where microfinance loans for sanitation are handled by MFIs, and the sanitation revolving fund in Viet Nam that provides loans to low-income households and managed by the Women's Union.

Partnerships. Cities and water utilities responsible for sanitation and/or wastewater management can work with partner groups or organizations not only to gain financing support but also to benefit from their management and technical expertise. Partnerships can be between the city and the water district (e.g., Dumaguete Septage Management Project); and the municipality and the private sector (e.g., municipality and BOT operator in the Alandur Sewerage Project). An interesting case is that of the Baliwag Water District (BWD), which initially collaborated with the LGU of Baliwag for possible partnership in implementing the project. The LGU was able to help in terms of providing the regulatory framework (septage ordinance) and in the advocacy campaign. Eventually, however, the BWD decided to pursue the project on its own, and financed the septage project through its equity and a loan from a local bank. This case demonstrates that septage projects can be implemented by water utilities on their own, even without subsidies from the national government or cost sharing with the LGU. One vital component is to put in place a cost recovery mechanism through the collection of user charges.

I. SUBSIDY

Kitakyushu Wastewater Management (JAPAN)

Table 2: Financing Mechanism and Tariff-Setting Principle for Kitakyushu Wastewater Management Project

		Financing Mechanism			Tariff-Setting Principles	
Project	Country	National Government	City Government	Beneficiary contribution	Cost Recovery of CAPEX	Cost Recovery of OPEX
Kitakyushu Wastewater Management Project	Japan	26% subsidy	65% municipal bonds & 6% general account of the city	3% beneficiary contribution	PARTIAL cost recovery from sewer user change	PARTIAL cost recovery from sewer user change

CAPEX = capital expenditure, OPEX = operating expenditure.

Source: ADB. 2015.

Project Description

The combined sewer system was introduced in the 1960s in almost all of the central city area of Kitakyushu. At the final stage of sewerage implementation, the combined sewer system, which covers an area of 3,422 hectares, represents 20% of the whole wastewater-treated area, while the separate sewer system has been installed in the remaining 80%.

Since 2003, the City of Kitakyushu has been fully tackling the improvement of the combined sewer system, while continuing the changeover to the separate sewer system and the construction of stormwater reservoirs for pollution control during heavy precipitation events.

Small-scale sewerage systems have been planned in suburban areas with low population density. The wastewater unit load and the minimum diameter of sewer pipes were determined based on data from water supply conditions to reduce construction costs.

The city has five wastewater treatment plants. These plants use the conventional activated sludge process and have a total capacity of 621,000 cubic meters per day (m^3/day).

Financing Mechanism

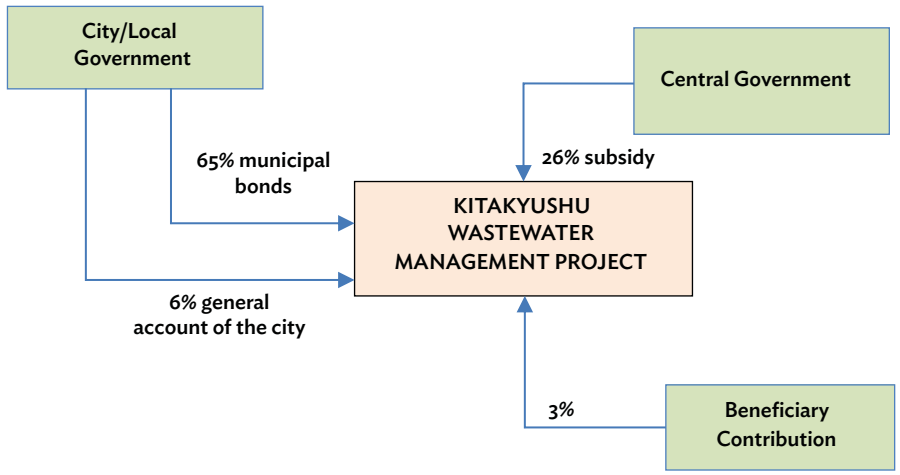
- In Japan, the implementation of sewage works is placed under the responsibility of local governments.
- The central government provides subsidies at fixed rates, which depend on the type of facilities. The provision of subsidy is based on the Sewerage Law, which also stipulates the basic rules and regulations for sewage works, and the proper planning, design, construction and management of sewerage systems.
- The funding of unsubsidized facilities is done through local bonds and the general account of the local government. Residents also partly pay for the capital cost through beneficiary contribution.
- Experts and knowledgeable persons from central and local governments were gathered in the so-called Sewerage Finance Research Committee (SFRC), whose goal is to determine the fundamental principle for the financing of sewage works according to socioeconomic conditions (i.e., decision of subsidy rules with transparency).[1] The current subsidy rate is up to 55% for eligible wastewater treatment plants, and 50% for sewer lines. Sewerage projects are eligible for national government subsidy if they are in accordance with the Comprehensive Infrastructure Development Plan and are submitted to the Ministry of Land Infrastructure, Transport and Tourism for approval.
- The total capital investment cost for sewerage facilities in Kitakyushu exceeded $7.5 billion (¥600 billion) over the last 40 years. According to the fundamental principle of sewerage finance established by the SFRC, this cost was shared between municipality bonds (65% of total cost), subsidies from the central government (26%), beneficiary contribution (3%), and the general account of the city (6%).
- At the time of bond repayment by local governments, the law authorizes about 50% redemption with the tax revenue allocated to local governments for this purpose. Generally, sewer user charges are calculated by the addition of the basic charge and the charge depending on the supplied water amount. In the case of Kitakyushu, for a family that uses 20 cubic meters per month (m^3/month), the sewer user charge is $53.65 (¥4,292) for 2 months, which is equivalent to $1.34 per cubic meter (¥107/m^3).[2] This is cheaper than in many cities of Europe.

Figure 1 shows the funding contributions for the sewerage project of Kitakyushu. Table 2, on the other hand, presents an overview of the financing mechanism and the tariff-setting principle applied in the City of Kitakyushu.

[1] SFRC was established to study the government's roles and responsibilities and to enable the rational cost for sewage works. It formulated the current fundamental principle for stormwater as a public burden and wastewater as a private burden. There are two components for sewerage systems: sewer pipes and wastewater treatment plants. For projects with grant component, the sewer pipe component will be financed through 50% national government subsidy and 50% local government subsidy (through local bonds).

[2] Conversion rate: $1.00 = ¥80.00, as of October 2012 (¥ - Japanese yen).

Figure 1: Funding Contributions for the Kitakyushu Wastewater Management Project



Source: ADB. 2015.

Lessons

- The development of a legal and financial support system from the central government was a powerful incentive for sewerage implementation. In addition, the local government also provided subsidy through the municipal bonds. Without these subsidies, the sewerage tariff would have been much higher.
- The determination of a business scheme well-suited to the characteristics of the city enabled effective project cost reductions. The scheme includes
  - (i) the appropriate cost sharing between the public and private sectors;
  - (ii) long-term forecasting of income and expenditures considering the life span of the facilities and the increase in the number of users;
  - (iii) appropriate economic management based on tangible business objectives and future business prospects; and
  - (iv) disclosure of management information to citizens as taxpayers and users who pay user charges.
- The adoption of the combined sewer system in areas with urgent needs and the establishment of a monitoring system to assess water quality in major discharge points receiving industrial wastewater from factories contributed to the success of the project.
- The strong will of the city authorities, represented by the mayor and supported by the residents, was a powerful driving force for the sewerage project.

Maharashtra Community-led Total Sanitation (INDIA)

Table 3: Financing Mechanism for Maharashtra Community-led Total Sanitation

		Financing Mechanism		
Project	**Country**	**National Government**	**State Government**	**Beneficiary Contribution**
Maharashtra Community-led Total Sanitation	India	80% of software subsidies (sanitation awareness campaign) to both APL and BPL households & 60% of hardware subsidies (latrines) for BPL households	20% of software subsidies to both APL and BPL households & 20% of hardware subsidies for BPL households	20% contribution for hardware (latrines) from BPL households

APL = above-poverty-line, BPL = below-poverty-line.

Source: ADB. 2015.

Project Description

Total Sanitation Campaign (TSC) is a nationwide program launched in 1999 and primarily funded by the Government of India. It uses a community-wide approach based on participatory principles which seeks to achieve not only 100% open defecation-free (ODF) communities, but also broader environmental sanitation objectives such as promotion of improved hygiene behaviors and solid and liquid waste management.

In the State of Maharashtra, the approach is based on a Community-led Total Sanitation in promoting sanitation, combined with small hardware subsidies for the poorest households and monetary rewards for villages that achieve overall cleanliness objectives.

Since being introduced in Maharashtra in 2000, the approach has provided incentives for more than 21 million people to adopt improved sanitation. On average, the hardware cost of the sanitation solution built was $208.

Financing Mechanism

Under the TSC program, software activities are conducted to generate demand and village-level mobilization. Separate from the TSC, monetary rewards are provided to villages that reach ODF status. The Nirmal Gram Puraskar (Clean Village Prize) is a national program that provides one-off monetary rewards from the central government to qualifying Gram Panchayats (the smallest units of local government of India). Payments are based on a set of criteria including 100% sanitation coverage of individual households and being totally free from open defecation. The payments are made following a thorough verification process. These rewards can range from $1,250 to $12,500 per Gram Panchayat, depending on the population.

Gram Panchayats can use the cash incentive to improve and maintain sanitation facilities in their respective areas with focus on solid and liquid waste disposal and maintenance of sanitation standards. In addition, the State of Maharashtra has introduced a number of state-based campaigns such as the Clean Village campaign, which takes place annually and encourages maintaining overall cleanliness in the villages. In total, approximately $15 was spent on software support per household, which represented about 7% of total sanitation adoption costs.

Hardware subsidies are also provided to below-poverty-line (BPL) households after the village has been declared ODF.[3] As they are outcome-based, hardware subsidies are referred to as "incentives" in the TSC guidelines, which are provided to households "in recognition of their achievements." The initial level of subsidy was $7.97 (Rs500) per BPL household.[4] This was raised to $19.12 (Rs1,200) in March 2006 to reflect cost inflation. The subsidy was initially intended to cover 80% of the hardware costs of a basic sanitation solution for BPL households. In practice, however, it covers only about 20% of hardware costs as most BPL households chose to invest in a higher level of service than the basic minimum.

In Maharashtra, hardware subsidies for BPL households accounted for about 22% of hardware costs for those households and were provided to 20%–59% of households, depending on the district. According to the TSC guidelines, BPL households were supposed to fund only 20% of the latrine cost, with the federal government to cover 60% and the state government 20% of the latrine cost. However, as the subsidy was capped at $19.12 (Rs1,200) and the average investment costs to BPL households in the study districts was $87.64 (Rs5,500), the actual subsidy was much lower. This was partly because actual costs tended to be higher than originally estimated, particularly in hilly areas and rocky terrain, and also because BPL households were willing and able to invest more. Prefinancing support provided at the village level, together with microcredit in certain districts, helped make such levels of investment by BPL households possible.

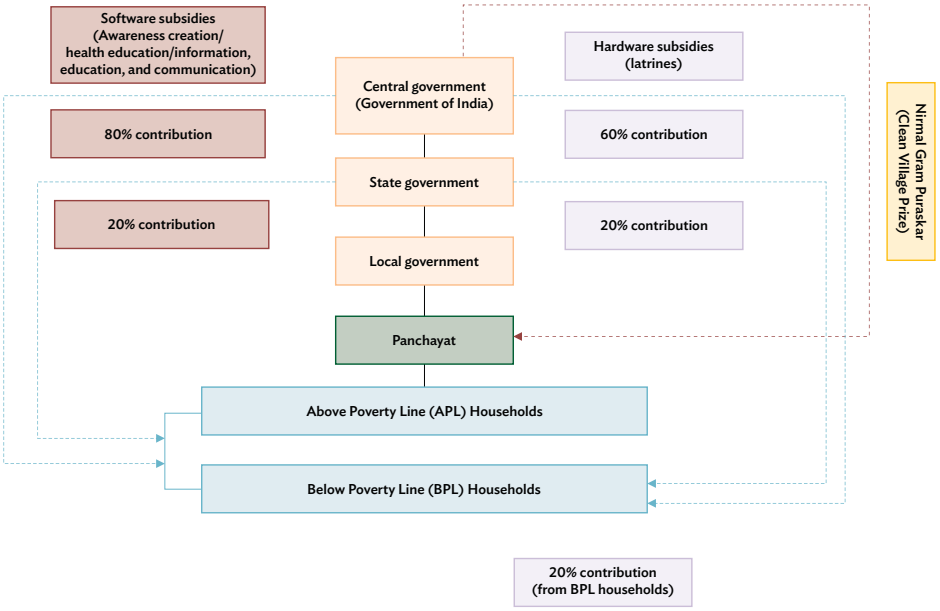
In some areas, access to credit has been provided to speed up the adoption of sanitation. Access to credit has supported stronger demand for sanitation in districts where it was systematically introduced. However, these financial products tended to be more widely available in comparatively richer districts and largely benefited above-poverty-line households in those districts.

Figure 2 highlights subsidies for TSC components. Table 3, on the other hand, presents an overview of the financing mechanism implemented in the State of Maharasthra.

[3] To measure poverty, the level of personal expenditure or income required to satisfy a minimum consumption level was determined. The Planning Commission of the Government of India uses a food adequacy norm of 2,400–2,100 kilocalories per capita per day to define state-specific poverty lines separately for rural and urban areas.

[4] Conversion rate: $1.00 = Rs62.76, as of March 2015 (Rs - Indian rupees).

Figure 2: Subsidies for Total Sanitation Campaign Components



Source: ADB. 2015.

Lessons

- The TSC can be considered one of the most effective programs in rural sanitation across the world for its focus on a community-led, demand-driven approach in reaching total sanitation in villages across the country.
- Sanitation coverage in India increased significantly from 21% to more than 65% in 2001, according to the TSC online monitoring system. The number of Gram Panchayats that won the Nirmal Gram Puraskar for achieving total sanitation also increased to more than 22,000.
- The software subsidies, which come in the form of information, education, and communication (IEC), are vital components in the TSC. Without the awareness campaigns, it would have been difficult for the program to gain acceptance among households. Since the principle of "low to no subsidy" is followed, the success and sustainability of the Community-led Total Sanitation and the TSC, in general, can be attributed to an effective IEC for awareness building and social mobilization.

II. Public–Private Partnership

Alandur Sewerage Project (INDIA)

Table 4: Financing Mechanism and Tariff-Setting Principles for Alandur Sewerage Project

		Financing Mechanism			Tariff-Setting Principles	
Project	Country	City Government	Private Sector Partners	Beneficiary Contribution	Cost Recovery of CAPEX	Cost Recovery of OPEX
Alandur Sewerage Project	India	59% loan from TUFIDCO/ TNUIFSL & 12% grant from TUFIDCO/ TNUIFSL (for sewerage network which is 83% of total project cost) + 1% of total project cost (for land acquisition)	16% of total project cost from BOT operator (for sewerage treatment plant)	29% public contribution (for sewerage network)	FULL cost recovery from sewerage fees	FULL cost recovery from sewerage fees

BOT = build-operate-transfer, CAPEX = capital expenditure, OPEX = operating expenditure, TNUIFSL = Tamil Nadu Urban Infrastructure Financial Services Limited, TUFIDCO = Tamil Nadu Infrastructure Development Corporation.

Source: ADB. 2015.

Project Description

The Alandur Sewerage Project was initiated in 1996 by the Chairman of the Alandur Municipality, which is adjacent to Chennai and forms part of the Chennai Metropolitan Area. With a population of around 165,000, Alandur is a residential suburb with predominantly residential and commercial activities. Approximately a quarter of its population lives in slums.

Prior to 1996, the town did not have an underground sewerage system and sewage was managed with individual septic tanks. The largely unregulated disposal of sewage in stormwater drains was an environmental and health concern for local residents and was frequently raised as a political issue. About 98% of the 19,800 households used either septic tanks or holding tanks collected periodically by tankers and disposed in the low-lying areas outside the municipal limits.

In 1996, the Alandur Municipality announced an ambitious plan to construct an underground sewerage system and wastewater treatment facility with the participation of the private sector, contribution from the public, and payment to be provided by the city.

The proposed sewerage system was to be designed for the estimated population of about 300,000 in 2027 and was planned to be completed within a 5-year period from its inception date. The project components included (i) a sewerage network consisting of the main sewer line, (ii) branch sewer line and manholes, (iii) construction of a sewerage pumping station, (iv) a sewerage treatment plant, and (v) low-cost sanitation. In the initial phase, the plant was to treat 12,000 m^3/day or 12 million liters per day (MLD) of sewage supplied by the municipality. The ultimate capacity was to be 24,000 m^3/day (24 MLD).

The Alandur Municipality worked in partnership with the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL), the state asset management company, and with the Financial Institution Reform and Expansion Project of the USAID.

The Alandur Sewerage Project was the first project in the municipal water sector to be taken through the PPP route in India. The construction of the underground sewerage system in Alandur town, involving the laying of pipes and construction of pumping station, was done on a bill of quantities basis, and the sewerage treatment plant on a BOT basis. Besides the construction responsibility, the contractor was also required to undertake the operation and maintenance (O&M) of the sewerage system for a period of 5 years from the date of completion of the construction, on a fixed fee basis. The collection of tariff and provision of new connections during the O&M phase was to be undertaken directly by the municipality.

Financing Mechanism

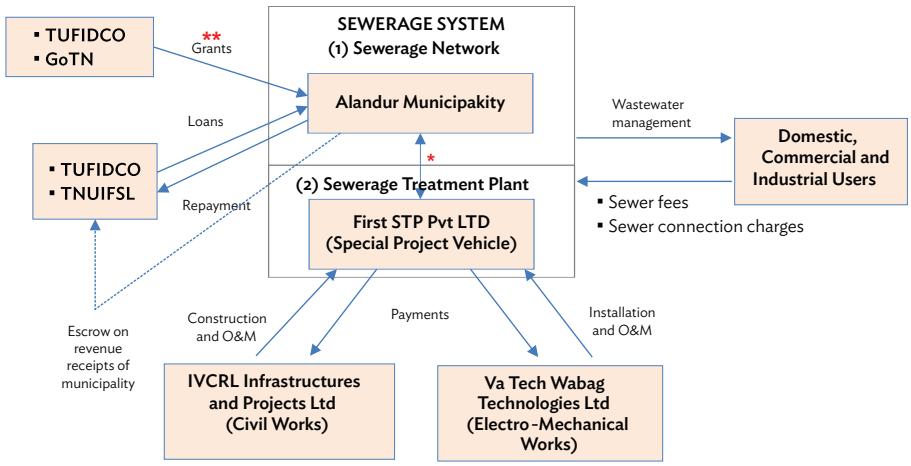
The total cost for the sewerage network, which was borne by the municipality, amounted to $5,513,067 (Rs346 million). An additional capital cost of about $1,064,372 (Rs66.8 million) for the sewerage treatment plant was financed by the BOT operator. The municipality also acquired the required land (measuring about 0.5 hectare) for the construction of the sewerage treatment plant and pumping station by using its own sources at a cost of approximately $39,834 (Rs2.5 million). Figure 3 shows the financing mechanisms for this sewerage project. Table 4, on the other hand, presents an overview of the financing mechanism and the tariff-setting principle applied in the Municipality of Alandur.

To finance the municipality's portion of the capital cost, a package of loans and grants was structured as shown in Table 5. All loans were from domestic sources and denominated in Indian rupees. A unique aspect of the project funding was the initiative of bringing in people's money to fund public infrastructure by generating public awareness and interest right from inception.

Loans

The majority of financing to the municipality (59%) was made through loans provided by the Tamil Nadu Infrastructure Development Corporation (TUFIDCO) and TNUIFSL. The loan provided by TUFIDCO was payable over 8 years (after a 2-year moratorium) at an interest rate of 5% per annum (as against a prevailing market rate of 15% at that time).

Figure 3: Financing Mechanisms for the Alandur Sewerage Project



* Take-or-pay arrangement; ** Tamil Nadu Infrastructure Development Corporation (TUFIDCO) grant fund to oversee and monitor progress of project; Government of Tamil Nadu (GoTN) grant to bridge gap in sewer account and fund part of the monthly operating costs of the system; TNUIFSL = Tamil Nadu Urban Infrastructure Financial Services Limited; O&M = operation and maintenance.

Source: ADB. 2015.

Table 5: Sources of Financing for the Alandur Sewerage Project

Sources of Finance	Amount (in $)	Amount (in Rs10,000,000)	% of Total
1. SEWERAGE NETWORK (Alandur Municipality)	**5,513,067.12**	**34.60**	**83.31**
1a) Loan			
Term loan from TUFIDCO	2,581,262.64	16.20	46.82
Term loan from TNUIFSL	669,216.24	4.20	12.14
1b) Grants			
From TUFIDCO for supervision	159,337.20	1.00	2.89
From Government of Tamil Nadu to bridge the gap	509,879.04	3.20	9.25
1c) Public Contribution			
Deposit collection	1,274,697.60	8.00	23.12
Term loan from TNUIFSL	318,674.40	2.00	5.78
2. SEWERAGE TREATMENT PLANT (BOT Operator)	**1,064,372.50**	**6.68**	**16.08**
3. LAND ACQUISITION (Alandur Municipality)	**39,834.30**	**0.25**	**0.60**
TOTAL	**6,617,273.92**	**41.53**	**100.00**

BOT = build–operate–transfer, TNUIFSL = Tamil Nadu Urban Infrastructure Financial Services Limited, TUFIDCO = Tamil Nadu Infrastructure Development Corporation.

Note: Rs62.76 = $1.00; Rs10 million (1 Rs. Crores) = $159,337.20, as of March 2015 conversion rate.

Source: Department of Economic Affairs, Ministry of Finance. Public Private Partnership Toolkit. Public Private Infrastructure Advisory Facility, the World Bank, and AusAID. Government of India.

TNUIFSL's loan was set at a rate of 16% per annum payable over a period of 15 years with a 5-year moratorium.

The term loan conditions resulted in the municipality assuming significant financial risks. One condition of the TNUIFSL's loan was that the disbursements would be provided for 3 years, after which they would be subject to the condition that the municipality meets its connection targets. Should targets not be achieved, further disbursements would be terminated. Interestingly, no funds were required to be disbursed under the TNUIFSL loan as the revenues generated from the one-time connection fee exceeded the amount anticipated when the finance package was structured.

Both the term lenders stipulated as escrow account, to the extent of the debt finance, where all the revenue receipts of the municipality (including property tax, stamp duty, and the grant from the Government of Tamil Nadu) as well as the sewer tariff was to be deposited in favor of TNUIFSL and TUFIDCO. The municipality also accepted limits imposed on future indebtedness.

Grants

TUFIDCO provided a special grant from the Tamil Nadu urban development grant fund to oversee and monitor the progress of the project. The Government of Tamil Nadu agreed, in principle, to bridge the gap in the sewer account during the life of the projects, after providing for O&M expenses, debt servicing, and contribution to the sinking fund. It also agreed to fund the monthly operating costs of the system above the $2.39 (Rs150) per household sewer charge to a maximum of $0.478 (Rs30) per connection per month.

Public Contribution

The municipality decided to collect one-time deposits in the form of connection charges from the citizens of Alandur. Around $1,274,698 (Rs80 million) out of the capital cost of $5,513,067 (Rs346 million) was through public contribution. Collection of sewerage fee from the public (on a graded structure amounting to a weighted average of $1.20 or Rs75 per connection) amounts to $318,674 (Rs20 million) per month and covers both debt repayment and O&M costs.

Public–Private Partnership Structure

As the first project in the municipal water sector in India under PPP, construction of the underground sewerage system was completed on a bill of quantities basis; while that of the sewerage treatment plant was on a BOT basis. Under the PPP scheme, the contractor oversees construction as well as the O&M of the sewerage system for a period of 5 years from the date of the project's completion, on a fixed fee basis. The municipality directly oversees the collection of tariff and provides new connections during the O&M phase.

Accordingly, the PPP structure of the project was governed by three contracting mechanisms awarded to an engineering, procurement, and construction contractor selected through a competitive process:

- A Works Contract for the construction of the sewerage network;
- An Operations and Management Contract wherein the selected contractor would operate and maintain the underground sewerage system for a period of 5 years on a fixed fee basis; and
- A Lease Contract (in the nature of a BOT agreement) for the sewerage treatment plant wherein the contractor would finance, build, and operate the sewerage treatment plant for a period as proposed in the contractor's successful bid. The contractor would be allowed to recover the investment on the sewerage treatment plant on the basis of a per unit rate payment from the municipality for the treatment of sewage delivered. The municipality agreed to provide a minimum payment level per annum regardless of the volume of sewage actually delivered. It was designed to cover the company's minimum fixed operating cost and capital investment.

Following the bid process, the project was awarded to IVRCL Infrastructures and Projects in technical collaboration with Va Tech Wabag Technologies. A Special Project Vehicle called First Sewerage Treatment Plant (First STP) was incorporated and was the concession company with whom the BOT agreement was signed. Once the project achieved financial closure, First STP signed contracts with IVRCL and Va Tech Wabag. IVRCL was to carry out the civil works for the project. Va Tech Wabag, through the electromechanical contract, was to design the process; supply, install, and commission the equipment; and carry out a contract for operating and maintaining the facility for 14 years. The land on which the plant is located was leased by the municipality to First STP.

Lessons

- The Alandur Sewerage Project illustrates how large infrastructure development projects can be managed even if the municipality does not have a formal credit rating and does not have experience in raising large sums of finance.
- A combination of private money, government support (in the form of concessional loans and grants), and public participation can be used to fund a major infrastructure project.
- A well-planned communications strategy evoked a strong and positive community response. To gain acceptance and build consensus among the public, the municipality mounted a vigorous public outreach and participation campaign with extensive media coverage to explain the project benefits, costs, and tariff system.
- A Willingness-to-Pay survey was conducted during the feasibility study stage to assess the acceptability of the connection and sewerage fees among the citizens of Alandur. Results of the survey helped determine the appropriate fees to be imposed.
- The project demonstrated that political will and quick decisions make projects happen. The political leadership and strong advocacy for the project provided by the chair and council of the municipality proved to be a critical element for success.
- The loan as well as the contractual obligations made it necessary to have strong fiscal discipline from the municipal body, obliging it to make difficult decisions on capital priorities, closely oversee the sewer system management, and ensure budgeting of sufficient funds to meet payment schedules.

- The municipality agreed to provide the BOT operator a minimum level of income by accepting the take-or-pay condition in the agreement.[5] Thus, the municipality assumed the risk of minimum payment to the operator, while the private partner assumed all other responsibilities and risks of financing, constructing, and operating the sewerage treatment plant for 14 years.
- An important aspect of the success of the project stemmed from concession financing and subsidies from the government and public–private entities, established specifically to meet the credit needs of the municipalities without access to private capital, due to a low or nonexistent credit rating.
- The transparent approach to the project, right from inception to selection of contractor or operator and implementation, was critical to providing the necessary assurance to the private sector bidders on the professional approach of the municipality. This included strict application of World Bank and International Federation of Consulting Engineers processes. Public participation in the deliberations of the management committee overseeing the tendering process execution was also important.

[5] Take-or-pay agreement is an agreement between two parties wherein one agrees to either buy certain goods or services from the other on a certain date or to pay for them even if that party does not need them on that date. The agreement provides guaranteed revenue for the seller even if the buyer decides against actually purchasing the goods or services.

III. Output-based Aid

Increasing Household Access to Domestic Sanitation in Greater Colombo (SRI LANKA)

Table 6: Financing Mechanism for Sri Lanka's Output-based Aid Project

			Financing Mechanism for Sanitation System	
Project	**Country**	**Nature of Financing**	**Global Initiative/ Subsidy**	**Household Contribution**
Increasing Household Access to Domestic Sanitation in Greater Colombo	Sri Lanka	OBA	GPOBA funds part of the cost of improved sanitation (average subsidy of $313 for eligible households)	Households contribute a reduced access fee of $30 for new connections; or $1 per month for 15 months (through the water bill) for existing onsite improvements

GPOBA = Global Partnership on Output-based Aid, OBA = output-based aid.

Source: ADB. 2015.

Project Description

Under this OBA pilot project, the National Water Supply and Drainage Board (NWSDB) will provide sanitation services to low-income households. Part of the cost of improved sanitation (which will include both new connections to sewers and improvements to on-site sanitation) will be funded by GPOBA, a multi-donor trust fund administered by the World Bank, through an OBA approach. The specificity of OBA is that it is performance-based subsidies disbursed on the basis of realized pre-agreed outputs, after an independent verification of their eligibility for financing under the project is carried out. NWSDB will plan and implement the work.

The project will deliver two types of outputs expected to directly benefit 15,407 households (about 77,035 individuals):

- New household connections to reticulated (networked) sewerage (13,107 households), and
- Improvements to the performance and operation of on-site sanitation systems and services (2,300 households).

Financing Mechanism

The project will provide financial incentive to the operator (NWSDB) to rapidly increase connection rates to its existing sewer network, implement decentralized wastewater treatment systems, and install improved on-site treatment units. It will result in greatly enhanced levels of service for poor households who currently rely on substandard on-site systems and will have a wider positive environmental impact on the city. The project is demand-based but uses GPOBA funds to remove financial barriers that have previously suppressed connection rates.

The introduction of GPOBA funding will leverage ongoing investments by the Swedish International Development Cooperation Agency and sunk investments in the sewer network to ensure that these result in service delivery at the household level.

GPOBA funds will enable NWSDB to pilot several important innovations:

- Use of time-bound subsidies to directly increase access to networked services;
- Use of subsidies to improve the operation of on-site systems; and
- Mainstreaming the concept of a universal sanitation service which enables households to become legitimate sanitation customers of the utility irrespective of whether services are provided to piped sewers or properly managed on-site systems.

The main innovation of the OBA approach is to link the payment of pre-agreed unit subsidies to the actual delivery of outputs—in this case access to improved sanitation services. OBA is also pro-poor and uses targeting, typically by income or geography, to ensure that subsidy payments help those who need it most. For poor households living on a monthly income of $150, the cost of connection to the sewer network ($250–$350 per household) remains a barrier to access. Grant funding from GPOBA will bridge the gap between what users can realistically afford to pay and the actual cost of connection.

- GPOBA will pay a subsidy for new connections to the sewer network, ranging from $100 to $419 per household depending on the type of connection provided; and an average subsidy of $313 per household eligible for improvements to existing on-site sanitation services.
- Households will contribute a reduced access fee of $30 for new connections; or $1 per month for 15 months (through the water bill) for existing on-site improvements.

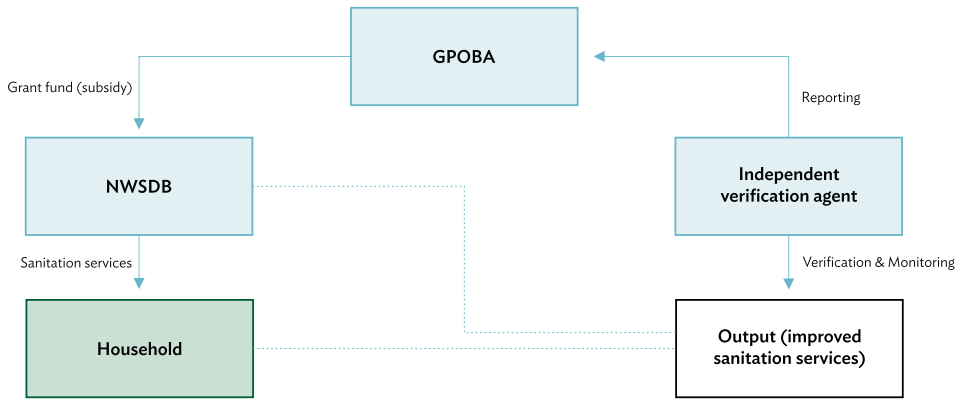
Consistent with the OBA approach, NWSDB will prefinance the necessary investments. It will then receive subsidy payments in two phases after access to improved sanitation has been delivered and verified, on a sample basis, by an independent verification agent. For new connections to networked sewerage, the first 50% of the unit subsidy will be paid after a household connection is complete, and the remaining 50% after a connected household has received 6 months of continuous service delivery. For work to improve on-site sanitation systems, NWSDB will be paid on a quarterly basis for every household that qualifies for the subsidy that has had improvements made to existing on-site systems.

Figure 4 presents the schematic diagram of the OBA scheme. Table 6, on the other hand, presents an overview of the financing mechanism implemented for the project.

Lessons

- As noted in a paper on sanitation financing, results-based finance has high transaction costs with their requirements for strong verification of results.[6] An allowance for potentially higher costs for performance verification needs to be built-in. Nonetheless, it has the potential to promote innovation because they specify in advance the desired outputs of the program but not the exact mechanisms to achieve the results.
- Because OBA transfers risk to the service provider who has to source the up-front finance and deliver investments before receiving the funds, it is accessible only to service providers with relatively strong financial positions.
- Financing access to sanitation is the "first mile" of adequate sanitation services, and subsidies may be needed to develop the entire system. Hence, OBA payments and contracts have to be packaged in a way that incentivizes sustainable service delivery alongside the entire sanitation value chain.

Figure 4: Output-based Aid Scheme



GPOBA = Global Partnership on Output-based Aid, NWSDB = National Water Supply and Drainage Board.

Source: ADB. 2015.

[6] ISF-UTS. 2014. *Financing Sanitation for Cities and Towns: Learning Paper.* Prepared for Stichting Nederlandse Vrijwillligers (SNV) Netherlands Development Organisation by Institute for Sustainable Futures, University of Technology Sydney.

Output-based Aid for Sanitation (NEPAL)

Table 7: Financing Mechanism for Nepal's Output-based Aid for Sanitation

Project	Country	Nature of Financing	Financing Mechanism for Sanitation System	
			Global Initiative/ Subsidy	National Government Contribution
Output-based Aid for Sanitation	Nepal	OBA	ADB provides financing for the Second Small Towns Water Supply and Sanitation Sector Project which has an OBA component.	Performance-based grants are used to support the construction of latrines in poor households.

ADB = Asian Development Bank, OBA = output-based aid.

Source: ADB. 2015.

Project Description

An OBA scheme is being utilized in the implementation of the Second Small Towns Water Supply and Sanitation Sector Project in Nepal.[7] The OBA incorporates the strategy of using explicit performance-based grants to deliver water supply and sanitation services primarily to the poor and vulnerable groups. Under the OBA, grants are given to service providers, i.e., water users and sanitation committees (WUSCs), after delivery of the household connections has been verified by an independent verification agent. Grants are provided to carefully selected households for water supply and sanitation services, the details of which are determined by each WUSC. This enhances service delivery without compromising financial viability.

The OBA scheme piloted under the Second Small Towns Water Supply and Sanitation Sector Project has two major outputs—house or yard connections to piped water supply and private latrines. The project management office in the Department of Water Supply and Sewerage manages the scheme in partnership with the towns' WUSCs. The WUSCs prefinance the construction of facilities and only receive OBA upon successful validation of outputs. Local nongovernment organizations (NGOs) serve as independent verification agents.

Financing Mechanism

OBA uses performance-based grants to support the delivery of basic services to poor households that have traditionally been left out or provided with poor quality service. The aid bridges the gap between the total cost of providing a service to a user and the user's ability to pay the cost. Unlike traditional subsidies, however, aid is given only after successful completion and inspection of the service (output). In the meantime, a service

[7] The Project has three components: Component 1 aims to develop an efficient, effective, and accountable urban water supply and sanitation sector by establishing and implementing policies, and establishing service standards to enhance sector coordination; Component 2 entails the development of safe, accessible, and adequate water supply and sanitation facilities in about 20 towns; and Component 3 strengthens governance and capacity for project management and operation. OBA is part of Component 2 with a cost of $1.3 million out of the $71.7 million total project cost.

provider prefinances the cost of installing the service, with counterpart from the poor household targeted.

After the target households (poor families) are identified, the WUSC engages them until an agreement on financing, benefits, and obligations is reached. An initial commitment of $4.92 (NRs500) is required from households.[8]

The construction phase begins with a local NGO acting as independent verification agent, photo documenting the conditions of the proposed sites prior to any construction. For installing water connections, the WUSC taps the services of a civil works contractor. For latrines, the WUSC provides a voucher to households, who procure construction materials.

Once the facilities are completed and their functionality validated by the NGO, the Department of Water Supply and Sewerage will release 80% of the aid to the WUSC. The NGO revisits the sites 6 months later to ensure that the facilities remain in working order.

If so, the department releases the remaining 20% to WUSC. If work is unsatisfactory, the WUSC will not be reimbursed. This provides strong incentives to the WUSC to closely supervise the work and ensure that facilities operate as planned.

The goal of the latrine program is to increase the demand and use of properly designed and constructed household latrines by providing grants to poor households. The OBA program will provide financial as well as technical and educational incentives to bring sanitary latrine usage to higher levels. First priority is given to households with monthly incomes of less than $29.51 (NRs3,000). Second priority is given to households with incomes up to $44.27 (NRs4,500). Households with higher incomes will be eligible for assistance depending upon available financing under the OBA program but will receive education about other programs and the benefits of safe sanitation.

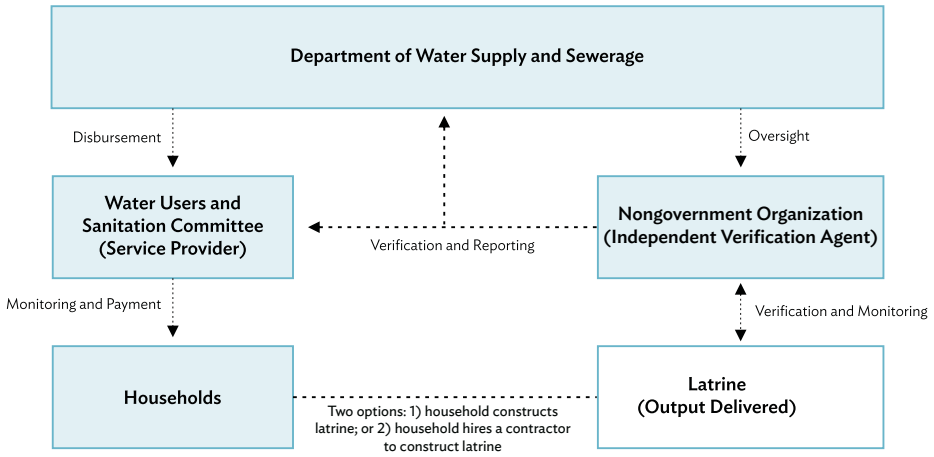
The OBA process for latrines is somewhat different than for water supply which utilizes civil works contractors to construct the water system and provide the connections. In water supply, the WUSC and its civil works contractors are the responsible parties. In the case of latrines, the construction of units is the responsibility of individual households (although households can hire individual contractors to construct the latrine), while the WUSC ensures that work is carried out as intended. The OBA mechanism is described in Figure 5. Table 7, on the other hand, presents an overview of the financing mechanism applied in Nepal's OBA scheme.

Lessons

- OBA ties subsidies to outputs, rather than inputs. Payment of subsidies is made only after the successful completion of the household latrines and validation by an independent verification agent.
- The OBA scheme ensures that the facilities are constructed according to specifications and the desired quality is achieved.

[8] Conversion rate: $1.00 = NRs101.65, as of June 2015 (NRs - Nepalese rupees).

Figure 5: Output-based Aid Mechanism for the Second Small Towns Water Supply and Sanitation Sector Project



Source: J. Romm. 2010.

IV. CARBON CREDITS

Carbon Credits for the Kinoya Sewerage Treatment Plant (FIJI)

Table 8: Financing Mechanism for Carbon Credits for the Kinoya Sewerage Treatment Plant

		Financing Mechanism for Sanitation System	
Project	**Country**	**Global/Donor Initiative**	**National Government**
Kinoya Sewerage Treatment Plant	Fiji	APCF cofinanced carbon savings through up-front payment against the purchase of CERs. ADB supported the development of development of the Kinoya Sewerage Treatment Plant Greenhouse Gas Emission Reduction Project under ADB's loan on the Suva-Nausori Water Supply and Sewerage Development	

ADB = Asian Development Bank, APCF = Asia Pacific Carbon Fund, CER = certified emission reduction.

Source: ADB. 2015.

Project Description

The project aims to recover methane generated by the anaerobic decomposition of organic matter in sludge of an existing sewerage treatment plant. It introduces methane recovery and combustion system to the existing and proposed anaerobic sludge treatment units (anaerobic digesters).

The project will reduce greenhouse gas (GHG) emissions, methane in particular, in an economically sustainable manner. It will also result in other environmental benefits such as improved effluent quality, improved digested sludge quality, and reduced odor. It proposed to move from a potentially high GHG emission option of open air venting of methane to environmentally benign option of capture and combustion of methane.

The existing sewerage treatment facility in Kinoya, which was constructed during the 1970s, consists of both primary and secondary processes, with the final treated effluent being disposed of to the sea and the sludge generated being tapped off for drying and used for

soil application as end use. The existing treatment facility consists of grit traps, step screen, primary clarifiers, trickling filters, sequential batch reactors, anaerobic digester, and sludge drying beds. Prior to the installation of the methane recovery mechanism, the methane generated from the digestion of sludge in the anaerobic digester was vented into the atmosphere due to technical barriers and lack of awareness and capacity to capture and utilize biogas.

The benefits that can be attributed to the project are as follows:

- The methane capture and combustion project will have a major impact on development of similar and other potential renewable, environmentally benign projects eligible under the Clean Development Mechanism (CDM) for CER revenues.
- The project avoids venting of methane, a GHG with very high global warming potential, into the atmosphere resulting in environmental protection of the region and the global level as a whole.
- The project will address the immediate concerns raised by the local population and communities in terms of improving the local environmental hygiene by eliminating obnoxious odors and air pollution in the project vicinity.
- The reduction of a significant quantity of methane will result in increased revenue to the national government from the sale of CERs. The additional revenue is envisioned to be used for the implementation of urgently needed developmental activities in the country.

Recovery of methane generated by the anaerobic decomposition of organic matter in sludge at the existing and proposed (for capacity augmentation) Kinoya sewerage treatment plant. Annual CERs are estimated at 22,469 CERs. Total expected CERs for the Asia Pacific Carbon Fund (APCF) are 44,938.

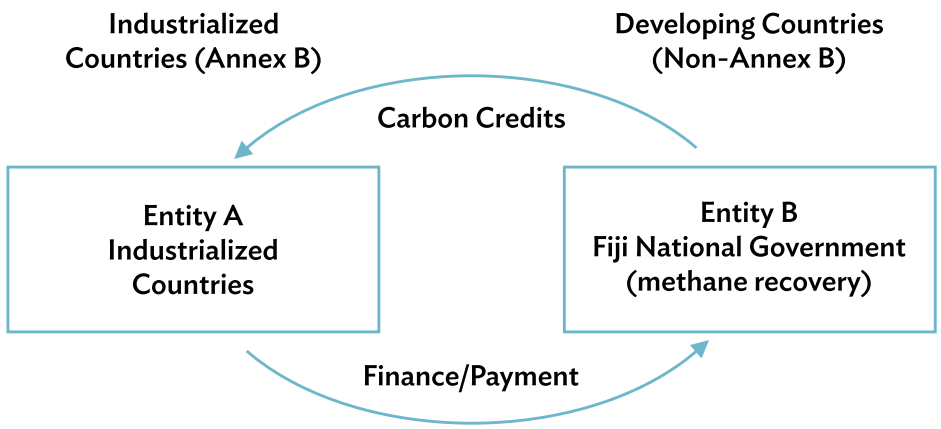
Table 8 presents an overview of the financing mechanism applied for carbon credits under the Kinoya Sewerage Treatment Plant Project.

Financing Mechanism

- The APCF is cofinancing carbon savings through up-front payment against the purchase of CERs to be generated by the project up to 2012.
- ADB supported the development of the Kinoya Sewerage Treatment Plant Greenhouse Gas Emission Reduction Project under ADB's loan on the Suva–Nausori Water Supply and Sewerage Development.[9]
- The project is the first sewerage treatment initiative in Fiji to be registered as a CDM project.
- The CDM allows emission-reduction projects in developing countries (non-Annex B countries) to earn CER credits, each equivalent to 1 ton of CO_2. These CERs can be traded and sold, and used by industrialized countries (Annex B countries) to meet a part of their emission reduction targets under the Kyoto Protocol. Figure 6 shows the flow of funds under the CDM project.

[9] ADB. 1998. *Suva–Nausori Water Supply and Sewerage Project (L2055-FIJ)*. Manila.

Figure 6: Clean Development Mechanism Flow of Funds



Source: T. Kubo. 2010.

Table 9: Revenues from Certified Emission Reductions

Year	Gross Income		Costs (Capital and Operations)		Net Benefit	
	F$	$	F$	$	F$	$
2010–2012	906,113.00	431,032.00	635,007.00	302,069.00	271,106.00	128,963.00
2013–2020	2,774,743.00	1,319,926.00	334,764.00	159,245.00	2,439,979.00	1,160,681.00
				TOTAL	2,711,085.00	1,289,644.00

Note: F$1.00 = $0.48, as of June 2015 (F$ - Fiji dollar).

Source: S. Yanuyanurua. Director, Water Supply and Sewerage Department, Ministry of Works, Transport and Public Utilities. Government of Fiji.

- The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets.
- For this project, it is estimated that net revenues from the CER credits will be $1.29 million (F$2.71 million) from year 2010 to 2020. The net revenues from CERs are highlighted in Table 9. The CDM is the main source of income for the United Nations Framework Convention on Climate Change Adaptation Fund, which was established to finance adaptation projects and programs in developing country parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change. The Adaptation Fund is financed by a 2% levy on CERs issued by the CDM.

Lessons

- The project is the first of its kind in the Pacific and is expected to serve as a model for the development of similar and other potential renewable, environmentally benign projects eligible under the CDM.
- The project is expected to contribute to the worldwide effort in controlling GHG emissions.
- The reduction of a significant quantity of methane will result in increased revenue to the national government from the sale of CERs. The additional revenue is envisioned to be used for the implementation of urgently needed developmental activities in the country.

National Biodigester Program (CAMBODIA)

Table 10: Financing Mechanism for Cambodia's National Biodigester Program

		Financing Mechanism for Sanitation System	
Project	**Country**	**Global Initiative/Subsidy**	**National Government Contribution**
National Biodigester Program	Cambodia	Asia Biogas Program (Dutch Ministry of Foreign Affairs), with additional funding from GIZ, provides funding for the establishment and maintenance, IEC activities and flat rate subsidy on the cost of biodigesters for farmers	The Ministry of Agriculture, Forestry, and Fisheries manages the National Biodigester Program

GIZ = Deutsche Gesellschaft für Internationale Zusammenarbeit (German Federal Enterprise for International Cooperation); IEC = information, education, and communication.

Source: ADB. 2015.

Project Description

Cambodia's National Biodigester Program, which is being managed by the Ministry of Agriculture, Forestry, and Fisheries, aims to disseminate domestic biodigesters as indigenous, sustainable energy source through the development of a commercial, market-oriented biodigester sector in selected provinces.[10] From 2006 until 2014, the program enabled the construction of 22,119 biodigester units with 120,679 direct beneficiaries.

Financing Mechanism

The funding for the project comes from the Dutch Ministry of Foreign Affairs, through their Asia Biogas Program, with additional funding from the German development agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (German Federal Enterprise for International Cooperation). The funding is allocated to program establishment and maintenance, information, education, and communication activities, and a flat rate subsidy on the cost of the biodigesters for farmers. The Netherlands Development Finance Company is also providing loans to two local MFIs, Programme de Rehabilitation et d'Appui

[10] A biodigester or biogas system consists of a large tank or digester where the bacteria work symbiotically to convert organic waste into methane gas through the process of anaerobic digestion.

au Secteur Agricole du Cambodge and Amret Microfinance Institution, that offer loans to farmers of up to the total cost of the biodigester plant (a maximum of $1,000), at an interest rate of 1.2% per month for a duration of 4 or 24 months.

The main executing agencies include the following:

- Ministry of Agriculture, Forestry, and Fisheries as the program owner and host;
- SNV Netherlands Development Organization as the main technical assistance and planning agency; and
- Department of Animal Production and Health of Cambodia, as the coordinating agency for the project.

There are also several cooperating agencies including:

- Humanist Institute for Development Cooperation, which is purchasing the carbon offsets generated by the project;
- ACELDA Bank, which is channeling funds from the program to individual farmers for a post-construction, flat rate subsidy of $150 off the cost of all biodigesters purchased through the program;
- Cambodian Center for Study and Development in Agriculture, which is acting as the Provincial Biodigester Program Office (PBPO) in Kampot, Prey Veng, Kandal, and Kampong Thom provinces;
- Preah Kossomak Polytechnic Institute, which is training technicians and masons on biodigester construction;
- Development Technology Workshop Cambodia, which is developing appropriate biodigester accessories such as stoves, drains and lights for the program;
- Cambodia–India Entrepreneurship Development Center, which is assisting in capacity building for entrepreneurs who want to start a new biodigester company as part of the program; and
- Local governments of the selected program provinces of Siem Reap, Battambang, Pursat, Kampong Cham, Kampong Chhnang, Kampong Speu, Svay Rieng, Takeo, Kep, and Sihanoukville, which helped establish their PBPOs.[11]

Figure 7 shows the overall scheme for the National Biodigester Program of Cambodia. Table 10, on the other hand, presents an overview of the financing mechanism implemented for the program.

The total costs of different sizes of biodigester, including the subsidy provided by the program to individual farmers upon completion of construction and the subsequent costs to the farmers, are shown in Table 11. While these costs seem high for rural Cambodian farmers, the economics of using free biogas instead of fuelwood/charcoal/liquefied petroleum gas/kerosene help to provide a fast payback period. This provides a strong incentive for farmers to buy biodigesters, even without the loans available through the MFIs.

[11] The local governments of Kampot, Prey Veng, Kandal, and Kampong Thom provinces liaised directly with the biodigester sales companies, the MFIs, and the interested farmers.

Lessons

- The sustainability of the program is enhanced by the establishment of a comprehensive management framework for the sales and maintenance of biogas digesters, involving businesses, banks, MFIs, marketing and promotion campaigns, business trainers, technical designers, researchers and various levels of project management.
- Based on local monitoring, 95% of all biogas digesters sold are still operational, which shows the effectiveness of the quality control measures and also on the availability of local PBPOs and business to address any maintenance issues that may arise.
- One issue of the project to date is that only 10% of the units sold thus far also have a personal toilet of the purchasing family connected to them. While all the units are improving local sanitation by at least treating the feces of farm animals, as of 2011, only about 1,200 of them are also giving effective treatment to the otherwise risky human feces produced by these farming families. The remaining families are likely still practicing open defecation or are making use of a basic pit latrine that contributes to groundwater pollution. One possible reason is that the program did not provide toilets as part of the installation, either as an additional cost or as a subsidy or loan-worthy accessory, since many of these purchasing families likely do not have toilets. This program could have benefited from being more closely integrated with the various latrine marketing and building programs currently under way by other NGOs in Cambodia, so that joint latrine–biodigester models could have been offered for sale.
- The National Biodigester Program provides economic benefits in terms of the following:

  (i) It helps improve the overall sanitation in Cambodia.

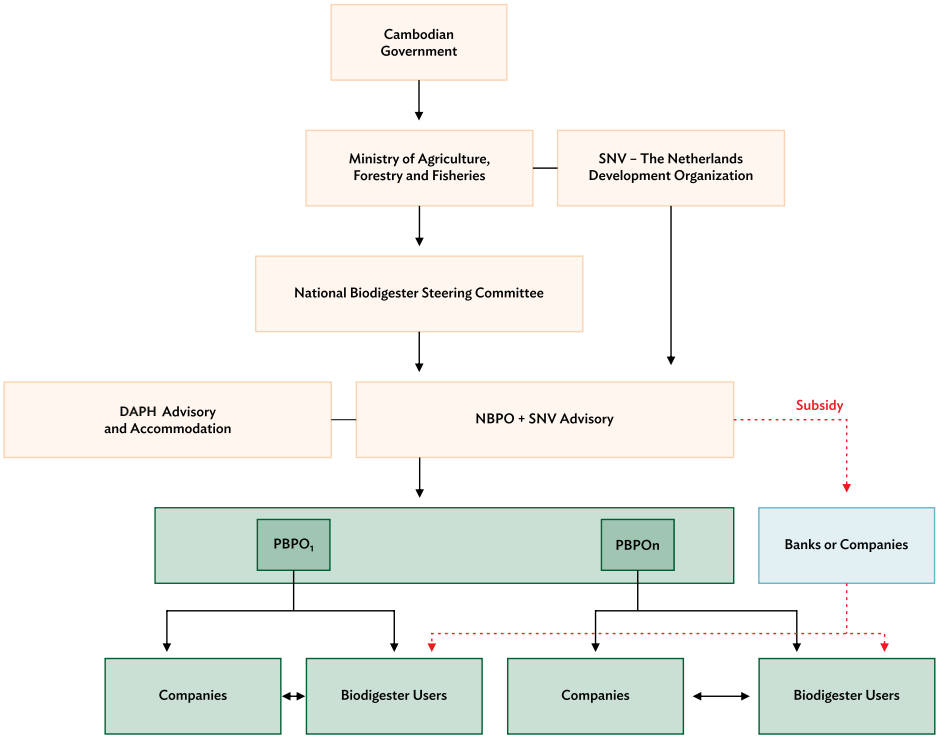
  (ii) It enhances the lives of the farming families by utilizing an existing resource (manure of their animals) to give them free biogas for cooking and lighting.

  (iii) It improves the agriculture sector through the "closing of the loop" with the use of the output bio-slurry.

  (iv) It helps develop the governing and marketing institutions of the country by using this multipartnership program to bring together and utilize the talents of the different government, private sector, and NGOs in the country.

- With additional revenues being generated from the sale of verified carbon off sets from these biogas digesters, the program is also helping prevent climate change and be a source of revenue at the same time. It is hoped that this program will continue in earnest and make Cambodia a model for biodigester marketing and sales.

Figure 7: Project Management Scheme for the National Biodigester Program



DAPH = Department of Animal Production and Health, NBPO = National Biodigester Program Office, PBPO = Provincial Biodigester Program Office, SNV = Stichting Nederlandse Vrijwillligers (Netherlands Development Organization).

Source: Center for Advanced Philippine Studies (CAPS), Korea International Cooperation Agency (KOICA), and United Nations Environment Programme (UNEP). 2011.

Table 11: Payback Period of the 4 m³ Biodigester at a Cost of $400
(per prior fuel source)

Types of Fuel Sources	Quantity Saved	Cost per Unit ($)	Total Cost Saved per Day ($)	Total Cost Saved per Year ($)	Payback Period without Subsidy	Payback Period with Subsidy ($150)
Firewood	6 kg	0.07	0.42	153	2.6 years	1.6 years
Charcoal	2 kg	0.2	0.42	153	2.6 years	1.6 years
Kerosene	0.7 liter	0.65	0.46	166	2.4 years	1.5 years
Liquefied petroleum gas	0.5 kg	1.00	0.50	183	2.2 years	1.3 years

kg = kilogram.

Source: CAPS, KOICA, and UNEP. 2011.

V. MICROFINANCE

Sanitation Revolving Fund (VIET NAM)

Table 12: Financing Mechanism for Viet Nam's Sanitation Revolving Fund

			Financing Mechanism for Sanitation System	
Project	**Country**	**Nature of Financing**	**Global Initiative/ Subsidy**	**National Government Contribution**
Sanitation Revolving Fund	Viet Nam	Revolving fund for building on-site sanitation facilities for low-income households	WB with the governments of Australia, Finland, and Denmark provided working capital for the revolving fund which provides loans at partially subsidized rates to low-income households for the construction of improved sanitation facilities (septic tanks, composting latrines, or sewer connections).	The Sanitation Revolving Fund is a component of the Three Cities Sanitation Project implemented by the government with WB support.

WB = World Bank.

Source: ADB. 2015.

Project Description

A Sanitation Revolving Fund component was incorporated in the broader Three Cities Sanitation Project in Viet Nam to provide loans to low-income households for building on-site sanitation facilities.[12] Working capital for the revolving funds was provided by the World Bank, the Government of Australia, the Government of Finland, and the Government of Denmark for three subprojects in Da Nang City, Hai Phong City, and Quang Ninh Province (Ha Long City and Cam Pha Town). The program benefited almost 200,000 households

[12] The Three Cities Sanitation Project ($119.17 million) has five components: (i) drainage ($58.32 million), (ii) sewerage and sewage treatment ($27.96 million), (iii) solid waste management ($8.01 million), (iv) institutional development and construction management ($21.77 million), and (v) revolving funds for household sanitation facilities ($3.1 million).

over a period of 7 years. The average hardware costs of the sanitation facilities built was $197.

Financing Mechanism

The average hardware cost of the sanitation facilities built through the program was $197. The Sanitation Revolving Fund provided small loans ($145) over 2 years at partially subsidized rates to low-income and poor households to help them construct or improve on-site sanitation facilities, mainly individual septic tanks and urine-diverting and/or composting latrines, or to build sewer connections. The subsidized interest rate was equivalent to providing a $6 subsidy on each loan. The loan covered approximately 65% of the average costs of a septic tank and enabled the households to spread these costs over 2 years. They acted as catalyst for household investment, though households needed to find other sources of financing to cover their total investment costs, such as borrowing from friends and family.

The program also included a significant software support component for sanitation promotion, the creation of Savings and Credit groups, and hygiene education. Software support per household was about $21 and represented about 10% of the total costs of sanitation adoption.

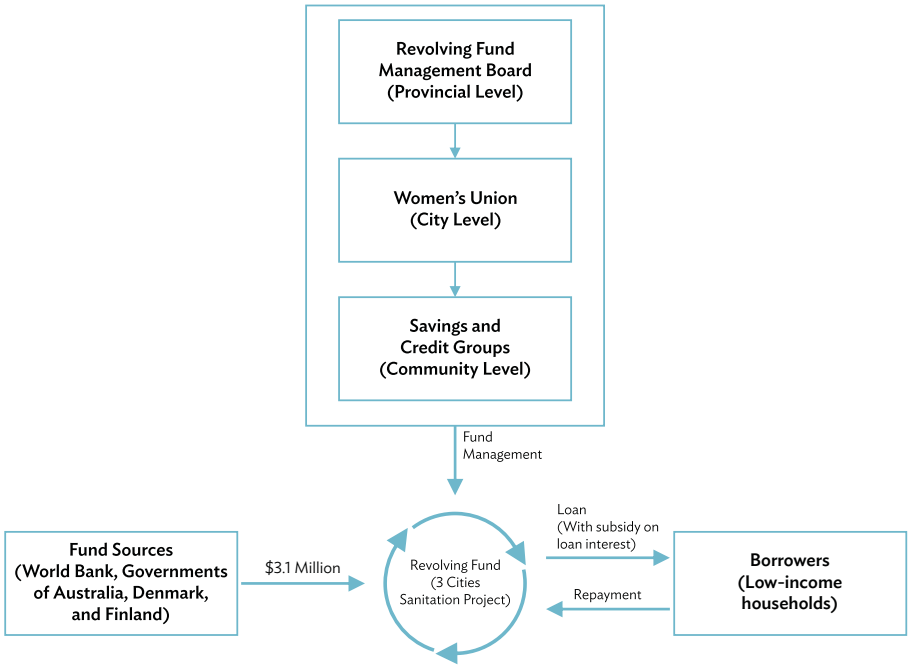
Figure 8 illustrates the various components of the revolving fund while Table 12 presents an overview of the financing mechanism implemented.

The Revolving Fund institutional set-up is as follows:

- In each city, the local sanitation service companies appointed the local branch of the Women's Union to administer the revolving funds on their behalf. The Women's Union has a lot of experience and is the most competent organization to deliver health education programs and manage microcredit schemes in Viet Nam.
- At the community level, the revolving funds functioned on the basis of Savings and Credit groups, formed by potential borrowers and led by a group leader. Savings and Credit groups included 12–20 people each who had to live close to each other in the same ward in order to ensure community control. People in the same groups had to pay back the loan on time to enable others to get a loan.
- Savings and Credit groups were monitored at the ward and provincial levels by Revolving Fund management boards, which were themselves placed under the scrutiny of the project management units in each city.[13]

[13] In Viet Nam, a ward (phường) is an administrative sub-unit of an inner city district (quận).

Figure 8: Components of the Sanitation Revolving Fund



Source: ADB. 2015.

Lessons

- The revolving fund proved highly sustainable as the funds were revolved several times before being transferred back to the municipalities for further allocation. Repayment rate is high at about 99%.
- Lending procedures were attractive to borrowers, and the loans worked as catalyst for households to find additional financing and investment.
- The creation of Savings and Credit groups was seen as critical to ensure repayment of the loans and regular savings contributions.
- The Sanitation Revolving Fund approach was effective at leveraging household investments and proved highly sustainable and scalable. However, a potential drawback is that the lowest-income households, which are excluded, may need to receive direct support either from the central government or through the revolving fund.

Microfinance Loans for Sanitation (CAMBODIA)

Table 13: Financing Mechanism for Cambodia's Microfinance Loans for Sanitation

			Financing Mechanism for Sanitation System	
Project	**Country**	**Nature of Financing**	**Global Initiative/ Subsidy**	**Household Contribution**
Microfinance Loans for Sanitation	Cambodia	Sanitation financing program for low-income households	WB WSP worked with international partners and local MFIs to provide microfinance loans for the construction of latrines in low-income households	Households shoulder other costs (i.e., shelter for the latrine)

MFI = microfinance institution, WB WSP = World Bank Water and Sanitation Program.

Source: ADB. 2015.

Project Description

Over a 13-month period, the World Bank's Water and Sanitation Program (WSP) worked with a number of partners, including the international nonprofit Program for Appropriate Technology in Health (PATH) and International Development Enterprises (iDE), to pilot a sanitation financing program to address the challenge of reaching low-income households with improved sanitation solutions.[14] Together with PATH and iDE, WSP sought to collaborate with MFIs with established scale and penetration in rural areas. Through this process, VisionFund Cambodia in Kandal Province (July 2012–March 2013) and KREDIT Microfinance Institution (KREDIT) in Prey Veng Province (November 2012–July 2013) were engaged in the pilot.

KREDIT was chosen in part because of its strong existing social loan program targeting the poor. As of 2011, KREDIT served over 56,500 clients and had an operating self-sufficiency ratio of 123%, meaning that the organization's operating expenses were covered by their operational revenue. Meanwhile, VisionFund Cambodia was chosen partly because it has a low average loan size and one of the largest outreach into rural areas among MFIs in Cambodia. As of 2011, it served more than 132,000 clients and had an operating self-sufficiency of 119%.

Financing Mechanism

KREDIT group and individual loans

KREDIT offered both group and individual loans to customers that enabled villagers to decide whether they wanted to join a group or obtain an individual loan. Some villagers chose an individual loan because they did not want to share default risk.

[14] The pilot sanitation financing program is part of a broader sanitation marketing initiative cofunded by the Bill & Melinda Gates Foundation and Stone Family Foundation.

Under the community bank model, KREDIT offered loans to groups of 4–6 households and required at least two groups in order to establish a community bank. In three Prey Veng districts, group loans could be repaid locally. Group loan sizes ranged from $40 to $250, at an interest rate of 2.9% per month.[15] The group of households shared default risk as a collateral substitute, and the community shared the risk of losing access to future loans in the event of default. Many of the borrowers under this program were existing customers and several new customers took out follow-on loans, so risk of losing access to future loans was a serious consequence of default. KREDIT required a balloon repayment for all group loans wherein the entire principal is not amortized over the life of the loan but must be repaid in a lump sum at the end of the loan term. Balloon repayments are popular with farmers or other households with seasonal income since they can time the lump-sum payment with their income.

KREDIT also offered loans from $40 to $250 to individuals. Initially, individual loans were offered at an interest rate of 2.65% per month, and individuals had to travel to make payments at the MFI branch located at the district centers. The MFI also planned to require movable collateral (e.g., motorbikes and hand tractors) but found this requirement difficult to implement. Eventually, KREDIT decided to offer loans with no collaterals to test if this would stimulate loan demand. To offset the increased risk, the MFI increased the interest rate on individual loans to 3%, and ultimately changed to allow repayment at the village level. KREDIT required a declining balance repayment method for all individual loans wherein the principal repayments are spread out over the duration of the loan and interest is only charged on the actual principal, rather than the initial amount borrowed.

VisionFund Cambodia group loans

In the VisionFund Cambodia's community bank repayment method, the MFI offered group loans with a 2.6%–2.8% interest rate per month. VisionFund Cambodia charged 2.6% for loans funded through Kiva and 2.8% for loans funded by other sources.[16]

Groups of households shared the risk of default. Customers could choose loan terms of 4–12 months as well as whether to use a declining balance or balloon payment method. About 90% of customers chose to use the declining balance repayment method.

Latrines sold and distributed directly to groups and individuals

Latrines (excluding the shelter) were sourced from independent latrine businesses, which hired commission-based sales agents responsible for selling latrines to groups of households in a given area. MFI field loan officers also attended these meetings to offer households the option to purchase latrines on credit. Sales orders and loan applications were completed at the end of these sales meetings. Once the loan applications were approved, the latrine businesses distributed the latrines to households within a few days.

Following confirmation that the latrines had been received, the MFIs disbursed loan payments to the latrine businesses once per week. To make the process work smoothly, PATH field staff provided considerable coordination support.

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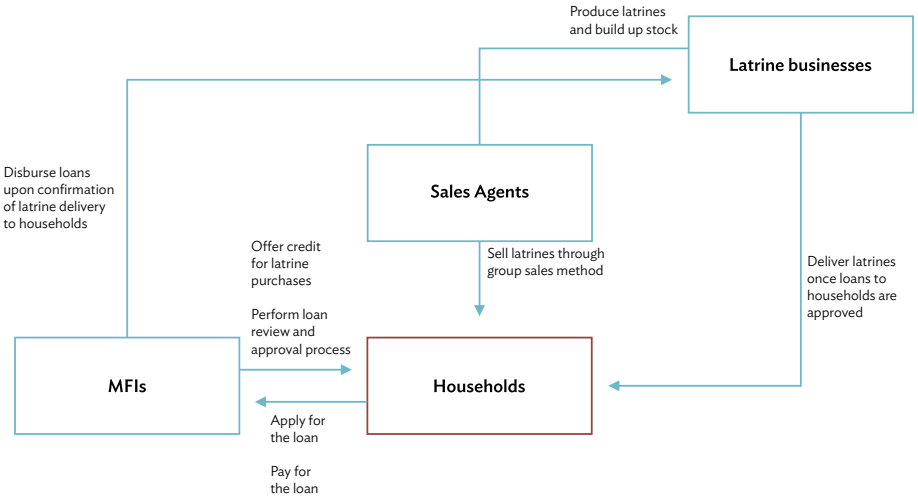
[15] Conversion rate: $1 = KR4,000 (KR - Cambodia riel).

[16] Kiva is a nonprofit organization that, through leveraging the internet, provides no-interest funds to its worldwide network of MFIs.

Figure 9: Sanitation Loan Implementation Process



MFI = microfinance institution.

Source: ADB. 2015.

Figure 9 shows the sanitation loan implementation process. Table 13, on the other hand, presents an overview of the financing mechanism applied under Cambodia's microfinance loans for sanitation.

Lessons

- There is demand for latrines even among poor households. A sanitation loan program offered by socially oriented MFIs helps to increase uptake among the poor.
- Dedicated loan officers can streamline and expedite the loan process.
- Reducing loan processing times can increase sanitation uptake and may require removing regulatory barriers for loan approvals.
- Households may be willing to pay a slightly higher interest rate in exchange for a closer and more convenient payment location.
- A close partnership between an MFI and a latrine business that has the motivation and capability to produce and deliver on time is needed to maximize commitments from customers and avoid losing orders.
- A poor-inclusive sanitation loan program has a relatively low risk profile and can be financially viable and sustainable given the right support. It can help socially oriented MFIs widen their customer base and achieve their missions.

VI. PARTNERSHIPS

Dumaguete City Septage Management System (PHILIPPINES)

Table 14: Financing Mechanism for the Septage Management System in Dumaguete City, Philippines

Project	Country	Financing Mechanism for Sanitation System			Tariff-Setting Principles	
		Global/ Donor Initiative	City Government	Water Utility	Cost Recovery of CAPEX	Cost Recovery of OPEX
Dumaguete Septage Management Project	Philippines	Pre-FS by USAID	City septage ordinance + 50% of capital investment + Land for septage treatment plant + Operate septage treatment plant	50% of capital investment + Operate vacuum trucks + Collect septage fees	FULL cost recovery from septage fees collected through water bill	FULL cost recovery from septage fees collected through water bill

CAPEX = capital expenditure, FS = feasibility study, OPEX = operating expenditure, USAID = United States Agency for International Development.

Source: ADB. 2015.

Project Description

Completed in May 2010, the Dumaguete City Septage Management System is a collaboration between the Dumaguete City Government and the Dumaguete City Water District (DCWD).[17] It is the first LGU-financed septage management program in the Philippines. The project involved the construction of a septage treatment plant at a cost of $465,116 (₱20 million) and the purchase of seven desludging vacuum trucks for $139,535 (₱6 million).

[17] Water districts are utilities that are legally and financially autonomous from LGUs. Water districts are government-owned and controlled corporations focused on providing water and sanitation services in cities and municipalities outside Metro Manila. The Local Water Utilities Administration provides technical and financial support to water districts.

The septage management system caters to about 5,450 households, 709 commercial establishments, and 552 institutional establishments.[18] The septage treatment utilizes a series of anaerobic and facultative lagoon cells, and subsurface flow constructed wetlands. Sludge drying beds are provided for dewatering the accumulated biosolids. The septage treatment facility is capable of handling a daily load of 80 cubic meters (m^3) of fecal sludge per day. Capital and operating costs are recovered through the septage user fee of $0.05 (₱2.00) per m^3 of water consumed.

Financing Mechanism

In June 2009, the Dumaguete City Government entered into a joint venture agreement with the DCWD based on the following salient provisions:

- Equal sharing of capital and operating costs and any future income between the City Government and DCWD.
- DCWD will collect and transport septage to the treatment plant.
- DCWD will maintain financial records.
- The city government will operate and maintain the septage treatment plant.

The city government and DCWD will have equal sharing of the net income from septage revenues. The net income is computed as the gross income less expenses such as O&M costs, Barangay Assistance Fund for host barangay (village), and reserve and/or contingency funds.

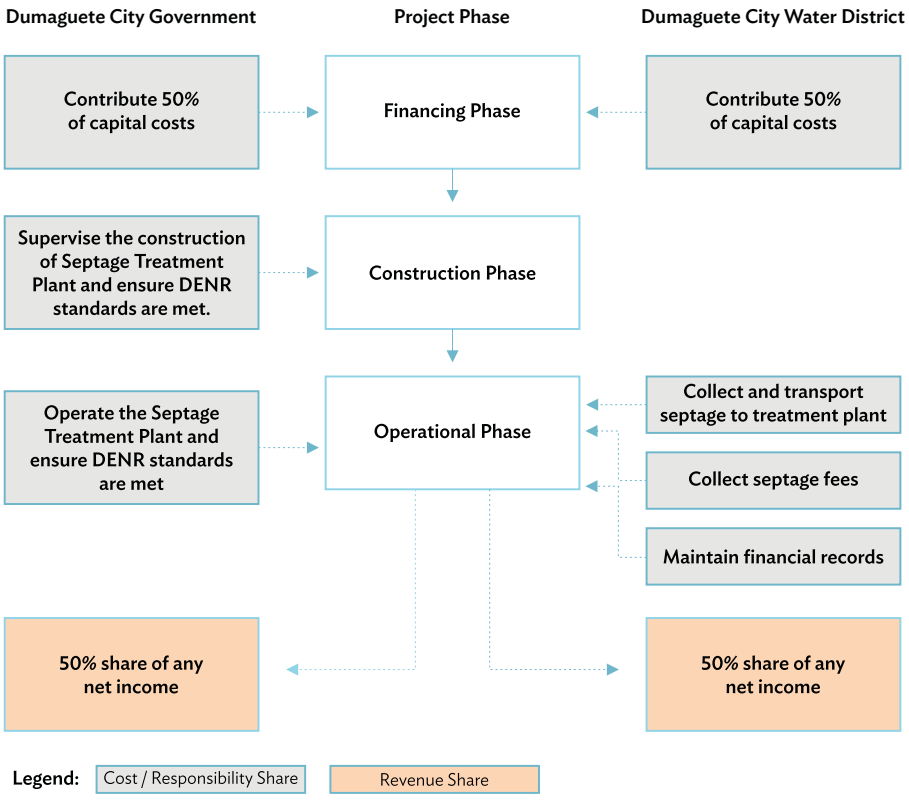
Figure 10 shows the sharing of costs as well as responsibilities and revenues between the city government and DCWD. Table 14, on the other hand, presents an overview of the financing mechanism and the tariff-setting principle implemented in the septage management program in Dumaguete City.

Lessons

- Partnership between the city government and the water utility is possible. They can collaborate and successfully finance, construct, and operate septage management systems. In the case of Dumaguete, the city government facilitated the enactment of the Local Septage Management System Ordinance, contributed 50% of the capital costs, and supervised the construction and operation of the septage treatment plant. Meanwhile, the water district contributed 50% of the capital costs, collects and transports the septage through the vacuum trucks, collects septage fees (as add-on to the monthly water bill), and maintains financial records.
- A low-cost, low-maintenance septage treatment facility translates into affordable user fees. The key was the selection of simple wastewater treatment technologies with low construction and O&M costs.
- Full cost recovery can be achieved in about 5 years through user fees. The water district charges $0.04 (₱2.00) per m^3 of water used.
- The project is widely supported by the community. The information, education, and communication campaigns played a big role in gaining community acceptance and in the passage of the city septage ordinance.

[18] A septage management system consists of collection through septic tanks, transport using vacuum trucks, and treatment in a septage treatment facility.

Figure 10: Cost and Revenue Sharing for the Dumaguete Septage Management System



DENR = Department of Environment and Natural Resources.

Source: ADB. 2015.

Baliwag Water District Septage Management Project (PHILIPPINES)

Table 15: Financing Mechanism for the Septage Management Project in Baliwag, Philippines

		Financing Mechanism for Sanitation System			Tariff-Setting Principles	
Project	Country	Global/ Donor Initiative	City Government	Water Utility	Cost Recovery of CAPEX	Cost Recovery of OPEX
Baliwag Water District Septage Management Project	Philippines	Pre-FS by USAID	City septage ordinance	Land for the septage treatment plant + 100% of project costs financed through loan and equity	FULL cost recovery from septage fees collected through the water bill	FULL cost recovery from septage fees collected through the water bill

CAPEX = capital expenditure, FS = feasibility study, OPEX = operating expenditure, USAID = United States Agency for International Development.

Source: ADB. 2015.

Project Description

The BWD septage management services involve the desludging of septic tanks every 5 years, transport and treatment in a septage treatment plant, and disposal of effluent and biosolids in an environmentally acceptable manner. The septage management services cover all water district customers in all of the 27 barangays (villages) of the municipality of Baliwag, which are grouped into Zones 1–5. Zone 1 will be served in the first year of operation, Zone 2 in the second year, and so on until all zones are covered. The second cycle starts in year 6.

The treatment process uses a fully mechanized system, consisting of the following:

- Preliminary treatment – mechanical bar screen, macerator, and septage acceptance unit;
- Primary treatment – chemical dosing system and dewatering unit;
- Secondary treatment – sequencing batch reactor; and
- Tertiary treatment – disinfection.

Financing Mechanism

Existing septage management programs in the Philippines had been undertaken by the LGU and the private sector (e.g., in San Fernando City, La Union), by an LGU–water district partnership (e.g., in Dumaguete City, Negros Oriental), or through a BOT arrangement (e.g., Manila Water Company and Maynilad Water Services in Metro Manila). BWD decided

to try a different arrangement with its new septage management program—one led entirely by the water district, with very little LGU and government collaboration.

In 2008, BWD secured the support of the USAID-funded Philippine Water Revolving Fund to finance a feasibility study on septage management for the water district. From the data and analysis gathered by the study, BWD was able to pursue its own program without any further donor assistance.

BWD worked with the local government of Baliwag to help them pass an ordinance in 2009 that allowed the establishment of the BWD septage and (future) sewerage management program. BWD and LGU also signed a memorandum of agreement in 2010 to provide further details on the sharing of responsibilities for septage management program. Most of these responsibilities were taken on by BWD, with the LGU responsible for levying fines, where necessary, and in supporting the outreach efforts of BWD about the program.

Rather than rely on donor assistance, BWD secured a $1.5 million (₱60 million) loan from the Philippine National Bank, with a 10-year repayment period and 7% interest. Through the loan, BWD purchased two 5 m^3 desludging trucks at a cost of $420,000 (₱17.4 million). The trucks will bring the septage to the new septage treatment plant, which has a capacity of 30 m^3/day. The new plant costs about $800,000 (₱32.7 million). The water district also purchased the land for the plant, even though the LGU is supposed to be obligated to provide it, thus showing the agency's desire to do it themselves.

BWD also conducted a thorough public information drive across the entire LGU to discuss and seek feedback on the program's legality, guidelines, and proposed tariff structure. The water district also engaged in a Water Operators Partnership through the USAID-sponsored Waterlinks program, which linked them up with Indah Water Konsortium of Malaysia for joint trainings, site visits, and consultations on the technical aspects of Indah's successful program.

Unlike a private company, BWD does not need to make a profit but needs only to recover costs. This allows BWD to offer a low water tariff, with the subsidized price for the first 10 m^3 at only just over $3 (₱145), with average monthly water consumption in the community of approximately 20 m^3. Due to its 80% water supply coverage, BWD decided to use this water tariff as the basis for financing their septage management costs. Their financial models determined that a fixed charge of 10% of the user's total water bill would be enough to recover the costs.

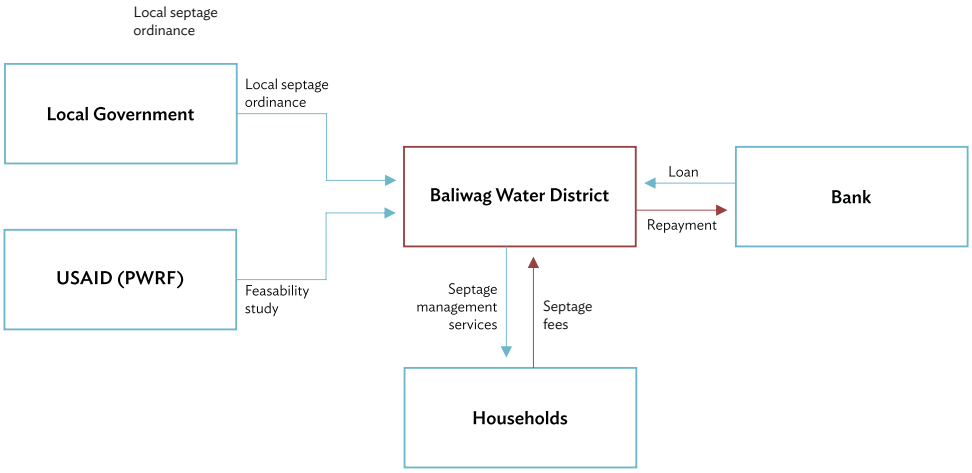
To expand its revenue base, BWD will extend its sanitation service to nearby towns by requiring other water districts to purchase vacuum trucks and transport septage to the BWD septage treatment plant. A tipping fee will be collected from each water district that will subscribe to the septage treatment service.

Figure 11 presents the diagrams representing the flow of funds for the Baliwag Septage Management Project. Table 15, on the other hand, presents an overview of the financing mechanism and the tariff-setting principle implemented by BWD.

Lessons

- While the LGU is not significantly involved in project implementation, it played a vital role in providing the regulatory environment through the passage of the local septage and sewerage ordinance and in supporting the outreach efforts of BWD.
- Cost recovery is possible for a septage management program, which is considered as a first-stage, community-wide sanitation solution, as against the ultimate solution that is a sewerage system wherein cost recovery is deemed difficult and requires substantial subsidies.
- The leadership of the general manager of BWD, who can be considered a sanitation champion, is a major factor in the successful implementation of the project.
- Information and advocacy campaigns significantly contributed in gaining public acceptance of the septage management project.
- The project can serve as a model for the water district-led septage management in the Philippines, with its lessons applicable to septage management programs around the world.

Figure 11: Flow of Funds for the Septage Management Project



PWRF = Philippine Water Revolving Fund, USAID = United States Agency for International Development.

Source: ADB. 2015.

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Financing Mechanisms for Wastewater and Sanitation

This publication is a guide for government and city planners to identify financing mechanisms as they develop their own wastewater and sanitation projects. Case studies culled from various countries provide insight on various financing instrumentalities (subsidies, output-based or performance-based aid, carbon credits, and revolving funds) and financing arrangements (local government–water utility operator and public–private partnership) available to support the sanitation agenda. Financing flowcharts should help planners visualize the flow of funds and identify funding sources, including grants and loans. Examples of financing mechanisms can help cities identify business models they can adopt given their specific circumstances.

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