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# A RAPID ASSESSMENT OF SEPTAGE MANAGEMENT IN ASIA

## Policies and Practies in India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam


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# A RAPID ASSESSMENT OF SEPTAGE MANAGEMENT IN ASIA

## POLICIES AND PRACTICES IN INDIA, INDONESIA, MALAYSIA, THE PHILIPPINES, SRI LANKA, THAILAND, AND VIETNAM

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# EXECUTIVE SUMMARY

According to the WHO/UNICEF 2008 Joint Monitoring Program, urban access to improved sanitation has risen to 57 and 78 percent in South Asia and Southeast Asia, respectively, due in large part to investments in onsite sanitation systems such as septic tanks and pour-flush latrines. However, the management of onsite sanitation remains a neglected component of urban sanitation and wastewater management. Only recently have national governments, cities, and wastewater utilities begun to address the management of septage, or the sludge that accumulates inside septic tanks. Rather, most sanitation programs have focused on toilet installation and sewerage development, viewing onsite sanitation as an informal, temporary form of infrastructure. As a result, septic tanks and latrines in urban areas have become major sources of groundwater and surface water pollution, with significant environmental, public health, and economic impacts.

To better understand the status of septage management policy and practice in Asia, Environmental Cooperation-Asia (ECO-Asia), a regional program of the United States Agency for International Development (USAID), conducted a rapid assessment of septage management in India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam. This assessment report summarizes the institutional and infrastructure capacity of these countries to manage septage, identifies the common challenges that prevent better service provision, and provides recommendations for program improvements based on good practices across the region. Given the prevailing focus on physical infrastructure in this field, this report focuses principally on the enabling conditions that help cities better manage septage, including private sector participation and stakeholder awareness.

To validate the findings of the assessment and to facilitate dialogue among regional stakeholders, ECO-Asia and Indah Water Konsortium (IWK), Malaysia's national sewerage services provider, co-organized a workshop and training in Kuala Lumpur from May 25-28, 2009. The Department of Water and Sanitation in Developing Countries (Sandec) at the Swiss Federal Institute of Aquatic Science and Technology (Eawag) also collaborated with ECO-Asia in the assessment.

One finding from the assessment is that a key challenge shared by all countries is the limited awareness of policymakers about septage management and the corresponding need for policy setting, funding allocation, and enforcement. At the implementation level, as detailed in the assessment, this lack of awareness translates into a range of common challenges, including weak enforcement of septic tank construction codes; lack of data on the location and condition of septic tanks; infrastructure development without corresponding adoption of local policies and regulations, capacity building programs, or public promotion initiatives; limited local capacity to design, construct, and operate collection and treatment infrastructure; and tariff structures that do not promote cost recovery, compliance with septage management regulations, or entrepreneurship. In addition, while private operators provide septage collection and disposal services in most countries in the region, few local governments or utilities regulate their activities, or leverage their capabilities to expand local scheduled desludging services.

Despite gaps in national policymaking and weak septage management programs, however, the assessment identified good practices in septage management in every country related to legal and institutional frameworks, infrastructure development, private sector involvement, capacity building, and services promotion. While Malaysia is the clear leader of the target countries examined, every country has developed some good practices that deserve consideration. Some countries, especially India, the Philippines, and Vietnam, are increasingly recognizing the need to invest in septage management as a complement to sewerage development.

The report also offers a series of recommendations based on the lessons learned and good practices identified through the country assessments. Some of the key recommendations based on the assessment findings are:

**Raise Awareness of Both Policymakers and Septic Tank Users.** Building stakeholder awareness is critical for creating effective new policies and programs, and

for ensuring public and financial support for initiatives. Efforts should focus on raising policymaker awareness of the direct health, environmental, and economic benefits of improved septage management. Responsible agencies and organization should also implement community-level awareness initiatives that highlight the benefits of more frequent desludging to ensure acceptance of new programs and costs.

**Establish and Enforce Clear National and Local Policies.** Clear legal and regulatory requirements for scheduled desludging, and septage collection and treatment provide the foundation for comprehensive septage management programs. Countries should work to establish appropriate legal and regulatory frameworks and also create regulatory regimes that ensure effective enforcement.

**Strengthen the Capacity of Implementing Agencies and Utilities.** Inadequate human and institutional capacity at the local level is a major barrier to constructing and maintaining infrastructure, and regulating programs. National and local governments should develop capacity building initiatives that provide technical support and training for national and local officials, and both public and private operators. Focus areas should include technical, institutional, planning, social and financial aspects.

**Enable Private Service Providers in Scale Up Scheduled Desludging.** At present, private operators are major providers of septage management services in most countries in the region. By creating new incentive schemes and regulatory programs, local governments can better leverage the private sector to scale up scheduled desludging, while minimizing infrastructure requirements and creating business opportunities.

**Increase Funding and Reform Tariff Structures.** To build or rehabilitate infrastructure, local governments and utilities must have access to national funding and low-interest loans, and/or have the authority to increase septage or wastewater tariffs. Where there are national caps on desludging tariffs, rates should be increased to cover the cost of septage collection, treatment, and disposal. Where possible, billing and collection for septage management should be combined with that of water services, in order to break customer payments into installments, reduce unregulated private desludging activity, and increase willingness to pay.

In working to develop new policies and practices, as well as strengthen capacity, wastewater operators and cities should share experiences and information though partnerships, networking, and knowledge sharing. One proven approach for cooperation are water operator partnerships (WOPs), which enable the direct transfer of technical assistance through peer-to-peer exchange. In particular, these partnerships link "mentor" utilities that have developed good practices with "recipient" utilities that are interested in technical assistance. WOPs leverage mentor interests in corporate social responsibility, staff training, or understanding of other countries with recipient interest in adopting new policies or practices. WaterLinks, a regional network that facilitates WOPs with the support of the Asian Development Bank, International Water Association and United States Agency for International Development, has implemented dozens of successful WOPs (www.waterlinks.org).

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# GLOSSARY*

**Biosolids** – the byproduct of the treatment of domestic wastewater in a domestic wastewater treatment plant. Biosolids consist primarily of dead microbes and other organic matter and can be used as organic fertilizer or soil amendments.

**Desludging** – the process of cleaning or removing the accumulated septage from a septic tank or wastewater treatment facility.

**Digestion** – a microbiological process that converts chemically complex organic sludge to methane, carbon dioxide, and inoffensive humus-like material.

**Domestic Sewage** – wastewater composed of untreated human waste coming from residential and commercial sources. Domestic sewage does not include industrial and/or hazardous wastes.

**Effluent** – a general term for any wastewater, partially or completely treated, or in its natural state, flowing out of a drainage canal, septic tank, building, manufacturing plant, industrial plant, or treatment plant.

**Faecal Sludge Management** – also known as septage management, FSM concerns the various technologies and mechanisms that can be used to treat and dispose of sludge – the general term for solid matter with highly variable water content produced by septic tanks, latrines, and wastewater treatment plants.

**Improved Water** – access to a household connection, public standpipe, borehole, protected dug well, protected spring, or rainwater collection, according to the Millennium Development Goals.

**Improved Sanitation** – a connection to a public sewer or septic system, or access to a pour-flush latrine, a simple pit latrine or a ventilated improved pit latrine, according to the Millennium Development Goals.

**Onsite Sanitation System** – infrastructure that aims to contain human excreta at the building; comprises of septic tanks and improved latrines.

**Seepage Pit** – a hole in the ground that receives the effluent from a septic tank and allows the effluent to seep through the pit bottom and sides; may be lined with bricks or filled with gravel.

**Septage** – the combination of scum, sludge, and liquid that accumulates in septic tanks.

**Septic Tank** – a watertight, multi-chambered receptacle that receives sewage from houses or other buildings and is designed to separate and store the solids and partially digest the organic matter in the sewage.

**Service Provider** – a public or private entity, operator or water utility that is engaged in the collection, desludging, handling, transporting, treating, and disposing of sludge and septage from septic tanks, cesspools, Imhoff tanks, portalets, sewage treatment plants.

**Sewage** – mainly liquid waste containing some solids produced by humans, which typically consists of washing water, feces, urine, laundry wastes, and other material that flows down drains and toilets from households and other buildings.

**Sewer** – a pipe or conduit for carrying sewage and wastewater.

**Sewerage** – a system of sewers that conveys wastewater to a treatment plant or disposal point. It includes all infrastructure for collecting, transporting, and pumping sewage.

**Sludge** – precipitated solid matter with a highly mineralized content produced by domestic wastewater treatment processes.

**Stabilization** – the process of treating septage or sludge to reduce pathogen densities and vector attraction to produce an organic material that may be applied to the land as a soils conditioner.

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*Note: This glossary follows that found in the following source: Government of the Philippines, Department of Health. "Operations Manual on the Rules and Regulations Governing Sludge and Septage." Manila: Department of Health, 2008.

# ACRONYMS

This list contains acronyms used in the report, with the name of the country where the term is used in parentheses, where appropriate.

| | |
|---|---|
| ADB | Asian Development Bank |
| ANAMAI | Department of Health in the Ministry of Public Health (Thailand) |
| AusAID | Australian Government Overseas Aid Program |
| BAPPEDA | Local branches of the BAPPENAS (Indonesia) |
| BAPPENAS | National Development Planning Agency (Indonesia) |
| BMA | Bangkok Metropolitan Authority (BMA) |
| BORDA | Bremen Overseas Research and Development Association (Germany) |
| BOT | Build-Operate-Transfer schemes |
| CBO | Community-Based Organization |
| CEA | Central Environmental Authority (Sri Lanka) |
| CPHEEO | Central Public Health and Environmental Engineering Organization (India) |
| CWA | 2004 Clean Water Act (Philippines) |
| DAK | Special Allocation Funds (Indonesia) |
| DANIDA | Danish International Development Agency |
| DENR | Department of Environment and Natural Resources (Philippines) |
| DKP | *Dinas Kebersihan dan Pertamanan*, also Dinas, or sanitation agencies (Indonesia) |
| DPWH | Department of Public Works and Highways (Philippines) |
| DOE | Department of Energy (Malaysia) |
| DOH | Department of Health (Philippines) |
| EOLA | Department of Local Administration (Thailand) |
| DEWATS | Decentralized Wastewater Treatment Systems |
| ECO-Asia | Environmental Cooperation-Asia, a program of USAID |
| EAWAG | Swiss Institute for Aquatic Science and Technology |
| EPA | Environmental Protection Agency (United States) |
| ESP | Environmental Services Program, a program of USAID (Indonesia) |
| ISSDP | Indonesia Sanitation Sector Development Program (Indonesia) |
| FORKALIM | *Forum Komunikasi Air Limbah* or the communication network for wastewater treatment operators (Indonesia) |
| GDP | Gross Domestic Product |
| GIS | Geographic Information System |
| GOI | Government of India |
| GTZ | German Agency for Technical Cooperation |
| HCMC | Ho Chi Minh City, Vietnam |
| IMF | International Monetary Fund |
| IPLT | *Instalasi Pengolahan Lumpur Tinja* or septage treatment plant (Indonesia) |
| IRD | Research Institute for France |
| IRR | Implementing Rules and Regulations (Philippines) |
| IWA | International Water Association |
| IWK | Indah Water Konsortium (Malaysia) |
| IST | Individual Septic Tank (Malaysia) |
| JBIC | Japan Bank of International Cooperation |
| JNNURM | Jawaharlal Nehru National Urban Mission (India) |
| KfW | German Reconstruction Credit Institute |
| LA | Local Authority (Malaysia, Sri Lanka) |
| LGA | Local Government Authority (Thailand) |

| | |
|---|---|
| LGU | Local Government Unit (Indonesia, Philippines) |
| LWUA | Local Water Utilities Administration (Philippines) |
| MDG | Millennium Development Goal |
| MOC | Ministry of Construction (Vietnam) |
| MOE | Ministry of Environment (Indonesia) |
| MOF | Ministry of Finance (Indonesia) |
| MOH | Ministry of Health (Indonesia, Vietnam) |
| MONRE | Ministry of Natural Resources and Environment (Malaysia, Thailand) |
| MOPH | Ministry of Public Health (Thailand) |
| MOUD | Ministry of Urban Development (India) |
| MPW | Ministry of Public Works (Indonesia) |
| MWCI | Manila Water Company, Inc. (Philippines) |
| MWSI | Maynilad Water Services, Inc. (Philippines) |
| NA | Not available |
| NAP | National Action Plan (Indonesia) |
| NEQA | 1992 National Environmental Quality Act (Thailand) |
| NGO | Nongovernmental Organization |
| NSP | *Nirmal Shahar Puraskar* or Clean Cities Award (India) |
| NSSMP | National Sewerage and Septage Management Program (Philippines) |
| NUSP | 2008 National Urban Sanitation Policy (India) |
| NWQMF | National Water Quality Management Fund (Philippines) |
| NWSDB | National Water Supply and Drainage Board (Sri Lanka) |
| ODA | Official Development Assistance |
| O&M | Operations and Maintenance |
| OSS | Onsite Sanitation System |
| OUSDD | Orientation for the Development of Urban Sewerage and Drainage until 2020 (Vietnam) |
| PC | Provincial Councils (Sri Lanka) |
| PCD | Pollution Control Department (Thailand) |
| PDAM | *Perusahaan Daerah Air Minum* or local water supply agency (Indonesia) |
| PHA | 1992 Public Health Act (Thailand) |
| PHED | Public Health Engineering Departments (India) |
| PS | *Pradeshiya Sabhas* or town councils (Sri Lanka) |
| PSA | Philippine Sanitation Alliance (Philippines) |
| PWRF | Philippine Water Revolving Fund (Philippines) |
| Sandec | Department for Water and Sanitation in Developing Countries under Eawag |
| SANIMAS | *Sanitasi Berbasis Masyarakat* or Sanitation for Communities (Indonesia) |
| SDC | Swiss Agency for Development and Cooperation |
| SPAN | *Suruhanjaya Perkhidmatan Air Negara* or Water Commission (Malaysia) |
| SSA | 1993 Sewerage Services Act (Malaysia) |
| SSD | Sewerage Services Department (Malaysia) |
| STP | Septage treatment plants |
| SUSEA | Sustainable Sanitation in East Asia, a program of WSP |
| UASB | Upflow Anaerobic Sludge Blanket |
| UDA | Urban Development Authority (Sri Lanka) |
| UIDSSMT | Urban Infrastructure Development for Small and Medium Towns (India) |
| ULB | Urban Local Bodies (India) |
| UNICEF | United Nations Children's Fund |
| UPWC | Urban Public Works Companies (Vietnam) |
| URENCO | Urban Environmental Company (Vietnam) |
| USAID | United States Agency for International Development |

| | |
|---|---|
| WASPOLA | Water and Sanitation Policy Formulation and Action Planning Project (Indonesia) |
| WHO | World Health Organization |
| WMA | Wastewater Management Authority under MONRE (Thailand) |
| WOP | Water Operator Partnership |
| WQMA | Water Quality Management Area (Philippines) |
| WSDC | Water Supply and Drainage Companies (Vietnam) |
| WSIA | Water Services Industry Act (Malaysia) |
| WSP | World Bank Water and Sanitation Program |
| WWTP | Wastewater treatment plant |
| WSS | Water Supply and Sewerage sector (India) |

# INTRODUCTION

Widespread migration to urban centers throughout Asia is placing tremendous stress on urban water supplies and sanitation services, with a disproportionate impact on the poor and women. Improving access to clean water and adequate sanitation for the urban poor is among the highest priorities facing Asian decision-makers, who are committed to achieving the Millennium Development Goals (MDG) target of halving the proportion of people without sustainable access to safe drinking water and sanitation by 2015. In 2005, the United States Government strengthened its commitment to helping these countries achieve their MDG targets by passing the 2005 Paul Simon Water for the Poor Act.

The Environmental Cooperation-Asia (ECO-Asia) program, a regional project of the United States Agency for International Development (USAID) Regional Development Mission Asia (RDMA), works to improve access to safe drinking water and sustainable sanitation. As part of these efforts, ECO-Asia developed this rapid assessment of the legal and policy frameworks and institutional capacity of seven countries in South and Southeast Asia to manage septage. Septage is the human waste contained in onsite sanitation systems, such as septic tanks and latrines, and are one of the most prevalent and least addressed forms of sanitation in Asian cities. This assessment aims to: (1) consolidate information on the status of septage management in the region; (2) determine the barriers to effective septage management programs faced by government agencies and utilities; and (3) identify best practices in the region and help increase country capacity to provide sustainable sanitation and wastewater treatment.

This report draws mainly on desk studies of policies, laws, and sector assessments for India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam. As a general approach, researchers visited septage facilities that typify the situation in each country, and conducted interviews with representatives from relevant government agencies and private sector companies. Since most countries currently do not comprehensively address septage management, information on this sector is often very limited. To improve the accuracy of the assessment, independent experts from each country, including staff from line agencies, utilities, international organizations, and universities reviewed draft country reports. In developing the first three chapters of this report, ECO-Asia collaborated with the Department of Water and Sanitation in Developing Countries (Sandec) at the Swiss Federal Institute of Aquatic Science and Technology (Eawag), a research institute that specializes in applied research and capacity building, particularly in the field of septage management. This assessment contains the following sections:

- An Overview of Septage Management that provides background on the need for septage services, the function of septic tanks, and the components of a septage management program;
- Regional Challenges and Good Practices that summarize the status of the seven target countries, and key common challenges and good practices;
- Regional Recommendations and Opportunities that provide recommendations to help strengthen programs as well as a strategy for regional capacity building; and
- Country Assessments that document the infrastructure, legal, institutional, and funding conditions in each country and the ability of national governments, cities agencies, and operators to provide comprehensive septage management.

To validate preliminary findings from the desk studies, in May 2009, ECO-Asia and Indah Water Konsortium (IWK), Malaysia's national sewerage services provider, co-organized a workshop in Kuala Lumpur to discuss findings and provide practitioner training on effective septage management. Fifty participants from water and wastewater utilities, government ministries, local government agencies, universities, and international organizations from India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam attended the workshop. The valuable feedback and recommendations provided by these participants have been incorporated into this report.

This assessment also serves as a knowledge product of WaterLinks, a regional network that supports water operator partnerships in Asia. WaterLinks disseminates knowledge products such as this report to provide water operators with additional tools to address the region's water and sanitation challenges. WaterLinks is supported by the Asian Development Bank (ADB), International Water Association (IWA), and USAID.


DOULAYE KONÉ, SANDEC/EAWAG

A privately-owned septage collection truck empties its waste on a piece of vacant land. In the cities all over developing countries, septage haulers empty waste into water bodies, vacant land, drains, and landfills due to the lack of treatment facilities, easily accessible facilities, and incentives for compliance.

# OVERVIEW OF SEPTAGE MANAGEMENT

## 1.0 THE CASE FOR IMPROVED SEPTAGE MANAGEMENT IN ASIA

Despite gains in the past two decades, safe sanitation remains a public health and environmental crisis for many countries in South and Southeast Asia. An estimated 1.2 billion people in South and Southeast Asia still lack access to improved sanitation, and waterborne diseases cause over 800,000 premature deaths each year, 90 percent of whom are children under the age of five.[1] In South Asia, which is not on track to meet the Millennium Development Goal (MDG) of halving the proportion of people without sustainable access to basic sanitation from 1990 to 2015, only 33 percent of the population had attained access to improved sanitation as of 2006.[2] In Southeast Asia, which is on track to meet the MDG sanitation target, 67 percent of the population had attained access to improved sanitation as of 2006.[3] While access is gradually increasing in the region (see Figures 1 and 2), a World Bank Water and Sanitation Program study of Cambodia, Indonesia, the Philippines, and Vietnam estimates that poor sanitation costs these countries a total of $9 billion per year – roughly 2 percent of their combined GDPs – in the form of economic, health, and environmental losses.[4]

The challenge to achieving the MDG targets for sanitation, as well as the MDG child health target of reducing by two-thirds the mortality rate of children under the age of five between 1990 and 2015, is the treatment of human excreta, not the provision of sanitation facilities.

The MDGs define an improved sanitation facility as "one that hygienically separates human excreta from human

FIGURE 1: INCREASED ACCESS TO IMPROVED WATER, 1990-2006 (% OF POPULATION)[5]

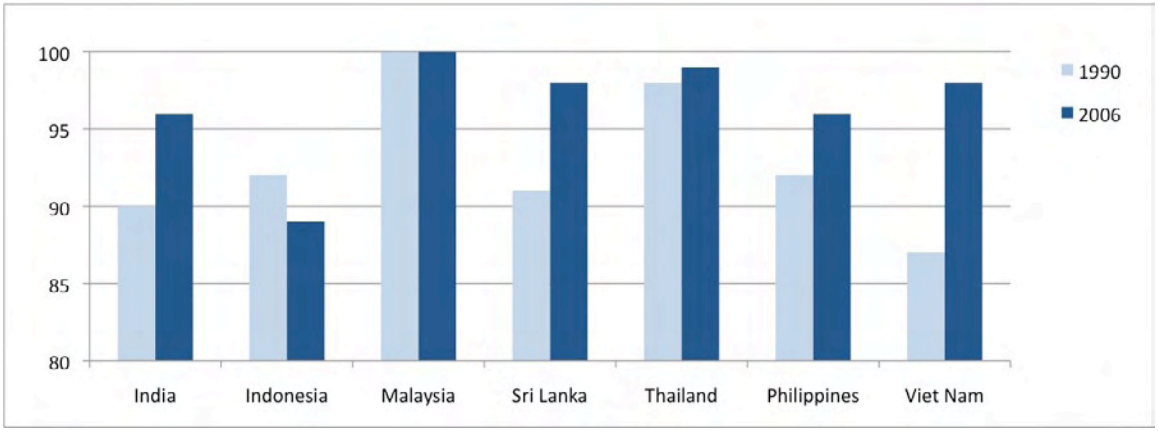
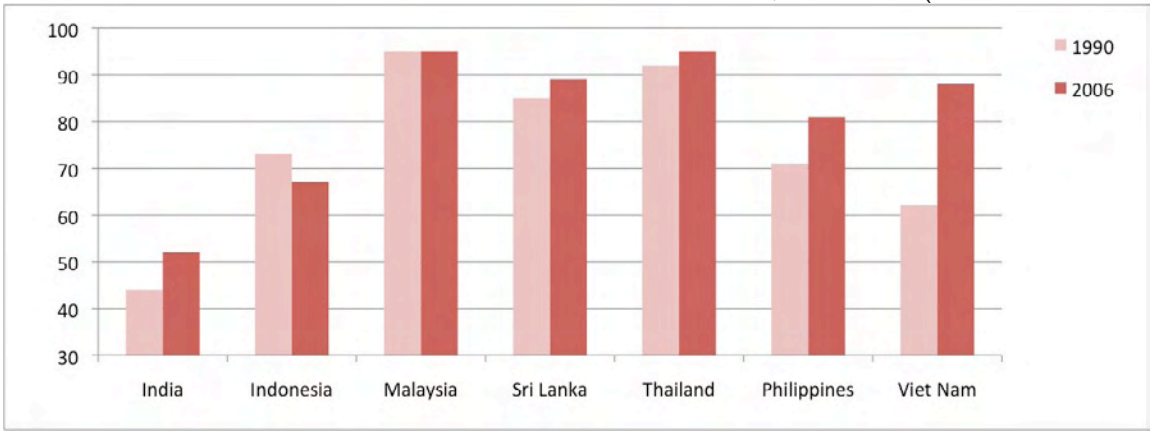



FIGURE 2: INCREASED ACCESS TO IMPROVED SANITATION, 1990-2006 (% OF POPULATION)[6]



contact."[7] These facilities include connections to public sewers, as well as onsite sanitation systems such as septic tanks, pour-flush latrines, simple pit latrines, pit latrines with slabs, ventilated improved pit latrines, and composting toilets. Since access to improved water has reached 92 and 95 percent for urban areas in South Asia and Southeast Asia, respectively, households are increasingly upgrading to water-flushed forms of sanitation facilities, thereby increasing the volume of wastewater.[8]

On paper, these facilities count towards reaching the MDG targets, but in reality, most improved sanitation facilities in South and Southeast Asia drain untreated into waterways and groundwater, and do not fully separate human excreta from human contact in the long run (see Table 2, p. 12). In the countries studied in this report, septic tanks are one of the more common, if not the most, common, forms of urban improved sanitation facilities, with 29 to 89 percent of urban households relying on these systems. As most septic tanks are rarely desludged, they tend to be too full to perform the intended primary treatment, and instead effectively serve as holding tanks. Highly contaminated septic effluent flowing out of septic tanks enters waterways through the open bottoms of older septic tanks or via the drainage system, which usually empties into the nearest waterway. When tanks are desludged, the septage, or sludge inside septic tanks, is often dumped into waterways, drains, landfills, and vacant land due to the lack of septage treatment plants and inadequate enforcement. Except for Thailand and Malaysia, countries in this report treat five percent or less of their septage. Even areas that have direct sewage connections, which comprise two to 40 percent of the urban population in the countries studied in this report except Malaysia, sewage treatment is less than 15 percent of the total volume.

Across the region, domestic wastewater has become the main contributor to the degradation of rivers, lakes, groundwater, and coastal waters. This in turn threatens the provision of safe water supply, especially to the poor. Without septage management and sewage treatment, even so-called "improved" sanitation facilities will remain a significant source of waterborne diseases and water pollution. Strengthening septage management by developing the enabling policies and physical infrastructure for septage collection and treatment capacity can be an effective and practical short- to medium-term solution for wastewater treatment.

## 2.0 SEPTIC TANKS

Onsite sanitation systems (OSS) aims to contain human excreta and domestic wastewater at the household level, and can be classified into two main categories (wet and dry) and seven sub-systems as shown in Table 1. An overview of these systems is described in the "Compendium of Sanitation Systems and Technologies" published by Eawag/Sandec in 2008.[9] This report broadly categorizes OSS as septic tanks and latrines and focuses particularly on septic tanks. However, as discussed in the box to the right on terminology, many septic tanks in the region are not built to code and function more as improved latrines, which also need to be desludged.

Septic tanks are watertight, multi-chambered receptacles that receive black and/or grey water and separate the liquid from the solid waste, which it stores and partially digests. They provide primary treatment, or the separation of solids and liquids, typically through two-chamber settling tanks. Once raw sewage flows into the tanks, solids settle to the bottom, forming sludge. Oil and grease float to the top, creating a layer of scum that prevents oxygen from penetrating the surface. Under these anaerobic conditions, bacteria digest the wastewater, usually over a period of at least 24 hours. In a regularly desludged system, sludge fills less than one-third of the tank, leaving the remaining two-thirds of the tank to perform anaerobic digestion. Functioning septic tanks remove 60 to 80 percent organic pollutants and total suspended solids, but are less effective in removing pathogens.[11] Some have a filter system, which can further increase primary treatment efficiency by 25 percent.

Together with leaching fields, septic tanks can reduce contaminant levels to less than one percent. However, urban environments do not have space for leaching fields and urban septic tanks usually discharge effluent into the soil, a soakage pit, open channels, drains, or sewers. Effluent is particularly a threat to groundwater if the water table is less than two meters deep.[12]

If a tank is not regularly desludged, the sludge gradually fills the tank, leaving less and less space for anaerobic digestion and increasing the level of suspended solids and untreated sewage in the effluent discharged from the tank (see Figure 3). In such cases, polluted effluent will also quickly clog the filters. The quality and quantity of septage collected from onsite sanitation systems

TABLE 1: CLASSIFICATION OF ONSITE SANITATION SYSTEMS[10]

| No. | OSS Technology | Waste Flows |
|---|---|---|
| 1 | Septic tank connected to existing sewer systems | Wet; mixed black water and grey water system with offsite treatment |
| 2 | Septic Tank with onsite effluent treatment or infiltration | Wet; mixed black water and grey water system with onsite treatment |
| 3 | Septic tank with onsite effluent treatment or infiltration; latrines | Wet; black water systems that are separate from grey water |
| 4 | Septic tank discharging to existing sewer systems | Wet; urine-diversion system |
| 5 | Latrines, composting toilet, VIP latrines | Dry; grey water-separate system |
| 6 | Urine Diverting toilet, dehydration toilet | Dry; urine- and grey water-diversion system |
| 7 | Latrines | Dry; all wastes mixed together |

## Clarifying the Terminology

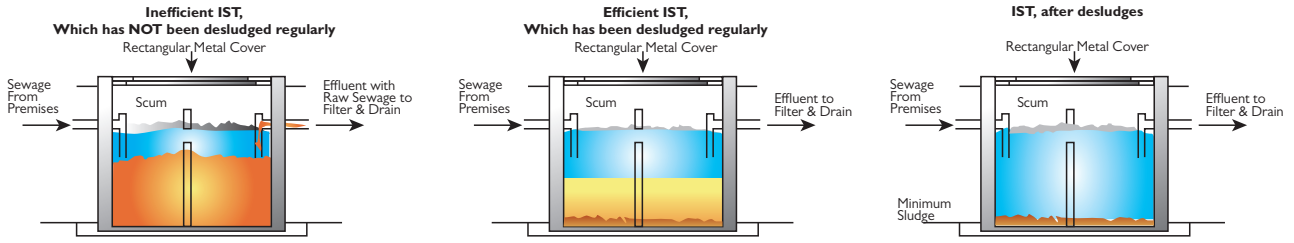
Onsite sanitation systems include both septic tanks and latrines, and different countries call the waste that accumulates inside OSS by different names. Thailand calls it "night soil", Vietnam calls it "septic tank waste," some English speaking countries use "septage," and Sandec/Eawag defines it as "faecal sludge."

- Septic tanks are watertight, multi-chambered receptacles that receive black and/or grey water and separate the liquid from the solid waste, which it stores and partially digests. Many OSS are mistakenly called septic tanks, even when they are inadequately sized or designed, have only one chamber, or have open bottoms, and therefore do not perform primary wastewater treatment.
- Septage is the combination of scum, sludge, and liquid that accumulates in septic tanks. Although this term technically applies only to septic tank wastewater, many people use it to describe waste from all onsite sanitation systems.
- Sludge by itself refers to any precipitated solid with a highly mineralized content produced by domestic wastewater treatment processes, including those created by septic tanks, centralized wastewater plants, or industrial processes.
- Faecal sludge is a term developed by Sandec/Eawag uses to apply to human excreta in both septic tanks and latrines.

Given the number of countries in the region that use the term "septage" to describe waste in onsite sanitation, this report also uses the term for all types of human excreta collected from onsite sanitation systems, including wet and dry systems, and private or public toilets. These elements of onsite sanitation should not be confused with the piped wastewater collection system:

- Sewage is mainly liquid waste containing some solids produced by humans, which typically consists of washing water, feces, urine, laundry wastes, and other material that flows down drains and toilets from households and other buildings. It is usually applied to wastewater that flows into sewers.
- Sewers are pipes or conduits for carrying sewage and wastewater.
- Sewerage is the system of sewers that conveys wastewater to a treatment plant or disposal point. It includes all infrastructure for collecting, transporting, and pumping sewage, but does not include the wastewater treatment plant, since sewerage systems can convey sewage to waterways as well.

FIGURE 3: THE IMPACT OF FULL SEPTIC TANKS[13]




depends largely on the types of technology in use, the frequency of desludging, climate, and soil conditions. The septic tank's primary treatment efficacy can also decrease if households use chemical cleaners to clean the toilet, which may kill the bacteria and destroy anaerobic digestion.

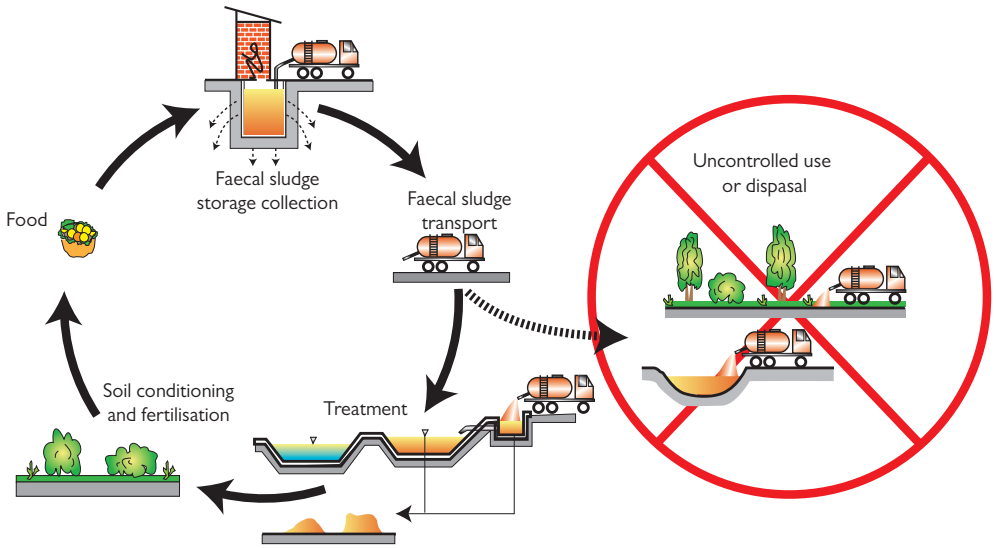
While many countries and international organizations have published guidelines for OSS design, in many cases these guidelines are inappropriate, inadequate, or not enforced. Therefore, in reality, the sizes and designs of septic tank or latrines vary from one country to another, and are influenced largely by the local construction standards or the skill of masons.

## 3.0 COLLECTION AND TREATMENT INFRASTRUCTURE

Despite the widespread promotion of onsite sanitation systems in reaching the MDGs' sanitation target, most toilet provision programs and city agencies do not address the issue of what people do with the septage that accumulates inside OSS. In the absence of adequate public services, private service providers have emerged to empty OSS by hand or with vacuum trucks. Operators with mechanized equipment often transport and dispose of septage several kilometers from people's homes in drains, waterways, open land, and agricultural fields. Manual desludgers working in low-income areas and squatter settlements, which are often inaccessible by truck, usually deposit the septage within the family's compound, into nearby lanes, drains, open land or waterways. Thus, the poorest have the highest health risk both because they are the most likely to provide manual desludging services, and because their homes are closest to the actual dumping grounds.

To achieve effective and sustained health protection for these exposed urban populations, future toilet provision programs and city agencies must address the

FIGURE 4: THE COMPLETE SEPTAGE MANAGEMENT CYCLE[15]



Examples of collection vehicles in Malaysia. Clockwise from the upper left: a 2.5 $m^3$ tanker for small tanks and narrow lanes, a 4.5 $m^3$ tanker for most domestic and commercial septic tanks, and an 11 $m^3$ tanker for large industrial and government septic tanks and sludge removal from wastewater treatment plants.

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collection, transport, treatment, and safe disposal or reuse of treated septage from OSS (see Figure 4). A comprehensive septage management program consists of the following physical infrastructure and processes, and can be modified depending on the community's demand, density, and ability to pay.[14]

## 3.1 Septage Transportation

While desludging frequencies vary, it is typically considered best practice to desludge tanks once every three to five years, or when the tank becomes one-third full. Studies have shown that after this period, sludge decomposes, solidifies, and can no longer be removed by suction alone.[16] Frequent desludging also helps reduce the pollution levels in the liquid effluent, which typically enters waterways untreated.

Desludging trucks play the role of a "mobile sewer network" for onsite sanitation systems. They collect the pollution at the building level and convey it to treatment or discharge sites, hence providing the same service as the underground sewer network. Today, there are a number of vacuum trucks and gully suckers that desludge OSS. These systems range in size and design, and some, like the UN-Habitat Vacutug, can now reach low-income areas that were previously inaccessible to mechanized desludging vehicles. The city of Hai Phong, Vietnam, for example, uses a combination of small, hand-pushed vacuum tugs of 350 liters and truck-mounted vacuum tanks of five cubic meters.[17]

Given the safety and health risks of manual OSS desludging, it is critical for cities to take steps to end this common practice, which is dangerous and unpleasant work often carried out by the poor. A manual of practice can guide service providers on how to properly contact customers, inspect and clean tanks, take safety precautions, transport the waste, and maintain the equipment. Conducting physical surveys and maintaining accurate records through manifests and receipts of desludging events, locations, and waste volumes help ensure accurate billing and develop a database of information to facilitate future desludging. Procedures that tie records to payment for collection operators can also prevent illegally dumping.

## 3.2 Septage Treatment and Disposal

Septage can be treated in a variety of ways, and there is no single best option given the widely varying conditions of urban areas in developing countries. Sandec and its partners have found that treatment using natural processes, including waste stabilization ponds, unplanted sludge drying beds, reed-planted drying beds, constructed wetlands, and composting, are the most cost-effective solutions. Sandec has developed a series of guidelines for planners and engineers to build and implement these options.[18] Anaerobic digestion (with biogas generation), lime treatment, and mechanized systems, such as activated sludge process, are also widely used technologies in treating septage. Important considerations include the cost of land, the capacity of staff to operate and maintain the system, and the location of the treatment facility with respect to OSS. Digested sludge from OSS is 100 times more concentrated than domestic wastewater flowing in the sewer systems, and therefore should not be treated with wastewater in sewage treatment plants.[19]

Although septage and sewage may share drying beds, this combination may affect the quality of the dried output if the sewage includes industrial wastewater. If the dried sludge meets established standards, it can be used as a soil amendment for reclaimed land, landfill cover, landscaping compost, or fertilizer for non-edible plantations. For use as compost for edible crops, treatment facilities need to ensure that the end product attains standards for agricultural reuse. The World Health Organization's 2006 "Volume 4: Excreta and

Examples of septage treatment facilities in Malaysia. Clockwise from the upper left: a trenching site, a sludge drying bed, a mobile dewatering unit, and an activated sludge facility - just some of the possible septage treatment technologies.

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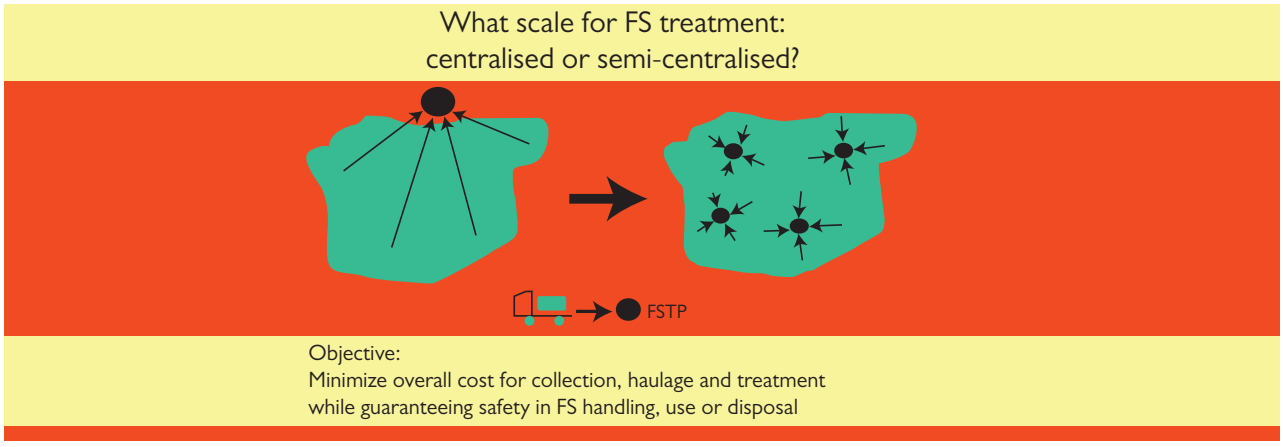
Grey Water Use in Agriculture" of the "Guidelines for the Safe Use of Wastewater, Excreta, and Grey Water" provides standards for reuse.

In choosing the most appropriate treatment option, the following factors should be considered: population density; capital and operating cost; levels of mechanization; levels of external energy input; compatibility with available local expertise; and the existing institutional framework. Low capital and operating cost treatment options are usually associated with large land requirements. When selecting a treatment option, a balance between economic and technical feasibility on the one hand and land requirement on the other must be achieved to match local conditions and needs.[20]

## 3.3 Decentralizing Physical Infrastructure

Given the difficulty of collecting septage and hauling it across cities to designated disposal and treatment sites, medium-scale satellite treatment plants in easily accessible locations may significantly reduce collection and haulage costs (see Figure 5). Capital, operating and maintenance costs decrease with increasing plant size. However, since larger treatment plants require longer haulage distances between pits and disposal sites, costs escalate for collection companies, which in turn increases the risk of indiscriminate and illegal dumping. The optimum plant size has to be determined on a case-by-case basis as it depends on the local context (e.g., labor cost, land price, treatment plant scale, haulage distance, and site conditions).

FIGURE 5: SCALE OF SEPTAGE TREATMENT: CENTRALIZED OR SEMI-DECENTRALIZED?[21]



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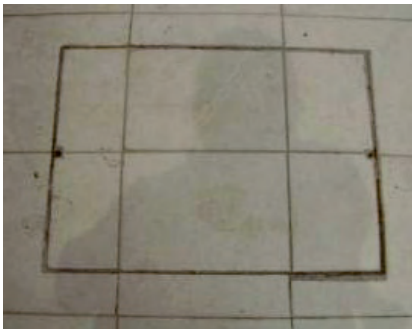


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Many septic tanks are difficult to access or not built to code in the region. Developing a database of their location and condition is the first of a number of challenges to developing a successful septage management program.

# REGIONAL CHALLENGES AND GOOD PRACTICES

The development of physical infrastructure is only one component of a functioning septage management program, which also depends upon sustained public sector commitment and funding, effective policies, appropriate implementation, and compliance enforcement. To understand the diverse policies and practices for septage management in the region, this report conducted country assessments for India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam.

Broadly speaking, septage management in most countries is a public sector activity. In the most common model, the national government adopts a legal and policy framework requiring local governments to develop septage and sewerage programs, and local governments develop collection services and treatment facilities. Actual implementation approaches can be quite varied. Countries regulate septage management through different national ministries (e.g. environment, public health, public works, planning, and construction), and manage septage with wastewater services, water, or solid waste. Service providers can include local public service providers, nationalized public service operators, private concessionaires, private contractors, or a combination of organizations. With the exception of Malaysia, independent service providers tend to fill gaps created by inadequate public services, and operate without public monitoring or regulation. Although little is known about these informal operators, in many countries they are the main service providers and should be an integral part of formal desludging programs.

To validate the preliminary findings of this assessment, and to strengthen awareness, capacity, and regional dialogue, ECO-Asia and Indah Water Konsortium (IWK), Malaysia's national sewerage services provider, organized a workshop and training in Kuala Lumpur from May 25-28, 2009. The workshop was attended by 50 participants from water and wastewater utilities, government ministries, local government agencies, universities, and international organizations from India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. These participants contributed important information and insights on current conditions, challenges, and opportunities, which are included throughout the report, but particularly in this section (see Tables 3-5) and the next.

The experiences of these countries, summarized below, demonstrate that any number of approaches can be successful when implemented in conjunction with a comprehensive legal and policy framework, clear delineation and appropriate delegation of roles and responsibility, and dedicated public funding. Across the region, there are some cities, utilities, and agencies that effectively manage septage, and can serve as models for others. Nevertheless, the country assessments reveal that, overall, septage management remains a significant challenge and is not a top priority for most countries.

Where governments do undertake septage management initiatives, they tend to focus on physical infrastructure, particularly the construction of treatment facilities, and place less emphasis on enabling conditions, such as policies, education, operator training, and sustainable financing. In many cases, without an effective enabling environment, septage treatment facilities sit empty or underutilized and often eventually shut down. Key challenges, summarized below, include fragmented or inadequate local regulations, weak enforcement, weak institutional capacity, unclear delineation of responsibilities, and inadequate local and national funding for capital and operational expenses.

## 1.0 SUMMARY OF COUNTRY EXPERIENCES IN SEPTAGE MANAGEMENT

Strengthening septage management capabilities and capacity is not a top priority of most countries in the region. Policymakers tend to perceive septic tanks and other onsite sanitation facilities as interim solutions that should not receive significant public funding. As a result, sector funding has focused on sewerage development and the construction of centralized wastewater treatment facilities, projects that can take decades to complete given the expense and difficulty of retrofitting cities with wastewater infrastructure. Meanwhile, septic tanks and septage will continue to be a prevalent form of urban sanitation, and will continue to have a significant impact on public health and the environment. Some countries, namely India, the Philippines, and Vietnam, are beginning to recognize the need to expand investments in septage management after understanding the potential health impacts and the challenges of developing large centralized sewerage

TABLE 2: SNAPSHOT OF THE STATE OF SANITATION IN SOUTH AND SOUTHEAST ASIA[1]

| | Southeast Asia | | | | | South Asia | |
|---|---|---|---|---|---|---|---|
| | Indonesia | Malaysia | Philippines | Thailand | Vietnam | India | Sri Lanka |
| Population (in millions) | 222 | 28 | 88 | 63 | 86 | 1,150 | 19 |
| Urban Population (in millions) | 93 | 18 | 54 | 21 | 23 | 350 | 3 |
| % Access to improved water (urban) | 89% | 98% | 96% | 99% | 98% | 96% | 98% |
| % Access to improved sanitation (urban) | 67% | 95% | 81% | 99% | 88% | 52-86% | 89% |
| % Sewerage connections | 2.3% (urban) | 73% (national) | 7% (urban) | NA | NA | 40% (urban) | 4% (urban) |
| % Sewage treated | <14% | 100% | <10% | 14% | 4% | 9% | NA |
| % Septic Tanks | 62% (urban) | 27% (national) | 40% (national) 85% (Metro Manila) | all but highly urbanized areas | 77% (urban) | 29% (urban) | 89% (nation) |
| % Septage treated | 4% (national) | 100% (national) | 5% (Metro Manila) | 30% (national) | <4% (national) | 0% (national) | <1% (Nuwara Eliya) |
| % Organic water pollution due to domestic wastewater | NA | NA | 50% | 54% | 55% (Hanoi) | 80% | NA |
| % Surface water polluted | 75% | 45% (monitored rivers) | 58% (groundwater) | 52% | NA | 75% | NA |
| Economic Cost of Poor Sanitation (in billions) | $6.3 | NA | $1.4 | NA | $0.8 | $5.7 | NA |

Note: NA = not available < = less than

systems. While these infrastructure initiatives can face many challenges, some countries, particularly in Malaysia, the Philippines, and Thailand have made good progress in overcoming obstacles.

What follows is a brief summary of the status of septage management policies and practice in the target countries. These summaries are complemented by Tables 2-5, which compare the physical, political, institutional, and financial situations and challenges in the seven countries. The data in these tables are drawn from the country assessments, as well as the feedback from participants at the septage management workshop. The country assessments in later sections provide detailed information on the legal and institutional frameworks, status of implementation and enforcement, and best practices in each country.

## 1.1 India

By one estimate, about 40 percent of urban households in India are connected to a sewerage system, 29 percent are connected to a septic tank, and 17 percent use pit or vault latrines.[2] However, very few cities in India have the physical capacity to safely collect, transport, and treat urban septage and sewage. Most OSS are emptied manually; only some of the larger cities have private desludging companies that use vacuum trucks. Medium- and large-size cities treat on average only nine percent of collected wastewater, and although

there are over 160 million OSS in Indian cities, there are no septage management programs or treatment facilities in the country.[3] As a result, while as many as 86 percent of urban residents in India have access to improved sanitation, the continued pollution of water sources with human excreta takes an immense toll on public health.

Historically, the Government of India has focused its wastewater investments on centralized sewerage and treatment. However, the 2008 National Urban Sanitation Policy (NUSP) changed the country's approach to urban sanitation. According to the NUSP, local governments are to be responsible for behavioral change, total sanitation, 100 percent safe waste disposal, and ending manual scavenging, in addition to sewerage development.[4] The NUSP tasks state governments with drafting state urban sanitation policies that in turn require cities to develop city sanitation strategies. As of 2009, six states have developed these plans and some cities have begun the citywide sanitation planning process. Unlike other countries where the construction of facilities has preceded policy, India's focus on policy development allows cities to develop integrated strategies that maximize the efficacy of the future physical infrastructure. These are very positive steps, although the lack of existing local and state policy and management practices, and the lack of physical infrastructure to treat septage pose significant challenges for India as it begins to address the critical issue of onsite sanitation. To implement NUSP, India will need to further increase sector funding, which is $2.80 per capita for sanitation and $3.60 per capita for water.[5]

## 1.2 Indonesia

Approximately 62 to 71 percent of the urban population in Indonesia uses septic tanks and latrines, a figure that is expected to rise as the country implements land titling policies that foster homeowner investments.[6] Although Indonesia ranks third in the world after India and China in terms of under-built sewerage infrastructure, it is among the few countries in the region that have built a large number of septage treatment plants. Unfortunately, over 90 percent of these facilities are not in operation, due to limited local capacity to maintain and fund collection and treatment programs.[7] As a result, leaking septic tanks as well as septage disposed of in waterways cause as much as 70 percent of the country's groundwater contamination.[8] The World Bank estimates that inadequate sanitation and wastewater treatment costs Indonesia $6.3 billion in economic losses each year, equal to 2.3 percent of its gross domestic product (GDP).[9]

Indonesia's sanitation sector faces many challenges, including a fragmented policy and institutional framework, low government prioritization of sanitation (as demonstrated by the national budget of $0.37 per capita for sanitation, versus $3.40 per capita for water),[10] and overlapping responsibilities for sanitation across many agencies. Decentralization in Indonesia has also presented a challenge, as local governments, which manage sanitation through two to four departments, often lack awareness and capacity to implement sanitation programs, or may even use national sanitation allocations for other departments. Recognizing the difficulties of implementing sanitation projects in the country, the National Development Planning Agency (BAPPENAS) is working with international organizations, such as USAID, BORDA, and the World Bank, to develop top-down and bottom-up initiatives for community-based sanitation.

## 1.3 Malaysia

Malaysia is a clear leader in the region in septage management. As of 2006, 98 percent of the country had access to safe water and 95 percent to improved sanitation.[11] Malaysia increased the number of households with sewerage connections from five percent in 1993 to 73 percent in 2009.[12] For households connected to septic tanks, 50 percent now participate in scheduled desludging in compliance with federal law. Malaysia's experience provides many important lessons in policy formation, institutional and implementation capacity, and funding for other countries interested in implementing successful septage management programs.

Prior to 1993, local governments were responsible for both water and sewerage services, but typically lacked the capacity to provide adequate sewerage services, which were more expensive and complex than water supply. In response, Malaysia nationalized sewerage services in 1993, transferred all wastewater assets to the federal government, and offered services through a single, private concessionaire, Indah Water Konsortium (IWK). From 1993 to 2008, IWK built sewers, developed desludging services, constructed septage and wastewater treatment facilities across the country, and, together with the regulatory agency, established clear

policy guidelines and standard operating procedures for developers and wastewater operators. Important to Malaysia's success was the national requirement that developers construct their own wastewater treatment systems. By leveraging a private sector building boom to construct and fund 70 to 80 percent of the country's sewerage and wastewater treatment infrastructure, the government reduced its capital expenses and could focus on subsidies for operations and maintenance (O&M) costs and pro-poor services. Malaysia's national budget is $8 per capita for sanitation, and $17 per capita for water, the highest among the countries in this report.[13]

The consolidation of sewerage services under one policy and one implementer empowered IWK to effectively develop and reinforce its expertise and to disseminate its knowledge across branch offices in the country. Having established a functioning program and infrastructure, the federal government is deploying a new framework to decentralize responsibilities back to local service providers and integrate the management of water and wastewater resources in each locality. This restructuring raises new questions on how to decentralize IWK's expertise, how far to decentralize collection and treatment operations, and how to manage contractors and ensure regular desludging. Other countries that already provide joint water and wastewater services may provide lessons and models for Malaysia as it transitions into the new framework.

## 1.4 The Philippines

More than 40 percent of residents in the Philippines and 85 percent of residents in Metro Manila use latrines and septic tanks.[14] Only four percent of all citizens have a sewer connection that leads to a treatment facility. As there are only a few septage treatment facilities in the entire country, the Philippines treats very little of its domestic wastewater. As a result, the World Bank estimates that, although 78 percent of the country has access to improved sanitation, the Philippines still loses over $1.4 billion in related health, environmental, and economic costs per year.[15]

Recognizing the urgent need to address this issue, the Philippines adopted the Clean Water Act in 2004, which requires national agencies, local governments, and water districts to provide either septage management or sewerage services for all domestic wastewater dischargers. Early adopting cities, such as Marikina and Dumaguete, have developed local ordinances requiring regular desludging and have constructed new septage treatment facilities. The Department of Health has also issued a comprehensive manual guiding local implementation of septage management programs. These efforts serve as useful models for other cities and countries. The relevant national agencies are now developing a national implementation master plan for septage management.

LINDA SHI, ECO-ASIA

**Inadequate wastewater collection and treatment has turned Metro Manila's many waterways into open sewers. Ongoing and planned projects in sewerage and septage development aim to restore local water quality.**

TABLE 3: SEPTAGE MANAGEMENT POLICY FRAMEWORK[17]

| | Southeast Asia | | | | | South Asia | |
|---|---|---|---|---|---|---|---|
| | Indonesia | Malaysia | Philippines | Thailand | Vietnam | India | Sri Lanka |
| **National Septage Management Policy** | No national septage management policy; 2008 National Policy and Strategies on Domestic Wastewater Management: requires increasing the use of existing STPs to 60% | 1994 Sewerage Services Act, 2006 Water Services Industry Act: clear, comprehensive language on managing septage | 2004 Clean Water Act: requires local governments and water districts to provide septage management or sewer connections; DOH Manual gives implementation guidance | 1992 Public Health Act: local governments are responsible for managing septage as a solid waste and prohibits illegal dumping. Ministerial regulations guide tank design, and septage collection and treatment | 2009 Orientation on Water Supply and Sewerage Services calls for septage management regulations; 2008 Building Code: all households must at least have a septic tank | 2008 National Urban Sanitation Policy: tasks states and cities to provide 100% safe disposal of human waste | None |
| **Models of local policy** | Local parliaments are responsible for implementing policies, but only a few have issued; see Malang's ordinance, and Surabaya's treatment plant regulations; none require regular desludging | None, national management only, though moving towards decentralization | A few cities have local ordinances (see Dumaguete and Marikina), others are developing them. Most have sanitation plans, but need to synchronize with the develoment of the National Sewerage and Septage Master Plan. | 78% of surveyed local governments in Thailand have septage management ordinances, but few require scheduled desludging and few enforce tank design per code. | Water, wastewater, solid waste policies under review, should add septage management, then elaborate and adopt at the local level along with enforcement regulations. See Nam Dinh, HCMC local ordinances. | Several states' urban sanitation policy now address this; local sanitation policies under development | Model ordinance in local languages has been developed, but not yet adopted. |
| **Challenges** | Lacks national comprehensive management policy; lack of political commitment to accelerate or prioritize sanitation development; little public awareness; | No clear method of implementing SPAN regulations; opening the sector to more service providers could challenge monitoring and enforcement. | National act vague on institutional roles; no common interpretation of the many regulations in this area. Lack of appropriate technology models and baseline data at the local level. | Separation of septage and sewerage management; lack of enforcement; little political concern now that Thailand has 99% access to sanitation. No effluent standards for septage facilities; lack of public awareness; no motivating or enforcement mechanisms. | Lack of national and local policies; limited government and public awareness; no enforcement of existing regulations; lack of experience in formulating desludging regulations. | No city has yet to manage septage. Lack of political will; politicians, households, and others resist change; limited Interdepartmental coordination; no timeline for NUSP; weak data. | Lacks national and local policies; and g uidelines; models have been developed with USAID assistance but need to be adopted. |

Implementation has been delayed, however, in large part because the national government has yet to disburse the necessary funds. Indeed, the Philippines' national sanitation budget per capita amounts to $0.34 against $10 per capita in the water sector.[16] Without national funding, few local governments have been able to construct septage treatment facilities; as a result, the country's private septage haulers continue to dispose of human excreta directly into waterways and onto vacant land. Ongoing initiatives are heavily driven by international organizations, including USAID, the World Bank, and Japan Bank of International Cooperation (JBIC). An impressive model exists in Metro Manila, where Manila Water Company, Inc., a private water and sewerage services concessionaire, has successfully constructed several septage treatment facilities, initiated regular desludging, and conducted successful public promotion campaigns. The positive models in the Philippines now need to be replicated countrywide with the support of national funding.

## 1.5 Sri Lanka

As of 2006, 82 percent of people in Sri Lanka have access to safe drinking water and 86 percent to improved sanitation.[18] The rise in access to improved sanitation is due mainly to household upgrades to OSS; only four percent of the population has a direct sewerage connection. Desludging is the responsibility of local authorities and, after the 2004 tsunami, most received gully suckers through development assistance. However, only one local authority has a small septage treatment facility, while the remaining local authorities dispose of septage in landfills or trenches. There are no policies at national or local levels specifically requiring regular desludging or mandating septage treatment. In addition, the Government of Sri Lanka has historically not prioritized wastewater treatment and only five percent of the water and sanitation budget has been used for sanitation over the past two decades.[19] Therefore, many local authorities are neither aware of the need for septage management, nor have funding for implementing such programs.

## 1.6 Thailand

In Thailand, 99 percent of all households have improved water and sanitation.[20] Almost all households rely on some kind of septic tank, except in highly urbanized areas, as there are few direct sewer connections in the country. Typically, septic tank effluent enters drains and then travels by urban canals to waterways or, in some areas, to wastewater treatment plants. While cities typically have relatively high capacity to convey sewage and collect septage, most lack adequate septage and wastewater treatment facilities. As a result, 86 percent of sewage and 70 percent of septage are directly disposed of in waterways, drains, farmland, and landfills. Around the country, human waste causes 54 percent of organic water pollution, which remains one of the country's most pressing environmental challenges.[21]

The 1992 Public Health Act requires local governments to provide collection and disposal services for solid waste and septage. The Ministry of Public Health's 2001 guide outlines the designs specifications for septic tanks and anaerobic digestion tanks for septage treatment; the standards for health, safety, and recordkeeping; and cost estimates for facilities of varying sizes. Most local governments have adopted regulations on septage management. However, due to a lack of funding for urban environmental projects like septage and solid waste, as well as limited technical assistance from the Ministry of Public Health, only 20 percent of local governments have active septage treatment facilities.[22] A significant barrier to more widespread implementation is the legal classification of septage with solid waste rather than wastewater. As a result, the entities responsible for septage operate in complete isolation from those that address wastewater management. Nevertheless, Nonthaburi Municipality in Thailand provides one of the best examples of septage management in the region, and can be an appropriate model for replication, especially in small- and medium-size municipalities.

## 1.7 Vietnam

As of 2009, over three-quarters of urban households in Vietnam rely on septic tanks; by 2015 this number is expected to grow to an estimated 95 percent among urban dwellers and 60 percent among rural homeowners, due to the implementation of a 1999 policy that requires all households to use at least a septic tank. However, until recently, the central government did not specifically direct local governments to address septage treatment or disposal. In most cities, a mix of public and private service providers have been desludging septic tanks. Publicly-owned environmental companies collect septage and dispose of it legally in landfills, while most private companies dispose of septage illegally into waterways, drains, and aquaculture ponds to avoid paying a fee for the use of the public landfills.

TABLE 4: IMPLEMENTATION RESPONSIBILITIES IN SEPTAGE MANAGEMENT[24]

| | Southeast Asia | | | | | South Asia | |
|---|---|---|---|---|---|---|---|
| | Indonesia | Malaysia | Philippines | Thailand | Vietnam | India | Sri Lanka |
| **Ultimate Responsibility** | Local governments | National, now decentralizing | Local governments | Local governments | Local governments | Local governments | Local governments |
| **National Agencies** | BAPPENAS, MPW, MOH | SPAN Commission | DENR, DPWH, DOH, LWUA | MOPH, MONRE | MOC, MOH | MOUD | CEA, NWSDB |
| **State or Local Agencies** | BAPPEDAS, Local Environmental Agencies, Dinas, PDAM | None | Local governments units and water districts | Public health and engineering divisions in local governments | DOCs, DOE, or People's Committees | Dept. of Urban Development; PHEDs, WSS Boards; ULBs, water utiltiies, city sanitation steering committees | Local governments |
| **Private Service Providers (or publicly-owned companies)** | Septage collection is often private; no private treatment faciltiies. | Indah Water Konsortium (state-owned company); other operators entering field (Ranhill Utilities). | Most septage collection is private; treatment may be LGU or private water district. See Maynilad Water Services, Inc. Manila Water Company, Inc. | Many collectors are private; no private treatment facilities. | URECNOs and UWMCs: state-owned environmental companies; a number of private, unregulated companies. HCMC has a private treatment facility. | All septage collection is private, no information available. | None |
| **Major international Organizations** | ADB, AusAID, Borda, USAID, World Bank | None | ADB, JBIC, USAID, World Bank | JICA, IGES, DANIDA | ADB, BTC, DANIDA, IRD, JBIC, GTZ/KfW, SDC, World Bank | ADB, AusAID, DANIDA, DFID, GTZ/KfW, JBIC, UNDP, USAID, UNDP, World Bank | ADB, AusAid, CIDA, DANIDA, GTZ, JBIC, SDC, USAID, World Bank |
| **Academic, NGO Organizations** | Indo. Society of Sanitary & Environmental Engineers, IWA, FORKALIM | None | Phil. Ecological Sanitation Network, Philippines League of Cities | Asian Institute of Technology, Mahidol University, Kasetsart University | Hanoi University of Civil Engineering | India Water Works Association, various colleges and institutes | CBOs |
| **Challenges** | Segmented policies and responsibilities; lack of planning, technical expertise, especially at local level; need for training and options analysis. | Decentralizing service provision opens new challenges in monitoring, recordkeeping, and enforcement. | Unclear delegation of responsibility between local government and water district; lack of local and national capacity. | Limited technical assistance for LGAs from MOPH or MONRE; limited local capacity, especially in small municipalities. | Public companies often inefficient; donor programs often unsustained due to limited local commitment and funding; lack of staff capacity. | Lack of experience and staff; too many organizations; unclear roles; immense training needs. | Limited local| awareness or capacity to improve service provision. |

Inadequate sanitation and wastewater treatment cost Vietnam an estimated $780 million each year in health, environmental, and economic expenses.[23]

A few cities in Vietnam – including Da Nang, Ha Long, Hai Phong, and Nam Dinh – have built septage treatment facilities or initiated regular desludging programs as part of larger sewerage development projects funded by international organizations, such as the German Technical Cooperation, Swiss Agency for Development and Cooperation, JBIC, and the World Bank. However, absent central government pressure, these cities did not prepare the necessary ordinances requiring septage management, or reserve operations and maintenance funds, which resulted in several of these projects not proceeding to full operation. As a result of participation by representatives from the Ministry of Construction in the septage management workshop, this Ministry updated sector policy to require wastewater treatment plants to treat sludge, including septic tank sludge. The Ministry of Construction plans to develop a framework for action and guidelines for septage management in Vietnam.

## 2.0 COMMON CHALLENGES TO EFFECTIVE SEPTAGE MANAGEMENT

Most countries have initiated at least some elements of a septage management program, but few national agencies and cities provide comprehensive management that ensures safe disposal of septage. Given the prevailing emphasis on physical infrastructure in this field, this assessment focuses on country progress in putting in place the enabling conditions that lead to effective programs. This section identifies the common challenges countries and cities face in creating enabling environments based on the country assessments and feedback from countries during the regional workshop.

### 2.1 Fragmented Policy Frameworks and Weak Enforcement

**Weak Policies and Piecemeal Implementation.** Despite the widespread use of septic tanks, most countries have not developed comprehensive policies and legal and institutional frameworks for septage management. Policymakers typically do not view water and sanitation as interconnected, leading to a piecemeal policy framework. Not surprisingly, different water and wastewater agencies typically implement policies and undertake projects without effective coordination. As a result, septage receives limited attention and funding, although it directly impacts public health and water quality in profound ways. This restricted view of septage management prevents policymakers and implementers from considering related causes and impacts, such as public health, water quality, agricultural codes, and urban development trends. Many policies are also segmented hierarchically and developed without consulting the needs of the local implementers and service providers.

**Lack of Clear Delineation and Delegation of Responsibility.** Since implementation of septage management policies requires involvement at multiple government levels, it is important to establish a coherent institutional framework that clearly delineates roles and responsibilities among responsible agencies, including decentralizing or devolving authority in line with national and local laws. At present, most countries have not put in place clear and effective institutional arrangements, or established inter-agency coordination mechanisms, which can lead to inaction or even confusion. Some policies on septage management involve too many parties, while others do not sufficiently require relevant agencies to coordinate activities. In Thailand, for instance, the Ministry of Public Health is responsible for guiding municipalities on managing the septage inside the septic tank, while a separate regulation requires the Ministry of Natural Resources and Environment to manage the liquid waste discharged from septic tanks. In the Philippines, the Clean Water Act delegates to three ministries at the national level, and both water districts and local governments units at the local level, resulting in different interpretations about roles and responsibilities. In addition, with the exception of Malaysia, all countries delegate septage management to local governments; the more levels of government involved, the greater the need for training and capacity building.

**Weak Enforcement and Implementation of Septage Management Policies.** Where septage regulations exist, the level of enforcement varies by country, depending on the authority's powers and resource capabilities. In Thailand, for example, the Public Health Act has required cities to undertake septage management since 1992, yet an estimated 80 percent of local governments lack septage treatment facilities; at the same time, the Ministry of Public Health lacks enforcement authority. In Vietnam, many cities are reluctant to enforce a national mandate requiring the city to charge a wastewater fee,

TABLE 5. FUNDING SOURCES FOR SEPTAGE MANAGEMENT[25]

| | | Southeast Asia | | | | South Asia | |
|---|---|---|---|---|---|---|---|
| | Indonesia | Malaysia | Philippines | Thailand | Vietnam | India | Sri Lanka |
| **Water budget per cap** | $3.35 | $17.00 | $9.92 | $30 | NA | $3.60 | $6.50 |
| **Sanitation budget per cap** | $0.37 | $8.00 | $0.34 | NA | NA | $2.80 | $0.30 |
| **National funding for sanitation projects** | Ministerial Funds, Special Allocation Funds for poor areas | Subsidy for IWK's capital and O&M expenses; connection fees by developers | Water Quality Management Funds (not yet developed) generated by fines | Royal project funds; DOLA disbursed funds based on Provincial Environmental Action Plans | 85% from ODA | JNNURM, UIDSSMT, special earmarked funds for city sanitation planning | 70% from ODA; also central transfers to NWSDB |
| **Tariff regulations or Local Revenue Sources** | User fees collected at the door; 11% of local sector funding for sanitation, rest goes to water | User fees charged through bi-annual wastewater bills; in the future, joint water and wastewater bills | User fees on monthly water bills; municipal loans | User fees collected at the door; desludging prices capped by 1990s national policy, covers only desludging, not treatment costs | Wastewater surcharge of 10% on water bills, set by national and local DOCs (only in a few cities); user fees collected at the door | None | User fees charged at the door, property taxes |
| **Challenges** | Austere fiscal policies since 1997 financial crisis; inability to get private sector investment for wastewater | Model depends on federal subsidies | National government has yet to create the national and local funds to implement Clean Water Act | Lack of funding for environmental project; user fees capped at 1992 level, do not cover treatment costs; no access to wastewater funding. | No national funds dedicated for septage management; public companies cannot control tariffs; cities reluctant to issue wastewater surcharge; lack of financing for O&M. | Most residents have never paid a wastewater bill; limited public willingness and ability to pay | Only 5% of water and sanitation sector budget used for sanitation |

which would raise funding for projects like septage management. In Malaysia, the regulatory agency has rarely, if ever, fined or forced households to conduct scheduled desludging, although the law allows for such measures. In many countries, inspections of septic tank, a common requirement of construction codes, are inadequate due to limited local capacity or concern.

## 2.2 Weak Human and Institutional Capacity

**Limited Stakeholder Awareness.** Across the region policymakers, government officials, civil society and even academics have a limited awareness about the importance of effective OSS management, including implementation strategies and costs, health and environment impacts or even the market potential for treated septage. Governmental agencies typically prioritize water above sanitation, and sanitation provision above wastewater treatment; for them, septage management is often only an afterthought. For households, septic tanks are often constructed below or behind the house and are difficult and inconvenient to access and open; the lump-sum expense of desludging also discourages frequent emptying. Moreover, few people know where desludged septage goes once it leaves their houses, or understand how improperly disposed septage can impact water quality and human health. This lack of awareness about septage and effective septage management is consistently cited as the main cause of inadequate septage management services throughout the region.[26]

ARIE ISTANDAR, ECO-ASIA

**In many cities in Asia, lack of household water connections and intermittent water supply causes many households to rely on public waterways for their water. The contamination of public waterways with organic pollution, largely due to untreated sewage and septage, has a direct impact on public and environmental health.**

**Limited Human Capacity.** In addition to a lack of awareness, at all governmental levels in most countries there is a significant capacity gap on the technical and institutional aspects of septage management. Moreover, universities and training centers have not incorporated septage management into their curricula. Accordingly, when responsibilities are delegated to local governments, they are unable to undertake effective or timely implementation. As a result, many countries rely on international experts for developing septage programs.

**Limited Regulation of or Partnership with Private Service Providers.** In most countries in South and Southeast Asia, private entrepreneurs play an important role in providing either all desludging services or supporting limited public desludging services. Their presence demonstrates the inability of public service providers to meet existing desludging needs. While some operators provide high quality services that comply with environmental and other legal requirements, others violate the law and increase profits by selling septage to farmers for use as a fertilizer, illegally dump septage to avoid traveling long distances to designated disposal sites, delay necessary investments in equipment, and ignore health and safety regulations. These practices degrade the quality of service, impact the environment, and endanger the health of workers and others. In many countries, cities do not have the capability and resources to regulate private service providers, nor do they form strategic public-private partnerships.

**Insufficient Wastewater Planning.** Urban growth in most Asian cities outpaces the public sector's ability to plan for or provide sanitation services, especially for new residential and commercial developments. As a result, the public sector typically is compelled to install relatively more costly sewerage and sanitation systems after the developments are built.

## 2.3 Funding Capital and Operational Costs

**Inadequate Public Funding and Overreliance on External Aid.** While at a national level, many Asian developing countries allocate funds for water and

sanitation projects, most funding is for water and centralized wastewater treatment, and not septage management (Table 5). In addition, many of the target countries rely on official development assistance to fund sanitation and wastewater projects. Dependence on external assistance can reflect a lack of long-term commitment and project ownership.

**Low Wastewater Tariffs and Lack of O&M Funding.** Cities and utilities that have constructed centralized wastewater treatment and septage treatment facilities often have difficulty generating funds to cover O&M costs. Even in Malaysia, the sewerage fee covers only 20 percent of operating expenses. In Malaysia and also in Thailand, national regulations on septage tariffs have either reduced user charges over time, or kept them the same, even while costs have inflated. Oftentimes, household payments for desludging also only cover collection costs, not treatment costs.

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LINDA SHI, ECO-ASIA

Indah Water Konsortium, Malaysia's national septage and sewerage services provider, guides regional visitors from India, Indonesia, the Philippines, Switzerland, and Thailand through an activated sludge treatment facility. Tours and trainings such as this can inspire renewed commitment to improving septage management services back home.

# REGIONAL RECOMMENDATIONS AND OPPORTUNITIES

By reviewing regional challenges and best practices in septage management, this assessment aims to serve as a resource for policymakers and practitioners in adopting new solutions for strengthening septage management initiatives. As the country assessments reveal, target countries have developed some good practices that can be expanded or replicated nationally or regionally.

Based on the outcomes of the regional septage management workshop, countries place special importance on strengthening awareness, building political support, and increasing national funding for septage management. Countries also highlighted the value of leveraging the private sector in catalyzing the development of services, including through public-private partnerships. These suggestions, as well as other insights developed through the country assessments, are provided in the following recommendations.

## 1.0 RECOMMENDATIONS

Target countries in this assessment all have good practices that are worth highlighting to encourage national or regional replication. In putting forward recommendations for consideration by policymakers, it is useful to identify these good practices. What follows are a collection of recommendations – some that can be considered during new policy formulation and some that can be applied immediately. Their experiences demonstrate that comprehensive and sustainable septage management programs are possible, and relatively easier to adopt and manage than sewerage development projects. Overall, while each country has a different focus, depending on existing programs and priorities (see Table 6), all countries need to strengthen their programs in three areas: (1) integrated and comprehensive legal and policy frameworks; (2) a clear delineation of institutional roles and responsibilities; and (3) funding support for capital and operational costs.

### 1.1 Establish and Enforce Clear and Effective Policy Frameworks

**Establish Clear Septage Management Policies and Institutional Arrangements.** National policies should encourage holistic management of water resources from source to final disposal or reuse, and design distribution, collection, treatment systems and the corresponding incentives to support the sustainable consumption of water. As water resources become increasingly scarce in the region, wastewater must be considered a resource more than a pollutant. Policies should clearly and definitively establish responsibility for construction, maintenance, and desludging of septic tanks, as well as treatment, inspection, and enforcement. The national government should also provide the technical guidelines on collection, treatment, disposal, permitting, health and safety, monitoring, and enforcement. Planning for local septage management infrastructure and programs should consider the prevalence and growth of septic tanks in their jurisdictions, future population growth, and the rate of development of septic tanks and sewerage systems, urban road networks, population density, and public willingness to participate in septage management programs. The local ordinances developed in the cities of Marikina and Dumaguete in the Philippines serve as good models; they establish standards for septic tanks, desludging access, desludging frequency, septage collection and treatment, user fees, penalties, and government implementation and monitoring mechanisms.

**Update and Enforce Septic Tank Design Codes.** Properly designed and sited septic tanks are less likely to pollute groundwater, and more likely to provide primary treatment and easy access for future desludging. Local governments can slowly upgrade septic tank infrastructure by updating and simplifying existing construction or sanitation codes, training plumbers and masons to build to code, and enforcing inspections during construction. In Malaysia, developer-oriented guidelines provide detailed instructions on septic tank construction requirements and standards, while Vietnam is considering promoting prefabricated septic tanks to ensure proper design.

**Mandate Scheduled Desludging.** National agencies developing septage management policies should consider mandating regular desludging on a three to five year cycle. This is especially important in areas where septic tank effluent is not further treated before it drains into waterways. Requiring scheduled desludging helps maintain sufficient liquid volume for anaerobic digestion. Malaysia requires regular desludging on a three year cycle, while the Philippines on a three to five year cycle.

TABLE 6: PRACTITIONER RECOMMENDATIONS TO IMPROVE SEPTAGE MANAGEMENT
(Developed by participants of the 2009 regional septage management workshop)

| | India | Indonesia | Philippines | Thailand | Vietnam |
|---|---|---|---|---|---|
| **NATIONAL GOVERNMENT** | | | | | |
| Establish or improve septage management requirements and guidelines | | ✓ | | ✓ | ✓ |
| Provide technical support, guidelines, training | ✓ | ✓ | | ✓ | ✓ |
| Clarify roles, improve agency coordination | | ✓ | ✓ | | |
| Draft model local bylaws or ordinances | ✓ | | | | ✓ |
| Clarify laws on private sector participation | | | ✓ | ✓ | |
| Streamline different policies | | | ✓ | | |
| Permit communities to share management | | | | ✓ | |
| **LOCAL GOVERNMENT** | | | | | |
| Develop and adopt local septage ordinances | ✓ | ✓ | ✓ | | ✓ |
| Institute regular desludging programs | ✓ | ✓ | | ✓ | ✓ |
| Promote demand driven solutions rather than politically-backed technologies | ✓ | ✓ | | | |
| Create public-private partnerships between service providers and government agencies | ✓ | | ✓ | ✓ | |
| Strengthen implementation capacity by training operators and civil servants | ✓ | ✓ | | ✓ | |
| Gather information and develop databases | ✓ | | ✓ | ✓ | |
| Enforce existing regulations by raising monitoring and enforcement capacity | | | | ✓ | |
| **FUNDING** | | | | | |
| Government supports capital investments, while local utilities recoup O&M costs through service charges and taxes | ✓ | ✓ | ✓ | ✓ | ✓ |
| Increase national sectoral budgets | | ✓ | ✓ | ✓ | ✓ |
| Update and amend national regulations on tariffs for septage management | | | | ✓ | |
| **PROMOTION** | | | | | |
| Raise public awareness through multimedia campaigns, targeting children in particular | ✓ | ✓ | ✓ | ✓ | ✓ |
| Expose NGOs and media to importance of sanitation to gain their support | ✓ | ✓ | ✓ | ✓ | |
| Build political support with exposure visits, technical trainings, reports, and workshops | ✓ | | | ✓ | ✓ |
| Provide sanitation workers with alternatives | ✓ | | | | |
| Develop annual septage symposium | | | | ✓ | |
| **INFRASTRUCTURE** | | | | | |
| Build new treatment plants | ✓ | | ✓ | ✓ | ✓ |
| Purchase additional desludging trucks | ✓ | ✓ | ✓ | | ✓ |
| Promote septic tanks that meet standards | | ✓ | | ✓ | ✓ |
| Engage civil society to end open defecation | ✓ | | ✓ | | |
| OPPORTUNITIES FOR EXCHANGE | Marikina IWK Nonthaburi | IWK, Marikina, MWCI | PSA, MWCI, Marikina, IWK, Nonthaburi, AIT, Sandec | IWK, MWCI, Sandec | Malaysia SSD, Philippine DOH |

**Strengthen Monitoring and Enforcement of Illegal Dumping.** In tandem with efforts to engage diverse stakeholders, cities should also rigorously enforce regulations that prohibit illegal dumping. Actions to build compliance include making permit and license requirements more strict, requiring more frequent license renewals, building the capacity of law enforcement agencies, educating the public, and providing hotlines to report illegal activity. In Hanoi, environmental police fine operators who illegally dispose of septage and impound their vehicles for one week. In Malaysia, collection trucks are fitted with Global Positioning Systems (GPS) units to track vehicular activities in real-time.

## 1.2 Strengthen Institutional and Implementation Capacity

**Develop Comprehensive Awareness Programs, Especially Targeting Septic Tank Users.** Building stakeholder awareness is critical for creating effective new policies and programs, and for ensuring public and financial support for initiatives. Efforts should focus on raising policymaker awareness of the direct heath, environmental and economic benefits of improved septage management. At the local level, to ensure acceptance of new programs and costs, governments and others should implement awareness raising efforts that highlight the benefits of more frequent desludging. In Marikina, based on community surveys to evaluate sanitation concerns and values, the local government conducted a targeted promotion campaign to build willingness to participate in scheduled desludging. Post-desludging surveys found a significant increase in stakeholder awareness and willingness to participate.

**Develop Mechanisms for Inter-agency Coordination and Dialogue.** To help overcome implementation challenges related to overlapping or fragmented authorities, governments should develop new inter-agency coordination mechanisms to enable vertical and horizontal coordination and dialogue on septage management. Local governments in India and the Philippines are establishing sanitation committees to implement new national sanitation regulations. For example, in Dumaguete, the Philippines, the City Septage Management Authority comprises representatives from the local environmental, health, water, engineering, legal, and financial departments.

**Develop Comprehensive Capacity Building Programs that Engage Educational Institutions.** National governments should develop capacity strengthening initiatives that provide technical support and training for national and local officials, and both public and private service providers. Focus areas should include technical, institutional, planning, social and financial aspects. Government programs can cooperate with universities and research institutes to both broaden and deepen capacity efforts. In Thailand, several leading universities, including Mahidol University and Kasetsart University, as well as the regional Asian Institute of Technology assist the Ministry of Public Health and local governments in developing pilot projects, conducting research on alternative technologies, and organizing regional workshops.

**Apply Economies of Scale in Deploying Septage Services.** State and provincial level governments should consider strategies that offer economies of scale in providing technical assistance, service provision, and operator training. Experience shows that empowering fewer organizations at the early stages of septage services development can accelerates capacity building. For instance, Malaysia created a single national sewerage and septage services concessionaire that was able to quickly build and replicate its knowledge about wastewater management throughout the country. Strategies to increase economies of scale in service development include creating a national septage services training and certification organization and encouraging the growth of regional septage service providers.

**Leverage Real Estate Development to Build Wastewater Infrastructure.** National law can hold private real estate developers, no matter the size of their projects, responsible for building, or paying the public sector for, adequate septage or sewage collection and treatment networks. Such approaches should ensure that developer-driven sewerage and septage projects are coordinated to maximize efficiency and operations. By reducing its capital investments, the public sector can focus its funds to retrofitting existing and poorer communities. In Malaysia, 70 to 80 percent of all sanitation infrastructure, including septic tanks and wastewater treatment plants, was built or paid for by private developers.

**Engage Private Service Providers.** Public-private partnerships on septage management can create win-win benefits for both parties by reducing the level of investment needed from the public sector, while generating revenues for the private sector. To ensure

a stable investment climate, government authorities should clarify and simplify policies, regulations, permitting processes, and enforcement with respect to private sector participation. The public sector should also establish incentives that optimize the costs of investing in new equipment, and oversee the qualifications of and the fees charged by private service providers.[1] In Manila, the Metropolitan Waterworks and Sewerage System oversees the city's two concessionaires, and regulates tariff charges, service expansion, and operating standards. Governments should also explore ways to enable waste management firms to provide a range of services, including for both septage and solid waste. In Vietnam and Thailand, service providers tend to offer a combination of septage and solid waste collection services and disposal sites, which allows them to balance fluctuations in collection demand and reduce risks.

## 1.3 Increase Funding for Septage Management

**Strengthen National Financial Support for Septage Management.** National governments should increase funding allocations for the sanitation sector as a whole, and septage management in particular. Funding for septage management should allow programs to develop progressively over several years, and address not only capital investments, but also "soft costs", such conducting promotion campaigns and obtaining baseline data. In Malaysia, domestic and commercial user fees cover only 20 percent of the costs to maintain and operate septage and wastewater services in the country. The federal government subsidizes the remainder because it recognizes that polluted waterways not only impact the environment, but also public health, real estate development, and foreign investment perceptions.

**Promote Creative Financing.** Where national funding support is limited, local governments, utilities, and other organizations should develop creative financing strategies. In Vietnam, the Women's Union disbursed small loans for households to upgrade their sanitation facilities to a proper septic tank and to develop a local scheduled desludging program. The SANIMAS program in Indonesia leverages funding from local, national, and households to establish community sanitation programs. The Philippine Water Revolving Fund is a co-financing credit agency that combines official development assistance with private lending to provide local governments and water districts with funding for water supply and sanitation projects. While lack of funding is often used as a reason for not improving services, innovative approaches to leveraging diverse funds can often overcome this challenge.[2]

**Design Innovative Wastewater Tariff Structures.** Desludging tariff structures should be designed to cover the operating costs of transport, treatment, and disposal or even to recoup capital costs. National caps on septage tariffs should consider not only collection costs, but also treatment and disposal fees. Charges can be billed in a way that encourages collection companies to deliver their loads to treatment plants. Desludging fees can be broken into installments for customers, linked to water bills to give service providers an enforcement mechanism, or paid directly to the government rather than to desludging companies to create an incentive for proper disposal. In Metro Manila, customers pay an environmental fee on their water bill to fund wastewater services; in Hai Phong, Vietnam, customers pay a 15 percent surcharge on water bills to fund wastewater services.

**Develop Progressive Fee Structures in Line with Willingness to Pay.** Fee structures that reflect public willingness to pay will enable new programs to become established and eventually expand. For example, programs can start with simple septage treatment technologies, such as trenching systems, oxidation ponds, and sludge drying beds, which are less expensive to operate. As desludging volumes rise, and public willingness to pay increases, cities can later upgrade to more intensive facilities.[3]

**Create Opportunities and Incentives for Commercial Activities.** The byproducts of septage treatment include biosolids, methane gas, biomass, and liquid fertilizer, which have commercial applications or at least can reduce operational costs. Cities and utilities can design facilities in ways that allow for the recapture of these byproducts, such as separating septage from sewage sludge to minimize pollutant loading and promote reusability, or installing methane gas recapture pipes for anaerobic septage digestion tanks. Governments can establish incentive programs to encourage more private sector involvement. For example, cities in Vietnam and Thailand sell treated septage for fertilizer, and apply treated leachate to roadside medians and parks. Indah Water Konsortium in Malaysia has also built a methane gas recapture facility at one of its treatment plants.

## 2.0 OPPORTUNITIES FOR PEER-TO-PEER COOPERATION

Peer-to-peer cooperation provides an important opportunity for strengthening septage management policies and practices throughout Asia. Key mechanisms include water operator partnerships, dissemination via national associations and other organizations, cooperation between research institutions, and regional networking events and knowledge-sharing tools.

### 2.1 Water Operator Partnerships

To build their capacity, wastewater operators and cities should consider engaging in water operator partnerships (WOPs), a mechanism that promotes the direct transfer of technical assistance as put forward by the Hashimoto Action Plan. These partnerships link "mentor" utilities that have developed good practices with "recipient" utilities that are interested in technical assistance. WOPs leverage mentor interests in corporate social responsibility, staff training, or understanding of other countries with recipient interest in adopting new policies or practices. WaterLinks, a regional network that facilitates WOPs with the support of the Asian Development Bank, International Water Association and the United States Agency for International Development, has implemented dozens of successful WOPs.

As detailed in this assessment report, a number of national agencies, local governments, and private utilities that have achieved significant results in septage management (Table 7), and are good candidates for

TABLE 7: REGIONAL EXAMPLES OF GOOD PRACTICES IN SEPTAGE MANAGEMENT

| | India | Indonesia | Malaysia | Philippines | Sri Lanka | Thailand | Vietnam |
|---|---|---|---|---|---|---|---|
| **Clear Policy Frameworks** | ◉ (NUSP, state sanitation plans) | ○ | ● (WSIA, developer guidelines) | ● (CWA, DOH operations manual) | ○ | ◉ (PHA, MOPH operations manual) | ○ |
| **Strong Local Programs** | ○ | ◉ (Malang) | ○ | ● (Marikina, Dumaguete) | ○ | ● (Non-thaburi) | ◉ (Hai Phong) |
| **Effective Promotion Campaigns** | ◉ (*Nirmal Shahar Puraskar*) | ○ | ● (Indah Water Konsortium) | ● (Marikina) | ○ | ○ | ○ |
| **Successful Private Service Provision** | ○ | ◉ (Surabaya) | ● (Indah Water Konsortium) | ● (Manila Water Company) | ○ | ○ | ◉ (Hoa Binh Company) |
| **Diverse Technologies for Septage Treatment** | ○ | ◉ (drying beds, modified activated sludge) | ● (trenches, drying beds, mobile dewatering units, activated sludge) | ● (mobile dewatering units, activated sludge) | ◉ (trenches, coco coir mats) | ● (anaerobic digestion tanks) | ◉ (dewater-ing units, drying beds, wetlands, compost) |

○ = no known good practices ◉ = emerging practice, needs improvement ● = replicable good practice

serving as mentors through WOPs. In Southeast Asia, Malaysia has developed the most comprehensive septage management program, and uses a unique model of a single national concessionaire providing sewerage and septage services for the entire country. Many elements of the Malaysian system serve as regional good practices. Driven by the Clean Water Act, the Philippines is currently the most active country in developing new septage management programs, and could benefit from WOPs to support implementation. As Malaysia moves to integrate its water and wastewater service provision, and as the Philippines scales up implementation, these two countries could benefit from each other's experiences.

In Thailand, where most local governments have not yet built treatment facilities or established a regulatory framework for private operators, awareness-raising may be the most urgent need. One area where Thailand has made good progress is in using treated septage as a form of fertilizer. One potential partnership, therefore, could pair Thai local governments with Malaysia's IWK to assist Thailand in regulating private contractors, while expanding the knowledge base of IWK in the use of treated septage for fertilizer.

Indonesia has 150 septage treatment facilities, 90 percent of which are not fully operational due to the absence of clear local and national policies requiring septage management, limited funding sources for operations and maintenance, and the lack of enforcement and involvement of private operators. Similar challenges exist in Vietnam, where official development assistance has helped build septage facilities in a number of cities that have yet to fully develop supporting policies, funding mechanisms, and management systems. These Indonesian and Vietnamese cities could jointly partner with utilities such as IWK and Manila Water Company in the Philippines to develop their management capacity and fully operationalize their existing infrastructure.

As compared with countries in Southeast Asia, India and Sri Lanka have made less progress on septage management. Both countries effectively have no septage collection, treatment or disposal systems, and have weak enforcement for septic tank construction standards. India passed regulations in 2008 to require septage management and has dedicated funds for cities to implement sanitation plans. State governments in India and Sri Lanka's National Water Supply and Drainage Board could gain from partnerships with counterparts in Southeast Asia.

## 2.2 National Replication

National level organizations, such water associations and governmental agencies, are well positioned to help disseminate best practices, as well as build local

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Participants of the "Developing Comprehensive Septage Management Programs in Asia Workshop" organized by USAID and IWK in Kuala Lumpur, May 2009, visit the city's mechanized septage treatment facility. Seeing facilities with their own eyes and learning directly from their peers helped these participants improve and redesign sanitation programs in their own cities.

capacity. Organizations might include the Association of Indonesian Municipalities, Philippines Association of Water Districts, Vietnamese Water Supply and Sewerage Association or the National Water Supply and Drainage Board in Sri Lanka. These national level organizations, working in partnership with leading national and regional utilities, can develop national capacity building initiatives. They can also serve as advocates for clearer policies and greater access to private and public financing, as well as nodes for communication and knowledge dissemination.

### 2.3 Regional Research Collaboration

Given that septage management is becoming a priority for many countries in the region, there are considerable opportunities for regional collaboration in research and development. For example, gaining a better understanding of septage characteristics, which can depend on climate, septic tank type and other local factors, can provide important information on effective treatment or options for reuse. Climate, soil typologies, and habitat can also impact natural methods of treatment, such as reed beds and constructed wetlands, and require careful study to optimize treatment efficiency. In addition, there are opportunities for better understanding financial and institutional mechanisms, such as good models for public-private partnerships. Research on operational constraints and key factors for effective O&M are also needed.

To advance regional research, universities and institutes in the region should establish collaborative initiatives on research and development. Current leaders in this field of research, such as the Asian Institute of Technology, Sandec/Eawag, and the International Water Association, as well as development agencies and national organizations, can form working groups, communities of practice, or joint research teams to develop the necessary research and knowledge products.

### 2.4 Continued Dialogue at Regional Events

The growing recognition that septage management is a practical and urgent near-term strategy for wastewater management suggests that there will be a need for continued dialogue in the region. Sanitation-related workshops and conferences should incorporate issues concerning septage management and provide opportunities for sharing best practices in this field. International organizations and donors should make septage management a priority, and help consolidate and disseminate information through networking and knowledge management tools.

## ENDNOTES

1. For additional information on private sector engagement, see: Jeuland, M., M. Strauss, and D. Koné. "Private Sector Management of Fecal Sludge: A Model for the Future? Focus on an Innovative Planning Experience in Bamako, Mali." Switzerland: EAWAG/SANDEC, 2004. <http://www.sandec.ch/FaecalSludge/Documents/Private_Sector_Management_FS.pdf>.
2. For additional information on innovative financing, see: Steiner, M., A. Montangero, D. Koné, M. Strauss. "Towards More Sustainable Faecal Sludge Management through Innovative Financing – Selected Money Flow Options." Switzerland: EAWAG/SANDEC, 2003.

# COUNTRY ASSESSMENTS


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Local sanitation workers in Sirisilla, India, scatter disinfectant into the community's drains, which carry septic tank effluent and other wastes to the nearest waterway. The new national focus on 100 percent safe sanitation is a promising turning point for India's wastewater sector; but with no existing septage treatment facilities in the country, India faces tremendous implementation challenges.

## COUNTRY ASSESSMENT

# INDIA

| | | | |
|---|---|---|---|
| Country Population (in millions) | 1,150[1] | Nominal GDP (in trillions) | $1.2[2] |
| Urban Population (in millions) | 350[1] | Nominal Income per cap | $1,016[2] |
| Urban Population (% of total) | 30%[1] | Annual Urban Water Budget per cap | $3.60[1] |
| Access to Improved Water (urban) | 96%[1] | Annual Urban Sanitation Budget per cap | $2.80[1] |
| Access to Improved Sanitation (urban) | 59-86%[1] | Cost to Desludge 1 Septic Tank | $5-100 |
| Access to Sewerage (Class I cities) | 40%[1] | Surface Water Polluted | 80%[1] |
| Use of Onsite Sanitation (urban) | 46%[1] | Health Cost of Poor Sanitation (1995, in billions) | $5.7[3] |
| Wastewater Treatment (Class I and II cities) | 9%[1] | Other Terms for Septage in India: septic tank sludge, faecal sludge, sludge | |

**Key Challenges**

- No physical infrastructure to treat septage in the country, and very limited use of mechanized desludging
- Manual scavenging still widespread, although prohibited by law; onsite sanitation not viewed as a problem or priority
- Emphasis on centralized, advanced engineering solutions for sanitation; septage management not perceived as a solution
- Most cities and states do not have policies on septage management and lack data concerning onsite sanitation systems in their jurisdictions

**Key Strengths**

- 2008 national policy requires states and local governments to develop integrated sanitation policies, including septage management
- Availability of national funding support for cities to develop septage management infrastructure
- Presence of international, NGO, and research organizations supports the development of septage management

## 1.0 SUMMARY

With 1.15 billion people, India faces an immense challenge in providing all residents with adequate sanitation facilities and wastewater treatment. As an estimated 50 percent of the country lacks access to improved sanitation, much of the current focus in India is on providing basic sanitation. Access to improved sanitation is higher in urban areas, where, by one estimate, about 40 percent of households are connected to sewerage systems, 29 percent are connected to a septic tank, and 17 percent use other onsite systems like pit or vault latrines. However, very few cities in India have the physical capacity to safely collect, transport, and treat urban domestic septage and sewage. Most onsite sanitation systems (OSS) are emptied manually; only some of the larger cities have private desludging companies that use vacuum trucks. Medium and large cities treat on average only nine percent of collected wastewater, and although there are over 160 million OSS in Indian cities, there are no septage management programs or treatment facilities in the country.[4] As a result, while the majority of urban residents in India have access to improved sanitation, the ongoing contamination of water sources with human excreta is taking an immense toll on public health.

Historically, the Government of India (GOI) has focused its wastewater investments on centralized sewerage and treatment, and considered OSS a temporary measure. However, the 2008 National Urban Sanitation Policy (NUSP) changed the country's approach to urban sanitation, and mandates local governments to address behavioral change, total sanitation, 100 percent safe waste disposal, and manual scavenging, in addition to sewerage development.[5] The NUSP tasks state governments to draft state urban sanitation policies that in turn require cities to develop city sanitation strategies. As of 2009, six states have developed these plans and a number of cities have initiated the citywide sanitation planning process. India's new focus on policy development allows cities to develop integrated strategies that maximize the efficacy of the future physical infrastructure. These are very positive steps, although the lack of existing local and state policies and management practices, and the lack of physical infrastructure to treat septage, pose significant challenges as India begins to address the critical issue of onsite sanitation.

## 2.0 BACKGROUND AND CONTEXT

### 2.1 National Sanitation Context

India's growing population has overwhelmed the country's water and sanitation infrastructure. From 2007 to 2017, the country's urban population is projected to grow from 350 million to 500 million.[6] Through continuous household and public investments, urban access to improved sanitation has risen to somewhere between 59 and 86 percent, depending on the estimate.[7] The development of wastewater treatment infrastructure has proven to be a greater challenge. By one estimate, only 13 percent of all wastewater is treated in India.[8] Although there are an estimated 102 million septic tanks and 60 million latrines in cities in India, there are no known septage treatment facilities in the country.[9] As a result, domestic waste contributes to 80 percent of the pollution in India's surface waters.[10] With so many people depending on surface water for washing and drinking, waterborne diseases account for one-fifth of communicable diseases in India. Diarrheal diseases cause an estimated 20 percent of deaths among children under the age of five, or somewhere between 365,000 to 500,000 child deaths per year.[11] At last count, the World Bank estimated that water pollution causes $5.7 billion in health costs alone in India.[12]

### 2.2 Onsite Sanitation Prevalence

Among 350 million urban residents, an estimated 144 million people (40 percent of the urban population) are connected to sewerage systems, 102 million (29 percent) are connected to septic tanks, and 60 million (17 percent) use pit or vault latrines (see Table 8).[13] The prevalence of onsite sanitation varies dramatically from state to state, with as many as 80 percent of toilets connected to septic tanks in the states of Orissa and Rajasthan.[14] The number of septic tanks has grown quickly over the last few decades as households invest in private sanitation. In the future, many households that currently have latrines will invest in septic tanks, and some septic tank users will connect to sewerage systems. By 2017, the World Bank estimates that 260 million urban residents will have sewer connections, 148 million will use septic tanks, and 78 million will use latrines.[15] While these numbers differentiate between latrines and septic tanks, many septic tanks are in reality similar to latrines, and have leaking sides and open bottoms. Many septic tanks, even for public toilets and

TABLE 8: ACTUAL AND TARGETED ACCESS TO SANITATION INFRASTRUCTURE AT THE END OF FIVE-YEAR PLAN PERIODS IN INDIA (IN MILLIONS)[16]

| | 1992 | 1997 | 2002 | 2007 | 2012 | 2017 |
|---|---|---|---|---|---|---|
| Total Population | 850 | 940 | 1,030 | 1,110 | 1,200 | 1,300 |
| Urban Population | 210 | 250 | 290 | 350 | 420 | 500 |
| Access to improved sanitation | 152 | 189 | 238 | 306 | 386 | 486 |
| Access to sewers | 53 | 76 | 104 | 144 | 193 | 260 |
| Access to septic tanks | 44 | 58 | 79 | 102 | 126 | 148 |
| Access to latrines | 55 | 55 | 55 | 60 | 67 | 78 |
| Rural Population | 640 | 700 | 740 | 760 | 780 | 800 |
| Access to improved sanitation | 37 | 68 | 150 | 234 | 335 | 425 |

Note: 1992 and 2002 estimates are from the 1991 and 2001 Census of India; 2007 to 2017 targets are from World Bank forecasts.

commercial entities, are inaccessible for desludging and maintenance.

## 2.3 Septage Collection and Treatment Capacity

Historically, the GOI has prioritized water supply far above sanitation; for instance, the 1997 to 2002 national budget for rural water supply and sanitation provided less than six percent of its total funding for sanitation.[17] Within sanitation funding, the government focused on centralized sewerage systems and wastewater treatment plants (WWTPs). While India is beginning to address septage following the NUSP, no local governments have yet provided public collection or treatment services.

In this context, communities generally depend on private service providers – small companies or individuals – to clean septic tanks and latrines on an emergency basis. Municipal sanitation workers commonly double as cleaners as well. Though a few companies use gully suckers or vacuum cleaning pumps in larger cities, most informal, individual service providers empty tanks manually, without taking safety precautions or having permits. Sanitation workers and companies dispose of the waste at remote locations, in landfills (if available), or sell it directly to farmers or fish farms as fertilizer. The NUSP estimates that the wastewater of 48 to 82 percent of urban households in India is not safely disposed.[18] Anecdotally, private operators charge an average of $25 to $30 per tank, but costs can range from as low as $5 to as much as $100 per tank, depending on the city, distance to the disposal site, and tank size.

The NUSP notes that onsite sanitation management is closely related to principles of a caste system in India, which indicates that the lowest castes should remove human excreta. Although the Constitution of India has banned manual scavenging and requires cities to provide scavengers with alternative, dignified work,[19] the task of cleaning latrines continues to be a job of members of the scheduled castes, whether they are government or private employees. This cultural practice has resulted in low levels of political and societal interest in sanitation and septage management. As cities develop sanitation plans and adopt septage management programs to meet NUSP requirements, they can help to eliminate manual scavenging and provide sanitation workers with improved working conditions or alternative employment.

# 3.0 LEGAL FRAMEWORK

In 2008, the Ministry of Urban Development (MOUD) issued the National Urban Sanitation Policy. In surveying the state of sanitation in cities, the policy finds that "sanitation – the safe management of human excreta, including its safe confinement and treatment, and associated hygiene-related practices – has assumed crisis proportions in urban areas."[20] According to NUSP, the sector faces these key challenges:

- Low prioritization and awareness of the public and government agencies;
- Lack of explicit policies on sanitation, particularly safe disposal;
- Abundance of fragmented agencies that lack the

### Town of Sirisilla: a Window into Urban Sanitation Needs[21]

The town of Sirisilla, with a projected 2011 population of 93,000, is located in western Andhra Pradesh and provides a typical example of sanitation in India's growing towns and cities. Over half of Sirisilla residents live in slums, and only 30 percent of households have their own toilet, one-third of which connect to a septic tank, and the remainder flows out a drain to feed pigs. Those without private toilets must use the two community toilets or practice open defecation. One public toilet has been desludged twice since its construction in 2003, while the other has never been desludged because the septic tank is inaccessible. As the town government does not provide desludging services, residents use private service providers from the district headquarters, which charge $40-$100 per trip, depending on season and tank size. The private company then dumps the septage in the river or onto open fields. The municipal leaders recognize the need for Sirisilla to develop sanitation and wastewater treatment services and Sirisilla has received $400,000 from the Urban Infrastructure Development for Small and Mediums Towns Fund, part of which will go towards improving sanitation. Sirisilla demonstrates the complex array of sanitation needs present in India's cities: toilet provision, toilet upgrades, septage management services, sewerage development, waste treatment, and public sanitation education.

direction and incentive to provide comprehensive sanitation;

- Focus on project- and technology-based investment decisions rather than citywide planning;
- Lack of attention on access by the poor and underserved to safe sanitation; and
- Supply-driven rather than demand-responsive solutions.

In responding to these challenges, this policy sets the following goals:

- Raising awareness and promoting behavior change;
- Achieving open defecation free cities;
- Developing citywide sanitation plans;
- Providing 100 percent sanitary and safe confinement, transport, treatment, and disposal of human excreta and liquid wastes; and
- Providing proper operations and maintenance (O&M) of all sanitary installations.

The NUSP mandates states to develop state urban sanitation strategies and work with cities to develop city sanitation plans. It also includes draft frameworks to guide states and cities in developing their sanitation strategies. The Government of India plans to support states in this effort by helping them prepare their plans by 2010, providing technical assistance, funding policy development, and rating city sanitation progress through a National Award program. At the time of writing, six out of 28 states have developed urban sanitation policies.

The 74th Constitutional Amendment of 1992 substantively recognized the powers of municipal governments, called Urban Local Bodies (ULBs), which are responsible for initiating preventive and reactive measures to tackle infectious diseases, and directing and managing sanitary facilities and infrastructure. While they have had the power to address onsite sanitation and septage since 1992, most ULBs have not done so. The NUSP, therefore, now makes it explicit that cities and states must issue policies and technical solutions that address onsite sanitation, including the safe confinement of septage.

## 3.1 Septic Tank Design

In India, the 1983 National Building Code of India governs the design, installation and maintenance of toilets, septic tanks, and sewers. Part IX, Chapter VI, Section A on "Drainage and Sewerage" specifies the sizing and design of septic tanks, sewers, toilets, and other sanitation devices.[22] The National Building Code states states:

- The modern septic tank system is an onsite disposal method, which uses standard flushing. The septic tank acts as sedimentation-cum-digestion tank. Anaerobic digestion of the settled septage occurs in its bottom zone and the supernatant liquid has to undergo treatment in a soak pit or filter bed.

Sanitation conditions in Sirisilla are typical of India, where household septic tanks overflow or empty into public drains, and pigs and other livestock mix freely with human excreta.

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- The septic tank should be constructed in two compartments to facilitate cleaning of one tank while the other is in use. A bottom slope of five to ten percent towards inlet is recommended.
- For providing any soak pit or filter bed with septic tanks, the water table must be well below their depth and the rainwater from surface also should not interfere with their functioning. Hence, these are not usually suitable where water tables are high or where ground slopes are flat.
- Use of septic tanks without follow-up treatment is not permitted, as the effluent from the septic tank is hazardous from the point of view of health and pollution. Since it is usually not possible to provide soak pits or filter beds in urban areas, a septic tank system would therefore not be appropriate in such areas.
- The capacity of the septic tanks should account for variations in the flow. In general, a tank serving less than 50 people should have a detention period of 24 to 48 hours, and a tank serving more than 50 people should have a detention period of 10 to 18 hours.

The 1985 Code of Practice for the Installation of Septic Tanks (IS 2470) applies more specifically to the construction of septic tanks. This Code notes that secondary treatment is required when using septic tanks; like the National Building Code, it states that septic tanks that do not have space to construct soakage pits or drainage fields may not be constructed. In theory, the Central Public Health and Environmental Engineering Organization, state-level Public Health Engineering Departments, and ULB water and sanitation departments are responsible for issuing technical guidelines and supporting or providing local implementation. In practice, local governments lack the capacity to enforce these Codes' requirements concerning design or placement, and the quality and size of the finished system is based entirely on the owner's ability to pay and the mason's skill.

### 3.2-3.3 Septage Collection and Treatment

The National Building Code of India states that septic tanks should be regularly maintained and desludged as often as every year. "Septic tanks should be cleaned when a large quantity of septage has collected in the bottom of the tank. The interval of cleaning should not normally exceed 12 months. After cleaning, three or four shovelful of surface earth containing grass roots and decaying vegetable matter should provide a good start. No disinfectants should be used in latrines attached to septic tanks as they kill the organisms, which digest sewage."[23] This Code, however, does not charge any particular agency with implementation responsibility. Not surprisingly, few cities to date have developed policies to implement this desludging requirement.

The NUSP broadly states that cities should develop integrated sanitation strategies that holistically manage sanitation from the toilet to the disposal site. Although it requires cities to address onsite sanitation, it does not provide specific guidance or requirements for the safe confinement of septage, leaving policy development and role delegation to the states.

In its draft State Sanitation Policy, the State of Maharashtra directs ULBs to manage the total safe transport, treatment, and disposal or reuse of sanitation.[24] To ensure safe transportation, for example, ULBs should estimate how much septage the community generates, encourage private operators and community-based organizations to provide services, provide public services if necessary, develop a computer database to monitor emptying and track operator activities, and provide health and safety guidelines for operators. For safe treatment, ULBs should determine an appropriate treatment technology and disposal method, develop the necessary infrastructure, and regularly monitor the effluent and dried septage quality. The plan further indicates that the state government should amend policies and standards to support and require ULB sanitation improvements, and reorganize and clarify institutional roles and responsibilities.

### 3.4 Key Challenges and Strengths

Challenge: To date, most cities have not yet developed policies to regulate septage management, and ULBs are not very knowledgeable about this issue.

Strength: Increasingly, septage management is seen as an effective way to improve water quality and public health. The NUSP shifts the national focus to OSS and the safe collection and disposal of septage, and requires state and local governments to create sanitation plans to address septage management.

Strength: Since 2008, six state governments have drafted urban sanitation strategies that will direct local governments to address total sanitation.

## 4.0 INSTITUTIONS AND IMPLEMENTATION CAPACITY

The 74th Constitutional Amendment Act of 1992 reformed the sector by transferring responsibility for domestic, industrial, and commercial water supply and sewerage (WSS) from state agencies, such as Departments of Public Health Engineering and State Water Boards, to ULBs. This transfer has resulted in a variety of implementation models, as well as a confusing allocation of roles and responsibilities between state and local agencies, which sometimes leave large gaps in implementation. The 2006 World Bank report on the WSS sector in India notes, "In urban [water supply and sanitation] there is often an unhealthy overlap between policymaking, regulation, financing, ownership of infrastructure, and operation of service within State agencies responsible for the two sub-sectors."[25] Another challenge facing the sanitation sector is the disconnect between WSS initiatives and the public health and education sectors.[26] The NUSP aims to address the lack of systematic policies by calling on cities to develop integrated sanitation strategies; however, the existing bureaucracy surrounding the WSS sector will be a key challenge to implementing new practices, such as septage management.[27]

### 4.1 Major National Agencies

Ministry of Urban Development (MOUD): The MOUD, which issued the NUSP, is responsible for urban development planning and implementation. It establishes the framework policies for sanitation, and provides state governments with funds for sanitation and wastewater projects. The Ministry's technical branch, called the Central Public Health and Environmental Engineering Organization (CPHEEO), serves as the central advisory body to states on the implementation, operation, and maintenance of water, wastewater, and solid waste projects. The technical guidebooks that CPHEEO publishes serve as the foundation for state-level Public Health and Engineering Departments, Water Boards, and ULBs as they implement planning, design, construction, and maintenance of local sanitation and sewerage schemes. However, these guidebooks, including the 1993 "Manual on Sewerage and Sewage Treatment," do not provide guidance on septage collection or disposal.[28] This Ministry is also responsible for managing international finance as it relates to urban development.

### 4.2 Major Sub-National Agencies

Municipal Administration Departments: Also called State Urban Development Agencies, these state-level departments are responsible for implementing urban development, and therefore have a major role in the development of WSS services. Typically, these departments delegate WSS responsibilities to state-level Public Health and Engineering Departments (PHEDs), State WSS Boards, city-level WSS boards, and ULBs. These departments regulate revenues, provide budgets, and fund disbursements to state-level agencies, and provide technical support to ULBs.

### *Nirmal Shahar Puraskar*: Clean Cities Award Program that Motivates Local Action

Following the success of the rural sanitation rewards scheme (*Nirmal Gram Puraskar*, NGP), the NUSP established the *Nirmal Shahar Puraskar* (NSP), or Clean Cities Award. This award rates cities on the basis of their achievements towards eliminating open defecation and manual scavenging, providing drainage and wastewater treatment or reuse, and the 100 percent safe disposal of human and solid waste. Cities can be classified red (emergency status), black (needs considerable improvement), blue (recovering but still diseased), or green (healthy and clean). Upon achieving green status, cities do not receive monetary gains, but rather may be invited to attend the national award ceremony, where they shake the President's hand, attend trainings, and participate in exchanges and learning visits. The rural version of this award, the NGP, received 40 applications in 2005 and over 1,000 applications for the 2006 award.[29] Given the lack of political will to improve sanitation, the GOI hopes the NSP will shame poorly performing local governments and motivate them to transform their cities into clean and healthy communities.

**State Water Supply and Sewerage (WSS) Boards:** Owned by state governments, the WSS Boards are semi-autonomous agencies that are responsible for managing service provision in each particular state. While the structure of these boards varies greatly from state to state, there are two general operational models. In one model, state governments, such as Kerala and Maharashtra, directly build, own, and operate water and wastewater treatment plants through WSS Boards. In Maharashtra, the WSS Board is known as the Maharashtra Jeevan Pradhikaran (MJP), which operates 25 water utilities across the state. In another model, states, such as Harayana and Gujarat, build and own the utilities, but outsource the O&M. The WSS Boards solely provide technical services, while the Urban Development Departments under each state's Municipal Administration Department provides regulatory oversight. The user fees for WSS services are usually too low for cost recovery, and the central government, through the state governments, provides them with annual grants and funds. Increasingly, public agencies perceive services as commodities for which they can charge a service or user fee, although currently, few cities charge monthly or bi-monthly water bills.

**Public Health and Engineering Departments (PHEDs):** These state-level departments employ qualified engineers and other technical staff who provide technical support to ULBs, especially smaller ones that may not have their own technical staff. In theory, PHEDs are expected to provide support during the construction and development of WSS projects and then withdraw from ULBs by eventually devolving O&M responsibility. However, due to the continued lack of capacity of many ULBs, PHEDs in many cases retain WSS responsibility at the local level. In many states, these agencies are the driving force behind infrastructure development, such that they design, fund, and build infrastructure before turning it over to local governments. Since they are not responsible for O&M, many WSS systems that PHEDs construct are too costly or complex for ULBs to maintain.[30] As an engineering department, PHEDs also tend to regard OSS as temporary measures before the installation of complex sewerage networks, which has contributed to its lack of leadership in developing physical infrastructure for septage management.

**Urban Local Bodies (ULBs):** Depending on their population, municipal administrations (called ULBs) are categorized into four tiers: (1) City Corporations in large cities; (2) City Municipal Councils; (3) Town Municipal Councils; and (4) Town Panchayats. By constitutional mandate, ULBs are responsible for their wastewater discharge, collection, and treatment. In some smaller cities, ULBs do provide these services; however, since most ULBs are critically understaffed and most staff members have inadequate training, larger cities usually depend on WSS Boards and PHEDs to provide these services on their behalf. Notably, the NUSP requires ULBs to develop city sanitation plans that will allow them to meet state and national sanitation standards, and does not mention the role of WSS Boards or PHEDs. As states develop state urban sanitation strategies, they should make the role of WSS Boards and PHEDs in supporting local governments more explicit.

## 4.3 Other Organizations

**Private Service Providers:** The provision of septage services in India is currently conducted only by private operators. Operators may be individuals desludging by hand, or small companies with tanker trucks. They provide an essential service for septic tank users, but are not yet monitored or regulated. There are no known formal private treatment facilities, per se, although collectors often bring septage to nearby farms for composting and direct fertilizer application.

**International Organizations:** Multilateral organizations like the World Bank, WHO, UNICEF, ADB, and UNDP, and the bilateral agencies of Japan, the United States, Australia, Denmark, Germany, the Netherlands, Sweden, and the United Kingdom are very active in the urban sanitation sector in India. Today, while donor support provides only three percent of sector funding, this international involvement provides a valuable contribution to pilot demonstration projects, research, and policy reforms, including on cost recovery, public participation, financing, and demand-driven solutions.[31] Though these organizations have not developed India's capacity for septage management in the past, the World Bank's Water and Sanitation Program directly helped develop the NUSP and is now supporting the development of state and local urban sanitation strategies.

**Academic Institutes:** Several institutes in India, including the National Environmental Engineering Research Institute, the Human Settlement Management Institute, the Engineering Staff College of India, and the State Institutes of Urban Development, promote education and knowledge sharing among practitioners in the water and sanitation sector. These institutes can play an important role in developing training materials, workshops and trainings, and knowledge development and dissemination as states and ULBs begin to address domestic septage management.

## 4.4 Key Challenges and Strengths

**Challenge:** Although the NUSP tasks ULBs to develop city sanitation strategies, most ULBs have very limited institutional, financial, and staff capacity to improve sanitation provision and septage management.

**Challenge:** Agency roles and responsibilities for water, sanitation, and public health are often unclear, overlap, and inadequately coordinated. State policies need to clarify roles and clearly indicate how state agencies will support ULBs in implementing their city sanitation plans.

### Implementing the West Bengal Urban Sanitation Strategy

The state of West Bengal, India's fourth largest by population and density, is one of the first states in the country to develop a statewide sanitation plan, which is currently awaiting cabinet approval. In addition to the NUSP goals, West Bengal aims to reduce the gap in access between geographic and social groups, convert unsanitary latrines into sanitary systems, and provide community sanitation for slums and floating populations. To do so, West Bengal plans to create institutional roles at both the state and local levels. While the strategy clearly indicates the responsibilities of the state and ULB, it does not mention the roles of WSS Boards or PHEDs.

**State Level:** A state-level Coordinating Committee under the chairmanship of the Urban Development and Municipal Affairs will involve diverse agencies, NGOs, and private sector participants. To implement the sanitation plan, the State Urban Development Agency will create a group that serves as the "custodian of sanitation" and have at least two, full-time senior staff (one technical, one policy-oriented) who will guide ULBs with their sanitation planning and development efforts. The Institute of Local Governments and Urban Studies will also provide local governments with trainings and capacity building support.

**Local Level:** Each ULB will create a Sanitation Task Force that represents diverse stakeholders who will lead efforts to raise awareness through communication programs and campaigns, and monitor progress. ULBs will also create Sanitation Cells that conduct baseline surveys, develop the citywide sanitation plan, coordinate with other agencies, and contract and manage plan implementation, monitoring and evaluating progress.

**Strength:** The many donor, NGO, and research organizations active in India's sanitation sector serve as important resources in developing necessary trainings, advocacy, community organization, and technological solutions for septage management.

## 5.0 FUNDING SOURCES

Cities depend largely on the national and state governments for sanitation and wastewater funding. Though the national government prioritized water supply in the past, it is now increasingly investing in sanitation, especially in urban areas. Nevertheless, this funding cannot meet the immense backlog of infrastructure in the wastewater sector, and cities will also need to look to develop local sources of revenue and private sector participation.

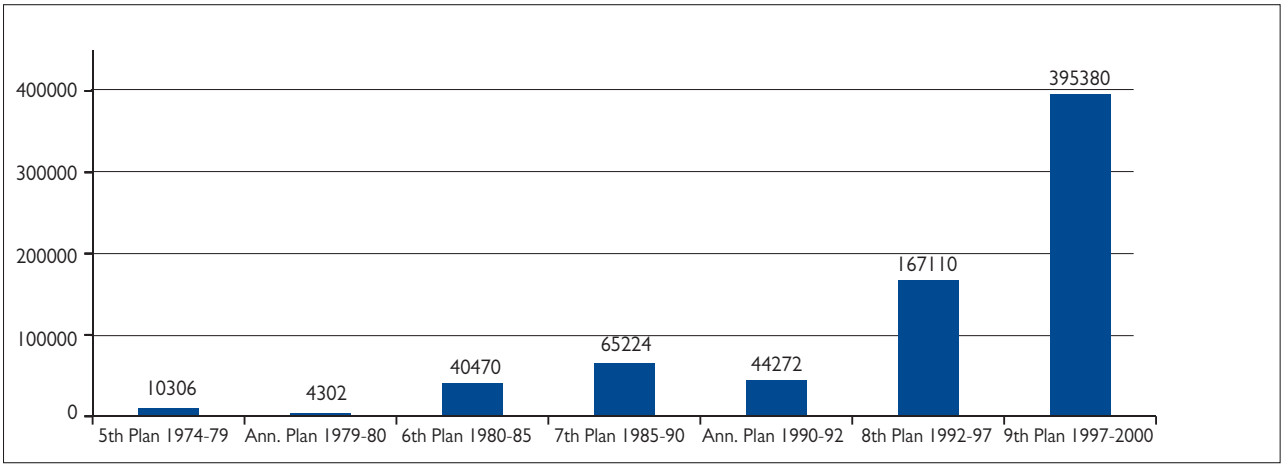
### 5.1 National Funding Sources

Funding for water and sanitation has been increasing in India, as seen in Figure 6 below, and indicates that the sector is of growing importance to the national government. The GOI budget for water and sanitation rose to $16.5 billion, or 0.64 percent of GDP, for the 10th Planning Period (2002-2007), up from $6.6 billion, or 0.34 percent of GDP, for the 9th Planning Period (1997-2002).[32] Nationwide, the 10th Plan budget translates into an average of $1.80 per person for water investments, and $1.00 for sanitation improvements. However, the plan favors urban infrastructure development and provides $6 billion for urban water supply (or $3.60 per urban resident per year) and $4.6 billion for urban sanitation services (or $2.80 per urban resident per year). State governments provided around 76 percent of this funding, and the central government provided 24 percent. Most of this increase in funding focused on developing sewerage networks and wastewater treatment plants.

After the passage of the NUSP, the GOI also earmarked funds to help states develop state strategies and for cities to develop city sanitation plans. Currently, MOUD has set aside $4 million to assist states and cities with the development of their sanitation strategies.[34] They are also looking at funding opportunities to support the implementation of city sanitation plans.

Jawaharlal Nehru National Urban Renewal Mission (JNNURM) is a national initiative to support infrastructure development in 63 large cities. It aims to support infrastructure projects for water supply and sanitation, sewerage, solid waste, roads, transportation, and urban redevelopment, and integrate slum development through projects that provide shelter, basic services, utilities, and civic amenities.[35] Funds are conditional on recipients adopting modern accounting techniques, adopting e-governance and computer software, creating GIS-based property tax systems, providing services for the poor, and levying user charges that will recover O&M costs within seven years. To apply for the funds, cities must draft City Development Plans and identify specific projects funding needs. The local cost share can range from 10 to 50 percent, depending on its size and political status.[36] The 2005-2012 budget for JNNURM is $9.9 billion.

FIGURE 6: INCREASING INVESTMENTS IN WATER SUPPLY AND SANITATION IN INDIA (IN MILLIONS OF RUPEES)[33]




Note: Outlays shown are Central plus State investments at current prices.

The Urban Infrastructure Development for Small and Medium Towns (UIDSSMT) is a centrally sponsored grant that supports infrastructure development in small- and medium-sized towns in order to boost regional development and stem the flow of people moving into bigger towns and cities. The fund supports communities that have fewer than 500,000 people, and covers a host of urban infrastructure projects. Cities must obtain UIDSSMT grants in conjunction with state grants, and loans from other sources, with the cost share varying depending on the city's size.

### 5.2 Local Funding Sources

The 74th Constitutional Amendment Act emphasizes shifting responsibilities for urban water and sanitation services to local governments. The Act envisions that ULBs would develop services through a municipal department, contract with a state utility, or contract with a private service provider. The Act also underscores the need for ULBs to improve their management practices, professionalize services, and undertake tariff reforms. In practice, many local governments generate very little own-source revenue from property taxes and user fees for services, due to poor collection capacity and low rate structures. As a result, they continue to rely on PHEDS and WSS Boards, and various centrally sponsored infrastructure development funds, such as the two described above.

### 5.3 Key Challenges and Strengths

Challenge: Despite the unprecedented growth in urban population and demand for services, municipal revenue generation has not increased due to limited property tax collection and low user fees for public services. As a result, most ULBs depend on the availability of state grants and the implementation priorities of state agencies, often becoming trapped in a cycle of inadequate service provision, inadequate revenues, and inability to improve services.

Challenge: The past focus on centralized sewerage systems drained available funding sources and created an immense backlog of undeveloped and inadequate septage management infrastructure.

Strength: The GOI has raised the budget for urban sanitation, set aside funding for cities and states to develop sanitation plans, and is exploring opportunities to assist cities with implementing their sanitation plans.

Feedback from participants at the 2009 workshop on "Developing Comprehensive Septage Management Programs in Asia" suggests that funding is not the limiting constraint for Indian cities. Rather, they stress lack of awareness and motivation as the main obstacle; the *Nirmal Shahar Puraskar* urban sanitation prize aims to address this issue.

## 6.0 RECOMMENDATIONS

With a national mandate to address onsite sanitation and septage management, states and cities in India are now starting to develop strategies to achieve total urban sanitation. The following recommendations aim to further strengthen these efforts based on other experiences in the region. These recommendations are also based on the feedback of participants from India at the 2009 regional septage management workshop held in Kuala Lumpur.

### 6.1 Short-Term Recommendations

Develop National Guidelines on Septage Management. To support the implementation of the NUSP, the Ministry of Urban Development can create an advisory board that will develop supporting guidelines. These guidelines can provide a starting point for state and local agencies who can further adapt the model guidelines and manuals for their own contexts. Guidelines for septage management could include provisions on the involvement of private service providers, health and safety standards, types of septage treatment technologies, and standards for effluent and treated septage discharge or reuse.

Complete State Urban Sanitation Strategies and Streamline Support for ULBs. Already six states have drafted their urban sanitation strategies; the remaining 22 states must develop and complete their strategies. The Ministry of Urban Development can assist lagging states to develop these strategies, potentially with the assistance of international organizations. In developing the strategy for urban sanitation in each state, it is critical that these state plans not only create sanitation cells, as directed by the NUSP, but also clarify the roles and responsibilities of the WSS Boards and PHEDs, which possess most of the technical expertise in the state. In addition to providing technical assistance and implementation monitoring, state sanitation cells should draft guidelines for local bylaws on sanitation.

### National River Action Plan: an Opportunity to Address Septage Management

The National Rivers Conservation Directorate (NRCD) under the Ministry of Environment and Forests works to improve the water quality of 27 major rivers that the Central Pollution Control Board has designated as extremely or moderately polluted. The program covers more than 150 towns in 16 states. Each river's action plan establishes strategies to mitigate pollution by developing sewage collection and treatment plants, intercepting and diverting sewage, and providing low-cost sanitation. The development of septage collection and treatment infrastructure could be an important, cost-effective, and near-term strategy for riparian towns that will receive funding from the NRCD.

**Integrate Septage Management into Environmental Planning.** Since NUSP charges ULBs to first survey the sanitation condition and then develop a comprehensive sanitation strategy before constructing facilities, cities in India have an opportunity to integrate septage treatment with other environmental initiatives. This could include jointly managing solid waste and septage collection and treatment, holistically addressing water and treated wastewater resources, managing septage collection and treatment to promote agricultural productivity or reduce agricultural runoff, creating centers of waste recycling to promote new jobs, or developing constructed wetland treatment systems to create new recreation spaces and wildlife habitat. Selecting strategies that resolve multiple problems and produce multiple benefits can build public support for projects and promote program sustainability.

**Provide Trainings and Exposure for Policymakers and Operators.** Having never had to address onsite sanitation before, many ULBs lack the technical knowledge or even the vision of how to develop adequate collection and treatment programs. States should use exposure visits, workshops, technical trainings, and twinning partnerships for policymakers and wastewater operators in order to raise awareness and capacity. To this end, states can look to the MOUD, donor agencies, and research or other training institutions for funding and technical assistance. Exposure visits and trainings can involve regional peers who have successfully provided septage management through a variety of modalities.

## 6.2 Medium-Term Recommendations

**Construct Septage Treatment Facilities.** There are a variety of treatment technologies that will render septage safe to reuse and dispose; these can be constructed in plantations, farms, landfills, and sewage treatment plants. As part of their baseline sanitation survey process, cities should determine the quality of collected septage, and whether it can meet international standards for reuse in edible and non-edible products. If the treated septage can be reused, the facilities can be designed to generate profitable fertilizers, possible in tandem with solid waste composting.

**Engage Existing Private Service Providers in Public-Private Partnerships.** For many years, private collectors have been providing desludging services when public agencies fail to do so. There are also many examples of private septage collectors who do not dispose of septage in treatment facilities because they were not adequately consulted or engaged in the facility's siting and design process. By involving private septage collectors, CBOs, and sanitation workers early in the planning process for new septage collection policies and treatment facilities, ULBs can help develop new local business opportunities, build future compliance, and ensure that new facilities will be used.

**Develop Public Promotion Campaigns.** Once treatment facilities have been constructed, cities will want to educate households on the value and importance of regular desludging. To develop a public promotion program, cities can first survey household attitudes and concerns towards sanitation and septic tanks, which will in turn help identify target audiences and tailor key messages. Cities can then conduct the campaign, evaluate attitudes post-campaign, and further refine future promotion campaigns.

**Engage Local Research Institutions in Developing Septage Treatment Facilities.** As the nutrient and pollutant composition of septage varies by climate and by culture, cities in India will need to conduct research to determine the efficacy of different treatment systems, opportunities for improvement, and possibilities of reuse and recycling, and new treatment technologies, such as

those that combine solid and human waste composting. Engaging engineering schools in this process also helps integrate onsite sanitation management and treatment into the curriculum and produces future professionals who are able and committed to solving this critical issue of national importance.

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FENITA ROSARIA, ECO-ASIA

Although Indonesia has 150 septage treatment plants, 90 percent are no longer in operation and only four percent of collected septage is treated at a facility. As the Government of Indonesia strives to rehabilitate the country's STPs, the country will need greater emphasis on policy development, agency coordination, local capacity building, and private sector engagement.

**COUNTRY ASSESSMENT**

# INDONESIA

| | | | |
|---|---|---|---|
| Country Population (in millions) | 228[1] | Nominal GDP (in billions) | $512[2] |
| Urban Population (in millions) | 112[1] | Nominal Income per cap | $2,246[2] |
| Urban Population (% of total) | 49%[1] | Annual Water Budget per cap | $3.35[3] |
| Access to Improved Water (urban) | 89%[1] | Annual Sanitation Budget per cap | $0.37[3] |
| Access to Improved Sanitation (urban) | 67%[1] | Fee to Desludge (per $m^3$) | $2-9 |
| Access to Sewerage (urban) | 2.3%[4] | Surface Water Pollution (% of samples, Jakarta) | 84%[5] |
| Use of Onsite Sanitation (urban) | 62%[6] | Economic Cost of Poor Sanitation (in billions) | $6.3[7] |
| Treatment of Collected Septage (urban) | 4%[6] | Terms for Septage in Indonesia: septage, fecal sludge | |

**Key Challenges**

- Lack of national policy and standard setting to guide local implementation
- Low public awareness of importance of septage management in wastewater treatment
- Lack of technical assistance, management support, and private participation leave 90% of existing STPs closed or barely operational
- National under investment in infrastructure, especially for wastewater

**Key Strengths**

- Treatment infrastructure exists but is underutilized
- Public and private operators provide mechanize septage collection in most cities
- Decentralized system allows local governments to customize wastewater treatment solutions
- Several national forums and working groups provide expertise, policy formation, and information dissemination on community-based sanitation

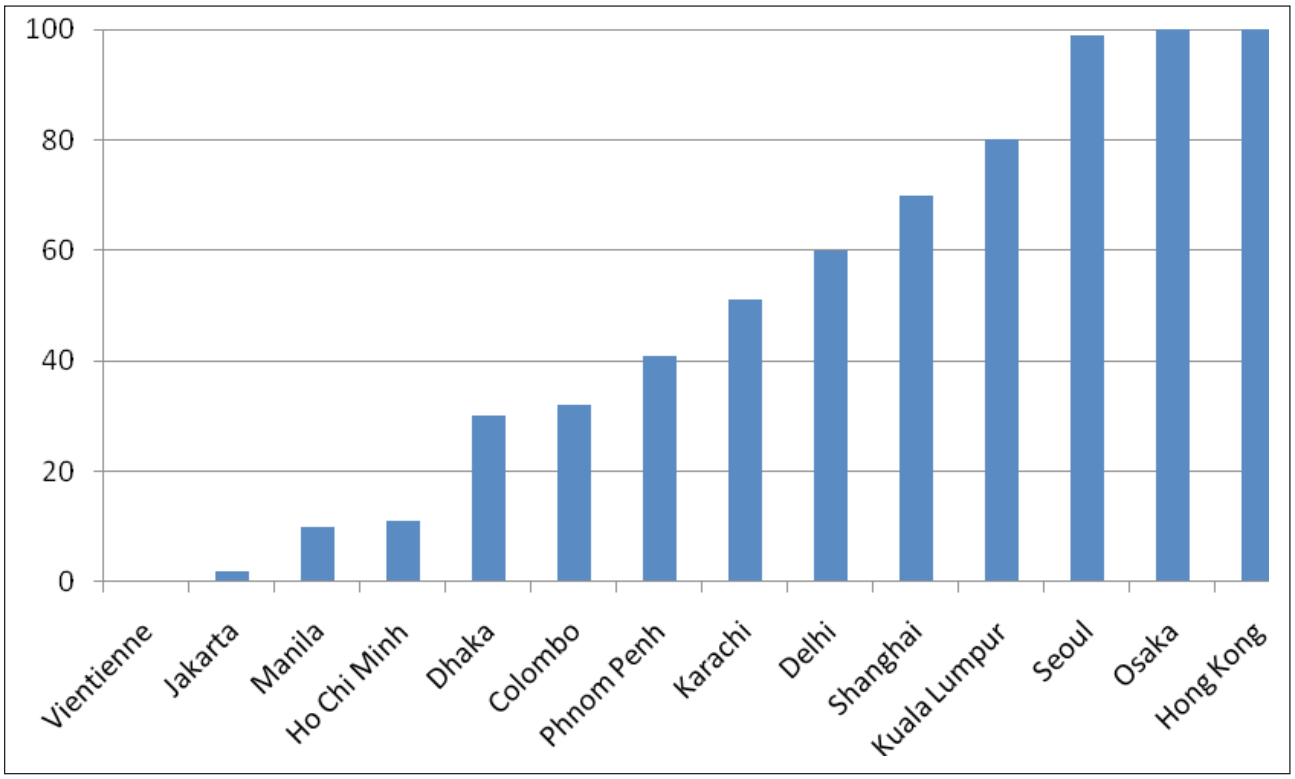
## 1.0 SUMMARY

With two-thirds of its urban residents relying on onsite sanitation systems (OSS) for wastewater disposal, Indonesia produces a tremendous volume of septage in its cities each year. Since one in six of these OSS leaks or has an open bottom, and 40 percent are located within 10 meters of a well or pump, which are major sources of water for urban residents, OSS cause as much as 70 percent of groundwater contamination in Indonesia.[8] Recognizing the importance of septage management, the national government constructed 150 septage treatment plants (STPs) in large- and medium-sized cities during the 1990s. This is a significant investment, considering that only 11 cities currently have wastewater treatment plants. However, these top-down projects lacked local support and corresponding local policies, monitoring and enforcement, operations training, and public outreach to make them sustainable. Importantly, the decentralization policy of 2001 transferred management responsibilities to local agencies without adequate training and ongoing technical assistance. As of 2009, 90 percent of STPs are closed or minimally operational, and those that are operational often charge private collection companies a dumping fee. Not surprisingly, private service providers often dispose of septage in nearby rivers. Lack of adequate sanitation, and septage and wastewater management have caused significant health and environmental impacts. The World Bank estimates that inadequate sanitation costs Indonesia $6.3 billion in economic losses each year, equal to 2.3 percent of its GDP.[9]

To avoid past problems, sanitation initiatives today stress both top-down and bottom-up actions to develop sustainable, community-based projects. Cities in Indonesia are increasingly interested in the use of communal septic tanks and DEWAT treatment systems, in addition to addressing septage management. The 2008 National Policy and Strategies on Domestic Wastewater Management also highlights the need to address regulations, private sector and community engagement, and infrastructure investment.

In support of these strategies, this report recommends that, in the near-term (within three years), the Ministry of Public Works (MPW) and the National Development Planning Agency (BAPPENAS) integrate septage management into the national dialogue on sanitation, and promote the importance of septage management

FIGURE 7: SEWERAGE ACCESS IN MAJOR ASIAN CITIES, 2001 TO 2002[15]



in cities where there are ongoing community-based sanitation projects. These national agencies can help a few cities that already have STPs develop model septage management programs. In the medium-term (three to five years), the national ministries can develop, improve, and disseminate standard guidelines, model local regulations, effluent and septage disposal standards, and training materials for collection and treatment operators. In these efforts, they should engage international organizations' support in providing training and technical assistance. To leverage additional funds for this sector, local governments should collaborate with private companies to develop new models of public-private partnerships for septage collection and treatment. The national government should also increase funding for wastewater infrastructure development and local capacity building, streamline regulations for private sector participation, and create financial incentives for cities to adopt and improve their capacity to manage and treat septage.

# 2.0 BACKGROUND AND CONTEXT

## 2.1 National Sanitation Context

As of 2006, 89 percent of urban residents had access to improved water and 67 percent to improved sanitation in Indonesia. Indonesia's wastewater treatment infrastructure, however, ranks third in the world after India and China in terms of the gap between demand and actual connections, and Jakarta ranks second to last in a comparison of major Asian cities (see Figure 7). As of 2009, 11 cities in Indonesia provide an average 14 percent of their residents with a sewerage system that has a total design capacity to treat just 826,000 cubic meters of sewage per day. In the absence of sewerage networks, the majority of urban households build their own septic tanks.

The lack of adequate wastewater infrastructure places a significant burden on water quality, human health, and economic productivity.[10] As an example, Jakarta's Health Agency's 2005 records show that 84 percent of groundwater samples taken from across Jakarta were contaminated with human waste, and the Jakarta Environmental Management Board found that all 13 of the city's rivers are severely polluted.[11] Polluted groundwater poses a severe public health hazard since the majority of the population relies on groundwater for their daily needs due to limited access to piped water supply.[12] Every year, waterborne diseases cause 50,000 premature deaths and 120 million cases of disease. Indonesia has the highest incidence of typhoid fever in Asia, and around 70 percent children have had hookworms and roundworms.[13] The World Bank estimates that inadequate sanitation costs Indonesia $6.3 billion in health, environmental, and economic losses each year, equal to 2.3 percent of the GDP.[14]

## 2.2 Onsite Sanitation Prevalence

An estimated 62 to 71 percent of urban residents and 24 to 32 percent of rural residents use septic tanks and other forms of onsite sanitation systems (OSS), although there are large disparities between regions and in the quality of the septic tanks.[16] The use of OSS in urban areas is expected to rise as the population grows and as Indonesia implements land titling policies that will foster homeowner investments.[17] Some of these systems overflow because they are too small or are rarely emptied; others have inlet pipes that do not function; and one out of six has an open bottom or is made from bricks that seep waste out of the tank.[18] As 40 percent of onsite sanitation facilities are within 10 meters of a well, leaks from the collection chambers cause as much as 70 percent of urban groundwater contamination.[19] Some districts, such as Medan and Parapat, now require households to connect their liquid outflow pipes to existing sewers.[20]

## 2.3 Septage Collection and Treatment Capacity

Since the 1980s, when the Government of Indonesia first addressed the issue of sanitation in the Five-Year Development Plans (RPJP), urban residents have increasingly used individual latrines, public toilets, and toilets connected to septic tanks. Over time, as these systems began to fill and overflow, and demand for desludging rose, a number of private companies began to appear in the 1990s to desludge OSS. While many cities now have public and private desludging service providers, some communities still desludge by hand. To operate, these companies must obtain business and nuisance permits, although these permits usually do not regulate health, safety or disposal. During the 1980s and early 1990s, since there were no STPs in Indonesia, desludging companies would dump their waste into the nearest waterway.

In Medan, where there are over one million septic tanks, waterways are highly contaminated with human waste. New sanitation initiatives in Indonesia focus on community-based sanitation to foster ownership and understanding of wasteater treatment systems.

ALEX ZVINAKIS, ECO-ASIA

In response to this situation, the Ministry of Public Works began building STPs in 1991, and has now built around 150 STPs throughout the country. In these projects, the central agencies led the development of these facilities, and required local governments to provide the necessary land. As a result, cities put forth their cheapest land, often in peri-urban areas that make transportation costs prohibitive for collection companies. After the Government of Indonesia handed over the facilities to local authorities in 2001, 90 percent of these facilities closed or run on very low volumes due to the lack of septage disposal at the facility and inadequate operations and maintenance (O&M) funds.[21] As a result, only four percent of septage in Indonesia is treated at an STP.[22] In Central Java, for instance, 23 out of 35 districts have an STP, but none of these facilities is functional.[23] Instead, as seen in Surakarta and Cirebon, most cities send septage to WWTPs; depending on the facility's design, the addition of septage can reduce its operational efficiency. Or, as seen in Bandung, collection companies dispose of septage in the sewer, which reduces their transport costs, but impedes the sewer's hydraulic performance. In addition, while households pay operators $5 to $27 at the collection site, municipal or district governments levy a tipping fee of $0.27 to $0.54 per cubic meter to dispose the septage at public treatment facilities. Although this fee is a fraction of the collection charge, collectors avoid it and the complications of proper disposal by discharging the waste directly into a river.[24]

## 3.0 LEGAL FRAMEWORK

In Indonesia, sanitation is fragmented across the ministries of health, infrastructure, planning, and the environment, each of which has developed laws that impact sanitation practices. In the absence of an overarching framework, Indonesia faces challenges in strategically planning for and providing adequate flows of financial resources to the sector at both the national and local levels of government. Throughout the country, however, there is a growing recognition of the importance of managing OSS. In 2008, the Ministry of Public Works issued the National Policy and Strategies on Domestic Wastewater Management, which provides direction and guidance for national and local governments, as well as the private sector and communities, in formulating policies and programs for domestic wastewater management.[28] While this policy does not specifically mention septage, it notes that key challenges to domestic wastewater management include the following:

- Low community awareness and participation;
- Lack of laws, regulations, operating manuals and standards, and policy enforcement;
- Lack of separation between regulators and operators;
- Lack of coordination among related agencies in policy formation; and
- Low national and local funding, low wastewater tariff setting, and reluctant private sector participation.

### Case Study of Surabaya: Model Septage Treatment Plant

In Surabaya, the capital of East Java Province and Indonesia's second-largest city with three million residents, 87 percent of households have access to improved sanitation, including 60 percent from OSS.[25] The city has constructed an STP and developed permitting standards for collection companies. Private companies began working in 1983 and now collect most of the septage in the city. With growing community demand, the number of companies has increased from 10 to 27 in the last 15 years, demonstrating the profitability of septage collection.[26] Companies must obtain a business license, a nuisance permit, and a disposal permit that requires private companies to dispose of septage at the STP. However, the local sanitation agency lacks the resources to enforce the requirements of the disposal permits. Fines for non-compliance are too small to prevent repeat offenses.

Surabaya's STP, considered one of the best in Indonesia, uses a modified form of the activated sludge process. The STP has a design capacity to treat 400 cubic meters per day and is open at all hours of the day. It is currently running at capacity and can accommodate all of the septage it receives, although its capacity would be overwhelmed if all households regularly desludged their tanks.[27] Dried septage is used as fertilizer for city gardens in Surabaya.

In response, the Policy aims to increase the utilization of WWTPs and STPs to 60 percent in accordance with the 2010-14 National Medium-Term Development Plan to develop regulations, strengthen institutional capacity, and increase financing alternatives for infrastructure development. To engage the private sector, the Policy proposes knowledge dissemination, the development of investment schemes, and the provision of incentives, such as tax rebates and business licenses. It will also engage communities in tandem with the 2009 National Action Plan, which commits Indonesia to raise sanitation coverage to 74 percent in urban areas and 65 percent in rural areas. These plans call for information and education campaigns to encourage households to improve their sanitation situation and to increase the use of treatment facilities.[29]

The decentralization of political and fiscal power in 1999 played an important role in policy formation and implementation of water, wastewater, and septage management in Indonesia. In 1999, the central ministries turned over water and sanitation planning, development, financing, and management responsibilities to local governments. The central ministries now focus on policy development, standard setting, and capacity building. At the national level, however, guidance on sanitation and septage management remains vague and incomplete. While there are national codes for septic tank design and guidelines for the design, operation and maintenance of septage treatment facilities, there are no national guidelines, technical assistance, or monitoring of septage collection, treatment, and disposal. Local governments that have WWTPs or STPs may regulate septage insofar as this pertains to the plant's operations; few cities have comprehensive septage ordinances. Some local government units (LGUs) that actively manage septage, such as Surabaya, have issued local regulations for nuisance permits, tipping fees at WWTPs and STPs, water quality management, and water pollution control. Most LGUs, however, are unable to provide comprehensive septage management.

## 3.1 Septic Tank Design

The Indonesian National Standard Code for Planning Septic Tank with Absorption System establishes design standards for constructing septic tanks.[30] This code states that materials used for construction must be impermeable, acid proof, strong, and use brick, stone, concrete, polyvinyl chloride, ceramic, cast iron, plastic or iron. It also sets the volumes of septic tanks based on the number of users and expected liquid waste flow rates, and gives specific dimensions for a small, one-family septic tank that should be emptied once every three years. The code specifies the location, slope and materials of the influent and effluent pipes, manholes, control box and tank chambers. However, local governments do not enforce these codes, and most individual OSS are not built to code.

## 3.2 Septage Collection

There are currently no national or local laws that require frequent or scheduled desludging.[31] The most relevant national policy is the requirement that all private companies obtain a Nuisance Permit (also known as a Hinder Ordonantie permit) from the local government when conducting potentially hazardous activities, such as septage collection. This permit allows government officers to conduct impromptu inspections to ensure compliance with safety and environmental regulations. At the local level, a few cities and districts have issued regulations on septage transport and disposal. The City of Malang, for example, requires collectors to conduct due diligence to ensure that waste does not leak out of trucks during transport and to discharge waste at a treatment facility. The ordinance also requires the police and sanitation and environmental agencies to monitor and enforce these regulations, and allows them to issue penalties for non-compliance.[32]

## 3.3 Septage Treatment

STPs in Indonesia, called *Instalasi Pengolahan Lumpur Tinja* (IPLT) in Bahasa, use a variety of technologies, such as Upflow Anaerobic Sludge Blanket (UASB), oxidation ditch, Imhoff tank and stabilization tank. The Ministry of Public Works Department has developed guidelines for each system that is used for septage treatment. Some STPs use the dried septage as fertilizer. Given the decentralized nature of management, there is no consolidated information on what each STP is doing in Indonesia.

Several ministries have created technical guidelines for the planning, design, materials, and O&M of wastewater treatment facilities, including STPs. These documents provide guidelines for activated sludge, stabilization ponds, and (UASB) technologies.[33] Despite the availability of these guidelines, however, many facilities do not operate effectively. The WWTP in Jakarta, for instance, produces effluent with 211 milligrams per liter of total suspended solids, more than double the national cap.[34] Government Regulation 16/2005 also prohibits dischargers from releasing untreated wastewater directly into water bodies that are designated sources of potable water, and requires operators of centralized treatment plants to monitor liquid effluent and solid waste quality on a regular basis. In practice, however, few cities have implemented these regulations.

## 3.4 Key Challenges

**Challenge:** Although 66 percent of urban residents use septic tanks, the national government has not developed a legal, institutional, or financing framework for septage collection, treatment and disposal.

**Challenge:** Local regulations on septage management are limited to STP operations and maintenance. After decentralization and the withdrawal of national technical and funding support, most local governments have been unable to improve wastewater services.

# 4.0 INSTITUTIONS AND IMPLEMENTATION CAPACITY

Today, a number of national agencies are involved in developing policies and programs on water and sanitation. In the decentralized system of wastewater management in Indonesia, local governments typically create two to four departments to manage water and sanitation, depending on the district leader or city mayor's objectives. Common departments include: public works, health, environmental sanitation, settlements and environment, and pollution control. A recent study of nineteen cities and two districts in seven provinces of Indonesia found that 99 percent of central transfers to the LGU went to either public works or health departments.[35] Since septage management has not been identified as a national priority in wastewater management, most local governments do not allocate staff for this issue beyond STP operations.

The lack of institutional capacity and staff expertise in sanitation remains a major challenge for Indonesia. Before decentralization, knowledgeable professionals from the central government sat in local government offices to develop local projects. Since decentralization efforts in 1999, these staff members have returned to the national government, leaving a gap in technical capacity at the local level that has yet to be replaced.[36]

## 4.1 Major National Agencies[37]

**National Development Planning Agency (BAPPENAS):** BAPPENAS, the national planning agency for all sectors, develops and monitors policies, strategies, and programs to increase access to sanitation. It houses two major water and sanitation programs that provide local governments with the tools to initiate efforts to increase

access and treatment – the Water and Sanitation Policy Formulation and Action Planning Project (WASPOLA) and the Indonesia Sanitation Sector Development Program (ISSDP). For both programs, BAPPENAS leads multi-ministerial working groups that consist of the Ministry of Finance, Ministry of Health, Ministry of Public Works, Ministry of Home Affairs, Ministry of Industry, and Ministry of Environment. BAPPENAS has also developed a national policy for Community-Based Drinking Water Supply and Environmental Sanitation, which sets guiding principles for addressing general sanitation services, but does not specifically address septage management. In Indonesia's decentralized context, these programs offer local governments guidance documents and tools, but not mandates.

**Ministry of Public Works (MPW):** Whereas BAPPENAS provides coordination and planning support, MPW's Directorate General of Human Settlements provides local governments with infrastructure development and rehabilitation, technical assistance, and technical and service performance standards.[38] This ministry plays a critical role in the sector and is instrumental in developing the National Action Plan for Wastewater. The MPW guides the development of large-scale, off-site sanitation systems. In the past, the MPW constructed STPs in major cities across the country with central government funding. The MPW then transferred facilities to local governments, many of which could not provide the funding and staff to operate and maintain them. The MPW also collaborates with the Ministry of Finance (MOF) to administer budgets for developing sanitation and wastewater facilities at the national, regional, provincial, local, and project levels.

**Ministry of Health (MOH):** The Ministry of Health is responsible for providing wastewater facilities, sanitation emergency response systems, and hygiene promotion, especially to low-income communities. This ministry also sets the standards for water quality, and, through the Directorate of Water and Sanitation, monitors water quality.[39] In conjunction with the Ministry of Environment and the Ministry of Public Works, MOH administers and enforces regulations for sources of domestic wastewater, including septic tank design, STPs, WWTPs, and community-based systems. Given the size of Indonesia, MOH faces considerable challenges in monitoring and enforcing these standards.[40]

**Ministry of Environment (MOE):** In the water sector, this ministry is responsible for regulating water quality management and water pollution prevention. The MOE monitors inter-provincial water bodies, while provincial agencies monitor inter-district water bodies, and districts monitor intra-district waters.

**Forum Komunikasi Air Limbah (FORKALIM):** Established in 2003 by the Indonesian Association of Waterworks and U.S. Asian Environmental Program, FORKALIM is a communication network for wastewater treatment operators, such as water utilities and sanitation agencies. The forum aims to improve members' performance in the delivery of wastewater services by increasing operating efficiency, achieving financial viability, and advocating for sector reforms."[41] Key partners include donor agencies, central government departments, local parliaments and governments, and nongovernmental organizations. The current organization's activities include knowledge

### Program Highlight: ISSDP

The Indonesia Sanitation Sector Development Program (ISSDP) began as a three-year program in 2006 with funding from the Government of the Netherlands. The program has two components: (1) to conduct pilot projects in which the community provides matching funds to install sanitation systems; and (2) to enable municipal matching contributions for the design and implementation of primary and secondary solutions. In the first phase of the program, which lasted two years, six cities agreed to devise sanitation strategies for their immediate and long-term needs. These cities included: Surakarta and Blitar in Java, Denpasar in Bali, Jambi and Payakumbuh in Sumatra, and Banjarmasin in Kalimantan. In phase two, ISSDP has expanded its work to another eight cities (Bukit Tinggi and Padang in Sumatera; Semarang, Tegal, and Pekalongan in Central Java; and Batu, Kediri, and Malang in East Java). In addition, 18 other cities have also adopted the ISSDP approach under programs funded by international agencies, such as USAID and UNICEF.

sharing, studies, pilot projects, capacity building, and public information campaigns.

## 4.2 Major Sub-National Agencies

Typically, cities address sanitation concerns through sanitation agencies and working groups or committees formed by relevant local departments. Wastewater treatment facilities, if available, are managed either by the sanitation agency or the local water utility. The availability and capacity of staff at local agencies varies from city to city, and directly impacts the city's ability to maintain functioning programs.[42] The choice of treatment technology also has a major impact on project outcomes. Simpler technologies, such as rotating biological contactors and aerated ponds, have proven to be more effective than activated sludge due to lower maintenance and staff capacity and training requirements. For example, in Tangerang and Balikpapan, the activated sludge facilities are well-designed to meet treatment standards, but are not maintained because PDAM employees do not know how to operate and maintain the facilities. However, in Banjarmasin and Yogyakarta, where more simple technologies are used, facilities perform much better.

**Local Environmental Agency (BLH):** As the local extension of the Ministry of Environment, the BLH protects water resources from domestic and industrial pollution by developing policies and regulations, and coordinating efforts in pollution prevention, control and monitoring. In Surabaya, the BLH operates a city-level committee to consider wastewater infrastructure development, promote cooperation between businesses and the community, and monitor and evaluate the implementation of wastewater infrastructure development.[43] It collaborates with the local Public Works and Spatial Planning Agency in managing the design and construction of sanitation facilities such as STPs and establishing technical guidelines related to O&M.[44]

**Sanitation Agency (*Dinas Kebersihan dan Pertamanan*, DKP):** To manage day-to-day facility operations, local governments usually create a Sanitation Agency that sometimes provides septage collection services, but more often provides wastewater treatment services. The DKP in Surabaya, for example, employs 22 staff who keep the plant operational 24 hours a day. In addition, Surabaya's DKP collects tipping fees from septage collection companies each month at a rate of $0.30 per cubic meter and tries to ensure that every collection company that disposes septage at the STP has a disposal permit.[45] In high-density areas where desludging trucks cannot enter, the DKP monitors traditional land disposal methods, such as the use of lime. DKPs typically face challenges in enforcing proper disposal and collecting tipping fees.

**Water Utilities (*Perusahaan Daerah Air Minum*, PDAM):** Out of the ten central wastewater treatment facilities in Indonesia, six are managed by the local water supply

### Program Highlight: SANIMAS

*Sanitasi Berbasis Masyarakat* (SANIMAS), or Sanitation for Communities, is a countrywide program that implements communal sanitation systems for domestic wastewater treatment. SANIMAS began in 2004 under the AusAID-supported, Water and Sanitation Sector Policy Formation and Action Planning Project (WASPOLA). As part of this program, NGOs work in selected cities to provide technical assistance to participating communities and local agencies. A typical communal sanitation system can treat the waste of 75-200 domestic users in a small area. The system, which costs about $30,000 to $36,000, consists of a sewerage network with individual house connections, with an anaerobic treatment system at the receiving end. Generally, the local government contributes the majority of the cost (about 65 percent), the central government contributes 30 percent, and local communities provide five percent.[57] This cost sharing encourages ownership, sustainability, and shared responsibility for project success.[58] Between 2004 and 2008, SANIMAS implemented projects in 345 locations in Indonesia.[59] These projects operate in many communities that have non-operational STPs. Rather than rehabilitate the STPs, these communities are now investing in decentralized treatment systems like SANIMAS or BORDA's decentralized wastewater treatment systems (DEWATS).

agencies (PDAM). Across the country, PDAMs face challenges in wastewater O&M since local governments set wastewater tariffs far below cost recovery. Therefore, when PDAMs must subsidize wastewater services with water supply revenues, they face challenges in improving services and expanding coverage. The case study on page 57 details the experience in Medan, Indonesia's fourth largest city, and highlights the challenges that PDAMs face in implementing wastewater treatment initiatives.

## 4.3 Other Organizations

**Private Service Providers:** Private service providers are increasing in number and collect the majority of the septage in most cities due to the limited capacity of most DKPs and PDAMs. In Malang, for instance, the DKP operates only one vacuum tanker for a city with 2.2 million people; the city's residents must therefore depend on private service providers for a quick response. While operators need a permit to operate, no cities require health or safety practices, or enforce desludging regulations where they exist.

**International Organizations:** These organizations are actively involved in Indonesia's sanitation sector, both in policy development and treatment plant funding and construction. For instance, official development assistance has helped fund the construction of eight out of the ten WWTPs in the country, as well as on-site treatment systems like SANIMAS and policy working groups like WASPOLA. In general, however, these programs do not address septage management.

LINDA SHI, ECO-ASIA

**Representatives of national and local sanitation agencies in Indonesia study the rotary screw press at Indah Water Konsortium's sludge treatment facility in Kuala Lumpur. Although Indonesia has a number of wastewater and septage treatment plants, most facilities face O&M challenges.**

**Academic Institutions:** There are a number of academic institutions involved in the water and sanitation sector, such as Bandung Institute of Technology, Institute of Sepuluh November Surabaya, and the center for environmental studies in some universities. The Indonesian Society of Sanitary and Environmental Engineers also provides technical assistance and training.

## 4.4 Key Challenges and Strengths

**Challenge:** Local governments lack the capacity to manage and maintain existing septage treatment facilities, causing these systems to fall into disrepair. National agencies have also not provided sufficient policy guidance or funding for cities to develop the necessary institutional and physical capacity.

**Challenge:** The fragmentation and overlap of authority among so many agencies makes it difficult to create integrated plans for sewerage and septic tank management and development.

**Strength:** The national working groups (ISSDP and WASPOLA) can serve as a nodal group for creating septage management policies, guidelines, pilot projects, and knowledge exchange and dissemination.

# 5.0 FUNDING SOURCES

In the aftermath of Indonesia's 1997 financial crisis, the government accepted austere fiscal and monetary policies as part of the conditions of its IMF loan that cut funding for many infrastructure and social programs. This austerity and Indonesia's low economic growth has caused the national government to significantly under invest in all sectors of infrastructure. As of 2009, Indonesia spends only 3.4 percent of its GDP on infrastructure; as a comparison, Vietnam spends 10 percent of its GDP on infrastructure.[47] Despite national sanitation targets and action plans, sanitation is a low priority for both central and local governments. Moreover, the water sector receives the majority of funding. Without national support, many local governments neither feel that sanitation and wastewater treatment are priorities, nor have the funding to develop new initiatives.

## 5.1 National Funding Sources

There are two major national sources for water and sanitation funds; (1) ministerial funds, and (2) the Special Allocation Fund (DAK). These loans emphasize capital investments, with limited support for technical assistance and human capacity building. The short-term nature of these loans makes it difficult for cities to use them for water and sanitation projects.

The Ministry of Public Works (MPW) and Ministry of Health (MoH) disburse the ministerial loans, which together provide around 20 percent of the funds for the water and sanitation sector.[48] Of the MPW's $8.3 million allocation for the sector, two-thirds address capital investments, and one-third is channeled towards technical assistance and awareness raising.[49] Through its Water Supply for Low Income Communities Project, the MOH provides $3.3 million in loans and places a greater emphasis on sanitation.[50] In areas where there are WASPOLA projects, MPW and MOH provide four percent of the total sanitation budget, highlighting the emphasis that cities draw on their own revenue to fund sanitation projects. Ministerial funds are not guaranteed from year to year, making it difficult to utilize them for large, multi-year projects common in the water and sanitation sector.[51]

Since 2005, BAPPENAS has also issued Special Allocation Funds (DAK), which are conditional grants for poor districts and cities whose budgets total less than one percent of the average. To use these grants, LGUs must contribute 10 percent of the grant amount and cover O&M costs. In 2008, DAK allocated $11 million for the water and sanitation sector, with water projects receiving 75 percent of the funding, and sanitation projects 25 percent. Funding is only provided for one year and extensions are not guaranteed, which again makes these grants less conducive to long-term wastewater and septage management programs.[52]

ARIE ISTANDAR, ECO-ASIA

**As part of a WASPOLA project, community members in East Java gather to learn about pathogen pathways and how to improve the area's sanitation and hygiene. Projects like this are small in scale, but more effective than earlier, top-down initiatives.**

## 5.2 Local Funding Sources

As with the central government, wastewater treatment is one of local governments' lowest priorities. In Surabaya, for example, the local government allocated one percent of its $360 million budget in 2009 to the environmental sector, which includes both water and sanitation.[53] Cities, districts, and provinces allocate on average 85 percent of sector funds to water supply and drainage projects, and 11 percent to sanitation projects.[54] Ninety percent of local investment in the sector is for capital expenditures, which typically means toilet construction and STP rehabilitation.[55]

Indonesia has not succeeded in attracting private investment to WWTP and STP construction, in part because local governments set tariffs below O&M cost recovery. As a result, government funds for these projects are quickly drained, which in turn prevents proper maintenance and service expansion. Policy ambiguity, corruption, and the high cost of doing business further deter private sector entry.

## 5.3 Public Awareness and Willingness to Pay

In general, households are not aware of the need to desludge and treat wastewater, which results in low willingness to pay and low demand for desludging. A few cities in Indonesia, however, provide models on raising public willingness to pay and reducing the levels of public subsidy. Jakarta and Banjarmasin achieve high cost recovery by cross-subsidizing domestic wastewater rates with payments from industrial clients.[56] Medan's PDAM attains a high collection rate of 98 percent by billing wastewater treatment together with the water bill. Those PDAMs that send separate water and wastewater bills have much lower collection rates.

### Case Study of Medan: Treating Septage at Wastewater Treatment Plants

Medan, the capital of North Sumatra Province, has a total population of over two million people. Indicative of the political bias in favor of centralized sewage treatment facilities, Medan has a WWTP, although only 11,000 homes, or two percent of Medan's population, are connected to a sewer system. In anticipation of future sewerage connections, the facility is currently operating at less than 27 percent capacity. Meanwhile, even though 50 percent of its residents use septic tanks, Medan lacks an operating septage treatment facility.

The WWTP in Medan uses UASB technology, a difficult technology for the few PDAM staff who operate and maintain the facility. The local sanitation agency and private collection companies also use the WWTP to dispose of septage, which can create problems in a facility not designed to treat partially digested septage. In addition, the local government charges households seven percent of the cost of installing a sewerage connection and subsidizes the remainder.[46] Given budget limitations, the government and PDAM may face challenges in further expanding and improving wastewater services.

## 5.4 Key Challenges

**Challenge:** DKPS and PDAMs need to develop and build public acceptance for wastewater billing systems that allow them to improve services, expand treatment capacity, and increase desludging frequency.

**Challenge:** Local governments face challenges in developing wastewater treatment initiatives because: (1) there is insufficient national funding for local governments to develop comprehensive septage management programs, forcing cities to rely on local revenue sources; and (2) the private sector is not interested in wastewater treatment service provision, in part because local governments typically set tariffs too low to achieve cost recovery.

# 6.0 RECOMMENDATIONS

With 150 STPs around the country, Indonesia has created a strong infrastructural base for septage management. However, most facilities are out of operation because they are not centrally located and local governments do not prioritize septage management. This report recommends that the national government strengthen its leadership and technical support for local implementation through clear regulations and guidelines, trainings, workshops, and for the rehabilitation of STPs. The national government also needs to take a strong role in issuing guidelines for private sector engagement and increase its funding support for local septage management programs.

## 6.1 Short-Term Recommendations

**Make Septage Management Part of the National Dialogue on Sanitation.** As the leading ministry in water supply and sanitation policy development, BAPPENAS should address septage management, demonstrate its support for cities to develop septage management programs, and integrate septage management into ongoing efforts for community sanitation. Since the national government no longer mandates sanitation actions, BAPPENAS should take a lead in promoting awareness of the importance of septage management among local governments and DKPs, and share best practices from Indonesia or other cities in the region through groups such as the Association of Indonesian Municipalities (*Asosiasi Pemerintah Kota Seluruh Indonesia*).

**Develop Comprehensive Local Management Programs.** Cities and DKPs can improve their public and environmental health by rebuilding septage management programs, especially in areas that already have septage treatment facilities. To do so, they can organize septage management workshops and create working groups that address policy setting, private operator compliance, and public awareness. These groups must address new strategies to build local budgets for wastewater treatment, for instance by raising tariffs, combining wastewater fees with water bills, or cross-subsidizing with the water sector or commercial and industrial customers. Local governments can work with ESP, ISSDP, MPW, and BAPPENAS to help develop and test model regulations and implementation models.

## 6.2 Medium-Term Recommendations

**Develop a National Septage Management Action Agenda.** The national government, through BAPPENAS, or project organizations, such as ESP, ISSDP, or WAPSOLA, can help organize a national-level workshop to discuss root causes of challenges in septage management and develop a long-term action plan. This workshop should, at a minimum, address the following issues.

- **Create National Guidelines and Standards.** The Ministry of Public Works (MPW), working in conjunction with BAPPENAS and its local branch offices, should update and disseminate national guidance documents on comprehensive septage management, descriptions of implementation models, sample local regulations, effluent and septage disposal standards, and training materials for septage collection companies.

- **Clarify the Roles for National and Local Governments.** The national government in conjunction with the local governments must work together to identify necessary actions and gaps in responsibility, and delegate roles based on the most appropriate level of implementation.

- **Develop Trainings and Technical Assistance for Local Implementers.** BAPPENAS and MPW should take the lead in developing regional capacity building and training programs for local government agencies and service providers. Trainings and technical assistance should address enabling policies and regulations, as well as infrastructure needs. BAPPENAS and MPW can pilot these capacity building initiatives at a few ESP or ISSDP project sites before scaling up efforts around the country.

- **Develop Incentives for Positive Local Initiatives and Disincentives for Inaction.** The national government should stimulate local initiatives to promote improved sanitation. For example, the national government could tie funding for higher priority issues, such as health, education, and infrastructure, to local governments' progress in increasing access to improved sanitation and development of sustainable septage management programs.

**Increase Funding for Water and Sanitation.** The Ministry of Health and Ministry of Public Works need to significantly increase funding for sanitation projects, and provide loans that are more suitable for long-term infrastructure investments. This funding should not only address hard costs, such as STP rehabilitation and the purchase of collection vehicles, but also set aside funds for training and public outreach. These projects can be clearly connected to public health, especially children's health, in order to gain political and public support.

**Promote Public-Private Partnerships to Regulate Proper Disposal.** To improve monitoring and enforcement of septage disposal among private collection companies, local governments should engage private operators through public-private partnerships. As a first step, local governments can require households to regularly desludge their septic tanks, which builds public demand for services. Tied to this initiative, local governments can then require private collection companies to properly dispose of septage at treatment facilities. The government can enforce this policy by collecting the household payments and paying collection companies after they deliver septage to a treatment facility.

**Promote Public Awareness and Willingness to Pay.** To foster willingness to pay and willingness to address septage management, local governments need to build local awareness of the value of wastewater treatment among public officials, government staff, and the general public. Governments can promote these ideas through promotional campaigns for water, sanitation, wastewater treatment and hygiene, conducted in conjunction with BAPPENAS' ongoing sanitation strategy development programs, such as WASPOLA and ISSDP. Eventually, local governments need to raise tariffs to a level that recovers O&M costs for sanitation projects.

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INDAH WATER KONSORTIUM SDN BHD

Malaysia is one of the few countries in the region that provides professional, scheduled, and comprehensive desludging services for the 25 percent of the country that relies on septic tanks.  Malaysia's experiences in building up its septage and sewerage infrastructure and management framework offers useful lessons for other cities and countries that seek to improve their own septage management.

## COUNTRY ASSESSMENT

# MALAYSIA

| | | | |
|---|---|---|---|
| Country Population (in millions) | 28[1] | Nominal GDP (in billions) | $222[2] |
| Urban Population (in millions) | 18[1] | Nominal Income per cap | $8,141[2] |
| Urban Population (% of total) | 65%[1] | Annual Water Budget per cap | $17[3] |
| Access to Improved Water (urban) | 98%[4] | Annual Sanitation Budget per cap | $8[3] |
| Access to Improved Sanitation (urban) | 95%[4] | Fee to Desludge (per $m^3$) | $3-10[5] |
| Access to Sewerage (IWK jurisdiction) | 73%[6] | Polluted River Basins (monitored rivers) | 45%[7] |
| Use of Septic Tanks (IWK jurisdiction) | 27%[6] | Economic Cost of Poor Sanitation | -- |
| Treatment of Collected Septage (IWK jurisdiction) | 100%[8] | | |

**Major Achievements**

- Developed a national policy that clearly mandates scheduled desludging
- Instituted guidelines and standard operating procedures for developers and service providers
- Conducts scheduled desludging and provides septage treatment
- Requires private developers to build wastewater infrastructure
- Established mandatory trainings for staff and contractors, and increasingly provides trainings for other countries
- Built public acceptance for paying for wastewater services
- Adopted and began transitioning to joint water-wastewater service provision and billing

**Major Lessons Learned**

- Establish clear policies and institutional responsibilities to facilitate implementation
- Address collection and containment first, then considered treatment form
- Match treatment technology to public demand and willingness to pay
- Achieve economies of scale through standardized policies, operating guidelines, and facilities at the national level
- Connect water and wastewater service provision, which improved enforcement of wastewater regulations
- Engage the private sector in providing sewerage infrastructure and operations services
- Obtain national financial support for capital investments and operating expenses

## 1.0 SUMMARY

Malaysia is a clear leader in the region for water, sewerage, and septage management services. As of 2006, 98 percent of the country has access to safe water and 94 percent to improved sanitation. Its provision of wastewater treatment is equally impressive. Malaysia increased the number of households with sewerage connections from five percent in 1993 to 73 percent in 2005. For the remaining households connected to septic tanks, federal law requires them to desludge the tanks every three years, and 50 percent of households with septic tanks now participate in scheduled desludging. River water quality is also improving, and waterborne diseases are no longer a major health issue.

Malaysia has achieved this progress through a series of legislative reforms and implementation models. Prior to 1993, local governments were responsible for both water and sewerage services, but typically lacked the capacity to provide adequate sewerage services, which were more expensive and complex than water supply. In response, Malaysia nationalized sewerage services in 1993, transferred all wastewater assets to the federal government, and offered services through a single, private concessionaire, Indah Water Konsortium (IWK). From 1993 to 2008, IWK built sewers, developed desludging services, constructed septage and wastewater treatment facilities across the country, and, together with the regulatory agency, established clear policy guidelines and standard operating procedures for developers and wastewater operators. Important to IWK's success was the national requirement that developers construct their own wastewater treatment systems, which reduced its capital costs, and the federal government's strong financial subsidy for IWK's capital and operating costs.

In 2008, largely in response to the uneven development of the water services sector, which had not been nationalized, Malaysia passed the Water Services Industry Act (WSIA), which aims to raise the industry's competitiveness and efficiency. This framework, which is still being developed and has not been implemented, will consolidate the regulation of water and sewerage services under one national agency (*Suruhanjaya Perkhidmatan Air Negara* or SPAN) that will holistically regulate water resources from source to disposal, and ensure uniform standards and tariffs across the country. Under this system, cities and states will transfer all physical water assets to the federal government, allowing local operators to focus only on operating services. To diversify sewerage services provision, SPAN will require local service providers to provide both water supply and wastewater services. For the wastewater sector, this has the benefit of giving providers the ability to cut off water in response to non-compliance with sewerage regulations, such as desludging. Malaysia's ability to return sewerage service provision to local providers is a direct result of IWK's work in constructing and rehabilitating facilities, building human capacity, and improving public acceptance across the country.

Over the last two decades, Malaysia's sewerage and septage management system has evolved from a very basic level of pour flush and pit latrines to a modern and increasingly mechanized network. In the process, the government and IWK have gained significant expertise in planning, designing, promoting, and financing sewerage services. These experiences, though specific to Malaysia's development context, offer important lessons for other countries as they begin to develop services in this sector.

## 2.0 BACKGROUND AND CONTEXT

### 2.1 National Sanitation Context

Malaysia is one of the only countries in the region to provide almost all residents with water, sanitation, and wastewater services; 98 percent of the country has had access to safe water and 94 percent to improved sanitation since 2006.[9] As a result of widespread wastewater treatment, waterborne diseases have been drastically reduced, including diarrhea, which causes almost one percent of deaths among children under five.[10] River water quality is also improving. In 2005, the Department of Environment (DOE) determined that, of 146 monitored river basins, 80 were clean, 59 slightly polluted, and seven polluted.[11] Nevertheless, domestic sewage remains the largest source of surface water pollution. While recognizing its significant progress in water management, Malaysia still has significant investments to make in wastewater infrastructure and improving surface water quality.

### 2.2 Onsite Sanitation Prevalence

Malaysia began to shift from latrines and pour flush toilets to septic tanks and Imhoff tanks in the 1960s

as households, especially in the cities, installed their own wastewater systems. In 1990, 40 percent of the population was connected to a septic tank, while only five percent was connected to a sewerage system.[12] As of 2005, within IWK's service area, there are an estimated 1.2 million individual septic tanks, serving around 5 million people or about 27 percent of the population. In the same area, 73 percent of the population is connected to the sewerage system.[13] Since national policy requires real estate developers to construct adequate wastewater infrastructure to serve their resident populations, the private sector has constructed roughly 70 to 80 percent of the country's wastewater infrastructure, including over 3,600 communal septic tanks. The liquid effluent from these tanks, however, continues to overflow and empty into storms drains and waterways, contributing to water pollution nationwide. In response, Malaysia has adopted a national policy to gradually reduce the number of septic tanks in the country through urban redevelopment.

## 2.3 Septage Collection and Treatment Capacity

Guided by former Prime Minister Mahathir's Vision 2020 plan, which aimed to transform Malaysia into a modern and developed nation, the federal government passed the Sewerage Services Act of 1993 to nationalize sewerage assets. The Act also transferred operations, maintenance, and development responsibilities to a private concessionaire, Indah Water Konsortium (IWK). The concession serves all of Malaysia, except for the states of Kelantan, Sabah, and Sarawak and two municipal areas in Johor. In its concession, IWK agreed to expand sewerage coverage to 85 percent in major cities, 30 percent in smaller cities, and provide septage management.[14] In 1993, it was estimated that only two percent of Malaysia's 302,800 septic tanks had ever been desludged and that scheduled desludging could reduce surface water pollution by half.[15] Under the new laws, owners and occupiers of premises with septic tanks were required to allow IWK to desludge their tanks every two years.

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**In using plantation sites for trenching, IWK can reduce its land costs and contribute to the productive reuse of septage. Trenching might only be appropriate for less urban areas; it also requires longer hauls, and consistent monitoring for groundwater contamination.**

In tackling the transformation of the nation's sewerage system, IWK first conducted sewerage studies by catchment basins to gauge demand and capacity on a 30-year planning horizon. Based on this study, IWK developed a three-stage strategy. First, it located and rehabilitated the old local sewerage treatment plants and developed its septage collection capacity. Second, IWK used available oxidation ponds as an interim measure for septage disposal while identifying and constructing trenching sites per Department of Environment (DOE) guidelines. In the third stage, since 2000, IWK built centralized and mechanized sewage and septage treatment facilities for more densely populated areas (see Table 9).

In addition to building up the country's infrastructure, IWK has raised public understanding of the value of wastewater treatment and acceptance for desludging and wastewater fees. Over the years, IWK developed a database of properties that had septic tanks, and conducted scheduled desludging by geographic area. Customer service operators contacted households prior to a visit to arrange specific appointments. Households participating in the regular desludging program paid semi-annual wastewater bills, at a rate of $1.70 a month for those with individual septic tanks (compared to $2.20 per month for those connected to the sewer system). For desludging requests outside of the regular program, IWK charged $14 to $50 per tank, depending on the size.[17] IWK registers all house calls into its database before issuing requests to desludging teams. Through its promotion campaigns, which uses radio jingles, television and newspaper ads, school programs, and trainings, IWK has increased tank desludging from two percent of 302,800 tanks in 1993 to 58 percent of 938,886 tanks in 2001 (see Table 10).[18]

Even so, only 50 percent of households with septic tanks in IWK's service area participate in scheduled desludging because most households do not want to pay for more frequent service, or do not want to be inconvenienced. Although the law mandates desludging, the sector's regulatory agency, the Sewerage Services Department (SSD), has never enforced desludging. As a result, most households wait to call IWK's customer service line until their tank becomes blocked or overflows.

Indah Water Konsortium treats septage in several ways depending on the area's density and service demand. In rural areas, sludge may be buried in trenches sited on dedicated areas or in between trees on plantations of non-edible products. Unlike more mechanized methods, however, trenching does not allow operators to sift out the trash that inevitably gets into septic tanks. Once full, these sites are closed for several years to allow for natural decomposition and absorption. In controlled research studies, IWK has seen trees grow faster and thicker in areas with trenches of septage than those without (see Table 11). In medium-density communities, IWK treats septage at its sewage treatment plants by dewatering the septage in IWK's gravity-based or mechanized mobile dewatering units or sludge drying beds, and then recycles the drained effluent back into the sewage

TABLE 9: PUBLIC SEWAGE TREATMENT PLANTS IN MALAYSIA AS OF 2008[16]

| Type of Sewage Treatment Plant | Number | Person Equivalents |
|---|---|---|
| Imhoff Tank | 760 | 557,752 |
| Communal Septic Tanks | 3,635 | 433,573 |
| Oxidation Ponds | 436 | 1,824,403 |
| Mechanical Plants | 4,026 | 15,099,139 |
| Total | 8,857 | 17,914,867 |

TABLE 10: NUMBER OF INDIVIDUAL SEPTIC TANKS DESLUDGED IN SCHEDULED CYCLES IN MALAYSIA[19]

| Year | First Cycle | Second Cycle | Third Cycle | Fourth Cycle | Total |
|---|---|---|---|---|---|
| 1994 | 8,628 | - | - | - | 8,628 |
| 1995 | 54,007 | - | - | - | 54,007 |
| 1996 | 147,065 | 6,279 | - | - | 147,065 |
| 1997 | 114,608 | 38,149 | - | - | 114,608 |
| 1998 | 49,153 | 78,321 | 9,693 | - | 137,167 |
| 1999 | 64,272 | 24,246 | 80,807 | - | 169,325 |
| 2000 | 53,952 | 469 | 69,991 | 9,867 | 134,279 |
| 2001 | 57,139 | - | 16,334 | 70,351 | 143,824 |
| Total | 548,824 | 147,464 | 176,825 | 80,218 | - |

Note: The cycles indicate the number of times a household has desludged its septic tank since 1994. For instance, in 2001, 70,351 septic tank owners desludged their tanks for the fourth time since 1994.

TABLE 11: EFFECT OF SEPTAGE ON THE AVERAGE GROWTH OF TREES IN MALAYSIA[20]

| Species | Basal Diameter (in cm) | | Height (in cm) | |
|---|---|---|---|---|
| | Treated | Control | Treated | Control |
| *Acacia Mangium* | 8.3 | 4.6 | 765 | 308 |
| *Cinnamomum iners* | 3.4 | 1.3 | 207 | 83 |
| *Hopea odorata* | 3.1 | 1.6 | 210 | 64 |
| *Dyera costulata* | 3.1 | 2.5 | 248 | 91 |
| *Shorea leprosula* | 1.6 | 0.8 | 125 | 51 |

treatment system. In highly urbanized areas, IWK has constructed three centralized sludge treatment facilities for northern, central and southern regions of Peninsular Malaysia. At the same time, the country is also planning to build advanced sewage treatment facilities that will incorporate centralized sludge treatment technology. These systems more quickly dewater larger volumes of septage.

Malaysia produces over six million cubic meters of raw sewage and septage each year. This results in over 100,000 tons of stabilized sludge each year. Since septage is often dewatered along with sewage in the sludge drying beds, and sewage sometimes contains high levels of chemicals, Malaysia does not use its stabilized sludge for edible crops. In 2000, two percent of stabilized sludge was used in horticulture,[21] while the remainder was disposed of as landfill cover, mining cover, or land reclamation. As landfill capacity diminishes and land prices increase, there is an increasing shortage of stabilized sludge disposal options in Malaysia. Indah Water Konsortium is conducting research and development on alternative reuse options, such as vermiculture.

## 3.0 LEGAL FRAMEWORK

Malaysia's sewerage services sector has developed significantly over the last two decades. Prior to 1993, the 144 individual local authorities (LAs) were responsible for providing their own sewerage services. However, this level of government lacked the knowledge and resources to provide modern sanitation infrastructure, and the federal government eventually decided to consolidate sewerage service provision at the national level. The 1993 Sewerage Services Act (SSA), in force from 1993 to 2008, provides the core policies on sewerage and septage management in Malaysia and requires owners or occupiers of premises with septic tanks to properly operate and maintain these systems. Through the SSA, the government requested LAs to transfer the title of their sewerage assets – pipes, treatment facilities, and staff – to the new federal Sewerage Services Department (SSD) in return for selected debt forgiveness. Since 2005, 86 local governments have transferred their assets to the SSD, which holds title to the assets. In 2000, to increase government subsidies and control, the federal government ended the private concession by buying IWK and turning it into a publicly owned company held by the Ministry of Finance.[22]

During this same period, the federal government did not nationalize its water services. Since water services remained under state regulation, differences in regulations and tariff structures developed between states over time. The SSA was also difficult to enforce because IWK had no means to compel customers to participate in desludging or pay their wastewater bills, and the SSD did not issue fines. Seeing the need for an integrated and holistic approach to water resources management, the federal government consolidated water and wastewater services provision with the passage of the 2006 Water Services Industry Act (WSIA), enacted on January 1, 2008.[23]

WSIA requires local governments to transfer their water infrastructure assets to a new federal asset management company, again in return for selected debt forgiveness. Local water service providers, which include both public and private operators, can then focus on water and sewerage services operation and delivery. To manage this newly combined sector, the federal government created a water services commission called *Suruhanjaya Perkhidmatan Air Negara*, or SPAN, which is responsible for managing licensing, homogenizing standards, setting uniform tariff rates across states, ensuring access for the poor, and obtaining customer feedback.[24]

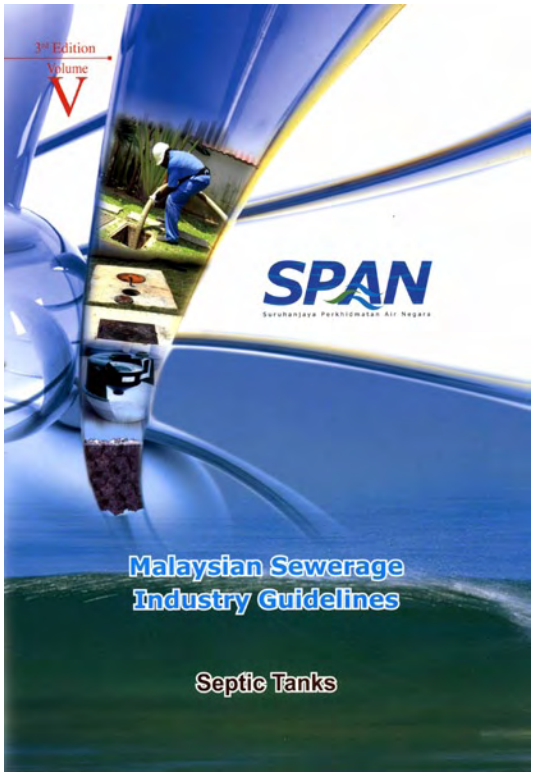
The government has also adopted the National Sewerage Development Plan, which aims to renovate existing treatment plants and deteriorating collection networks, consolidate small scale sewage treatment facilities, convert septic tanks to sewerage connections, and build more mechanized septage treatment facilities all over the next thirty years. Combined water and sewerage operators in the future must take this plan into account as they develop local capacity and services.

### 3.1 Septic Tank Design

The basic standards for proper septic tank design in Malaysia derive from "The Code of Practice for Design and Installation of Sewerage Systems (Malaysian Standards 1228:1991)." This code provides the technical specifications – dimensions, sizing, and compartmentalization – for septic tank design. These codes have since been superseded by the SSA and subsequent guidelines established in support of the SSA. The SSA specifically required owners to ensure adequate access to septic tanks for the purposes of maintenance and desludging, to maintain all elements

of septic tanks in good condition, and to have the septic tank cleaned by a licensed sewerage services contractor. The SSA also authorized the SSD to ensure that tanks are in working order, enforce desludging, issue notices of non-compliance, and charge owners or occupiers desludging and sewerage fees. The SSD, IWK, and the Malaysia Water Association also jointly developed a series of "Guidelines for Developers", which regulate private sewerage infrastructure development in Malaysia. "Guidelines for Developers: Septic Tanks" builds upon MS1228, but is much more stringent and provides important guidance on when to use septic tanks and how to maintain them. In addition to detailed design requirements, the guidelines require the following:

- No development with more than 30 units or 150 person equivalents can use septic tanks as its sewerage system.
- "It is of paramount importance…that septic tanks when designed and constructed must allow for regular desludging at a frequency of NOT less than once every two years" to meet effluent discharge standards and achieve environmental objectives.




**Through a five-part guide for developers, Malaysia's regulatory agency helps developers comply with requirements that they construct wastewater infrastructure for real estate developments.**

- Developers should consult IWK's certification offices to determine which treatment system to install. Proposed developments must connect to public sewers if a pipe is located within 30 meters. Septic tanks should be designed to permit future connections to new sewerage lines.
- Septic tanks located in water catchment areas or close to sensitive waterways should adhere to more stringent requirements. Areas with flat topography that do not have drainage networks should provide for further on-site treatment and disposal.
- Owners and occupiers of premises with septic tanks are responsible for placing the tanks in accessible locations to allow for desludging.

In general, the Water Services Industry Act (WSIA), which now replaces the SSA, provides the same guidelines for septage management. It does, however, ease the requirements for a two-year desludging cycle to a call for desludging "from time to time as may be prescribed,"[25] which is generally interpreted as a three-year cycle.[26] This policy is more flexible both to accommodate the new diversity of operators, and because IWK's experience demonstrated that most septic tanks in Malaysia could be emptied less frequently than every two years and still function properly. WSIA also notes that households connected to communal septic tanks are jointly liable for the desludging fees as if they were the owners of an individual septic tank.

In comparison to the SSA, WSIA significantly raises the fines to discourage owners and service providers from non-compliance. Any person violating maintenance and desludging requirements is liable for a fine not exceeding $14,000. Licensed service providers acting in contravention to the WSIA are also liable for a fine not exceeding $14,000. Any person constructing, altering, or disconnecting a septic tank without approval from SPAN is liable for a fine not to exceed $140,000 or imprisonment for five years. As a newly established commission, SPAN has not yet enforced these fines. However, because water and wastewater service provision are linked under WSIA, Malaysian service providers could technically withhold water supply in order to obtain compliance with payment for wastewater services or acceptance for scheduled desludging.

Left, IWK conducts a training for its sewerage network operators; right, IWK guides regional visitors through its highly mechanized septage treatment facilities. As sewerage services become re-decentralized, training programs will become an important part of IWK's work.

LINDA SHI, ECO-ASIA

## 3.2 Septage Collection

Indah Water Konsortium has issued standard operating procedures for its workers in collecting household sludge. Scheduled desludging and calls for on-demand desludging are logged in a computer database. Record-keeping and a GIS-based vehicle tracking system makes the desludging team responsible for delivering the waste at treatment facilities, regardless of whether they receive payment at the door (for on-demand service) or through monthly bills for scheduled service. Operators undergo trainings to ensure that they maintain health and safety standards. To promote public awareness and acceptance of services, IWK emphasizes professional behavior and hygiene.

## 3.3 Septage Treatment

The SSD requires operators to treat collected waste and dispose of only stabilized sludge, which the MS 1288 defines as "that which will not give rise to public health hazards, including odor, ground or surface water pollution, and nuisance of insects or rodents."[27] The SSD also provides guidelines for the following forms of septage treatment: anaerobic digestion, aerobic digestion, liquid sludge storage, septic tanks, Imhoff tanks, oxidation ponds, lime stabilization of liquid sludge, and dewatering and storage. These guidelines also establish standards and requirements for stabilized sludge disposal and reuse, including composting, land application for non-edible crops, land reclamation, erosion control in mining, and landfill cover.

The Environmental Quality Act (EQA) of 1974 authorizes the DOE to control water pollution and set water effluent discharge standards. The EQA sets two standards for effluent discharge: Standard A for dischargers located upstream of raw water intake points, which is more stringent, and Standard B for those located downstream. Larger wastewater dischargers, such as industries and IWK, must obtain licenses from DOE that limit effluent loads based on industry type and pollution discharge. IWK staff monitor the effluent quality and, where applicable, the groundwater quality, and send results each month to DOE. Smaller and older facilities were not designed to meet these standards and now require upgrades.

# 4.0 INSTITUTIONS AND IMPLEMENTATION CAPACITY

Like many other countries in the region today, local governments in Malaysia had little capacity to implement sewerage and septage management services prior to 1993. The consolidation of sewerage services under one policy and one implementer allowed IWK to operate with economies of scale, thereby allowing the country to more rapidly and effectively modernize its sewerage system. Over the last fifteen years, IWK has raised public and government awareness, acceptance, and understanding of sewerage and septage services by establishing branch offices around the country, training staff, and involving hundreds of contractors. Now, as the federal government consolidates water and wastewater services under WSIA and decentralizes operating

service provision for sewerage, local operators will have stronger and more capable human and infrastructural resources available to them.

## 4.1 Major National Agencies

**National Water Services Commission (SPAN):** Established in 2008, SPAN is responsible for implementing the WSIA and regulating water and sewerage service provision in Malaysia. It aims to establish a transparent and integrated system that efficiently provides water and sewerage services to consumers, while ensuring the long-term sustainability of water supply and preservation of watersheds.[28] Under this new regulatory system, service providers will obtain an operating license from SPAN, rather than concessions from local governments, and local assets will be transferred to the federal government. To promote the financial sustainability of the sector, the Commission aims to eventually raise tariffs to allow for cost recovery, while addressing consumer affordability. The Commission is divided into three regulatory departments: (1) economics and social issues, (2) water, and (3) sewerage. Presently, its staff members focus on standardizing the water services sector, and consult with IWK for sewerage services issues. Eventually, the Commission will regulate and manage the sewerage services directly.

**Sewerage Services Department (SSD):** The SSD began operation in 1993 and is presently under the Ministry of Energy, Water, and Communications. As a predecessor of the SPAN Commission's sewerage services department, the SSD will carry out planned infrastructure projects; in the future it may dissolve or become absorbed by the SPAN Commission once it has implemented planned and ongoing projects. Prior to SPAN, the SSD was responsible for developing sewerage services in the country, regulating IWK and private developers, and holding title to the nationalized sewerage infrastructure network. The department and its four branch offices manage project implementation, develop standards, enforce sewerage laws, license operators, and set tariffs. Since IWK first began operation, the SSD has lowered the sewerage services tariff by 40 percent for domestic users and by 70 percent for commercial entities, such that rates are now much lower than the original, cost-recovering rate. It has not enforced the fines for non-compliance with scheduled desludging set out in the SSA.

**Ministry of Natural Resources and Environment (MONRE):** The Department of Environment (DOE) in MONRE establishes water quality standards for the country, issues licenses to wastewater dischargers, monitors effluent loading and water quality, and enforces compliance. Indah Water Konsortium is considered a discharger since it treats its wastewater to secondary levels. In compliance with DOE regulations, IWK monitors the discharge at all of its treatment facilities, and sends the results on a monthly basis to DOE.

**Ministry of Finance (MOF):** The Ministry of Finance holds IWK as a publicly owned company and subsidizes wastewater treatment. Under WSIA, MOF will create a water asset management company that will hold title to all water and wastewater infrastructure in Malaysia, allowing local operators to focus on service delivery.

## 4.2 Other Organizations

**Indah Water Konsortium (IWK):** This company is responsible for providing sewerage services throughout the country, except in the States of Kelantan, Sabah, and Sarawak and two municipal areas in the State of Johor. Originally a private concessionaire, IWK became a public company owned by the Ministry of Finance in 2000 when the government de-privatized sewerage services. IWK develops sewerage systems, maintains and operates existing networks, and desludges septic tanks. It conducts public awareness campaigns through advertisements, pamphlets, exhibitions, briefings, school educational programs, and observational tours. Today, it serves 17 million people and manages roughly 5,000 treatment plants, 14,500 kilometers of sewage pipes, 195 desludging tankers, and over 2,500 staff.[29] IWK also contracts with 600 private desludging and sewerage services operators to provide on-the-ground services. Indah Water Konsortium provides trainings to its staff and contractors to ensure that they meet proper technical, health, and safety standards, and represent IWK in a professional manner. Increasingly, IWK has provided trainings to wastewater operators in Southeast Asia and as far away as the Middle East.

**Local Water Service Providers:** Under WSIA, local private or public water utilities must obtain the necessary staff and capacity to conduct both water and wastewater services. Some utilities may absorb IWK's branch offices; they may also contract much of the actual service provision out to private operators. Once

### Case Study: Transitioning to Joint Water-Wastewater Management

The City of Johor Bahru will serve as SPAN's testing ground for unifying water and wastewater services. As the capital of the state of Johor, Johor Bahru is one of the few areas where IWK does not operate. At the time of IWK's creation, Johor Bahru had contracted its sewerage services to another private provider, and was therefore exempt from participating in the nationalization of sewerage services. Unfortunately, the contract was never implemented, and today Johor Bahru's sewerage system, provided by the local government, lags behind other areas. Despite its proximity to Singapore and rapid economic development, Johor has 190,000 septic tanks, more than any other state in the country.[20]

Johor's water company, Ranhill Utilities Berhad, will be the first company to obtain both a water and a sewerage license under SPAN's new system.[31] Ranhill was Malaysia's first fully private water company to provide water from source to tap,[32] and holds a 30-year concession to source, treat, and supply water to 2.2 million consumers. In partnership with DGE, a Danish public engineering company, Ranhill has created a master plan to develop sewerage systems, consolidate small wastewater treatment systems, calculate the treatment volumes and tariffs, and conduct public campaigns for the cities of Johor Bahru and Pasir Gudang. As part of its contract with the local government, Ranhill will provide scheduled desludging on a three-year rotational cycle. With control of both water and sewerage services, Ranhill will have greater leverage on requiring households to pay for wastewater services. Customers will receive one bill with a water charge and a wastewater charge that is based on the volume of water consumed. If households refuse to pay for sewerage services or permit scheduled desludging, Ranhill will have the authority to cut off water supply, a practice that it already uses to enforce payment for water bills.

local governments transfer their water infrastructure to the federal asset management company, local water utilities must obtain an operating license from SPAN, and lease the infrastructure.

Private Developers: In Malaysia, private developers have constructed 70-80 percent of the country's sewerage and wastewater treatment infrastructure. In the past, the requirement that each developer construct its own wastewater treatment system has led to a proliferation of small plants that are not able to treat wastewater to required levels. Now, when developing a new property, developers must first consult local IWK offices to determine which type of treatment system they should construct, or whether they should share infrastructure with other nearby or planned developments. Once they build the infrastructure, developers retain title to these assets, while IWK provides the management and desludging services. Developments that use existing public sewerage infrastructure must pay one percent of the property's sales value as a connection fee.

## 5.0 FUNDING SOURCES

Malaysia's rapid economic development since 1990 enabled the federal government to allocate more funding to the sewerage development. Malaysia's key innovation, however, was leveraging the real estate building boom to construct and fund most of the country's sewerage infrastructure.

### 5.1 National Sources of Funding

In the 1990s, Malaysia's government made a strong commitment to modernizing the country's economy and its infrastructure. Both clear regulatory guidelines and dedicated national funding led to the transformation of the country's sewerage services sector. In 2006, the government allocated $200 million, or 0.14 percent of GDP, for national sewerage projects, and $466 million or 0.3 percent of GDP for water projects. This amounts to a sanitation budget of roughly $8 per person per year in Malaysia, one of the highest spending levels in the region, and $17 per capita for water.[33] Since government provision of sewerage services has been limited and is relatively recent, the Malaysian government requires private developers to build their own facilities, such as septic tanks, sewerage networks, and sewage treatment plants, on site. Under WSIA, private developers will continue to be responsible for developing adequate wastewater infrastructure.

As of 2009, wastewater tariffs cover only 20 percent of operational costs, and the MOF subsidizes the remaining operating costs. In the future, SPAN will increase the cost-effectiveness of the industry by increasing sector efficiency and competitiveness, as well as by raising tariff rates. To support the industry, SPAN will provide two funds. The Water Industry Fund will support the protection of water bodies, improve water quality, provide water and sewerage services in rural areas, and increase water supply sustainability.[34] Its revenue will be generated through the lease payments from licensed operators and customer billing. The Sewerage Capital Contribution Fund will supplement the capital funds needed to support the development of sewerage assets and implement the National Sewerage Development Plan, and will derive from developers' connection fees.

## 5.2 Local Sources of Funding

The 1993-2008 Malaysian system bypassed local governments. This wholly nationalized system relieves local governments of all responsibility for wastewater and sanitation, which has an unintended effect of reducing their willingness to participate or support IWK's wastewater initiatives. Under WSIA, any subsidies will continue to come from the federal government. Ultimately, the SPAN Commission aims to raise public acceptance for water and wastewater tariffs that will recover local operating costs.

## 5.3 Public Awareness and Willingness to Pay

In cities, 80 to 90 percent of customers connected to sewerage systems and septic tanks pay their monthly bills and comply with scheduled desludging. In less urban areas, compliance quickly drops off, such that the national average for participation in scheduled desludging is only 50 percent. Willingness to pay remains low, despite public outreach campaigns by IWK and Malaysia's relative affluence. Low public acceptance for sewerage treatment facilities, regardless of the level of technology, has also forced IWK to build treatment facilities farther from town, increasing transportation costs.

# 6.0 RECOMMENDATIONS

As Malaysia has a well developed septage management program, this assessment offers a few recommendations to further improve services, and to strengthen Malaysia's role in providing regional training programs.

**Improve the Cost Recovery of Current Programs.** While cost effectiveness may improve under WSIA through greater competition between contractors, the federal government will nevertheless have to commit to raising wastewater tariffs in order to make septage collection and treatment a profitable, or at least break-even, business. While the federal subsidy ultimately derives from taxes, shifting the payment stream from taxes to wastewater user fees will more directly improve household conservation and environmental consciousness, as well as hold service providers accountable.

**Increase Enforcement of Scheduled Desludging.** As SPAN begins to implement WSIA, which places regular desludging responsibility on the owner rather than the service provider, it must consider strategies to ensure that owners will actually regularly desludge their septic tanks. Enforcement responsibility should be clearly delegated to the relevant organizations, which should be authorized and incentivized to ensure owner participation.

**Establish a Regional Septage Management Training Program.** IWK can strengthen its role as a regional trainer by establishing a formal septage training program and academy for international utilities. This training curriculum should address all the components of a septage program a local government or utility would need to address, including policy and guideline development; collection and treatment infrastructure design, construction, and operation; private sector monitoring and engagement; public promotion; development of manual and standard operating procedures; and training the trainers programs.

**Take a Lead in Mentoring Peers through the Water Operator Partnerships Program.** IWK should support the development of functioning septage management programs in other countries through water operator partnerships. These partnerships allow for more direct and hands-on trainings with partner utilities than coursework at the training academy. IWK also has an important role in helping national associations develop training and dissemination programs and materials for utilities throughout the country.

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JAY TECSON, ECO-ASIA

Manila Water Company, Inc., a private concessionaire that provides water and wastewater services in Metro Manila, has been a leader in septage management in the Philippines. The Philippines has developed comprehensive septage management policies, and now must deploy the national funding and technical resources to promote the widespread adoption of septage management programs.

COUNTRY ASSESSMENT

# THE PHILIPPINES

| | | | |
|---|---|---|---|
| Country Population (in millions) | 88[1] | Nominal GDP (in billions) | $169[2] |
| Urban Population (in millions) | 54[1] | Nominal Income per cap | $1,866[2] |
| Urban Population (% of total) | 63% | Annual Water Budget per cap | $9.92[3] |
| Access to Improved Water (urban) | 96%[1] | Annual Sanitation Budget per cap | $0.34[3] |
| Access to Improved Sanitation (urban) | 81%[1] | Fee to Desludge (per $m^3$) | $4-14 |
| Access to Sewerage (urban) | 7%[4] | Groundwater Polluted (sampled areas) | 58%[3] |
| Use of Onsite Sanitation (Metro Manila) | 85%[5] | Economic Cost of Poor Sanitation (in billions) | $1.4[6] |
| Septage Treated (% in Metro Manila) | 5%[5] | | |

**Key Challenges**

- Little awareness of septage management among local governments and utilities
- National institutions lack septage management expertise and have not completed the National Sewerage and Septage Management Plan
- Little national funding to implement the Clean Water Act, including septage management projects
- Very little enforcement of environmental regulations for non-industrial sources

**Key Strengths**

- National legislation requires agencies at all levels to address septage management
- Comprehensive manual issued by the Department of Health provides guidance on septage management regulations
- Ongoing programs in several cities provide models for the country and region
- Strong donor presence and support for septage management projects

## 1.0 SUMMARY

Onsite sanitation is the principal form of wastewater treatment in Philippine cities, since piped sewerage serves only four percent of the country's population. In Metro Manila, a city of over 11 million people, about 85 percent of households use onsite sanitation systems (OSS), mostly in the form of septic tanks. Despite the prevalence of OSS, there were until recently only limited regulations on and physical capacity to collect and treat septage. As a result, very little domestic wastewater is currently treated in the Philippines. The World Bank to estimate that the country loses $1.4 billion per year in the form of health, environmental, and economic costs.

Recognizing the prevalence of OSS and the difficulty of building sewerage infrastructure, the Philippine government is increasingly focusing on septage management as a near-term solution. Most notably, the Clean Water Act of 2004 (CWA) requires local government units (LGUs) and water districts to create septage management programs in areas that lack sewerage systems. In response, the cities of Marikina and Dumaguete have adopted ordinances on septage management and constructed treatment facilities; other cities such as Cebu, Davao, and Laguna are also initiating septage programs; and private utilities in Metro Manila have begun collecting and treating septage on a scheduled basis. These initiatives serve as models for other cities and countries in the region.

Nonetheless, in the five years since the passage of the CWA, most local governments and water districts have not taken action due to limited national funding support and technical assistance. Many local agencies lack the capacity, experience, funding, and local demand for services to implement all septage management requirements under the CWA. In the near-term (within three years), the national government should clarify the roles and responsibilities of LGUs, water districts, and national agencies, and create the national and local water quality funds as stated in the CWA. As of 2009, international organizations, such as USAID and the World Bank, support a number of local governments in developing septage initiatives through exchanges, workshops, and information sharing with other cities in the region. In the medium-term, this report recommends that the relevant national government agencies increase their technical and financial support for local governments nationwide to replicate the models that are currently being developed in the Philippines. Given the success of Metro Manila's private utilities in deploying joint water and wastewater services, national agencies should support the exploration of new modalities of service provision, including greater private sector involvement, mechanisms for monitoring and regulating private concessions and service provision, and joint management of water and wastewater.

## 2.0 BACKGROUND AND CONTEXT

### 2.1 National Sanitation Context

Sanitation infrastructure, and wastewater treatment in particular, poses a significant challenge for the Philippines. As of 2009, 78 percent of the country (and 81 percent of urban residents) has access to improved sanitation, although this is often in the form of an inadequate latrine.[7] The World Bank estimates that more than 90 percent of the sewage generated in the Philippines is not treated, and that half of all organic pollution in surface water comes from domestic sources.[8] As a result, the Local Water Utilities Administration found that 58 percent of the samples it took from groundwater intended for drinking water supply contained fecal coliform.[9] A 2008 World Bank study found that poor sanitation causes 20,000 premature deaths, 38 million cases of diarrhea, and $1.4 billion in health, water, and economic losses each year in the Philippines.[10] The public's lack of awareness about the health, environmental, and economic impacts of untreated sewage and septage contributes to the government's limited investment in sanitation infrastructure and support.

### 2.2 Onsite Sanitation Prevalence

In this context, onsite sanitation plays a critical component in the Philippines' wastewater infrastructure. Nationwide, only four percent of households are connected to a sewerage system that includes both collection pipes and a treatment facility, while an estimated 40 percent of all Filipino households use septic tanks.[11] In Metro Manila, the sewerage network reaches 15 percent of the population, although half of the collected wastewater discharges without any treatment into Manila Bay.[12] The remaining 85 percent of residents in Metro Manila uses OSS, primarily in the form of septic tanks.[13] The World Bank-funded Third Manila Sewerage Project aims to increase sewerage connections and construct

10 new wastewater treatment plants. It also recognizes the importance of septage management, and will support the construction of two septage treatment plants (STPs), increased collection capacity, and public information campaigns.

### 2.3 Septage Collection and Treatment Capacity

Despite the prevalence of OSS, the Philippines has very limited capacity to collect and treat septage. In the 2004 Clean Water Act, the national government for the first time called on local governments and water utilities to manage septage. Due to lack of national financial support for this policy and its enforcement, only a few cities have responded to this challenge. Residents of cities small and large generally have their septic tanks desludged only on an emergency basis, often years after septic tanks have stopped providing primary treatment. Desludging services are usually provided by private companies, who dispose of the waste in waterways and drains, or onto open land. Anecdotally, the cost to desludge a tank is around $20-70 per tank, paid in a lump sum to the desludging truck driver.

## 3.0 LEGAL FRAMEWORK[15]

The Philippines has issued comprehensive national regulations on septage management. The Implementing Rules and Regulations (IRR) of the 2004 Clean Water Act (CWA) state that for areas without sewerage systems, LGUs or water districts should adopt septage management or other sanitation alternatives. The CWA calls on the Department of Environment and Natural Resources (DENR), the Department of Public Works and Highways (DPWH), and the Department of Health (DOH) to support LGUs in developing wastewater infrastructure by creating: (1) a National Sewerage and Septage Management Program (NSSMP), (2) a National Water Quality Management Fund (NWQMF), and (3) local Water Quality Management Area (WQMA) funds. The NSSMP should describe the needed institutional arrangements, financing options, and intervention and investment frameworks that will help local authorities and service providers develop sewerage, septage, and combined sewerage-septage projects. However, the NWQMF has not yet been created, only three WQMAs have been designated, and the NSSMP, due to be completed in 2005, is still being drafted.[16]

### Case Study: Metro Manila's Concessionaires Implement Scheduled Desludging[14]

Metro Manila's two water utilities are leaders in septage management in the Philippines. In the city's East Zone, Manila Water Company, Inc. (MWCI) provides water and sanitation services for 5.6 million people. It has initiated septage management pilot projects to provide routine septic tank desludging services. Although the original MWCI concession planned to phase out the use of septic tanks in favor of centralized sewerage systems, this plan proved too difficult due to low customer willingness to pay for sewerage services and lack of available land for treatment facilities. Instead, MWCI has shifted its emphasis towards septage management and smaller, localized treatment plants. At present, MWCI maintains a fleet of over 90 vacuum trucks. Since 2005, MWCI has desludged more than 400,000 septic tanks and aims to desludge all tanks in its service area on a rotating, five-to-seven-year cycle. MWCI has three dedicated septage treatment facilities with a total treatment capacity of over 1,540 cubic meters per day. In the West Zone, Maynilad Water Services, Inc. (MWSI) provides water and sanitation services for 6.2 million people. It has desludged over 160,000 septic tanks and operates a dedicated STP with a capacity of 450 cubic meters per day.

To pay for desludging services, these utilities add an "environmental fee" of 10 percent to the water bill – compared to 50 percent in areas with sewerage connections. In the future, the utilities plan to charge all households a "sewerage services" fee of 20 percent of the water bill, regardless of whether they are connected to the sewer or a septic tank. Though a good start, the current total treatment volume provides only five percent of the capacity required if all household tanks in Metro Manila were to be regularly desludged.

In support of local implementation, DOH issued an IRR in 2008 that provides guidance on local regulation of septage collection, handling, transport, treatment, and disposal that supplements the 1995 Sanitation Code of the Philippines. In addition, DOH developed an "Operations Manual on the Rules and Regulations Governing Sludge and Septage," which serves as an important guide for local implementation.[17] The CWA also requires local governments to appropriate land to build sewage and septage treatment facilities; subsidize necessary expenses for facilities' operations and maintenance (O&M) through local property taxes or service fees; sit on WQMA governing boards to set sanitation policies; and perform water quality surveillance and monitoring. At the local level, few cities have responded to the CWA due to ambiguous national delegation of responsibilities, lack of national funding support, and insufficient national pressure on local governments to enforce compliance. Nevertheless, a handful of early adopter water utilities and LGUs have initiated or are initiating promising septage management programs.

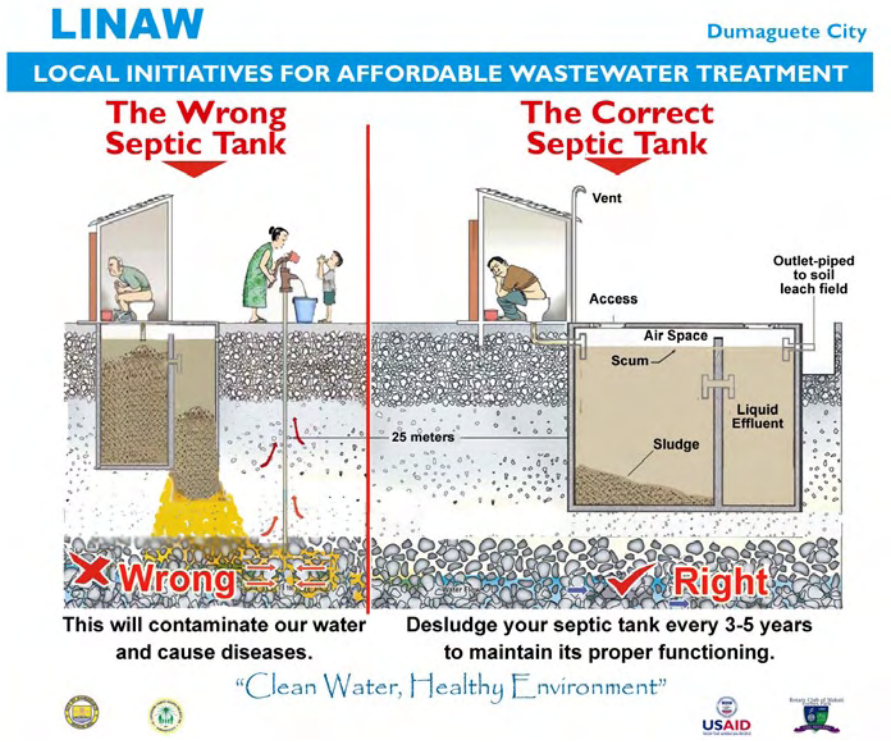
## 3.1 Septic Tank Design

The national Sanitation Code of the Philippines defines septic tanks as water-tight receptacles that receive the discharge of a plumbing system or part thereof and is designed to accomplish the partial removal and digestion of suspended solid matter in the sewage through a period of detention. It also establishes minimum design standards, noting that where a public sewerage system is not available, households must empty their waste into a septic tank to be constructed in accordance with stated minimum requirements, which are similar to international standards for sizing, construction, and materials. For commercial entities, the code requires additional pretreatment devices, such as grease traps.

The IRR for the Sanitation Code contain the following important clauses:

- Septic tanks shall be cleaned before excessive sludge or scum is allowed to accumulate and seriously reduce the settling efficiency.
- Septic tanks shall be inspected at least once a year and be cleaned when the bottom of the scum mat is within three inches of the bottom of the outlet device or the sludge and scum has reduced the liquid capacity by 50 percent.

The national Plumbing Code also sets specific and stringent standards for site evaluation, septic tank sizing, pre-operation inspection, and septic tank emptying before abandonment. Unfortunately, earlier versions of the Plumbing Code prescribed open bottom, or leaching, septic tanks, which in dense urban settings contribute to groundwater pollution. As a result, large numbers of open bottom tanks continue to pollute groundwater resources. Many practitioners also continue to apply this design in new construction, especially in areas outside of Metro Manila and for low-cost housing.




Dumaguete City developed this poster to educate the public about the correct way to design a septic tank, and the impact poorly designed septic tanks have on human health. Printed on billboards, this poster was placed around the city as part of the Dumaguete's sanitation promotion campaign.

## 3.2 Septage Collection

The DOH Manual provides detailed guidance and forms on proper septage collection and transportation practices. Specifically, the Manual states that collection companies must first obtain Environmental Sanitation Clearance permits to operate, that operators are responsible for checking the safety of their equipment and disinfecting collection sites after removing septage, and that workers must wear protective gear and wash their hands. The Manual also provides guidance on spills, vehicle maintenance, recordkeeping, and reporting. The Manual requires septic tank owners to desludge septic tanks every three to five years, or when the liquid volume has been reduced by 50 percent, whichever happens first.

## 3.3 Septage Treatment

According to the DOH Manual, septage must be treated and disposed of properly, and cannot be disposed of in manholes, drainage areas, or waterbodies without treatment. The national Sanitation Code also notes that sludge from septic tanks shall be disposed of by burial or by any other method approved by the Secretary or his duly authorized representative and not by being emptied into open fields, ditches or bodies of water. The DOH Manual also provides guidance on appropriate technologies, treatment processes, and end product disposal. For reuse as fertilizer and compost, the treated septage must meet standards in nutrients, pathogens, and heavy metals. Entities operating treatment facilities must first obtain an Environmental Sanitation Clearance from DOH.

### Local Regulations for Septage Management[18]

Some cities planning septage management programs have developed local ordinances to set fees, provide detailed requirements, and give the program more authority. Developing local regulations is also an opportunity to involve key stakeholders and decision-makers in the discussion, thereby increasing their awareness and understanding. With assistance from USAID, three LGUs in Alabel, Dumaguete, and Marikina have adopted comprehensive septage management ordinances that address permitting, septic tank design and inspection, routine septic tank desludging, and cost recovery. Major provisions of these ordinances include:

- **Pre-occupancy inspection of new septic tanks:** Building owners or contractors must inform concerned agencies of newly constructed sewage treatment facilities, including septic tanks. Systems may not be covered or used until inspected and approved by a City Engineer.
- **Commercial pre-treatment programs:** If commercial wastewater contains elements, such as oil or fuel residue, metals, or high volumes of fats and grease, an appropriate pretreatment program, approved by the City Environmental Officer, must be in place.
- **Septage must be disposed of in a designated place:** Septage must be transported by a hauler or vacuum truck to the septage treatment facility and cannot be disposed of elsewhere, including water bodies, agricultural fields, or city drains.
- **Periodic and regular desludging every three to five years:** Septic tanks must be desludged on an average of every three to five years, or when the sludge volume fills one-third of the tank.
- **User fees:** A fee will be added on to the water bill. For Dumaguete, the fee is $0.04 per cubic meter of water consumed.
- **Penalties:** Violators of these regulations must pay fines. For Dumaguete, the fines are $20 for residential buildings and $40 for commercial buildings.

The programs will be managed by City Septage Management Authorities, composed of representatives from the city departments of environment and natural resources, health, general services, treasury, water district, legal services, and engineering, as well as an appointed NGO.

### 3.4 Key Challenges and Strengths

**Challenge:** Implementation occurs mainly by early adopters and usually with donor assistance. Delays in the development of the NSSMP and the national and local funds have also hampered implementation.

**Strength:** The Philippines is one of few countries in the region that has a national policy and implementing regulations requiring proper collection, treatment, and disposal of septage.

## 4.0 INSTITUTIONS AND IMPLEMENTATION CAPACITY

Unfortunately, these regulations have not been effectively enforced and implemented due to the lack of national support for and pressure on local bodies, as well as delays in developing the NSSMP, NWQMF, WQMAs, and the local WQMA funds. In addition, the law directs either LGUs or water districts to develop septage management programs; however, neither entity is explicitly required to do so. Due to the low awareness of CWA provisions, low perceived need for septage management, and lack of funding and enforcement, only one septage management program has been completed outside of Metro Manila with donor assistance in Alabel Municipality.[19] However, once the national government creates the NSSMP and WQMFs, local replication of current best practices will be able to proceed much faster, particularly if donors provide additional assistance.

In 2006 and 2008, a diverse team of national government agencies, donors, and NGOs organized two National Sanitation Summits to raise the sector's profile and urge action among policymakers and government leaders. The media provided significant coverage for these events, highlighting the summits' action plans for policy, public awareness and local implementation. During the second summit, participants agreed that septage management should be the country's top sanitation priority, and that LGUs should take the lead in developing these programs, with water districts (if present) responsible for implementation.

### 4.1 Major National Agencies

**Department of Environment and Natural Resources (DENR):** DENR's institutional and financial capacity to implement and enforce the CWA is very limited. Its 2007 budget was $142 million, of which only $7 million went to the Environmental Management Bureau (EMB), which houses the office on water and sanitation. Of the 239 staff at EMB headquarters, only nine specialize in water, and even fewer in sanitation. To date, DENR has approved the creation of three Water Quality Management Areas, but many more are needed to facilitate implementation of the CWA. DENR has not yet established local or national water quality management funds to financially support activities in water quality management.

**Department of Public Works and Highways (DPWH):** The CWA charges DPWH, in consultation with key partner organizations, to create a NSSMP by 2005; although underway, the NSSMP has yet to be completed. The CWA also mandates DPWH, through its attached agencies, such as the Manila Metropolitan Waterworks and Sewerage System, Local Water Utilities Administration, and urban water utilities, to provide sewerage and sanitation facilities. For non-highly urbanized cities that lack existing sewerage systems, the CWA tasks DPWH, in coordination with other agencies, to deploy septage or combined sewerage-septage management systems. The NSSMP will specify the role of DPWH and how it should work with the LGUs and water districts.

**Department of Health (DOH):** This department prescribes the regulations governing septage management programs, which are contained in the IRR to the Sanitation Code and the companion DOH Manual. This Manual describes how collection, transportation, and septage treatment service providers can obtain an Environmental Sanitation Clearance from the DOH. Failure to comply can result in daily fines, although DOH lacks enforcement capacity.

**Local Water Utilities Administration (LWUA):** As the specialized lending agency that provides financial, technical, and institutional assistance to water districts, LWUA has traditionally provided technical and financial support for water projects. Of its 650 staff at the central office, only two specialize in sewerage and sanitation. However, agency officials have expressed interest in playing a key role in encouraging water districts to develop septage management programs and in providing financing for them. While LWUA has not yet financed any sanitation projects, it is able to lend

$6 million to water districts for water and sanitation projects.

## 4.2 Major Sub-National Agencies

**Local Government Units (LGUs):** The CWA requires LGUs and water districts to develop septage management programs in areas without sewerage systems. Most LGUs do not fully understand their role in developing these programs, although some are becoming aware of their responsibilities through donor-led workshops and pilot programs. However, many LGUs, especially the larger municipalities, have sufficient engineering, environmental and planning departments and staff such that, when provided with good examples and technical assistance, should be able to replicate septage collection and treatment projects using their own resources. For example, the LGUs of Alabel and Dumaguete have developed septage management programs that apply cost-recovery financing mechanisms with varying degrees of success. While Alabel's program lags behind, Dumaguete is targeted to implement its program in 2010. Marikina City has successfully worked with the Manila Water Company, Inc. to increase the percentage of customers who cooperate with the city's desludging program.

**Water Districts:** Presidential Decree 198 (the Provincial Water Utilities Act of 1973) mandates that "local water supply and wastewater disposal systems be operated by and through such districts to the greatest extent practicable," and authorizes water districts to build sewerage systems. To date, most water districts, which are private companies, have ignored the wastewater component and focused on water. Cabanatuan, Cebu, Davao, and Dumaguete water districts are developing septage management programs with USAID assistance. Other water districts, especially those that have reached 100 percent water supply coverage, are also exploring providing septage management. Water districts have a key role to play in planning, constructing, and operating septage management systems, and can coordinate with LGUs on local regulations and enforcement, and promote cooperation with the public.

## 4.3 Other Organizations

**Private Service Providers:** The best known private service providers in the Philippines are the two Metro Manila concessionaires, Manila Water Company, Inc. and Maynilad Water Services, Inc., which operate sewage collection and treatment systems, and are increasing their focus on septage management because of the high cost and difficulty of expanding sewerage systems. These utilities also have developed fee-based, scheduled septage collection services, although they are only providing these services to a fraction of their customers. Both companies ensure that treatment plants and septage collection equipment are designed and operated to meet international standards. Elsewhere in the Philippines, private operators provide almost all of the desludging services, but do not operate any treatment facilities.

**International Organizations:** Donor agencies and NGOs have played a key role in promoting septage management programs in the Philippines. The Third Manila Sewerage Project, funded by the Global Environment Facility and World Bank, will assist Metro Manila in piloting suitable technology for septage disposal. Through USAID support, ECO-Asia, Environmental Governance 2 (EcoGov 2), Philippine Sanitation Alliance (PSA), and Philippine Water Revolving Fund (PWRF) work with LGUs and water districts to develop septage management programs.

In 2006, the Japan Bank for International Cooperation funded the construction of seven STPs on the island of Mindanao in Sarangani Province, although only the largest plant, located in Alabel, is currently operating, due to fewer than expected septic tank connections.[20] The World Bank's Sustainable Sanitation in East Asia (SUSEA) project is working with the nearby city of General Santos to develop a comprehensive septage management program that will deliver septage to Alabel's plant. Several donors and NGOs also work with government agencies to promote sanitation and septage management as members of the Philippine Ecological Sanitation Network (PEN).[21]

## 4.4 Key Challenges and Strengths

**Challenge:** The CWA does not clearly require either LGUs or water districts to implement septage management by a certain date, making enforcement difficult.

**Challenge:** Both local and national levels of government lack staff who are able to promote and implement septage management, and are knowledgeable about

the CWA mandate and how to address it. This has led to significant delays in developing the NSSMP, WQMAs, and allocation of local and national funds.

**Strength:** Largely through the Metro Manila concessionaires and donor-led programs, there are many ongoing initiatives at the local level to establish innovative septage management programs, which can serve as a basis for strengthening and replicating septage management programs throughout the Philippines.

## 5.0 FUNDING SOURCES

A key element of successful septage management projects is a strong business plan that includes cost recovery, a realistic estimate of how much septage will be collected and treated, and an effective public outreach plan to ensure that the septage actually is collected and brought to the treatment plant. Strong national funding is often critical in helping cities build the necessary treatment facilities, and sometimes to fund operating expenses before user fees attain cost-recovering levels. Historically, the Philippines' national government has made very few investments in sanitation and wastewater treatment; the CWA mandates the national government to issue new funds in support of local development.

### 5.1 National Funding Sources

In the 2000 national budget, out of $944 million allocated to water and sanitation, water projects received 97 percent of the funds, and sanitation only three percent.[22] This imbalance is acute since sanitation investments, such as sewer systems and treatment plants, are generally three to five times as costly as water supply infrastructure.[23] By one World Bank estimate, a 10-year program to treat wastewater in rural areas and build sewerage systems in urban areas in the Philippines would require $5.3 billion to achieve the 2015 MDG targets.[24]

The CWA requires the creation of local and national water quality management funds that will financially support activities to improve water quality management. Revenue for the national fund will be generated from fines and damages awarded to the government by the Pollution Adjudication Board (PAB), as well as proceeds from DENR permits. Revenue for the local funds will consist mainly of fees collected under the wastewater charge system. However, DENR has not created either local or national funds, or approved guidelines on how the funds should be disbursed and applied.

### 5.2 Local Funding Sources

While septage management costs much less than a sewerage system and WWTP, the costs can still be significant. As a result, LGUs and water districts struggle to address new wastewater treatment requirements in addition to their current focus on providing safe, continuous water supply. However, a few water districts, utilities, and local governments have developed user fees added to the water bill, which can provide full cost recovery of the capital costs of a septage management program in five to seven years in many cases. This income stream makes it easier to access loans for project development, either from LWUA, development financing institutions, such as the Development Bank of the Philippines, or the Philippine Water Revolving Fund. Other potential funding sources include the LGU's internal revenue allotment, congressional funds, general appropriations through DPWH, and build-operate-transfer (BOT) schemes. The NSSMP will provide guidance for local implementers on sources of financing.

Some water districts have expressed concern that a new fee added to the water bill will generate public resistance. However, others believe it will be accepted if water districts effectively communicate that the small monthly fee replaces the current large payment that homeowners and private companies pay to a private desludger when they request desludging services.

### 5.3 Public Awareness and Willingness to Pay

Within Metro Manila, awareness of the need for sewage treatment is quite high, but most people surveyed were only willing to pay 20 percent of their water bill for improved services.[25] Outside the capital, there is generally low public awareness, low demand for services, and a low willingness to pay fees.[26] As noted in Table 12, recent USAID surveys of communities in San Fernando City (the capital of La Union Province) and Marikina City (in Metro Manila) demonstrate the need for greater public outreach.[27] Marikina City, served by MWCI's desludging initiative, has a relatively greater awareness about septage management.[28]

TABLE 12: COMMUNITY SURVEYS OF SEPTIC TANK AWARENESS IN MANILA

| | San Fernando | Marikina City |
|---|---|---|
| Number surveyed | 312 | 288 |
| Septic tanks contribute to water pollution | 57% | 43% |
| Know how septic tanks work | 31% | 20% |
| Tanks should be desludged at least every 5 years | 16% | 51% |
| Last desludged household tank 5+ years ago or never | 71% | 38% |
| Disinfects toilet w. chemicals once a week or more | 97% | 81% |
| Have received information on tank maintenance | - | 9% |

## Community Participation and Outreach

To achieve its goal of desludging all septic tanks in the city by 2011, Marikina City is implementing the "Oplan Todo Sipsip" program with Manila Water Company, Inc. (MWCI). Developed with support from the ECO-Asia program, the initiative mobilizes local barangay leaders to educate communities about desludging septic tanks. As a result, Marikina City has increased the percentage of households using desludging services from 40 to 55 percent. Cooperative actions include the following:

- Community meetings are held to explain the program in advance of the desludging;
- A sound truck and fliers advertise desludging in a community the day before it is done;
- Local barangay staff accompany MWCI desludging crews to encourage homeowners to cooperate and open inaccessible septic tanks;
- MWCI places stickers on houses that have been desludged, so a second visit can be made later to the homes without stickers; and
- Promotion campaigns are conducted that include distributing informative calendars, art contests, and handwashing events.

The project aims to desludge all 90,000 septic tanks in Marikina City on a rotating five-year cycle. At the time of writing, however, MWCI had only desludged 5,400 septic tanks.



Cities in the Philippines have developed dramatic promotional posters that alert the public about septic tank pollution and encourage participation in frequent desludging programs.

### Setting Cost-Recovering User Fees

Dumaguete City, a coastal city of about 120,000 people, passed an ordinance in 2006 mandating regular desludging and proper treatment. To fund the program, Dumaguete developed a series of calculations on septage volume, cost of collection, treatment, and infrastructure, revenue collection and models of revenue generation, and projected cost recovery. These figures showed:

- Capital costs for constructing the treatment plant ($453,000)
- Annual cost of collection ($87,000)
- Annual cost of treatment ($104,000)
- Annual cost of capital financing ($35,000)
- Annual revenue from wastewater fees $281,000

As a result of this cost projection exercise, Dumaguete City decided to establish a user fee to provide full cost recovery of capital and operating costs within three years. The fee will be added to the monthly water bill, at a rate of $0.04 per cubic meter of water consumed. Dumaguete City will build a treatment facility that uses waste stabilization ponds that will require very little energy and few chemical inputs. The facility will be completed in 2010.

## 5.4 Key Challenges and Strengths

**Challenge:** Despite legislative mandates, the national government has not mobilized local or national funding mechanisms to help implement the CWA. Partly due to the lack of public outreach, customers also exhibit a low willingness to pay for sanitation and septage management services, especially outside of Metro Manila.

**Strength:** Since water districts are named as a key implementing agency for septage management and sewerage development, they will eventually manage water and wastewater resources from source to final disposal or reuse, leading to greater opportunities for sustainable management. Joint management also simplifies and strengthens billing for wastewater treatment.

**Strength:** Through the successful application of user fees, LGUs and water districts can finance their own septage treatment projects. Donor-supported programs are assisting with promotion campaigns to raise awareness and willingness to pay user fees.

# 6.0 RECOMMENDATIONS

These recommendations are based on research, interviews, and discussions with staff who are implementing on-the-ground septage management projects. This report proposes in the near-term that the national government follow through on promises of funding and that it issue the NSSMP. In the meanwhile, local governments can work with international organizations to build their capacity to operate effective septage management programs. In the medium-term, this report recommends that the national government raise its technical assistance and knowledge dissemination capacity in order to facilitate the widespread adoption, implementation, and enforcement of septage management programs in the country.

## 6.1 Short-Term Recommendations

**Create Financing Mechanisms.** To support local program development, DENR should establish more WQMAs and local WQMFs, as well as the NWQMF to provide funding for feasibility studies or matching grants for infrastructure development. The Philippine Water Revolving Fund (PWRF) and LWUA should encourage water districts to access their funds for the development of septage management infrastructure. The PWRF Support Program is currently developing pre-investment (feasibility) studies for several water districts that can be shared nationwide.

**Develop a National Septage Management Promotion Campaign.** The DOH should lead the development of an effective national promotion campaign, which would build government and public awareness, compliance, and local willingness to pay for new septage management programs. The Philippine Ecological Sanitation Network could support the development and implementation of the campaign.

**Raise National Agency Capacity.** The national government should provide funding to DENR, DOH, DPWH, or LWUA to hire qualified staff to lead CWA implementation, and support increased outreach and enforcement. To help build its capacity, national agencies can conduct exchanges with other countries in the region, such as Malaysia, that have successfully promulgated national septage management policies and programs. The international best practices and innovations that they learn can improve national implementation in the Philippines.

**Follow through Existing Initiatives.** A handful of cities have initiated septage management initiatives. These cities should continue their commitment for these projects by expanding programs and treatment facilities, providing funding and public promotion campaigns, and monitoring private desludging service providers. Twinning partnerships between wastewater operators can be an effective mechanism for transferring best practices.

## 6.2 Medium-Term Recommendations

**Conduct Training for Local Agencies.** National government agencies, supported by donor-funded projects, should conduct a nationwide training program for LGUs and water districts on how to plan and implement septage management programs, using the DOH operations manual, NSSMP and PWRF business model as resources, and presenting existing best practices. LWUA should also become a resource for water districts to encourage them to develop septage management programs. This should be institutionalized in the form of classroom and on-the-job training for LGU and water district staff. This can be developed through the Department of the Interior and Local Government, LWUA, League of Cities, or other existing training institutes. The interested LGUs and water districts should pay for the training costs, perhaps with initial support from international organizations.

**Promote Sustainable Biosolids Reuse.** The DOH manual currently sets standards for biosolid disposal in landfills, and reuse in land reclamation and agriculture. The Department of Agriculture, together with the Department of Health, should formulate incentives and help develop markets for the use of biosolids for conditioning agricultural lands, both for edible and non-edible crops. DENR and LGUs can also link this new source of organics to existing local composting programs.

**Collaborate with Research and Educational Institutions.** To stem its reliance on international support, the Philippines will eventually need to incorporate septage management into the educational and research framework. Engineering schools and sanitary engineering programs need to teach proper septic tank design, and the policy and technical aspects of developing a septage management program. Research institutions can also conduct research and development on technical aspects of septage treatment, reuse, and disposal. Collaborations with international research organizations such as Sandec/Eawag and the Asian Institute of Technology can be a first step to building the Philippines' capacity in this regard.

## ENDNOTES

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7. Asian Development Bank. "Philippines: Country Sanitation Action Plan, Draft." Unpublished study, 2007.
8. World Bank, 2003.
9. This data is compiled from water quality studies conducted by LWUA from 1990-1997. World Bank, 2003.
10. Rodriguez, Jamora, and Hutton, 2008.
11. Asian Development Bank. "Philippines: Country Sanitation Action Plan, Draft." Unpublished study, 2007.
12. World Bank. "Manila Third Sewerage Project: Project Appraisal Document (Abridged version)." World Bank, Dec.2007.
13. World Bank, 2005.
14. Ibid. See also, Mulingbayan, Mark. Personal communication. Manila Water Company, Inc., 20 Feb. 2009.
15. For a comprehensive list of regulations on water and sanitation and their responsible agencies, see World Bank, 2003.
16. WSP and ADB are funding a technical assistance project to develop the NSSMP in 2009.
17. Government of the Philippines, Department of Health. "Operations Manual on the Rules and Regulations Governing Sludge and Septage." Manila: Department of Health, 2008. A full copy of the DOH Manual is available on the Best Practices Database of WaterLinks, <http://www.waterlinks.org>.
18. A full copy of Dumaguete's ordinance is provided in the DOH Manual, available at WaterLinks, http://www.waterlinks.org.
19. At the time of writing, only Alabel has built facilities outside of Metro Manila, which includes Marikina City. Dumaguete is currently constructing its septage treatment facilities.
20. Located in Sarangani Province, the Municipality of Alabel is currently operating a septage treatment plant built by JBIC. All homeowners are required to have their septic tank desludged every three years at a cost of about $22, which can be paid in one lump sum or in monthly installments over the three years. The facility, with a design flow of 80 $m^3$/day, is currently underutilized as only 20 percent of the 11,000 septic tanks in Alabel are considered desludgeable for a variety of reasons.
21. A list of PEN members and activities can be found at: http://ecosan.ph.
22. World Bank, 2003.
23. Ibid.
24. Rodriguez, Jamora, and Hutton, 2008.
25. About 90 percent of respondents were aware that improperly disposed of sewage can be responsible for variety of diseases in the community, as well as contribute to the pollution of river systems, groundwater and waterways. About 70 percent of respondents were willing to pay on average 20 percent of their water bill for improvement in their wastewater disposal systems. World Bank, 2005.
26. A 1993 study showed that willingness to pay in Davao, Calamba, and Dagupan was so low that cost recovery would take 16 years. See World Bank, 2003.
27. United States Agency for International Development. "Survey of Knowledge, Attitudes and Practices on Wastewater and Sanitation in San Fernando City, La Union." Unpublished study, 2006.
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LUKE DUGGLEBY, ECO-ASIA

In the municipality of Nuwara Eliya, Sri Lanka, staff empty the septage they collected that day at the muncipal septage treatment facility. This facility is the only one of its kind in all of Sri Lanka.

**COUNTRY ASSESSMENT**

# SRI LANKA

| | | | |
|---|---|---|---|
| Country Population (in millions) | 19[1] | Nominal GDP (in billions) | $40[2] |
| Urban Population (in millions) | 3[1] | Nominal Income per cap | $1,972[2] |
| Urban Population (% of total) | 15%[1] | Annual Water Budget per cap | $6-6.5 |
| Access to Improved Water (urban) | 98%[1] | Annual Sanitation Budget per cap | $0.3-$0.7 |
| Access to Improved Sanitation (urban) | 89%[1] | Fee to Desludge (per $m^3$) | ~$4 |
| Access to Piped Sewerage (nation) | 4%[3] | Surface Water Pollution | -- |
| Use of Onsite Sanitation (nation) | 82%[1,3] | Economic Cost of Poor Sanitation | --- |
| Septage Treatment (Nuwara Eliya) | <1% | | |

**Challenges**

- Almost no septage treatment facilities in the country, aging gully suckers in poor repair, and limited data about septage and onsite sanitation systems
- No national or local policies address onsite sanitation or septage management
- Low government prioritization of wastewater treatment and very low allocated budget for the sanitation sector
- Unclear delegation of roles and responsibilities between national and local agencies and little coordination between the health, water, and sanitation sectors

**Strengths**

- A model septage ordinance and "Septage Management Manual of Practice" exist in local languages and await adoption and dissemination
- Municipality of Nuwara Eliya has a small septage treatment facility
- Most local authorities have gully suckers

## 1.0 SUMMARY

Sri Lanka has made significant progress in this sector, and, as of 2006, provides 82 percent of the country with safe drinking water and 86 percent with improved sanitation. The rise in access to improved sanitation is due mainly to household upgrades to onsite sanitation systems (OSS) such as septic tanks and pit latrines; only four percent of the population has a direct sewerage connection. The desludging of OSS is the responsibility of local authorities (LAs) and, following the 2004 tsunami, most LAs received gully suckers through development assistance. However, disposal remains a serious countrywide problem as only one LA has a septage treatment, two LAs use trenches, while the remaining dispose of septage in landfills. Furthermore, there are no policies in place at the national or local levels specifically requiring regular desludging or mandating septage treatment. The Government of Sri Lanka has historically not prioritized wastewater treatment and only five percent of the water and sanitation budget has been used for sanitation over the past two decades. As a result, LAs are neither aware of the need for septage management, nor do they have national funding support for implementation.

In 2008, with USAID assistance, the Central Environmental Authority (CEA) and Municipality of Nuwara Eliya developed a model septage management ordinance and a "Septage Management Manual of Practice", as well as organized a "National Septage Management Workshop." To further promote Sri Lanka's improved septage management practices, this report makes the following recommendations. In the near-term (less than three years), the CEA can organize a follow-up national septage management workshop to formulate a strategy for disseminating the model ordinance and manual of practice. The CEA also can work with international organizations that are funding new wastewater treatment projects to incorporate septage treatment systems and desludging programs. In the medium-term (three to five years), following these demonstration projects, the CEA or National Water Supply and Drainage Board can recommend that the Government of Sri Lanka amend existing sanitation policies to require LAs to provide regular desludging and treat all human excreta from OSS. Such a policy recommendation must be accompanied by budget increases for sanitation, implementing guidelines for LAs, and technical assistance and training for local policymakers and operators.

## 2.0 BACKGROUND AND CONTEXT

### 2.1 National Sanitation Context

In the past two decades, Sri Lanka has made significant progress in providing essential services to its growing urban populations and particularly its rural citizens. The WHO/UNICEF Joint-Monitoring Committee estimates that, as of 2006, 82 percent of the country had access to safe drinking water and 86 percent has access to improved sanitation facilities.[4] The increase in access to improved sanitation is due mainly to the expanded use of septic tanks. Sri Lanka also has a strong record in public health improvements, including a 60 percent decline in mortality rates of children under age five from 1990 to 2004.[5]

However, cities in Sri Lanka, such as Colombo, Galle, Jaffna, and Kandy, face serious challenges in disposing sewage and industrial solid and liquid waste streams. At the 2008 "National Septage Management Workshop," environmental experts from the Central Environmental Authority and World Bank emphasized that untreated sewage and septage pose a greater environmental threat to inland waterbodies than industrial effluent. According to the country's English paper, *Daily Mirror*, "plugged or overflowing septic tanks compromise water quality and are the primary cause of diarrhea, [which is] the third leading cause of infant deaths in Sri Lanka."[6] Recent sanitation initiatives include efforts to provide sanitation facilities to the poorest households and those living by water sources. In addition, the Government of Sri Lanka has proposed a series of projects to upgrade and expand the sewer system of Greater Colombo, Hikkaduwa, and Kandy's city center. However, sanitation overall, and certainly septage management, has been a very low government and public priority, and sector investments continue to lag significantly behind water supply.[7]

The 2004 tsunami, which struck 1,000 kilometers of Sri Lanka's coastline and killed over 35,000 people and displaced another 443,000 people, had a significant impact on the country's water sector.[8] The tsunami caused over 60,000 wells to be abandoned or damaged due to saltwater intrusion, damaged nine pipe-borne water supply systems, and destroyed or damaged 30,000 latrines.[9] Post-tsunami, a number of countries provided aid to reconstruct water and wastewater infrastructure, including projects that placed new emphasis on sustainable sanitation, wetland wastewater

treatment systems, and septic tank desludging. The increased expense of reconstructing services in tsunami-affected areas, caused in part by population densification in resettlement areas and the destruction of cheaper resources, such as well water, continues to impact the sector's overall investment portfolio.

## 2.2 Onsite Sanitation Prevalence

As only four percent of Sri Lankans are connected to a sewerage system, pit latrines and septic tanks serve as the country's most prevalent urban sanitation system. Colombo is the only city in Sri Lanka with a sewerage system, most of which was built between 1906 and 1916. Despite some rehabilitation and new construction between 1982 and 1987, approximately 60 percent of the sewers are either full or overflowing due to high inflow of storm water and illegal connections. An estimated 25 percent of Greater Colombo is connected to this system, while most of the remaining population uses some form of a septic tank or pit latrine.[10] In Kandy, according to the 2003 national census, 66 percent of households have a water-sealed toilet, 17.5 percent use pour flush toilets, 12 percent use pit latrines, and less than two percent have no sanitation facilities.[11] Communal septic tanks are also used for new buildings and apartments. According to one study of OSS for hotels in Sri Lanka, septage accumulates at a rate of 18-20 liters per person equivalent per year for systems that accept greywater.[12]

There are two kinds of septic tank systems in Sri Lanka. The first features a septic tank with a soakage pit and is commonly used in rural and urban areas with soil that has high absorption capacity and low water tables. The second features a septic tank with an anaerobic biological filter and either a soakage pit or drainage field, and is used in medium-density housing settlements, apartment complexes, and industrial estates where the pollutant concentrations and volumes are high.

LUKE DUGGLEBY, ECO-ASIA

**A sanitation worker in Nuwara Eliya, Sri Lanka, waits to finish desludging a household septic tank. Onsite sanitation and septage are not well regulated or managed in Sri Lanka, where most municipalities dispose of septage in the local landfill or nearest waterway.**

## 2.3 Septage Collection and Treatment Capacity

Municipal Councils (MCs) within Local Authorities (LAs) are responsible for the provision of drainage, sanitation, and waste disposal. Typically, households will call the MC to request desludging, and the MC dispatches its gully sucker to the site. Recently, the Municipal Councils of Colombo and Kandy introduced private desludging companies. In these two cities, customers call the MC to report an odor problem or blockage, and the MC dispatches a private company's gully sucker; residents pay the MC, which then pays the private company. MCs typically charge $18-20 for desludging a household septic tank, or approximately $4 per cubic meter assuming a five cubic meter tank. Participants from the 2008 "National Septage Management Workshop" noted that the fee structure for septage pumping is viewed as inadequate to support the upkeep and replacement of vacuum trucks and pumping equipment. After the 2004 tsunami, as part of disaster relief grants, most LAs received gully tankers to remove septage, although many desludging trucks in the country, such as those observed at Nuwara Eliya, are poorly maintained because LAs have not allocated maintenance budgets. Trucks are typically licensed for safe transport, but workers usually do not operate the trucks with proper safety equipment.

Most cities lack septage treatment facilities. In cities with sanitary landfills, operators discharge the waste in designated areas of the facility. For municipalities without landfills, operators typically discharge septage into nearby streams or rivers without any prior treatment. A few municipalities, namely Thirainimadu and Thriruperenturai, discharge septage into trenches four feet deep and then cover them with sand. If properly designed, sited, and monitored, trenches that are located adequately far from water supply sources and actively used land can be an effective method of treatment. In the villages of Akkaraipattu and Pottuvil, septage is temporarily disposed of by diverting it to

another septic tank or soakage pit. Only the municipality of Nuwara Eliya has a built facility at the local landfill that is designed to treat septage. Currently operating at a maximum capacity of 200 to 250 households per year, this facility uses a treatment basin with a fixed media of coco coir mats to treat septage.

## 3.0 LEGAL FRAMEWORK

In Sri Lanka, a host of national acts provide regulations on wastewater management, but none specifically addresses onsite sanitation or septage management. The National Environmental Act (NEA) of 1980 stipulates that, "No person shall pollute any inland waters of Sri Lanka or cause or permit to cause pollution in the inland waters of Sri Lanka." It indicates that wastewater treatment plants are prescribed activities that are subject to licensing and national regulations on effluent quality, as implemented by the CEA and Local Authorities. The National Water Supply and Drainage Board (NWSDB) Act charges the NWSDB to establish water supply, and, to a lesser extent, drainage and sewerage systems, for local authorities through voluntary and compulsory takeovers. The 1986 Urban Development Authority (UDA) Planning and Building Regulations require all sewerage and wastewater outlets to be connected to the public sewerage system when possible, while the Municipal Council Ordinance of 1947 and subsequent amendments note that every new building or major renovation should provide drainage infrastructure in order to collect and remove rain and wastewater. The overlap and duplication of these regulations has led to confusion and jurisdictional overlaps and/or gaps that impede sewerage development and the creation of septage management programs.[13]

After a period of market-oriented policies, deregulation, and privatization from 1977 onwards, Sri Lanka's politics reversed in 2004 with the election of a more socialist government. These political shifts have delayed the consensus on and adoption of new water and sanitation policies that provide a coherent framework for the sector. The 2003 Water Services Reform Bill that aimed to issue standards for water quality, promote private sector participation, and standardize tariffs has been abandoned in favor of amending the NWSDB Act. These amendments, drafted in 2003, are still under consideration by the government. The Ministry of Urban Development and Water Supply also prepared a draft water supply and sanitation policy in 2002 that has since been redrafted as the 2006 draft national policy on drinking water supply. NWSDB also prepared a draft national sanitation policy in 2006. Broadly speaking, these polices aim to decentralize operations to LAs and community-based organizations (CBOs), set national tariffs in accordance with consumer demand, and provide research and development to improve the quality of service provision.[14]

### 3.1 Septic Tank Design

The 2003 Code of Standard Practice for the Design and Construction of Septic Tanks and Associated Effluent Disposal Systems issued by the Urban Development Authority within the Ministry of Local Government Housing and Construction sets the country's standards

#### Model for Local Septage Management

To help Sri Lanka develop an effective septage management program and replicate best practices developed in the region, USAID's ECO-Asia program facilitated a twinning partnership between Marikina City in the Philippines with the upland community of Nuwara Eliya in Sri Lanka. Specifically, ECO-Asia and sanitation officials in Sri Lanka developed a "Septage Management Manual of Practice" with support from the CEA. The manual provides information on how to safely collect, transport, and treat septage. Within a short time, city trucks employed new and improved solutions for pumping out long-clogged septic tanks and transporting the septage for treatment. Showcasing this experience, Nuwara Eliya and Marikina City led a national workshop, sponsored by USAID and the CEA, and introduced over 25 local authorities to best practices in septage management. The Manual outlines the steps that should be followed to effectively manage septage with particular focus on septic tank maintenance, desludging, and the use of vacuum trucks for collecting and transporting septage for safe disposal. Lessons learned in Nuwara Eliya can now be applied throughout Sri Lanka.

for septic tank design.[15] This Code is based on U.S. Environmental Protection Agency standards and covers sizing, tank geometry, and percolation testing requirements for soils-based leaching systems. Key provisions include:

- Every building shall be provided with a water supply system connected to an existing public or private service. No well used for the supply of drinking water shall be closer than 15 meters of a cesspit or a soakage pit or a septic tank.
- Every dwelling unit shall have at least one water closet. All sewerage and wastewater outlets shall be connected to an existing public sewerage system and the authority may, in any particular case, require that the sewage and wastewater be pretreated to bring them to acceptable standards before being connected to a public sewerage system.
- Where a public sewerage system does not exist or the outlets cannot be connected to the public system, the sewage shall be disposed of through a septic tank and wastewater shall be suitably disposed of through a soakage pit.

The Manual for Sri Lanka Public Health Inspection, published in 1989 by the Ministry of Health, also provides stipulations on septic tanks, although they need to be strengthened to provide updated and comprehensive information on septic tank O&M.

Municipal Councils are responsible for issuing wastewater permits for residential and commercial construction. The MC's Planning Department typically manages these permits, although the Health Department may also review building plans for appropriate wastewater system construction. Technical officers of the Urban or Municipal Councils review and approve properly designed septic systems along with the building plans, and planning officers perform a site inspection before they approve the Certificate of Occupation. For developments with more than 20 houses, the Central Environmental Authority is required to approve the plans. While this is the prescribed procedure, owners and developers often build properties without proper permitting and inspection, especially when the building uses a septic tank rather than a sewer connection.

### 3.2-3.3 Septage Collection and Treatment

Beyond the 2003 Code that governs septic tank design, the Government of Sri Lanka has not issued regulations on the collection and treatment of septage. Moreover, no city in the country has passed a local ordinance to manage septage.[16] In 2008, with support from USAID's ECO-Asia program, the municipality of Nuwara Eliya developed a model septage management ordinance. In the same project, Sri Lankan sanitation officials developed a "Septage Management Manual of Practice" that provides the designs for proper septic tank design, calls for regular desludging, prescribes health and safety guidelines for septage collection, and describes different methods for septage treatment. This manual is available in both Sinhala and Tamil.

### 3.4 Key Challenges and Strengths

**Challenge**: There are no national or local regulations requiring septage management for OSS.

**Challenge:** The multiplicity and overlapping nature of existing regulations on wastewater confuses the roles and dilutes responsibility in developing new septage management policies and programs.

**Strength:** A "Septage Management Manual of Practice" and a model local ordinance are available in both Sinhala and Tamil.

## 4.0 INSTITUTIONS AND IMPLEMENTATION CAPACITY

Sri Lanka's government has three levels: (1) Parliament, (2) Provincial Councils, and (3) Local Authorities consisting of Municipal Councils, Urban Councils and *Pradeshiya Sabhas* (PS). The National Water Supply and Drainage Board provides services in all urban areas, as well as many rural areas, while the Provincial Councils and Local Authorities plan, develop, and oversee the development of water supply and sanitation in smaller communities. In rural areas, community-based organizations play an important role in project implementation. Over the past several decades, the Government of Sri Lanka has been gradually devolving responsibility to local levels of government, although there have been delays in decentralization, as well as government reorganization as recently as 2007. As a

result, there continues to be confusion over roles and responsibilities between different agencies.

## 4.1 Major National Agencies

**Central Environmental Authority (CEA):** Established in 1980 by the National Environment Act, the CEA is the administering agency of the NEA and is housed within the Ministry of Environment. It is responsible for coordinating regulatory activities that result in discharging pollutants and wastes into the environment, and protects the environment by addressing pollution control, natural resources management, and environmental education. In the housing sector, the CEA implements the Environmental Protection Licenses, Environmental Impact Assessments, and Initial Environmental Examination Reports to regulate, maintain, and control the pollution from development projects. CEA was instrumental in the ECO-Asia-supported septage management work in 2008 and appears to be the lead national agency on this issue.

**National Water Supply and Drainage Board (NWSDB):** The NWSDB is the main agency that provides safe drinking water and sewerage in all urban and many rural areas of Sri Lanka. Formed in 1974 as an autonomous government-owned corporation, it is now housed under the Ministry of Water Supply and Drainage, and provides the investigation, planning, design, construction, O&M of water supply services and sewerage and sanitation facilities. It is the leading agency for all publicly- and foreign-funded projects in water and sewerage development. The Board can take over provision of services for LAs on a voluntary or compulsory basis. Today, NWSDB operates 287 water supply projects that provide 39 percent of Sri Lanka's population with water.[17] As water consumption has increased, NWSDB has also begun to focus on sewerage over the last 10 years. As of 2007, NWSDB maintains 9,772 sewerage connections in Greater Colombo, manages the wastewater collection and treatment systems for Katunayake, Seethawake, Biyagama and Koggala Investment Promotion Zones, and is building wastewater treatment plants in four other Investment Promotion Zones. While it is not responsible for desludging, NWSDB could potentially be the implementing agency for constructing septage treatment facilities on behalf of MCs. During the past thirty years, NWSDB has expanded its scope of activities considerably, and its employees have increased from about 1,000 in 1975 to almost 8,000 in 2005.


LUKE DUGGLEBY, ECO-ASIA

Most local authorities in Sri Lanka have gully suckers and vacuum trucks, many given as a part of tsunami assistance. Most LAs, however, have nowhere to properly dispose of septage.

## 4.2 Major Sub-National Agencies

**Provincial Councils (PCs):** In line with the Government's ongoing decentralization program, the nine Provincial Councils will play an increasingly important role in water supply and sanitation programs, especially in rural areas. Each Provincial Council has five ministries, and those responsible for water supply, sanitation, and local government are responsible for the sector activities within the council. The Provincial Councils coordinate programs and provincial agencies, support local implementation, monitor local performance, provide capacity building, and manage contracts and finances. The PCs have not been an effective agency in promoting sanitation and wastewater services in the past, but are potentially important stakeholders in future septage management initiatives.

**Local Authorities (LAs):** Local authorities are the ultimately responsible party for providing water supply and sanitation services within their jurisdictions. In Sri Lanka, there are currently 18 Municipals Councils, 37 Urban Councils, and 256 *Pradeshiya Sabhas* (PS). These three levels of local authorities are responsible for all piped infrastructure. The scale of these systems ranges from very small to large. Legally, the local Planning and Health Departments are responsible for reviewing the construction of wastewater systems.. Most local authorities struggle with inadequate budgets and staff, which limit their ability to implement new sanitation initiatives. Typically, the MCs have gully suckers and provide public desludging services; only Colombo and Kandy have introduced private desludging companies.

## 4.3 Other Organizations

**Community Based Organizations (CBOs):** Based in beneficiary communities, CBOs are responsible for promoting and facilitating hygiene education and sanitation services and facilities. CBOs currently manage around 1,000 mostly rural water and sanitation schemes scattered across the country. There is constant growth in the number of CBO-managed water supply systems as a result of local initiatives, bilateral and NGO funding, and large rural water supply and sanitation programs like those currently being implemented or planned by the World Bank and ADB. Though CBOs work to provide sanitation facilities, they are generally not involved in septage management, although they could serve as an important partner in promoting regular desludging.

**International Organizations:** A number of international organizations are active in Sri Lanka's water and sanitation sector, including the Asian Development Bank, Australian Agency for International Development, Canadian International Development Agency, Danish International Development Agency, German Agency for Technical Cooperation, Japan Bank for International Cooperation, Swiss Agency for Development and Cooperation, U.S. Agency for International Development, and World Bank. In 2007, international funding injected $169 million, or almost 70 percent of the country's total sector budget, into Sri Lanka's water and sanitation sector. These organizations provide post-tsunami rehabilitation, wastewater infrastructure development, and technical assistance. Given the strength of these agencies, they can play a major role in making sure septage management is included in planned and future projects.

## 4.4 Key Challenges

**Challenge:** Most local authorities do not have sufficient staff or technical capacity to undertake a scheduled desludging program. There are few private desludging companies in the country because only a few local authorities in Colombo and Kandy have allowed private sector participation in the collection and transportation of septage.

**Challenge:** Overlapping regulations and delayed decentralization make it difficult for government agencies to determine their roles and responsibilities. There is also inadequate coordination among agencies, involvement of health agencies, and prioritization of sanitation activities.

# 5.0 FUNDING SOURCES

Funding for sanitation and wastewater treatment in Sri Lanka is extremely limited, and is a major barrier to local investments in sewerage and septage management. Foreign funds compose a large portion of the sector's budget, and international organizations play an active role in developing the country's sanitation and wastewater infrastructure. The 26-year civil war and 2004 tsunami are partly responsible for diverting the government's funding away from sector. Nevertheless, as the ADB's 2007 "Water Development Outlook" Sri Lanka Country Paper notes: "The government views domestic water and sanitation as being closely and

inextricably linked but recognizes that sanitation has in the past been given lower priority."[18]

## 5.1 National Funding Sources

For the 2000-2010 period, NWSDB estimated that the sector required $850 million, about half of which came from government funds. In 2007, the Government of Sri Lanka allocated a total of $245 million to NWSDB, of which $169 million came from foreign governments and $24 million came from local contributions. The 2010 national water and sanitation budget, which will focus on rebuilding the areas recaptured from the Tamil Tigers, includes an $85 million ADB loan for water and sanitation projects in the north and east areas of Sri Lanka.[19] However, the vast majority of these funds, regardless of their source, fund water supply projects. Over the last two decades, sanitation has received less than five percent of the total sector budget.[20] About 90 percent of NWSDB's work focuses on water supply, and only 10 percent on sewage and drainage.

## 5.2 Local Funding Sources

In areas under its jurisdiction, NWSDB attains adequate levels of billing and collection to cover its water O&M costs. Water consumption tariff rates, which are subsidized by the government, are about $1 per month for a typical household. The low cost of water discourages conservation, with most people consuming 180 to 200 liters of water per day.[21] Moreover, the current tariff does not cover sanitation or wastewater treatment services. In 2002, the Government of Sri Lanka approved a regulation to introduce a sewerage charge, although it has yet to be implemented. As a result, Colombo Municipal Council relies on property taxes to pay for the O&M of the sewerage network. Budgets for capital expenditures depend largely on national funding, which, as previously noted, is extremely limited for sanitation projects.

DAVID ROBBINS, ECO-ASIA

**As a first step towards improving septage management services and standards, the CEA and Municipal Councils can improve health and safety standards for public staff who conduct desludging.**

## 5.3 Key Challenges

**Challenge:** The national budget for sanitation is five to 10 percent that of all water-related investments. With so little national funding, most MCs and the NWSDB simply cannot make wastewater investments.

**Challenge:** The government has approved a sewerage fee, but has not enforced it. Without this funding source, local wastewater budgets rely on property taxes to cover O&M and capital costs.

# 6.0 RECOMMENDATIONS

Sri Lanka's wastewater management sector faces challenges due to a lack of coherent national policy, low government prioritization, and lack of funding. The difficulty of developing water and sanitation policies in the past suggests that the development of national policies for septage management should be a medium-term goal. In the meantime, CEA and international organizations can play a more prominent role in developing demonstration projects.

## 6.1 Short-Term Recommendations

**Conduct a Follow-Up National Workshop on Septage Management.** Following up on the 2008 National Septage Management Workshop, CEA can conduct another workshop with stakeholders from the Ministry of Healthcare and Nutrition, Ministry of Urban Development and Sacred Places, Ministry of Drainage and Water Supply, NWSDB, MCs, and international development agencies. The workshop can develop a strategy for disseminating the Nuwara Eliya model ordinance and "Septage Management Manual of Practice," further training for MCs, and initiating pilot septage treatment projects in the country.

**Leverage International Organizations to Develop Demonstration Septage Management Projects.** International organizations are actively funding wastewater projects in the country. These organizations have promoted septage management in other publications and projects, and should encourage national and local governments to consider septage management in planned and ongoing projects. The CEA should push at least one internationally backed wastewater project to incorporate septage management in the survey process, and design the treatment facilities and maintenance needs and costs. By documenting the costs, benefits, and challenges of septage management projects, CEA can create stronger advocacy and training programs to promote septage management throughout the country.

**Develop Early Models of In-Country Septage Management Projects.** Motivated cities in Sri Lanka can also improve current septage management practices by adopting the model local ordinance drafted for Nuwara Eliya, following the guidelines developed by CEA and USAID, ensuring that all collectors dispose of septage at designated locations, and installing simple systems to treat septage in one location. Municipalities can also raise local communities' awareness of the importance of regularly emptying septic tanks, and provide more frequent emptying services.

**Promote Treated Septage as a Reusable Resource.** In developing demonstration septage management projects, international organizations, NWSDB, and CEA can promote the concept of septage treatment by stressing the benefits of treated septage as a reusable resource. By working with local research institutes or government labs, the projects can monitor the quality of dried sludge and determine its usability for edible crops or non-edible plantations. Dried septage could potentially become a profitable end product that reduces reliance on imported chemical fertilizers and boosts agricultural productivity.

## 6.2 Medium-Term Recommendations

**Amend Existing Sanitation Policy to Address Septage Management.** The Government of Sri Lanka should amend the existing sanitation policy to require LAs and national agencies to address septage management and clarify their roles and responsibilities. This overall policy should be accompanied by a code of practice for septage management, which operators can use in implementing septage management. In forming these policies, Sri Lanka can look to other countries in the region, such as India, Malaysia, and the Philippines, for different models of septage management laws, guidelines, and training materials.

**Increase National Sanitation Budgets.** After many years of neglecting the sector, the Government of Sri Lanka must allocate more funds towards sanitation, and particularly for septage management projects. Evidence from ongoing demonstration projects can be used to help the government determine the applicability of septage management, and where such projects can be implemented with greater cost-effectiveness than, or in conjunction with, sewerage development.

**Provide Training and Education for Policymakers and Operators.** The CEA (in close coordination with the Ministry of Provincial Councils and Local Governments) can educate MCs on proper septic tank design, maintenance, desludging health and safety standards, and the need to adequately treat septage after desludging. This education can include the distribution of the "Septage Management Manual of Practice," trainings for MC staff and operators, technical assistance in preparing action plans, and exchange visits to regional models of septage management.

**Conduct Promotion Campaigns to Raise Awareness about Desludging.** As MCs begin to construct septage treatment facilities, they should conduct promotion campaigns to educate the public about septic tanks and proper maintenance. By effectively building consumer demand for services, MCs can ensure that new facilities are used and that septage is properly treated and discharged.

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LINDA SHI, ECO-ASIA

Municipal staff empty the contents of a vacuum truck into the Nonthaburi Municipality septage treatment facility. Thailand has developed comprehensive septage management policies, but faces challenges in ensuring widespread adoption of programs due to segmented institutional implementation and limited funding support.

**COUNTRY ASSESSMENT**

# THAILAND

| | | | |
|---|---|---|---|
| Country Population (in millions) | 63[1] | Nominal GDP (in billions) | $273[2] |
| Urban Population (in millions) | 21[1] | Nominal Income per cap | $4,115[2] |
| Urban Population (% of total) | 33% | Annual Water Budget per cap | $30 |
| Access to Safe Water (urban) | 99%[3] | Annual Sanitation Budget per cap | NA |
| Access to Safe Sanitation (urban) | 99%[3] | Fee to Desludge (per $m^3$) | $4-7[4] |
| Access to Sewerage | NA | Polluted Surface Water (% of all sources) | 52% |
| Use of Septic Tanks | NA | Health Cost of Poor Sanitation (1999, in millions) | $23 |
| Treatment of Collected Septage (surveyed sample) | 30%[5] | Alternative Terms for Septage in Thailand: night soil, faecal sludge | |

**Key Challenges**

- Separate legal classification as well as implementing agencies for septage and sewage
- Lack of treatment facilities among most local governments
- Limited budget allocation from national government for local governments to build facilities

**Key Strengths**

- National and local regulations require local governments to address septage and prohibit disposal except at licensed facilities
- Ministry of Public Health (MOPH) has issued guidelines on proper septage management
- MOPH sponsors annual national 5-day training on septage management
- Several models of low-cost treatment technologies developed by a few local governments

## 1.0 SUMMARY

Thailand has achieved remarkable success in improving access to water and sanitation. According to the "2007 UNDP Human Development Report", 99 percent of all households in the Kingdom have access to improved water and sanitation.[6] Wastewater treatment and water pollution, however, continue to present major environmental and health challenges. Given the absence of adequate treatment facilities and poor operations and maintenance (O&M) of many existing facilities, 86 percent of wastewater generated in Thailand is not treated,[7] and 70 percent of septage, called night soil in Thailand, collected from onsite sanitation systems (OSS) is disposed of in landfills, agricultural fields, and waterways.[8] In accordance with the 1992 Public Health Act, the Ministry of Public Health (MOPH) requires local government authorities to collect and treat septage, and has provided policy guidance and technical guidelines on anaerobic digesters. Most local governments, however, have not been able to provide adequate septage collection or treatment services. A significant challenge to improving local capacity is the legal and institutional separation of septage, regulated by the Ministry of Public Health, and sewage and wastewater, regulated by the Ministry of Natural Resources and Environment (MONRE). The policy separation of these physically connected systems prevents wastewater agencies from contributing technical knowledge and resources to septage management.

In 2003, the King of Thailand highlighted the importance of septage management in his annual birthday address and created new impetus for MOPH to provide stronger support for cities in developing septage management programs. In one of the most anticipated events of the year, King Bhumibol discussed the need for municipalities to address solid waste and septage collection, treatment and disposal. He noted, "The slurry from septic tanks and cesspools collected by municipalities has been found to discharge into canals and rivers." He recommended that cities digest the waste and reuse the solid material and liquid effluent as fertilizer, and requested that municipalities "consider what should be done."[9] Responding to this challenge, MOPH updated its Manual on septage management and began an annual, voluntary training program for local governments on this issue. The training targets localities that have but are not operating their septage treatment facilities.

To strengthen Thailand's ongoing initiatives in the near-term (within three years), this report recommends that MOPH strengthen its capacity to provide participating localities with continuing support, such as additional training, technical assistance, and partnerships with operators from model local governments in Thailand, or elsewhere in the region. In addition, MOPH can survey other national governments' guidance on septage management and further develop its own guidelines on treatment options and standards, regulation and enforcement, public-private partnership, and public awareness campaigns. In the medium-term (three to five years), this report recommends that the national government permit and encourage local governments to diversify the methods of managing septage, including consolidating services with wastewater service providers, using alternative technologies, raising septage fees, and combining service provision with other local authorities to yield greater economies of scale. In addition, the national government should consider reorganizing the regulations and management of wastewater and septic planning and development in Thailand at the national level, or at least allowing smaller local governments to consolidate management of septage and wastewater if they choose.

## 2.0 BACKGROUND AND CONTEXT

### 2.1 National Sanitation Context

Thailand has provided improved water and sanitation for nearly all of its residents.[10] However, while cities typically have relatively high capacity to convey sewage and collect septage, most lack adequate septage and wastewater treatment facilities. As a result, 86 percent of sewage and 70 percent of septage are directly disposed of in waterways, drains, farmlands, and landfills. Around the country, human waste causes 54 percent of organic water pollution.[11] In 2002, a World Bank Study concluded that about one-third of the water resources in Thailand were unsuitable for drinking, 52 percent of all surface water bodies were deemed of poor or very poor quality, and by all indicators, water quality would continue to get worse if Thailand did not address wastewater management.[12] The economic losses from waterborne diseases like diarrhea, typhoid, and dysentery amounted to $23 million in 1999 – high, although significantly lower than some of the other countries in this World Bank study.[13]

## 2.2 Onsite Sanitation Prevalence

Thailand uses two types of OSS: (1) a single pit that serves as a soakage pit; and (2) a two-chamber "septic tank," where the second chamber is a soakage pit.[14] In actuality, neither system can be called a proper septic tank since they both have open bottoms, which can lead to groundwater contamination in urban areas where OSS are densely clustered.[15] In metropolitan Bangkok, soakage pits often do not work properly because the soil consists of low-permeability clay and the groundwater table is high. This raises the potential for groundwater contamination and septic tank overflows.[16] Older buildings in Thailand tend to use the single-pit system, while newer developments of a certain scale use the two-tank system. In areas of high urban density, developments may build small, decentralized WWTPs with direct household sewerage connections. In most cases, however, black water enters the septic tank, and liquid effluent flows into drains or canals; grey water enter the drains or canals directly. A recent study of housing estates in suburban Bangkok found that 77 percent of households located in housing developments of 40 to 500 units use only septic tanks; some estates with more than 180 units use small, decentralized wastewater treatment systems, in addition to septic tanks.[17]

The use of septic tanks is ubiquitous throughout the country, even in areas served by wastewater treatment plants (WWTPs). In general, WWTPs typically do not collect sewage from direct household connections; rather, they receive the water from urban canals, which contain liquid effluent from septic tanks and stormwater. This has the effect of reducing pollution in combined sewer overflows, but it also reduces the operating efficiency of WWTPs, since the relatively low nutrient content of the effluent inhibits normal treatment processes. In addition, since canals are considered an integral part of sewerage infrastructure, they are significantly polluted, and wastewater can sit for a long time in canals with inadequate slopes or when there is low rainfall. Many canals also empty directly into the Chao Phraya River and the Gulf of Thailand.[18]

## 2.3 Septage Collection and Treatment Capacity

The 1992 Public Health Act of Thailand delegates responsibility for septage management to local government authorities (LGAs). A recent survey of 117 major LGAs (out of 7,853 total LGAs) found that 78 percent had adopted local regulations requiring septage to be properly collected and treated before disposal.[19] As these regulations do not require regular maintenance, households usually desludge their OSS when they overflow. Both private and public companies provide collection services and over 80 percent of surveyed LGAs have septage collection services in their jurisdiction.[20] According to the Public Health Act, vacuum truck operators cannot charge more than $7 to desludge the first cubic meter of septage, and $4 for each subsequent cubic meter.[21] Partly due to the lack of available treatment facilities, collection

LINDA SHI, ECO-ASIA

**Except in the densest urban communities, households in Thailand flush their waste into septic tanks; septic tank effluent and other household wastewater flow into urban canals, which sometimes lead to WWTPs.**

operators – especially private or unlicensed operators – often dispose of the septage in landfills, fields, drains, and waterways. In western Thailand, an estimated 20 percent of LGAs have received complaints from the public about unsanitary transport and unsafe septage disposal.[22]

The same survey of LGAs found that 20 percent had septage treatment plants (STPs) that were well maintained, 22 percent had treatment plants that were out of operation, and 58 percent did not have any treatment facilities.[23] Of the facilities that exist, 86 percent use anaerobic digestion tanks, 12 percent treat septage at combined sewage and septage treatment plants, and two percent use constructed wetlands.[24] Among the surveyed group, facilities treat approximately 30 percent of collected septage. The remaining 70 percent is disposed of half in unsanitary landfills and half onto agricultural land where farmers use the untreated septage as fertilizer.[25] Only half of the surveyed collection operators and one-sixth of facility operators had the necessary protective equipment.[26]

Thailand produces and estimated 18.5 million cubic meters of septage per year.[27] Since septage in Thailand comes only from bathrooms and is treated separately from sewage, which contains higher levels of heavy metals and other chemicals, the treated septage from OSS is typically safe to use as agricultural fertilizer. Most of the STPs in Thailand sell their treated septage as fertilizer.

## 3.0 LEGAL FRAMEWORK

Despite the intertwined function of septic tanks and sewerage infrastructure in Thailand, the legal framework makes a sharp distinction between the two technologies. The 1992 Public Health Act (PHA) published by MOPH classifies septage as a form of solid waste, rather than wastewater, and tasks local governments to address septage collection, transport, treatment, disposal, and fee collection. Similarly, in the 1992 National Environmental Quality Act (NEQA), the Ministry of Natural Resources and Environment (MONRE) delegates local governments to address point source pollution, including wastewater treatment. Therefore, many agencies, laws, and funds that govern and regulate water quality and wastewater management do not apply to septage. For many local governments that lack the resources to adopt septage management, this separation between wastewater and septage makes wastewater implementation even more difficult, especially since funding for environmental projects is much lower than for wastewater projects. This policy separation of these physically connected systems prevents either MOPH or MONRE from managing wastewater infrastructure holistically or systematically. The ministries may collaborate, but their departments may not legally share internal project plans, proposals, and budgets with each other.

Noting the lack of local capacity to implement septage management and public willingness to pay, the 1997-2016 Pollution Prevention and Mitigation Policy mandates that each province develop a master plan and provide physical capacity for solid waste and septage disposal. To support local implementation, MOPH issued the "Manual on Integrated Septage Management" in 2001, updated in 2008, that outlines the designs of different toilets, septic tanks, and an anaerobic treatment system; the standards for health, safety, and recordkeeping; and cost estimates for constructing facilities of different sizes.[33]

### 3.1 Septic Tank Design

The Building Control Act (BCA) requires buildings to install systems that collect and treat human waste up to the effluent standards specified in NEQA. When constructing new properties, builders or developers must first present construction drawings of wastewater treatment systems, such as two-chamber septic tanks of a size proportionate to the number of residents. The BCA authorizes LGAs to establish regulations to implement this law, and inspect and monitor any buildings to ensure compliance before granting construction permits. The Pollution Control Department (PCD) has also developed guidelines and sample drawings for onsite treatment facilities for use by LGAs and the public.[34] These drawings have been incorporated into the MOPH Manual.

In reality, septic tanks and soakage pits are poorly designed and regulated. First, the government-sanctioned design has an open-bottom, which violates a fundamental design feature of septic tanks. Second, these codes and guidelines establish the physical standards for septic tanks but do not require owners or occupiers of premises with septic tanks to maintain the systems. Third, permitting controls are weak, leading to

**Nonthaburi Municipality's septage treatment facility has 30 anaerobic digestion tanks and is one of the best run facilities of its kind in Thailand.**

NONTHABURI MUNICIPALITY

## Best Practice in Treatment: Nonthaburi Municipality[32]

Nonthaburi Municipality, a city of 270,000 people just north of Bangkok, has established the best example of septage treatment in the country with the support of the King, the mayor, and key technical staff. Twenty-five years ago, a public health professor from Mahidol University began testing and developing septage treatment facilities in Nonthaburi, and his project came to the King's attention. With royal support, Nonthaburi eventually constructed a treatment facility that uses anaerobic digestion tanks (called "bio-tanks"), sludge drying beds, and an oxidation pond to transform septage into fertilizer. Each year, the municipality desludges around 3,300 septic tanks at the request of households, collecting almost 9,000 cubic meters of septage, or roughly half of the total volume generated in the municipality. Liquid effluent drained from the sludge drying beds filters through sand beds into the oxidizing pond, before being applied as liquid fertilizer in the city's public parks and green areas. Kasetsart University has also tested the fertilizer produced by the facility, and found the quality to be safe for edible crops. Private operators, who collect the other half of the city's septage, exist outside of this public system. They do not dispose of the waste at the treatment facility, in large part because the facility is already operating at capacity, and the city neither monitors nor enforces compliance.

The main costs of the facility include the land, construction, vacuum trucks, and O&M. Five people operate the plant, which has very low energy consumption, and the collection vehicles. Each month, the facility produces five tons of fertilizer, collects around $560 from households and generates around $210 in fertilizer sales. Due to growing demand for both septage collection and fertilizer, Nonthaburi aims to expand its facilities, although it faces land availability constraints. Thus far, the Nonthaburi facility attributes its success to a concerted public outreach effort to advertize public collection, and educate the community about the facility, which is located in a residential neighborhood near the center of the municipality.

the widespread construction of septic tanks that do not meet the standards and cannot be easily accessed for maintenance requirements.[35]

### 3.2 Septage Collection

The Public Health Act sets general principles for the collection of solid waste and septage, and tasks local governments to adopt their own regulations with more specific requirements. The 22 percent of LGAs that have not drafted local regulations on septage management are located mostly in rural areas.[36] The PHA forbids operators from discharging waste on public land except in officially designated locations. It also authorizes LGAs to prescribe methods for collecting, transporting, and disposing of septage, either by the government or through private, licensed operators. The Act requires LGAs to set tariffs for public and private operators within the PHA limit of $7 for the first cubic meter and $4 for each additional cubic meter. This charge does not cover treatment costs, and has not been raised since 1992.

The MOPH Manual also sets standard operating procedures for septage collection and transport.[37] The Manual requires collectors to obtain operating permits and trucks to have signage designating them as septage collection vehicles. Operators must ensure that trucks do not leak, that pumps are well maintained, and that they have cleaning equipment to disinfect the desludging site, the vacuum suction pipes, and the trucks themselves. Operators should wear protective gear, obtain a health check-up twice a year, and undergo training. They cannot dispose of septage except at designated locations, and they must show households their operating permit to demonstrate that they are in good standing. Moreover, operators must record the household's name, address, signature, septage volume, and final disposal location.

### 3.3 Septage Treatment

Of the 49 surveyed LGAs that have treatment facilities, an estimated 86 percent employ one type of technology – anaerobic digesters with sludge drying beds and oxidation ponds – to treat septage. This is the only design described in the MOPH Manual.[38] The system typically contains 30 anaerobic digestion tanks – one for each day of the month, with each designed to contain one day's worth of collected septage for 28 days. The MOPH Manual provides for three different sizes of tanks (five, ten, fifteen cubic meters), depending on the load demand. After the digestion period, the septage is released onto drying beds, where the liquids filter through sand beds and drain into a small oxidation pond. Once dried, the solids are removed to a warehouse to be sifted for remaining debris. Throughout Thailand, the treated septage is sold as fertilizer.

The MOPH Manual also provides advice on operating and maintaining the facility. For instance, the Manual recommends that facilities be located close to the sources of septage, close to access roads, and outside of flooding areas. Facilities should provide operators with protective gear, train staff, cover tanks, record delivery activities, and keep trucks and sand beds clean. It also provides detailed information on the materials needed and costs to construct facilities of different sizes. However, the Manual does not address how LGAs should regulate private contractors or private collection companies. Nor does it address standards on discharged effluent, discharged solid waste, and waste reuse in agriculture, or indicate who will monitor water and fertilizer quality.[39]

### 3.4 Key Challenges and Strengths

**Challenge**: The legal definition of septic tanks advises an open bottom; thus, in reality, many systems in Thailand function more as soakage pits, exacerbating water pollution and groundwater contamination.

**Challenge:** Despite the diversity of local climates, population densities, and staff capacity, Thailand largely employs one type of technology and provides guidance for only one type of technology.[40]

**Strength:** Thailand has developed a relatively comprehensive set of policies on septage management, including MOPH Manual, which supports local governments in creating septage management programs.

## 4.0 INSTITUTIONS AND IMPLEMENTATION CAPACITY

Thailand has increasingly devolved power to local governments, and involved the private and nongovernmental sectors. In the area of septage management, the PHA states that waste disposal is

the power and duty of local government and that LGAs can delegate responsibility to other operators under its control and supervision. However, while 22 percent of LGAs are able to provide comprehensive septage management programs for at least part of their jurisdictions, most LGAs lack the capacity to regulate private collectors and build or operate treatment facilities. These LGAs require greater support from the national government in the form of funding, policy guidance, technical assistance, and training. At the national level, MOPH provides most of the technical support and has begun a national voluntary training program on septage management, although more technical assistance will be needed.

## 4.1 Major National Agencies

**Ministry of Public Health (MOPH):** This ministry publishes technical guidelines, establishes ministerial regulations, and announces enforcement mechanisms with respect to sanitation. Within MOPH, the Department of Health (ANAMAI) develops guidelines on appropriate technologies and methods of septage management for different scales of LGAs. In 2001, ANAMAI developed the "Manual on Integrated Septage Management."[41] In 2008, it hosted the "Regional Symposium-cum-Training Workshop on Sustainable Faecal Septage management in Asia and the Pacific." As a result of the symposium, ANAMAI has restarted an annual training program on septage management that invites LGAs that have septage treatment facilities that they are not operating to attend a five-day training. ANAMAI is also developing a database and Web site on public health-related policies that address septage and solid waste, model local regulations, and guidance for LGAs of different scales. Since many small LGAs are not aware of the importance of managing sanitation, ANAMAI has begun an initiative to improve the management of LGAs' public bathrooms as a way of building local awareness and capacity. The national ANAMAI office has 42 staff, three of whom are directly involved in septage management. Regional offices have recently conducted surveys of LGAs and residents on actual septage management conditions.[42]

**Ministry of Natural Resources and Environment (MONRE):** This ministry is responsible for drafting and implementing regulations on sewage, and contains several departments that manage environmental quality and sewage. While these departments currently do not address septage, they have the staff, knowledge, and experience to provide valuable contributions to septage management.

- **Office of Natural Resources and Environmental Policy and Planning (ONEP):** ONEP sets environmental policymaking and planning.[43] Along

THAMMARAT KOOTTATEP, ASIAN INSTITUTE OF TECHNOLOGY

**As part of a pilot project to improve septage treatment in Lampang, the Asian Institute of Technology partnered with Lampang Municipality to build a treatment facility that uses a grid of reed beds to treat septage leachate to secondary levels.**

with the Department of Local Administration, it allocates funding to LGAs for environmental management.[44] It reviews environmental impact assessments for large housing estates and specific buildings, prepares and monitors environmental plans, and sets user fees for environmental services. It also plays a key role in preparing national environmental policy and long-term plans, which group septage with solid waste.

- **Pollution Control Department (PCD):** The PCD focuses on municipal water pollution control by setting standards, monitoring water quality, and providing technical support to LGAs. The Domestic Wastewater Division, which has a staff of thirteen,[45] requires buildings to use proper wastewater treatment systems and regulates the maximum allowable concentration of wastewater discharge from buildings.[46]
- **Department of Environmental Quality Promotion (DEQP):** This department promotes public education on environmental issues, prepares information systems, and trains government and private sector staff. Its Environmental Research and Training Center regularly provides trainings on sanitation and wastewater treatment.[47]
- **Wastewater Management Authority (WMA):** Established in 1995, WMA is a state-owned enterprise created to help LGAs optimize, operate, and maintain their wastewater facilities. A 2003 MONRE survey revealed that more than 75 percent of the over 100 existing WWTPs are in poor condition due to lack of staff capacity, weak enforcement in collecting wastewater user charges, inadequate public education about the importance of wastewater services, and lack of operations budget. To rehabilitate these facilities, WMA provides LGAs with technical assistance for operations and maintenance, billing and collection, tariff setting, public outreach, and the selection of appropriate treatment technologies. WMA is also charged with helping LGAs construct new wastewater treatment facilities.

## 4.2 Major Sub-National Agencies

**Local Governments Authorities (LGAs):** Under the Public Health Act, LGAs are responsible for providing desludging services, setting local regulations on septage collection, transport and treatment, and ensuring that waterways are free from nuisances. Depending on the locality, the LGA may establish one or more of the following agencies to address wastewater management: Public Health and Sanitation Divisions, Public Health and Environmental Bureaus, and Civil Engineering Divisions. Only municipalities and first-level Tambon Administration Organizations currently provide septage collection services, and some of these LGAs also provide septage treatment. The larger LGAs that provide both wastewater and septage services separate these sectors, thereby diluting resources, while most of the smaller LGAs lack the awareness or the capacity to provide services for either wastewater or septage.

**Bangkok Metropolitan Authority (BMA):** The Solid Waste, Hazardous Waste and Night Soil Management Division provides septage collection service, operates two septage treatment facilities, and employs around 130 staff members (compared to the Sewerage and Drainage Division, which has 450 staff).[48] The 2005 BMA budget allocated $3 million for septage management; BMA's budget mainly comes from local taxes and central government transfers.[49] The 2008 BMA budget set aside $200 million for new environmental management projects, of which less than $1 million went to public toilets and septage management.[50]

## 4.3 Other Organizations

**Private Service Providers:** A number of private operators provide collection services. Though there are no national-level figures, in western Thailand, 28 operators in eight provinces run 131 registered septage collection vehicles.[51] According to the PHA, all private operators must register with the LGAs in their service area. However, the majority of operators do not register in order to avoid service restrictions and taxes. Even though private operators can charge as much as $100 per cubic meter and discharge septage illegally, households sometimes opt for their services instead of public operators because they provide immediate service.[52] Many local agencies lack the capacity to control illegal or private operators.

**International Organizations:** International agencies have supported a few septage management projects in Thailand, although none have raised local capacity on a widespread level. In its wastewater master plan for BMA in 1999, JICA recommended that BMA plan for future septage treatment systems.[53] In Nakhon Ratchasima

### Case Study: Septage Management in Bangkok

The Bangkok Metropolitan Authority (BMA) provides septage services through the Department of Environment's Solid Waste, Hazardous Waste and Night Soil Division. This division provides septage collection in each of the city's 50 districts, and residents call local BMA offices to request desludging. In 2005, BMA registered nearly 110,000 calls for septage collection, and generated around $1 million from household fees. It owns fifty vacuum trucks, and claims that there are very few cases of illegal desludging in the city.[28] The BMA also owns two STPs, one of which operates under a private concession, and both use activated sludge technology. Together, these two plants can treat 1,200 cubic meters of septage per day, and operate at 50 to 70 percent capacity.[29] The director of the division notes that the treatment volume is low because people wait until their tanks are full, which may take five to 10 years since the tanks have open bottoms, before they call to request desludging. The combination of infrequent desludging, the use of canals as wastewater conduits, and inadequate wastewater treatment contributes to over 80 percent of the organic pollutants in Bangkok's waterways.[30] Due to the policy division of wastewater and septage management, the Solid Waste, Hazardous Waste and Night Soil Division operates in isolation from BMA's wastewater department, which runs seven WWTPs that treat about one-third of the three million cubic meters of wastewater the city generates each day.[31]

Municipality, Japan's Institute for Global Environmental Strategies provided financial and technical support to install anaerobic filter tanks to existing septic tanks.

**Research Institutions:** Research institutions have played a major role in developing Thailand's technical expertise in septage management. Key organizations include the Asia Institute of Technology (AIT), Mahidol University, Kasetsart University, and Sandec/Eawag, through its collaboration with AIT. Professors and students at the environmental and engineering departments have conducted research on the impact of septic tanks on water quality, the use of treatment wetlands, the development of anaerobic digesters with oxidation ponds, and testing for end product quality. These institutions could play an important role in providing technical assistance for expanding septage management in Thailand.

## 4.4 Key Challenges and Strengths

**Challenge:** The division of water, wastewater, and septage management among MOPH, MONRE, and other regulatory agencies in Thailand prevents systematic thinking in addressing water quality. At all levels of government, there is a lack of communication between sector agencies, which creates operational inefficiencies, especially in areas with smaller populations.

**Challenge:** There is little national support for local implementation. While MOPH has provided guidance documents and will provide training, MOPH is largely not a technical agency and does not provide on-the-ground technical assistance the way WMA provides assistance to LGAs on wastewater.[55]

**Challenge:** Most local governments do not enforce compliance in septic tank construction or private operation; nor does the PHA require or authorize MOPH to enforce local government compliance.

**Strength:** Institutional responsibilities are relatively clear, and the larger cities in the country provide septage collection and treatment services, although not on a scheduled basis. Technical support from academic institutions is also strong.

# 5.0 FUNDING SOURCES

## 5.1 National Funding Sources

Since the 1990s, Bangkok has invested $1 billion in wastewater infrastructure, compared to $2.6 billion invested in water supply.[56] From 1985 to 2000, Thailand's national government also funded 57 new wastewater treatment plants outside of Bangkok, totaling $500 million in investments, and the country now operates over one hundred such plants nationwide.[57] However,

the national government continues to under invest in septage collection and treatment infrastructure. For instance, in 2006, the national government provided LGAs with a total of only $68 million for all aspects of environmental management, including funding for wastewater collection and treatment, solid waste, and STPs.[58]

### 5.2 Local Funding Sources

Septage management is also a low priority for LGAs, which tend to focus more on well-funded, short-term public health campaigns like "Drink Don't Drive." Some have also recently shifted their focus to climate change and disaster prevention and mitigation. Those interested in obtaining national funding for septage management projects must first obtain local and provincial government support for the project in the Provincial Environmental Action Plans (PEAPs). The National Environment Board reviews PEAPs and then allocates the budgets and sets funding terms, and then distributes the funds to LGAs through the Department of Local Administration (DOLA) in the Ministry of Interior. DOLA approved a number of new solid waste facility projects, fourteen in 2008 and 10 in 2009. DOLA also approved a total of four STPs with a total budget of more than $40 in 2008 and $56 million in 2009.[59] The cap on septage collection fees at the 1992 level poses a major challenge to LGAs, who cannot charge rates that recover both collection and treatment costs.

### 5.3 Public Awareness and Willingness to Pay

Given the widespread use of septic tanks and the lack of adequate sewerage systems, regularly desludging septic tanks and treating septage is a relatively simple way to improve local water quality. However, both among septage management government staff and the public, there is little awareness of the need for regular desludging. Septage management departments note that they wait for the households to request desludging of their tanks, which may take five to ten years to fill. Public understanding of the connection between water quality and public health can also be low, especially in low-income communities, which in turn leads to low willingness to pay for wastewater services. A 1999 survey of households in the slums of Bangkok found that 30 percent of people had had a case of gastro-intestinal disease in the previous month, but while 75 percent of people thought that toilets flushed to open sewers, only 11 percent of people thought that this was in any way related to the water supply or their illness. The authors independently found that 50 percent of the surveyed communities were served by communal septic tanks, but typically the wastewater either went to overflowing septic tanks or straight into canals.[60]

### 5.4 Key Challenges and Strengths

Challenge: The segmentation of water, wastewater, and septage services prevents the government from evaluating sector costs and benefits from the point of generation to final disposal. As a type of solid waste, septage is funded separately from, and less than, water and wastewater at the national and local levels.[61]

Strength: The use of treated sludge as a fertilizer is widely accepted throughout Thailand, which has the benefit of mitigating treatment costs.

## 6.0 RECOMMENDATIONS

Thailand has established the foundations of septage management, and now needs to improve and expand upon existing laws and practices. This report recommends that, in the short-term, Thailand focus on strengthening management practices in cities that already have treatment facilities through trainings, technical assistance, information and education campaigns, and innovative financing and billing mechanisms. In the medium-term, this report recommends that national agencies reorganize or allow for the local reorganization of wastewater management in Thailand to allow for the systematic planning of septic tank and sewerage development, and wastewater and septage collection and treatment.

### 6.1 Short-Term Recommendations

Strengthen Existing MOPH Manual. The Ministry of Public Health can strengthen its guidelines by requiring sealed septic tanks, and providing guidance on effluent discharge quality and treated septage discharge reuse standards. The Manual could also provide recommendations on regular desludging, public outreach, educational campaigns, and the content of operator training programs. In addition, the MOPH Manual should contain a model regulation that can be readily adopted by LGAs and provide clauses on regulating septage collection companies and enforcing compliance. In further developing national regulations, Thailand may want to review the national laws and

guidelines developed by governments in Malaysia and the Philippines.

**Rehabilitate Existing Facilities.** In 2009, MOPH will restart the national septage management training program, and target participants from those cities that already have but are not operating treatment facilities. After trainings, MOPH should continue their collaboration with participating LGAs to ensure that trainees successfully transfer their new knowledge to actual improvements. During the training and afterwards, MOPH should consider partnering cities, for instance, in twinning arrangements, to catalyze the transfer of best practices.

**Establish Inter-Agency Communication and Collaboration on Wastewater Management.** As a first step to coordinating wastewater management in Thailand, MOPH and MONRE should strengthen inter-agency dialogue on septage and wastewater. Although they have different mandates, the agencies can find areas that would benefit from mutual cooperation, including standard setting, monitoring and enforcement, funding, billing, and public education.[62] The distinct bodies of expertise in each Ministry can complement each other, and both agencies can expand their capacity in providing technical assistance and public outreach.

**Promote Public-Private Partnerships.** In cities that have treatment facilities and private operators, local government agencies should engage private operators in partnerships to ensure proper septage disposal. These partnerships can begin with dialogue between the regulator and the operators about the barriers to disposal and the opportunities for win-win collaborations. Partnerships can explore different activities, such as promotional campaigns, private sector contracting, billing and collection reform, and trainings that will increase business for private collectors and promote proper disposal.

## 6.2 Medium-Term Recommendations

**Integrate Septage and Wastewater Management.** The current split in regulation and implementation of wastewater and septic tanks causes neither infrastructure to function efficiently. The national government may consider reorganizing the regulations on sewerage and septage planning and service development in Thailand such that MOPH and MONRE are jointly responsible for wastewater management or at least can legally collaborate on project implementation. Alternatively, smaller LGAs should be permitted to consolidate septage and wastewater management. An integrated management system would capitalize on the natural synergies that exist in managing these two sources of human waste, and allow for more systematic planning and development of the sewerage network.

**Increase Funding for Local Septage Management Projects.** Inadequate funding is an important barrier to LGA provision of septage projects. To address this, DOLA could increase the national government's support for these projects; MOPH should raise the cap on septage collection fees; and MOPH and participating LGAs should develop new models of public-private partnership to leverage additional funds for the sector.

**Fund Research and Pilot Projects for Alternative Technologies.** Thailand needs more research and pilot projects to create a database of alternative treatment methods that are appropriate for different conditions and scales. This could include co-treatment with sewage sludge, co-composting of raw septage with solid waste, and constructed wetlands. MOPH and MONRE can work with research institutions to identify gaps in technical applications, and support research and development to generate domestic solutions. MOPH can also develop guidelines on alternative treatment options in its septage management Manual. Depending on an LGA's density and level of development, different technologies may be more appropriate than others.

### Partnership and Participatory Planning for Septage Management[54]

The Sakon Nakorn Provincial Health Office under MOPH partnered the Regional Environmental Office 9 (REO9), DEQP, Kudbak Municipality of Sakon Nakorn Province, and the local campus of Kasetsart University to pilot a septage treatment system with anaerobic digestion tanks. The project, which also serves nearby LGAs, includes provisions for training operators on safe septage handling, and monitoring of septage disposal in public areas.

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Staff from the local drainage and sewerage company in Hai Phong manually clean a septic tank in an alley. By 2015, 95 percent of urban homes in Vietnam will have a septic tank, but the country faces challenges in operating comprehensive, sustainable septage management programs.

**COUNTRY ASSESSMENT**

# VIETNAM

| | | | |
|---|---|---|---|
| Country Population (in millions) | 86[1] | Nominal GDP (in billions) | $90[2] |
| Urban Population (in millions) | 23[1] | Nominal Income per capita | $1,040[2] |
| Urban Population (% of total) | 27%[1] | Annual Water Budget per cap | NA |
| Access to Improved Water (urban) | 98%[1] | Annual Sanitation Budget per cap | NA |
| Access to Improved Sanitation (urban) | 88%[1] | Fee to Desludge (per $m^3$) | $9-13 |
| Access to Piped Sewerage (urban) | NA | Polluted Surface Waterbodies | -- |
| Use of Septic Tanks (urban) | 77%[3] | Economic Cost of Poor Sanitation (in millions) | $780[4] |
| Treatment of Collected Sewage | 4%[3] | Others Terms for Septage in Vietnam: septic tank waste | |

**Key Challenges**

- Rapidly increasing number of septic tanks, mostly not built to code
- Lack of national regulations, guidance, coordination, and funding for septage management
- Cities are reluctant to implement the centrally mandated wastewater discharge fee
- Low awareness about septage management at government and household levels, especially in smaller cities
- Lack of space in low-income housing construction for accessible septic tanks

**Key Strengths**

- Ongoing septage management programs and facilities in several of the largest cities, with government and international support
- Local models of low-cost treatment facilities, scheduled desludging, and private participation in collection and treatment
- Ongoing policy development for septic tanks and septage reuse
- Increasing government awareness of septage management due to donor-led projects

## 1.0 SUMMARY

Over three-quarters of urban households in Vietnam rely on septic tanks. Both public and private septage collection companies exist; the public companies dispose of waste in septage treatment facilities, where they exist, and landfills, while private companies tend to dispose of septage in waterways and drains, contributing to high levels of water pollution that cost Vietnam $780 million each year in health, water, and economic losses.[5] For the most part, the national government of Vietnam has not issued regulations on septage collection, treatment, or disposal. Without this national mandate, most cities have not made septage management a priority. Rather, they have focused on government-backed projects in sewerage and wastewater treatment plant development.

Nevertheless, a number of larger cities in Vietnam have developed septage management projects, usually as a part of donor-funded wastewater infrastructure programs. These projects experiment with a variety of treatment mechanisms, private and public service provision, and funding instruments. Many of these initiatives have faced challenges in developing supporting local policies, mobilizing public support, and instituting payment structures once external funding programs come to a close. As a result of these initiatives, however, the national government is becoming increasingly aware of septic tanks and septage management, as evidenced in its current efforts to update septic tank guidelines and septage reuse standards.

To strengthen Vietnam's efforts in septage management, this report recommends several near-term (within three years) and medium-term (within three to five years) recommendations. In the near-term, international organizations, research institutions, and national agencies can help cities that already have the physical capacity to treat septage to develop corresponding management policies and practices. The Ministry of Construction and the Ministry of Health should expand their ongoing initiatives to develop septic tank guidelines and septage reuse standards into a comprehensive septage management manual. In the medium-term, the central government should set aside funding for local septage management projects, promote septage management by leveraging functional models already established in the country, and create ongoing training and technical assistance for local implementers. In addition, local People's Committees can reform their division of roles and responsibilities with local public service companies to allow for more effective service provision and regulatory enforcement.

## 2.0 BACKGROUND AND CONTEXT

### 2.1 National Sanitation Context

An estimated 65 percent of people in Vietnam have access to sanitation at the national level, with 88 percent access in cities, and 56 percent access in rural areas.[6] Access to wastewater treatment remains very limited. Since only six major cities have wastewater treatment plants (WWTPs),[7] an estimated 96 percent of wastewater in Vietnam remains untreated. Most industrial and domestic wastewater discharges directly into canals and rivers, resulting in severe water pollution.[8] The Dong Nai river basin around Ho Chi Minh City (HCMC) is considered biologically dead and the Nhue Day river basin around Hanoi is similarly impaired, with septage contributing over 55 percent of the waste load.[9] As a result of inadequate sanitation provision and wastewater treatment, waterborne diseases are widespread: hospitals register 250,000 cases of diarrhea a year and 44 percent of children have been infected with some kind of intestinal worm.[10] In 2008,

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**A desludging services operator empties a neighborhood septic tank. The accessibility of septic tanks can pose a significant challenge for septage collectors, and serve as a deterent to more frequent desludging.**

the World Bank estimated that poor sanitation costs Vietnam $780 million in economic losses each year, or 1.8 percent of GDP.[11]

## 2.2 Onsite Sanitation Prevalence

Septic tanks form the foundation of Vietnam's urban sanitation infrastructure and their importance is growing. Over 77 percent of households in cities and provincial towns, 40 percent in district towns, and 19 percent in rural areas use septic tanks.[12] Though there are codes for septic tanks, lack of enforcement has resulted in a variety of problems with the existing stock of tanks in the country. Traditionally, septic tanks, which tend to be three to four cubic meters in size, were built inside the house; the difficulty of accessing them discourages owners from frequent desludging. In addition, households and developers do not always build standard septic tanks, even if they submit the correct designs to the local Department of Construction. Anecdotally, some new housing developments do not build septic tanks at all, and instead connect directly to the drainage system, causing blockages and flooding.[13] Especially in small towns with higher elevations, many tanks also have open bottoms that allow direct leaching into the groundwater.

Looking forward, septic tanks will become even more prevalent in Vietnam. The Ministry of Construction's 1999 policy document, "Orientation for the Development of Urban Sewerage and Drainage until 2020" (OUSDD), requires dry and bucket latrines in urban centers to be eliminated from Hanoi before 2001 and from all cities in Vietnam by 2005. As a result, water supply projects are replacing dry latrines with flush toilets, the majority of which connect to septic tanks. In addition, the Ministry of Construction's 2008 Vietnam Building Code requires domestic wastewater from toilets in houses, public buildings, and hospitals to be treated in septic tanks before entering the municipal sewerage system. An estimated 95 percent of urban private homes and 60 percent of rural homes will be connected to a septic tank by 2015. In this context, proper septage management is a critical component of urban wastewater management. The widespread use of septic tanks in sewered areas can also present a challenge if WWTPs lack adequate solids for the digestion process.

## 2.3 Septage Collection and Treatment Capacity

Households pay service providers to empty septic tanks when they are full, which can take from three months

As evident in the sludge build up on the river bank, this site is used as a septage disposal point. Disposal of untreated sludge into waterways can rapidly degrade water quality.

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Landfills also serve as the dumping grounds for septage in many cities in Vietnam. Although this can be a temporary solution, cities can build separate septage treatment systems at landfills to safely contain human excreta and produce a reusable end product.

## World Bank Three Cities Sanitation Project[14]

The World Bank has assisted three medium-sized cities – Ha Long, Hai Phong, and Da Nang – in building septage treatment plants (STPs) and developing scheduled desludging programs. The World Bank also required these cities to start charging the new wastewater bills mandated by national law, in order to generate funds for the desludging program. As the following case study of Da Nang reveals, these projects faced ongoing operating challenges after World Bank funding ended.

With a population of 750,000, Da Nang is Vietnam's fourth largest city. As part of a World Bank sanitation initiative, the local Urban Environmental Company (URENCO) initiated regular desludging for Da Nang's 100,000 septic tanks in 2004. It aimed to desludge 20,000 tanks a year, on a five-year rotating cycle. During the pilot period, desludging expanded by 300 to 600 percent in different communities. The URENCO conducted awareness campaigns and partnered with private companies, which provided 60 percent of the city's collection capacity. The URENCO paid collectors once it certified receipt of the waste at the local landfill's STP, which was constructed with World Bank funding. The treatment system dewaters septage in settling tanks, treats the liquid effluent with landfill leachate, and disposes of the dried septage in the landfill. The City of Da Nang paid for the desludging program through a 10 percent wastewater fee collected on households' water bill. Collection and treatment costs totaled $9 per cubic meter of septage.

Unfortunately, the project was not integrated into local policies and the city has not promoted project implementation. From 2004 to 2008, it funded desludging for only 33,000 tanks (instead of the proposed 100,000), and in September 2008, the Local People's Committee ended the scheduled desludging program. Now, services are once again on-demand, which the URENCO estimates will fill 25 percent of treatment capacity. The funds generated by the wastewater treatment surcharge on water bills, initially used for the desludging program, will soon be used to fund the new WWTP, once it opens. Some private companies also continue to operate, charging households a higher fee and discharging septage illegally.

The City People's Committee of Hai Phong, however, has approved a 15 percent surcharge on the water bill, 90 percent of which will allocated for the local drainage and sewerage company to fund wastewater and scheduled desludging services. The local company aims to provide scheduled desludging for all of the city's 160,000 septic tanks on a five-year cycle.

## Nam Dinh's Scheduled Desludging Initiative

As part of Nam Dinh Urban Development Project, the city developed a strong septage management program in the early 2000s. A planning study found that Nam Dinh, a city of 230,000 people, would soon provide septic tanks to 80 or 90 percent of its residents, but did not have any infrastructure for emptying or treating septage.[15] Responding to this challenge, Nam Dinh updated its solid waste management regulation to require that septage disposed of at the landfill be treated according to established procedures, developed a scheduled desludging program, and built a septage treatment facility at the city's landfill.[16] The 200-cubic meter facility used settling tanks and constructed reed beds to treat septage, a system that required very little operations and maintenance. Project financing covered both construction and scheduled desludging operations.

However, as soon as the pilot period ended, desludging funds ran out, and the city did not mobilize additional government or household support for the project. Not surprisingly, the facility closed, and then reopened in 2007, operating on four cubic meters of septage every two to three days. Like Da Nang, Nam Dinh's experience indicates the need to complement project "hardware" with "software" components such as local policy integration, local government funding support, and public outreach, and billing and collection development.

to ten years.[17] A mix of state-owned, limited liability companies and private companies provide desludging for $18-25 per tank in Hanoi[18] and $40-50 per tank in HCMC.[19] Due to a lack of treatment infrastructure, service providers usually dispose of septage in drains, fish farms, and waterways. For example, in Hanoi, service providers collect 300 tons of septage daily, but the Cau Dien Composting Plant, even after its expansion, can only treat half the volume.[20] Since private collectors are charged a tipping fee to dispose of septage at public treatment plants, the Hanoi Environmental Police reports that none of the 40 private desludging companies uses the Cau Dien facility. If caught, truck drivers are fined $180 and their trucks are impounded for 10 days, but these penalties have not deterred illegal dumping.

With official development assistance (ODA) funding, several cities in Vietnam have built STPs and have initiated septage management programs. As described in the above case studies, these cities face a variety of challenges. Nam Dinh and Da Nang, for example, both received funding to construct treatment plants, but now find that they lack the operations and maintenance (O&M) budgets to fund septage collection, leaving new facilities running at 28 percent capacity or closed, respectively. Hanoi has the collection capacity, but lacks adequate treatment facilities. In HCMC, there is a mismatch between septage sources and treatment locations as only 20 percent of trucks use the new septage treatment facility located 20 kilometers out of the city center.

These experiences demonstrate the challenge of creating sustainable septage management programs using external funding in the absence of a supportive regulatory framework. To succeed beyond the period of external intervention, projects need to obtain the support of local agencies and officials, integrate infrastructure implementation into city policy frameworks, and educate government staff and the public about the project and its long-term value.

## 3.0 LEGAL FRAMEWORK

Vietnam's laws specify the design, construction, and operation of septic tanks, but do not regulate septage collection, treatment, or disposal. The 1999 policy document, "Orientation for Urban Sewerage and Drainage Development until 2020" (OUSDD), requires all dry and bucket latrines to be eliminated by 2005 and the 2008 Vietnam Building Code requires dischargers to pre-treat their domestic wastewater in septic tanks before it enters the public sewerage system.[21] However, while these regulations provide the imperative to improve sanitation and wastewater treatment, they lack specificity and do not address septage management. As a result, septage in Vietnam remains a largely uncontrolled pollutant. This problem will likely worsen, as urbanization continues and new housing developments install septic tanks in compliance with the OUSDD.

### 3.1 Septic Tank Design

The National Design Standard of Vietnam for Wastewater Systems, which applies mainly to urban areas, sets the technical specifications and standards for the size and design of septic tanks.[22] Key provisions include the following:

- Septic tanks conduct primary treatment, then discharge into stabilization ponds or filtration fields;
- Tank volumes are designed based on annual desludging and settling times;
- Flow volumes are capped based on tank chamber design;
- Septic tanks must have a sealed bottom; and
- Their location and dimensions should allow for inspections and desludging.

In general, these regulations have existed mainly on paper, as most cities lack the enforcement capacity to ensure compliance. At the time of writing, the Ministry of Construction and the Ministry of Health are updating the design standards for septic tanks that include model designs for systems that use urine diverting toilets, and designs for fiberglass or prefabricated systems that are visible, easier to manage, and easier to remember to maintain. In addition, these ministries are jointly developing a manual on septic tank O&M, which includes guidance on desludging frequency based on the size of the tank.[23]

### 3.2-3.3 Septage Collection and Treatment

There are as yet no national laws governing the collection and treatment of septage. In the 2009 update to the OUSDD, the Ministry of Construction briefly mentions

under the Article on Implementation Measures that the MOC should review, update, and issue new regulations, including on the treatment of sludge from wastewater treatment plants and septic tanks. The MOC may issue new regulations in the future on septage, but this will take some time. Meanwhile, all desludging operators are only required to obtain a business license. Since septage collection companies often also collect solid waste, they commonly dispose of septage at landfills, although solid waste laws also do not address septage. The Ministry of Health is currently drafting guidelines for composting human excreta into reusable fertilizer, based on the World Health Organization's 2006 "Volume 4: Excreta and Grey Water Use in Agriculture" of the "Guidelines for the Safe Use of Wastewater, Excreta, and Grey Water." This initiative indicates that people widely apply untreated septage as a fertilizer, and that there is a future for the sustainable, and potentially profitable, reuse of treated septage.

### 3.4 Challenges and Strengths

Challenge: Due to lack of enforcement by the local Departments of Construction, septic tanks are usually not designed to code, making them difficult to access for maintenance and desludging.

Challenge: The national government has not mandated septage management or provided policy guidance. As a result, local governments have no incentive to promote septage management, invest scarce resources in operating treatment facilities, or support such projects once ODA project funding ends.

Strength: The cities of Nam Dinh and HCMC have issued local septage management regulations, which can serve as models for other cities to replicate and adopt.

## 4.0 INSTITUTIONS AND IMPLEMENTATION CAPACITY

At the central level, several agencies are responsible for issuing and guiding the implementation of policies for the development of water supply, drainage, and sewerage infrastructure. While these agencies are aware that septage collection and disposal is a problem in the country, they have taken no steps to provide guidance at the national level.[26] At the local level, the ultimate responsibility for water and sanitation service provision is shared between the People's Committees, which control budgets and tariffs, and the public service companies, which provide services and retain equipment. This division of labor reduces the companies' capacity to improve services or infrastructure. The OUSDD aims to reduce government subsidies to the public companies and eventually combine water supply, sanitation, and drainage companies into one company in small- and medium-sized cities.

### 4.1 Major National Agencies

Ministry of Construction (MOC): The MOC is responsible for establishing and implementing policies on sanitation and wastewater infrastructure in the country. In particular, it develops infrastructure for flood control, water supply, sanitation, and wastewater programs and plans; establishes national and sector codes and standards on the technical and economic norms for the design, construction, and maintenance of

#### HCMC Establishes Local Regulation on Septage Management[24]

Unlike most other cities in Vietnam, HCMC passed legislation in 2007 on septage management in order to control rampant illegal septage disposal by private service suppliers.[25] Several key provisions of this regulation may be useful as a model for other cities in Vietnam. The regulation stipulates that septage removed from septic tanks, sewers, and drains be transported to a designated solid waste treatment plant (such as the Sludge Treatment Facility at Da Phuoc Solid Waste Treatment Complex in HCMC); requires service providers to register with the government and follow strict guidelines; sets penalties for non-compliance (such as administrative punishment or criminal proceedings); and calls on residents to follow the principle of "payment for service." The law charges the Department of Natural Resources and Environment, Municipal Public Works Department, Commune and Ward People's Committees, and Inspection Teams to implement the new regulations.

### Privatized Septage Management in HCMC

HCMC is the first city to have privatized septage management in the country. The STP at Da Phuoc Landfill owned by Hoa Binh Waste Treatment Ltd. is privately built, owned, and operated. The treatment process dewaters the septage and produces a biosolid that is commercially sold as fertilizer. The facility treats the leachate to required standards through activated septage technology before discharging the water into the environment. However, because the facility is located 20 kilometers outside of the city, most desludging companies choose not to travel the distance. The provincial Department of Natural Resources, which oversees collection, lacks the enforcement capacity to do more than fine companies minimal amounts for improper disposal.

sanitation systems; and guides, instructs, and monitors the implementation and adoption of these plans and codes. For many of these activities, it delegates responsibility to the Provincial People's Committees, although the division of labor between MOC and the provincial agencies is unclear, and sometimes undermines policy implementation.[27]

**Ministry of Health (MOH):** The primary responsibility of the MOH is to issue standards on drinking water quality and sanitation in rural areas. It has written guidelines for the development of toilets and septic tanks in rural areas, and also conducts awareness campaigns in urban areas to raise local understanding of the relationship between water quality and health risks. Following a cholera outbreak in Hanoi in April 2008, an MOH official commented that, "The sewage from septic tanks flows into the lakes…when people use the lake water for different purposes, such as washing food, they are helping to spread the disease." Together with MOC, MOH is now updating national codes on the design of septic tanks.

**Ministry of Planning and Investment (MPI) and Ministry of Finance (MOF):** The MPI is responsible for making sure the country reaches its national targets for sanitation; in coordination with MOF, it arranges effective financing for sanitation programs approved by the central government. The MOF sets tariff frameworks in cooperation with the MOC to guide, check, and monitor tariffs and fee collection.

## 4.2 Major Sub-National Agencies

**Provincial-Level People's Committees:** Local governments are responsible for creating an overall framework for water and sanitation. This includes establishing goals and targets, working with the local Department of Construction to assign city agencies roles in water and sanitation management, developing water and sewerage plans, organizing implementation, authorizing fees and tariffs, and appropriating land for the purposes of wastewater treatment. Typically, local government delegates these responsibilities to public service companies, but continues to control the funding, revenues, and tariff rates.

**Public Service Companies:** Publicly owned companies, managed by the local and provincial Departments of Construction, usually provide the water supply and sanitation services in Vietnam's cities. In some provinces, sewerage and drainage services are provided by Water Supply and Drainage Companies (WSDC), while in others Urban Environmental Companies (URENCO) or Urban Public Works Companies (UPWC) are responsible for providing a host of environmental services, including drainage, septage management, solid waste, street cleaning, and park and cemetery management. The most common public desludging service provider is the URENCO, although any of these companies may serve in this capacity depending on who operates the landfill or STP in the city. The national government is in the process of equitizing a number of publicly owned companies, or listing them on the stock exchange as partially private businesses, with the state continuing to own a majority share.[28] Equitization has thus far been adopted for fewer than 10 provincial water supply companies, and some URENCOs. No WSDCs have yet been equitized.[29]

While public service companies have the engineering, environmental, and planning staff to improve their septage management services, they require additional training in desludging services. These companies

have little managerial autonomy, and therefore, little accountability to meet or improve standards. Furthermore, the local People's Committees set restrictive tariff rates that prevent cost recovery for O&M, much less capital investment reserves.[30] As a result, many URENCOs tend to take a passive stance towards service provision and expansion.

## 4.3 Other Organizations

**Private Service Providers:** Since the 1990s, many private environmental companies have emerged to provide desludging services, although many continue to illegally dispose of septage. In HCMC, however, one private company has built a treatment facility and is now successfully operating the facility. The national government is currently exploring models of privatization for public service companies to improve effectiveness and efficiency.

**International Organizations:** Through the OUSDD, Vietnam has leveraged almost $850 million in official development assistance for ten cities and provincial towns to construct sewerage and drainage infrastructure. Many of these projects have developed septage management programs and treatment facilities as part of larger wastewater projects. Key funding agencies include: Asian Development Bank, Belgian Technical Cooperation Agency (BTC), Danish International Development Agency (DANIDA), Research Institute for France (IRD), Japan Bank for International Cooperation (JBIC), German Reconstruction Credit Institute (KfW), Swiss Agency for Development and Cooperation (SDC), and the World Bank. Ongoing and planned projects funded by KfW in ten cities and towns, including Bac Ninh, Hai Duong, Vinh, and Can Tho are incorporating septage treatment into wastewater treatment projects, and focus primarily on physical infrastructure needs.


RENE HEINRICH, KFW

**A private desludging company empties the contents of its vacuum truck into a city drain. In Vietnam, where most cities rely on both public and private providers, private participation poses both a challenge for regulators, and an opportunity to expand and improve desludging services.**

**Research Institutions:** Academic institutions, such as the Hanoi University of Civil Engineering's Institute of Environmental Science and Engineering, have been critical to developing national standards and policies on septic tanks, and have partnered with projects funded by international organizations. Such organizations provide continued technical assistance, and research and development.

### 4.3 Key Challenges and Strengths

**Challenge:** The public service companies lack the autonomy, funding, and incentives to improve their services, operations, and maintenance. People's Committees and these companies need to identify opportunities to adjust tariffs, or find alternative financing schemes so that operators can improve and expand service provision.

**Strength:** The Ministry of Construction and Ministry of Health are updating standards on septic tanks and septage reuse, demonstrating their growing awareness of septage management.

**Strength:** International organizations have helped build a number of STPs; while these projects are not always sustained, they have nevertheless created the foundation for septage management in Vietnam.

## 5.0 FUNDING SOURCES

### 5.1 National Funding Sources

From 1995 to 2005, Vietnam invested $1 billion in sanitation infrastructure, especially sewerage networks, and, to a lesser extent, wastewater treatment plants. However, to achieve its Millennium Development Goal for urban sanitation by 2015, Vietnam will have to invest four times as much as its current spending in this sector.[31] Furthermore, while 85 percent of the funding in the past came from international assistance, these funding agencies are unlikely to increase or even maintain current levels of funding in Vietnam in the future.[32] This means that new septage management programs will have to draw largely from user fees, local initiatives, and central government transfers.

### 5.2 Local Funding Sources

Government Decrees 67 (and accompanying Circular 125) and 88, issued in 2003 and 2007 respectively, require all cities to charge a wastewater fee to raise revenue for urban environmental protection.[33] Specifically, the public service companies are responsible for collecting a 10 percent fee on all water bills. Besides Ha Long, Hai Phong, and Da Nang where World Bank projects required a cost recovery component, however, few cities have implemented this charge, fearing public opposition. Even so, the World Bank estimates that a 10 percent charge would not be sufficient to cover septage O&M costs. In the three World Bank project sites, the government decided to stop using this revenue stream to fund septage management; only in Hai Phong has the government moved to reallocate funding for scheduled desludging.

### 5.3 Public Awareness and Willingness to Pay

To date, there is no known willingness to pay study in Vietnam. Expanded media coverage of the

#### Revolving Loans to Improve Community Sanitation

As part of its Three Cities Sanitation Project, the World Bank helped to create a revolving, micro-finance loan to improve community sanitation. In each city, the Women's Union disbursed small loans to households that would enable them to upgrade their facilities, usually to a septic tank. The program also contained a scheduled septage management program, and posted the times for desludging around the commune. During the project, desludging services were provided for free, although after the program ended, households had to pay for the service. In contrast to the common practice of sealing septic tanks with concrete, the project used plastic lids with gaskets for the openings of septic tanks to allow for easy access. Around 15,000 loans were disbursed during the first two years, and almost all loans were fully repaid within this same time period.[33] This model of lending has become increasingly popular in Vietnam, and these types of projects could be used to promote regular desludging in communities.

environmental police catching desludging companies illegally dumping septage, and scheduled desludging efforts in a few cities may be increasing public awareness of the need to manage household septic tanks. With an annual nominal income in Vietnam averaging $1,047 in 2007, desludging a septic tank could still be a costly expense for many households, especially if paid in one lump sum.

### 5.4 Key Challenges

**Challenge:** Low tariff structures and unwillingness to adopt the regular wastewater fee has made it difficult for cities with septage treatment facilities to maintain or expand current desludging programs.

**Challenge:** Almost all STPs in Vietnam are built with international funding assistance. In the future, the national government will need to find additional funding sources to support local project developments.

## 6.0 RECOMMENDATIONS

Vietnam has a growing network of STPs and desludging programs. At the national level, the Ministry of Health and Ministry of Construction are also beginning to establish standards and guidelines on septic tanks and septage reuse. These are important steps to build Vietnam's capacity to manage onsite sanitation systems, which are by far the most prevalent form of urban sanitation. To strengthen these initiatives and promote septage management around the country, this study provides the following recommendations, based on consultations with operators, government staff, and academic experts.

### 6.1 Short-Term Recommendations

**Transform Existing Projects into Model Initiatives.** A number of cities in Vietnam now have septage treatment infrastructure, but face a number of challenges related to O&M, integration into local policy, billing, private sector regulation, and public outreach. With the support of research institutions, international assistance, and national agencies, these cities can build their management capabilities to complement existing physical infrastructure through the following strategies:

- **Collaborate with Peers in the Region.** A number of cities in the region, and within Vietnam, have successfully overcome one or more of these challenges. Cities in Vietnam facing these challenges can partner with their peers in the region to strengthen each other's programs through exchanges, partnerships, and workshops. These collaborative partnerships can mitigate perceived risks and demonstrate appropriate solutions for local barriers.
- **Develop Public Information and Education Campaigns.** Local public service companies, in collaboration with local People's Committees, can build the public's willingness to desludge and pay new wastewater fees on water bills through public information and education campaigns. These campaigns can first survey public perceptions, concerns, and willingness to pay, and then tailor outreach to address these issues.
- **Incorporate Septage Management into Local Regulations, and Enforce Them.** Building on the 2008 Vietnam Building Code, Decrees 67 and 88, and models of septage management regulations in HCMC, Dumaguete (Philippines), and Malaysia, Vietnam cities can create a local framework for septage management by addressing the issue in existing wastewater or solid waste regulations, or stand alone policies.

**Establish a National Septage Management Policy.** The Ministry of Construction and Ministry of Health can expand current efforts to develop septic tank design guidelines and excreta reuse standards into a comprehensive septage management policy. This document should contain guidance on issues of septic tank design, the health and safety standards for septage collection, transport, and treatment, options for disposal and reuse, options in treatment technologies, and public outreach. In developing this guideline or policy, these ministries may benefit from exchanging experiences with agencies in other countries that have already established national policies, such as the Philippines and Malaysia.

### 6.2 Medium-Term Recommendations

**Restructure Institutional Roles and Responsibilities.** In order for public service companies to provide improved and expanded services, local People's Committees should make these companies autonomous entities that are responsible for their facilities and equipment, budgets, customer outreach, and billing and collections.

Whether or not public service companies become privatized, local People's Committees can increase the efficiency and effectiveness of public service companies by allowing them greater autonomy in setting budgets and tariffs. Local government agencies can focus their attention on enforcing compliance with septic tank design and construction, and legal septage disposal.

**Develop Training Programs to Support Local Implementation.** In support of these new national guidelines and policies, and ongoing local implementation efforts, the Ministry of Construction or Ministry of Health should create a new training program for staff from local and provincial Departments of Construction and public service companies to raise awareness, compliance, and enforcement capacity. In addition to trainings, the MOC and MOH should create mechanisms to provide ongoing technical support and knowledge dissemination to local implementers.

**Increasing Central Government Financing.** The Ministry of Planning and Investment and the Ministry of Finance should increase funding for septage management, given the prevalence of onsite sanitation. This could include revolving funds, low-interest loans, or direct central government transfers, especially in support of management and implementation.

**Promote Appropriate Technology.** Many of the existing septage treatment facilities in Vietnam use activated sludge technology, a complex and energy intensive system to maintain. Given the novelty of paying for wastewater services at household and government levels, cities that are considering building facilities should select non-mechanized technologies that they will be able to maintain, operate, and fund for the long-term. The MOC should compile guidelines for a variety of treatment technologies, along with associated construction, operations, and maintenance costs.

**Scale Up Model Practices and Promote Knowledge Exchange.** As early adopter cities like Ha Long, Da Nang, Hai Phong, Nam Dinh and a host of others develop functioning management programs to complement existing treatment systems, Vietnam will have a strong collection of country best practices. As other cities in Vietnam develop septage management projects, they should work with their colleagues in these early adopter cities to share lessons learned. Sector associations such as Vietnam Water Supply and Sanitation Association, can provide trainings and disseminate guidance documents, model policies, use of alternative technologies, and case studies of best practices in Vietnam and the region.

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