



URBAN WASTEWATER MANAGEMENT IN INDONESIA

Key Principles and Issues
in Drafting Local Regulations

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Abbreviations

ADB	Asian Development Bank
BOD	biological oxygen demand (at 5 days)
IPLT	instalasi pengolahan lumpur tinja (septage and excreta treatment plant)
SDO	Service Delivery Organization
TSS	total suspended solids
WWTP	wastewater treatment plant

1. Introduction

As part of its commitment to increase the coverage of sanitation, hygiene, and wastewater management in the Southeast Asia region, the Asian Development Bank (ADB) is also keen on helping provide local governments an adequate regulatory framework that would facilitate the implementation and management of wastewater collection, treatment, and disposal systems. To improve local government legislation on wastewater management and fill in the gaps of the national policies and existing regulations, especially in terms of technical and economic aspects, ADB has promoted the preparation of a guidance document for future local government wastewater management regulations (*Peraturan Daerah*) in Indonesia, the purpose and scope of which were agreed with the Directorate General of Human Settlements (*Direktorat Jenderal Cipta Karya*) of the Ministry of Public Works (*Kementerian Pekerjaan Umum*).

This document is provided as an aid to help implement certain new aspects in regulations of this type, such as

- (i) mandatory and scheduled desludging of septic tanks and treatment and disposal of septage in an appropriate and approved treatment facility, be it a specific sludge treatment plant or septage and excreta treatment plant (IPLT), or the wastewater treatment plant (WWTP) (or *instalasi pengolahan air limbah*) of the centralized system;
- (ii) proper design standards for new septic tanks;
- (iii) incentives and penalties for scheduled desludging of septic tanks and connections to the centralized sewer network;
- (iv) mandatory requirement to connect to the centralized sewer network, where available;
- (v) design standards and specifications for new connections to existing sewers;
- (vi) effluent standards for discharges into sewers, including a list of prohibited substances and practices;
- (vii) local government's right to enter private property for inspection of individual sewerage facilities and household plumbing;
- (viii) local government authority to issue and enforce permits for discharges into sewers based on the appropriate pretreatment of wastewater from commercial and industrial establishments;
- (ix) financial provisions for sewer use and septic tank desludging; and
- (x) enforcement and penalties for violations.

The document is intended to serve as a guidance document for local governments to develop their regulations on urban wastewater management (*peraturan daerah tentang pengelolaan air limbah perkotaan*). Therefore, the structure and the contents of the document follow that of a regulation to be set out in a way that its chapters and sections can be readily transformed into the chapters and articles of a regulation. Furthermore, the document is understood to be fairly useful for the preparation of the so-called “academic script” (*naskah akademik*) required by a Justice and Human Rights Minister’s Regulation¹ as part of the development of any legal instrument in Indonesia.

¹ Peraturan Menteri Hukum dan Hak Asasi Manusia Republik Indonesia Nomor M.HH-01.PP.01.01 Tahun 2008 tentang Pedoman Penyusunan Naskah Akademik Rancangan Peraturan Perundang-Undangan (Regulation of the Minister of Justice and Human Rights of the Republic of Indonesia Number M.HH-01.PP.01.01 2008 regarding the Guidelines for the Preparation of Academic Scripts for the Drafting of Legal Provisions).

2. Background and Rationale

Legislation on wastewater management or sewerage in Indonesia rests on the same three pillars as in most countries: public health, housing and urban development, and the protection of the environment, represented by the following laws: *Law No. 36 of 2009 on Health*, *Law No. 1 of 2011 on Housing and Residential Areas* (Government of Indonesia 2011), *Law No. 28 of 2002 on Buildings* (Government of Indonesia 2002), and *Law No. 32 of 2009 on Environmental Protection and Management* (Government of Indonesia 2009a).

There is no specific and comprehensive wastewater management law in Indonesia similar to the *Federal Water Pollution Act* (Government of the United States 1972), commonly called the Clean Water Act (1972), of the United States, or the *European Council Directive 91/271/EEC of 21 May 1991 concerning Urban Wastewater Treatment* (Council of the European Union 1991). The only legal instruments relating to wastewater available are regulations and decisions of the Minister of the Environment establishing effluent standards for “domestic” wastewater, the *Decision of the Minister of the Environment No. 112 of 2003 regarding Domestic Wastewater Quality Standards* (Government of Indonesia 2003); and for industries, the *Regulation of the Minister of the Environment No. 3 of 2010 concerning the Standard Quality of Industrial Zone Sewage* (Government of Indonesia 2010) and a number of specific ministerial regulations and decisions for the most important industrial sectors available in Indonesia. Some local (provincial) regulations also exist, establishing generally more stringent effluent quality standards.

The most important legal instrument that governs wastewater management at the local level is *Law No. 23 of 2014 on Local Government* (Government of Indonesia 2014), which attributes local (i.e., provincial, regency, and/or municipal) administrations the responsibility to cover, on a mandatory basis, the so-called basic services that include health, public works and spatial planning, and housing and residential areas, as well as services not determined as basic, such as environment. In the Annex of the law on the distribution of competencies between the different levels of government, it is set forth that wastewater systems development, as well as the management of the systems considered of national interest, is a national competency, while the development and the management of the other systems is established as regional responsibility for regional systems and regency/municipal responsibility for regency/municipal systems. This law therefore provides local (i.e., provincial [*provinsi*], regency [*kabupaten*], and municipal [*kota*]) governments the right obligation to establish wastewater services to comply with all state laws and regulations and regional/local regulations relating to environmental management, water quality, and wastewater management.

Based on this law, local governments need to adopt a specific regulation, a so-called “Sanitation Code” or a “Wastewater Management or Sewerage Regulation” or “Ordinance” as it is often called in English-speaking countries to enable them and their service delivery organization—which can be set up as a *Perusahaan Daerah Pengelolaan Air Limbah* (local government-owned wastewater enterprise), a wastewater department of a *Perusahaan Daerah Air Minum* (local government-owned water supply enterprise), a *Badan Layanan Umum Daerah* (Local Public Service Agency), or a *Unit Pelaksana Teknis Daerah Pengelolaan Air Limbah* (Local Technical Implementation Unit for Wastewater Management)—to comply with all state laws and regulations and regional/local regulations relating to environmental management, water quality, and wastewater management itself. These regulations derive from the abovementioned local government competency for wastewater management, which is why they have to be adopted at the local government level. This is reasonable because wastewater management systems, both on-site (individual or community-based) and off-site (centralized), can be quite different from one another in different cities or localities.

3. Purpose and Scope

A local government regulation on wastewater management is intended to govern the relationship between the local government and/or its service provider and the users, establishing the rights and obligations of both. The regulation should also set forth uniform requirements for the users of the regency's or city's wastewater management services, both for existing on-site facilities and newly developed off-site sewerage systems and wastewater treatment plants (WWTPs), to ensure public health and safety as well as the respect for the environment, in accordance with the legislation in force. On the other hand, the regulation should not contain aspects that fall outside the scope of this relationship, such as wastewater system planning and development, as well as operation and maintenance of centralized sewerage systems and WWTP.

As local wastewater management in Indonesia includes both on-site and off-site systems, local government wastewater regulations should deal with both systems, including (i) the individual and community-based wastewater collection and treatment facilities, and the public services and facilities aimed to extract, handle, transport, and treat septic tank sludge produced in them and (ii) the centralized sewerage system comprising the public sewer network and the WWTP, establishing the roles and responsibilities of local government and users in relation to them. It is to be noted that in other countries where off-site wastewater treatment systems are overwhelming, the remaining on-site systems are generally dealt with in a separate regulation.² In Indonesia, however, where the two systems and services coexist and will do so for a long time, as on-site wastewater management will still be very much present in many cities in the decades ahead; it is recommended that a local government regulation encompass them equally while at the same time clearly distinguishing between them and highlighting their particular aspects. The solution proposed in this document is to address the two types of systems and services separately.

Practically all existing regulations in Indonesia deal with “domestic” wastewater management (*pengelolaan air limbah domestik*). Domestic wastewater is defined as “wastewater from household activities, including bathing, washing, and toilet, originating

² For example, Government of the United States, County of Sacramento, California. 2010. An Ordinance of the Sacramento County Code Relating to On-Site Management of Wastewater, SSC No. 1465. <http://qcode.us/codes/sacramentocounty/revisions/1465.pdf>; Government of the United States, County of Sacramento, California. 2014. Sacramento Area Sewer District Sewer Ordinance. http://www.sacsewer.com/sites/main/files/file-attachments/sasd_ordinance_4-25-14_0.pdf; Government of the United States, County of Sacramento, California. 2013. Sacramento County On-Site Wastewater Treatment System Guidance Manual. <http://www.emd.saccounty.net/Documents/Info/EC/LiquidWaste/OWTS%20Guidance%20Manual.pdf>; Government of France, Bordeaux Urban Community. 2013. Regulation for the Public Service of Off-Site Wastewater Management. <http://www.sgacub.fr/doc/reglement.pdf>; Government of France, Bordeaux Urban Community. 2013. Regulation for the Public Service of On-Site Wastewater Management. http://www.bordeaux-metropole.fr/sites/default/files/PDF/services_proximite/reglements_eau_assainissement/reglement_assainissement_non_collectif.pdf

from settlements and/or other sources such as restaurants, offices, commercial establishments, hotels, apartments, dormitories, hospitals, and industry.” Based on this definition, however, it is necessary to change the denomination “domestic” to “urban” and distinguish clearly between domestic (household and other assimilable discharges) and industrial or commercial effluents (discharged from premises being used for business, commerce, or industry, coming from both large and small premises, including businesses such as car washes and laundrettes). Hence, commercial or industrial effluents may be wastewater contaminated with materials such as fats, oils and greases, chemicals, detergents, heavy metals, solids, food wastes, etc.

4. Objectives

Local wastewater management regulations are intended to fulfill a number of objectives. These objectives, although fairly similar, are not exactly the same for on-site and off-site wastewater management. Therefore, if the regulation, as recommended, deals with the two systems separately, the objectives may also be listed separately.

The objectives of the regulation of on-site wastewater management are to

- (i) protect the health and safety of the citizens of the regency and/or city residing within the service delivery organization (SDO) service area by ensuring that no person or entity allows untreated or inadequately treated wastewater to contaminate the water bodies or create public nuisance;
- (ii) establish an administrative framework for a comprehensive on-site wastewater management service by adopting minimum requirements for the siting, design, construction, installation, repair, modification, operation, maintenance, monitoring, and destruction of on-site wastewater treatment systems as well as for the extraction, storage, handling, transportation, treatment, and disposal of wastewater and/or septage within the regency and/or city;
- (iii) maintain the health and safety of SDO employees and those of subcontracted private companies assigned to extract, handle, transport, and treat the septage produced in the on-site wastewater treatment facilities;
- (iv) enable SDO personnel to examine and monitor the individual on-site sanitation facilities located within the premises;
- (v) provide for a permitting system that enables local government and the SDO to set out requirements for septic tanks and other on-site facilities and for their scheduled desludging;
- (vi) provide for fees for the equitable distribution of the cost of septage extraction, handling, transport, and treatment, and to establish how and when rates and fees are set out and collected; and
- (vii) establish enforcement procedures and penalties for violations of this regulation.

As for off-site centralized sewerage systems and services, the objectives are to

- (i) protect the health and safety of the citizens of the regency and/or city residing within the SDO's service area by establishing the mandatory nature of connection to the public sewerage system, wherever available, and the conditions of connection to it;

- (ii) protect the sewerage system and the wastewater treatment plant (WWTP) from damage due to inappropriate discharges;
- (iii) prevent the introduction of pollutants into the WWTPs that would interfere with its treatment process and operation and/or that will pass through the WWTP, without being removed, into receiving waters, and thus impeding the full compliance of local government with national laws on wastewater treatment and water quality;
- (iv) maintain the health and safety of SDO employees assigned to operate and maintain the sewerage system and the WWTP;
- (v) enable SDO personnel to examine the indoor installations and individual on-site sanitation facilities located within the premises to set up the conditions for its connection to the public sewerage system;
- (vi) provide for control of the quantity and quality of commercial and industrial discharges into the sewer collection system as well as pretreatment facilities;
- (vii) promote reuse and recycling of industrial wastewater which, in general, facilitates the fulfillment of effluent discharge limits;
- (viii) provide for a permitting system that enables local government and the SDO to set out requirements for sewer connections and, above all, for commercial and industrial pretreatment devices and plants;
- (ix) provide for fees for the equitable distribution of the cost of operation, maintenance, and improvement of the sewerage system and the WWTP, and to establish how and when rates and fees are calculated and collected; and
- (x) establish enforcement procedures and penalties for violations of the regulation.

5. Basic Principles and Concepts

5.1 Origin and Nature of Wastewater

Wastewater is produced by all water users with waterborne sanitation systems. In urban areas, the origin of wastewater may be essentially domestic, commercial, and industrial, while types of wastewater of agricultural or livestock origin are generally excluded. In all these uses, water is used as a conveyance medium: (i) in domestic water use, to carry waste from the discharge of toilets, showers, washing machines, sinks, dishwashers, etc.; and (ii) in commercial or industrial use, to carry waste produced in production, washing or cooling facilities, including large and small premises such as health care premises, laundries, restaurants, workshops, car washes, etc.

Urban³ wastewater effluents range from mild contamination, such as domestic wastewater, and those assimilable to it, to industrial effluents heavily contaminated with metals, organic solids, or oils. All types of wastewater may cause risks to public health and safety and pollute the environment. On the one hand, domestic wastewater contains pathogens that can cause disease spread when not managed properly. On the other hand, commercial and industrial wastewater may contain chemicals and heavy metals known to cause damage or harm to infrastructures, people, or the environment if not managed properly. To safeguard public health and safety, and prevent water pollution to protect the environment, all types of wastewater have to be adequately collected, treated, and disposed of in nature.

5.2 Wastewater Management Services and Users

Urban wastewater management encompasses the activities and efforts aimed to collect, treat, and dispose of wastewater to safeguard public health and safety, prevent water pollution, and protect the environment. All these activities and efforts constitute a wastewater management service that local governments are obliged to provide to all citizens and entities producing wastewater within the regency and/or city area. At the same time, these citizens and entities become automatically users of the service, and these two concepts—service provision and service users—constitute the basis of a local government wastewater management regulation.

³ The term “urban” is preferable to “domestic,” which is widely used in Indonesia’s regulations for all types of wastewater, including commercial and industrial effluents.

5.3 Types of Wastewater Collection, Treatment, and Disposal Systems

There are basically two types of wastewater management systems and services in Indonesia: the so-called on-site wastewater treatment and disposal systems consisting of septic tanks or similar facilities, both at individual and community scale, overwhelming throughout the country, and the newly developed off-site or centralized wastewater collection, treatment, and disposal systems that comprise public sewer networks and wastewater treatment plants (WWTPs). On-site systems produce sludge, also called septage, that needs to be collected by means of a service called desludging, and further transported and adequately treated either in specific septage and excreta treatment plants Instalasi Pengola Lumpur Tinja (IPLT) or whenever admitted into public WWTPs. IPLTs may also receive excreta produced by public bathing, washing, and latrines facilities and private latrines.

5.4 Joint Treatment and Pretreatment Program

Industries located within the range of an off-site public sewerage system are also required to connect to the sewer network as it is usually unfeasible to provide adequate treatment and disposal in each industry capable of complying with effluent discharge requirements. WWTPs, however, are generally designed to treat only domestic wastewater, or what they call conventional pollutants, characterized by biological oxygen demand (BOD), total suspended solids (TSS), fecal coliforms, and oil and grease (Government of the United States 2011), and are not prepared to cope with most toxic or nonconventional pollutants that are present in industrial wastewater. Consequently, discharges from both industrial and commercial sources may cause problems at WWTPs and make the public system noncompliant with national effluent standards.

The undesirable effects of those discharges can be prevented by using treatment techniques or management practices to remove the nonconventional pollutants discharge of the contaminants. The act of treating wastewater before discharge to a public sewerage network is called pretreatment, and this general principle of urban wastewater management is often referred to as “joint treatment with a pretreatment program” or, as it is called today in the United States, a publicly owned treatment works with an approved pretreatment program.⁴ It should be noted that the regulation of industrial discharges and the development of pretreatment programs are often the main issues of the local government regulations in most countries where centralized off-site treatment systems are overwhelming.

⁴ Government of the United States, Environmental Protection Agency. 2007. *Environmental Protection Agency Model Pretreatment Ordinance*. Office of Wastewater Management, Permits Division. January. <http://nepis.epa.gov/Exe/ZyPDF.cgi/P1005311.PDF?Dockey=P1005311.PDF>; Government of the United States, Environmental Protection Agency. 2011. *Introduction to the National Pretreatment Program*. http://water.epa.gov/polwaste/npdes/pretreatment/upload/pretreatment_program_intro_2011.pdf

Exceptions to this general principle are, of course, large industrial plants not integrated into the urban fabric, such as Pertamina's oil refineries and petrochemical plants or, e.g., the Pupuk Sriwidaja Palembang (Urea Fertilizer Factory in Palembang) fertilizer plant in Palembang, the discharges of which have to be treated in specific industrial wastewater treatment plants and comply with national effluent standards set out in the Ministry of Environment and Forestry regulations and/or decisions mentioned in this section.

6. Structure of the Regulations

In light of the considerations discussed in previous sections, it is recommended that the regulations in Indonesia be organized as follows:

Chapter 1. General Provisions: definitions, purpose, scope

Chapter 2. On-Site Wastewater Management: objectives, obligation of treatment, on-site facilities (septic tanks), community-based facilities, scheduled desludging, obligations of local government and users

Chapter 3. Off-Site Wastewater Management: sewer connections, prohibited activities and discharges, pretreatment program, indoor sanitation installations

Chapter 4. Permitting: principle of permitting, types of permits

Chapter 5. Financial Provisions: principle of setting out fees, categories of fees

Chapter 6. Enforcement: authority, easements and right to enter, enforcement mechanisms from notice of violation to legal actions

To facilitate their overview and comprehension, some data and information may be presented as annexes to the regulation:

Annex 1: List of Prohibited Substances

Annex 2: Commercial and Industrial Discharge Limits

Annex 3: Septic Tank Design Sketches

Annex 4: Sewer Connection Design Sketches

Annex 5: Permit Application Templates

7. On-Site Wastewater Management

7.1 Obligation of Wastewater Treatment

In a local wastewater management regulation, it is important to state that no wastewater can be discharged into the environment without treatment and, as the concept of treatment in case of a public sewerage system is obvious, the right place to do it is in the chapter on on-site wastewater management. Accordingly, every residence, place of business, industry, or other activity—wherever water is used for living, washing, cooling, or manufacturing—must have an approved means of wastewater disposal.

The treatment of wastewater issued from a building in areas where public sewerage system is not available should be carried out by an approved on-site treatment and disposal system that complies with the specifications described in section 7.3. A sewer is considered unavailable when a building is situated farther from the sewer than the distance established for mandatory sewer connections, as described in section 8.2.

No cesspools, septage pits, infiltration wells, free-surface wetlands, or ponds are allowed as on-site treatment or disposal facilities. Existing on-site wastewater treatment and disposal facilities in use prior to the adoption of the local wastewater management regulation will be exempt from its provisions until a failure occurs, or a repair, replacement, or upgrade is required. Notwithstanding this, as explained in section 9.2, all users of new and existing on-site wastewater treatment and disposal facilities have to apply for a permit that will allow them to benefit from the SDO's scheduled desludging service.

7.2 Admissible Discharges

Septic tanks and similar on-site wastewater treatment facilities are not to be used for the treatment of any wastewater discharge. Therefore, in the chapter dedicated to on-site wastewater management, it is necessary to state that only sewage or domestic wastewater and swimming pool filter backwash are admitted into on-site wastewater treatment facilities. It is prohibited to discharge any solid wastes or the like and substances that could risk the safety or health of people, pollute the natural environment, and affect the operation of the facility itself. This prohibition includes, in particular, garbage or any other domestic solid wastes, even grinded solid wastes; used oils; hydrocarbons, corrosive liquids; acids; medicines and drugs; and inflammable liquids that could cause a fire or explosions.

7.3 Design and Implementation of On-Site Wastewater Treatment and Disposal Facilities

The technical characteristics and the sizing of on-site treatment facilities have to be adapted to the building to serve, to the number of inhabitants and/or the number of rooms, and to the characteristics of the parcel in which they are implemented, particularly its aptitude for percolation and the sensitiveness of the surrounding area.

On-site wastewater treatment and disposal facilities or septic tank systems should preferably comprise a septic tank and a percolation area. Septic tanks are primary settlement tanks that provide a limited amount of anaerobic digestion. The percolation area should comprise a simple pipe network that can be at subsurface or ground level using subsoil for treatment. The majority of the treatment occurs in the percolation area and in the underlying subsoil. These systems provide effective treatment and disposal of domestic wastewater when properly sited, sized, installed, and maintained, in accordance with Indonesia's Standard No. SNI 03-2398-2002, *Design Procedures for Septic Tanks with Percolation System (Tata Cara Perencanaan Tangki Septik Dengan Sistem Resapan)*⁵ and with the proper local wastewater management regulation.

The septic tank should be of sufficient volume to provide retention time for the settlement of the suspended solids, while reserving an adequate volume for sludge storage (Figure 1). The volume required for sludge storage is the determining factor in sizing the septic tank. This sizing depends on the potential occupancy of the building, which should be estimated from the maximum number of people that the house can accommodate. Nominal septic tank capacities should be 3 cubic meters (m³) for 2–5 persons served and 4 m³ for 6–10 persons served. This assumes that desludging of the septic tank is carried out at least once in every 12-month period.⁶ If desludging is scheduled every 2 or 3 years, the nominal capacity should be twice or three times the given values. An effluent screen on the outlet is always recommended. Septic tanks may be constructed on-site if they comply with the requirements specified in the abovementioned standard and with the local wastewater management regulation, or prefabricated tanks may be installed if they are adequately designed and manufactured by a specialist company.

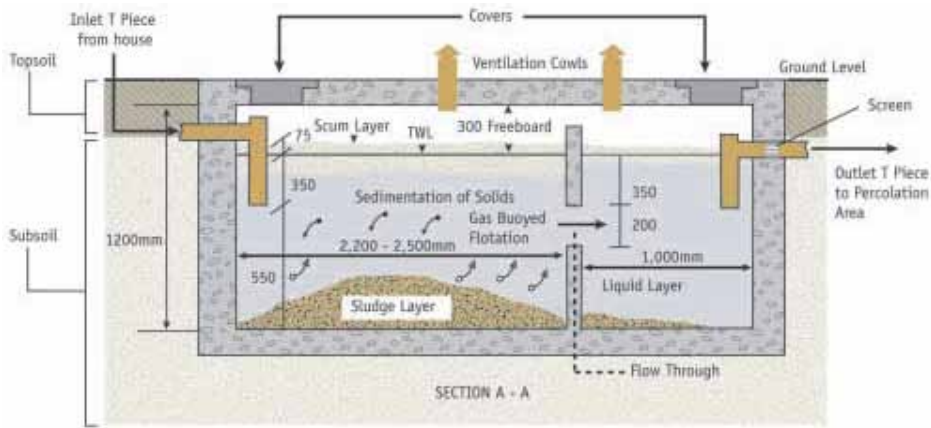
Wastewater treated in on-site wastewater facilities should be disposed of to the soil within the parcel where the building stands (Figure 2). Actually, the most important component of a septic tank system is the percolation area (also called the infiltration area), consisting of percolation trenches, as it provides the majority of the treatment of the wastewater effluent.

The length of the percolation trenches is calculated as a function of the number of persons for which the house is designed. A loading rate of 20 liters/square meter/day should be used for treated wastewater, and the overall length varies between 72 meters (m) for four persons served and 180 m for 10 persons served. The trench width is 500 millimeters, and no individual trench length should be more than 18 m.

⁵ National Standardization Agency of Indonesia. 2002. *Indonesian Standard No. SNI 03-2398-2002*. <http://pip2bdiiy.com/nspm/SNI%2003-2398-2002.pdf>

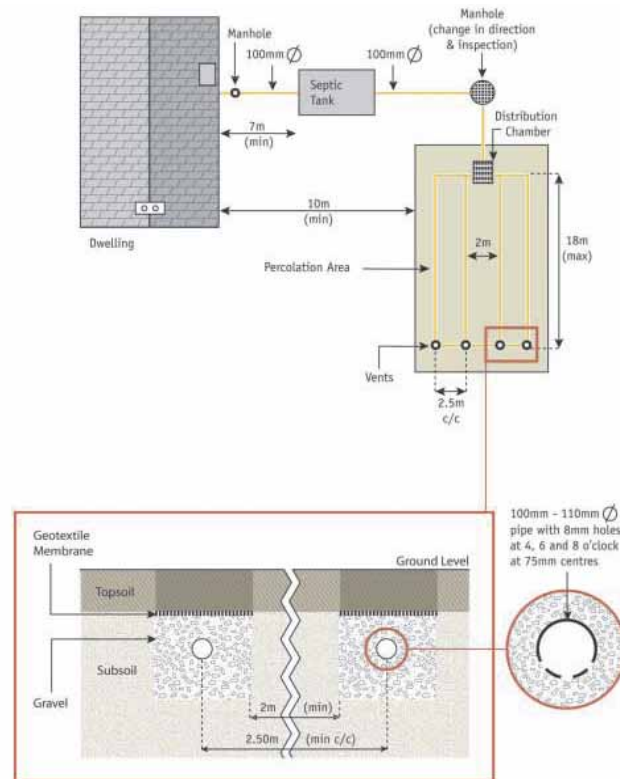
⁶ Government of Ireland, Environmental Protection Agency, Office of Environmental Enforcement. 2009. *Code of Practice, Wastewater Treatment and Disposal Systems Serving Single Houses*. <http://www.epa.ie/pubs/advice/water/wastewater/code%20of%20practice%20for%20single%20houses/#.VZaIKxvtmko>

Figure 1: Longitudinal Section of a Typical Septic Tank



Source: Government of Ireland, Environmental Protection Agency, Office of Environmental Enforcement. 2009. *Code of Practice, Wastewater Treatment and Disposal Systems Serving Single Houses (pe<10)*. Wexford.

Figure 2: Plan and Section of Layout of a Typical Septic Tank System



Source: G. Tchobanoglous, F. L. Burton, and H. D. Stensel. 2014. *Wastewater Engineering: Treatment and Reuse*. Metcalf & Eddy. 8 March.

In case the soil of the parcel is not appropriate for percolation, the treated effluent may be conveyed and discharged into drains, channels, or other elements of the water environment, provided that it is proven that no other solution is available and that the authorization of the owners concerned and that of the local government agency responsible for the regency's or city's drainage system is obtained. It is prohibited to discharge any domestic wastewater—even if treated—into sumps, deep wells, drain wells, abandoned wells, or any natural or artificial deep hole or cavity.

7.4 Community-Based On-Site Systems

On-site wastewater management systems may also be implemented for a group of dwellings in a neighborhood or community and operated and managed by the users involved. These systems are often best suited to low-income neighborhoods located in unsewered areas (where each individual house cannot afford its own individual treatment and disposal facility) and are intended to improve health and environment of communities in densely populated, low-income areas, usually located in inner-city areas or at the fringe of industrialized zones, at reasonable costs.

Community-based systems comprise a usually simplified private sewer network to which individual houses are connected and which conveys wastewater to a treatment and disposal facility generally located on community-owned or publicly owned land. For the conditions of implementation and for design and construction, the same provisions and technical specifications apply as those for individual on-site systems although, depending on the number of persons served, often more complex systems are envisaged (generally baffled anaerobic reactors). The same way as individual on-site facilities, community-based sewerage systems have to be monitored and controlled by the SDO which will also provide, either directly or indirectly, scheduled desludging services, as explained in Section 7.5.

7.5 Scheduled Desludging

Septic tanks and on-site wastewater treatment facilities are settlement tanks that produce sludge. The maximum amount of sludge that a septic tank can store is approximately a third of its total volume. If desludging is not carried out, the sludge level may exceed maximum level. When this happens, sewage retention time decreases causing an incomplete breakdown of sewage and thus, untreated sewage and sludge solids will be released from the septic tank into the percolation area or the drain. Therefore, regular desludging or removal of the accumulated sludge in the tank is critical to prevent water pollution. The frequency of desludging depends on the capacity and design of the septic tank.

To avoid causing a risk to public health or the environment and for the efficient operation of the treatment system, scheduled desludging will be practiced in all on-site wastewater treatment facilities of the regency or city, including individual septic tanks and community-based facilities. The actual frequency of desludging a septic tank or another on-site sanitation system depends basically on the wastewater inflow or the number of persons occupying the house(s) discharging to the system, and the design and capacity of the system and the treatment process within the system, etc. Scheduled desludging means

that the SDO will directly provide (and/or through licensed sludge hauler contractors) desludging of all on-site treatment facilities of the regency or city at evenly spaced time intervals. The desludging operation will include collection, transport, treatment, and adequate disposal of the extracted sludge. The cost of the operation will be covered by a fee to be collected from all owners or occupiers of the premises equipped with on-site wastewater treatment facilities.

In wastewater management regulations and, in particular, in line with the approach of a mandatory desludging under the SDO's responsibility, it is recommended to set a fixed time interval. Some earlier wastewater management regulations in Indonesia only indicate that desludging has to be carried out periodically, some give a time interval, such as Banjarmasin every 2 years; and Karanganyar, and the regulation in preparation in Makassar, every 3 years. Ireland's Code of Practice⁷ indicates a time interval of 1 year, while the *Lyonnaise des Eaux Handbook*⁸ recommends 2 years, which is also Indah Water's rule in Malaysia. In Victoria, Australia, the Environment Protection Authority's Code of Practice – On-Site Wastewater Treatment allows time intervals of between 1 and 5 years or even 8 years,⁹ but insists that the desludging period depends on septic tank capacity and design and that a regular check of the sludge level is indispensable. Based on these values, the adoption of a 2-year period for scheduled desludging seems reasonable for regencies or cities in Indonesia, and this is the value introduced into the Draft Template Regulation attached in the Annex. As noted, in some cases more frequent, unscheduled desludging might be necessary. To determine the need for these unscheduled operations, the SDO will carry out examinations of the facilities (at least once a year) as part of its routine monitoring and control activity. The unscheduled desludging operations will be requested through the SDO and carried out by registered waste hauler contractors.

7.6 Obligations of the Local Government and the Users

The on-site wastewater management service is a public service integrated into the local government's overall wastewater management service provided by the SDO. The tasks of this service include monitoring and control of on-site treatment facilities to ensure that these facilities do not cause a threat to public health or the safety of people, and that they allow the safeguard of the quality of surface waters and groundwater, as well as scheduled desludging of septic tanks and other on-site treatment facilities. Considering that the on-site wastewater service users constitute about 90% of the potential customers of the SDO, even after the implementation of the first stages of the new off-site sewerage systems, it is highly recommended that scheduled desludging be provided directly by the SDO or by the so-called waste haulers (licensed contractors registered with the local government) as this service would constitute the basis of the SDO's activity and revenues.

⁷ Code of Practice, Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤10), Environmental Protection Agency, Office of Environmental Enforcement, Wexford, Ireland, 2009; <http://www.epa.ie/pubs/advice/water/wastewater/code%20of%20practice%20for%20single%20houses/#.VZaIKxvtmko>

⁸ F. Valiron. 1986. *Handbook of the Water and Sewerage Operator*. Lyonnaise des Eaux, Technique en Documentation.

⁹ Government of Australia, State of Victoria, Environmental Protection Agency. 2013. *On-Site Wastewater Management*. February. <http://www.epa.vic.gov.au/-/media/Publications/891%203.pdf>

In this context, the local government and/or the SDO will

- (i) issue permits for the construction of new septic tanks and other on-site wastewater treatment facilities;
- (ii) issue licenses for waste haulers and other sewerage services contractors, and ensure that their functions and obligations are properly carried out in the city;
- (iii) issue licenses for works contractors specializing in the construction and/or implementation of septic tanks and other on-site treatment facilities and community-based wastewater collection and treatment systems;
- (iv) verify the design and implementation of new septic tanks and other on-site facilities and community-based wastewater collection and treatment systems;
- (v) perform monitoring and control of on-site wastewater treatment facilities including, in particular, the examination of the status of septic tanks at least once a year;
- (vi) carry out, the SDO itself or through licensed service contractors registered with the SDO, scheduled desludging including extraction and transport of septage to the treatment facilities, with the frequency of once every 2 years;
- (vii) arrange for the treatment of septage issued from scheduled and unscheduled desludging either at the available treatment facilities (the excreta treatment plants and/or, if foreseen, the wastewater treatment plant);
- (viii) operate and maintain the excreta treatment plants and/or the wastewater treatment plant according to the operating manuals and ensure compliance with national and/or provincial effluent standards and water quality regulations;
- (ix) verify the closure of on-site wastewater treatment facilities to be carried out by the owner after the connection of the household to the sewer network; and
- (x) impose fees on all wastewater service users for the services listed in this article and arrange for their collection.

Service users, i.e., the owners or occupiers of any premises having a septic tank or similar on-site treatment facility, will

- (i) maintain the septic tank, the private connection pipe, the percolation area, and/or, if authorized by the SDO, the outlet pipe, and all pertinent accessories, so as not to cause a nuisance or harm to health and safety and to the environment;
- (ii) ensure adequate access to the septic tank for examination and servicing by the SDO;
- (iii) ensure passage for the desludging tanker and equipment of the SDO or the licensed waste hauler to enter the premises and access the septic tank on the agreed date;
- (iv) avoid any obstacles such as flowerpots, gas cylinder, tool shed, car, and heavy objects over the septic tank;
- (v) ensure that the septic tank cover is not sealed or cemented and can easily be opened without force;
- (vi) ask for unscheduled desludging to be carried out by the SDO or a licensed waste hauler whenever necessary or when required by the SDO.

8. Off-Site Wastewater Management

8.1 Classification of Wastewater Discharges

Wastewater may be discharged into the public sewerage system if it complies with certain requirements that should be set out in the local wastewater management regulation. The categories of permissible discharges into the public sewerage system are as follows:

- (i) **Domestic Wastewater.** Wastewater originating from ordinary living uses. The discharge of domestic effluents does not require a specific discharge permit, although permits should be issued for building sewer connections.
- (ii) **Wastewater Assimilable to Domestic Wastewater.** Wastewater originating from any commercial or business activity relating to services where the pollution of water results mainly from water consumption, personal care and hygiene, and the cleaning and comfort of the facilities. The discharge of effluents originating from these activities does not require a specific discharge permit, but some other services, such as restaurants (except for small traditional eateries); laundrettes; car wash; gas stations; and mechanical, especially, car workshops, however, will be considered as activities producing commercial effluents, which require discharge permits and pretreatment devices or facilities.
- (iii) **Commercial and Industrial Effluents.** Wastewater produced in any commercial or industrial activity may be discharged into the public sewerage system if the wastewater discharge complies with the local wastewater regulation and especially with the effluent limits listed in Tables 1 and 2 (pp. 24-25). These discharges require a permit and, in most cases, a pretreatment facility, as described in Section 8.8.

8.2 Sewer Connection Requirements

Connection to the public sewer network is required if a building or business that generates wastewater is adjacent to any street or easement where a public sewer pipeline is available within a given distance L of the property line, or if the local government requires the user to install, at the user's expense, connection to the public sewer network. This distance L depends basically on urban structure and the density of the sewer network being

developed, and its value may vary from 60 meters (m) or 200 feet¹⁰ to 100 m¹¹ and several other wastewater management regulations in Spain. Taking into account the configuration of regencies or cities in Indonesia, the adoption of 75 m seems reasonable and coincides with the distance recommended in the Sewer Use Ordinance template prepared by the American Engineering Consultants for the Joint Municipal Water and Sewer Commission.¹²

At the same time, it is recommended not to allow maintenance, repair, or reconstruction of any septic tank, on-site wastewater treatment system, or other facilities intended or used for the disposal of sewage within the regency or city if a public sewer is available. A building is considered connectable even if its outlet is situated below the public sewer that serves it. In this case, the necessary wastewater lift station is at the expense of the owner.

The public sewer is considered as not available if

- (i) public sewer is located more than the distance L from the real property line;
- (ii) connection to public sewer is not practical in terms of physical configuration or property access, as determined by the local government; or
- (iii) for residential properties only, the total cost to connect to public sewer (including construction costs and permit fees) is greater than twice the total cost to repair or reconstruct the existing on-site system, based on estimated costs provided by licensed contractors or engineers.

When a building becomes connected to the public sewerage system, the existing septic tanks and other on-site wastewater treatment facilities have to be put out of service by and at the expense of the owner, which should be verified by the service delivery organization (SDO). In the event of noncompliance by the owner, the SDO and/or the local government may act for owner's account, risks, and expenses. The on-site wastewater treatment facilities put out of service will be emptied and cleaned and filled in or adequately closed.

8.3 Implementation of Domestic Sewer Connections

A sewer connection, also called household or property connection, is a work necessary to connect a building, industry, or business to the public sewer network. The denomination "connection" is independent of the nature of discharged wastewater.

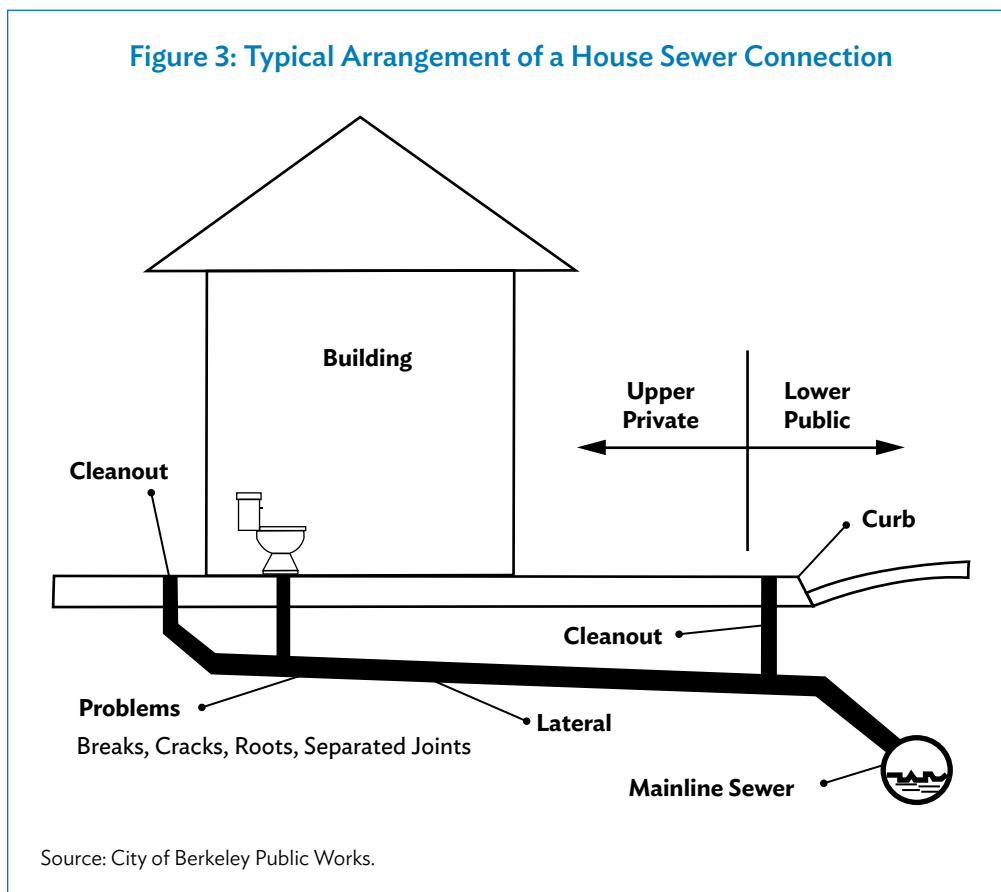
A sewer connection, also called lateral, consists of a public portion and a private portion. The public portion contains a joint or other device allowing the connection to the public

¹⁰ Government of the United States, County of Sacramento, California. 2014. *Sacramento Area District Sewer Ordinance*. http://www.sacsewer.com/sites/main/files/file-attachments/sasd_ordinance_4-25-14_0.pdf

¹¹ Government of Spain, Barcelona Metropolitan Area. 2015. *Metropolitan Wastewater Discharge Regulation*. 9 February. <http://www.enginyersbcn.cat/media/upload/arxiu/noticies/reglament%20metropolita%20abocament%20aigues%20residuals.pdf>

¹² Sewer Use Ordinance, Joint Municipal Water & Sewer Commission, American Engineering Consultants, Inc., January 2001; <http://www.lcjmWSC.com/Data/Sites/1/media/documents/specifications/seweruseordinance.pdf>

sewer pipe; a connection pipe, or lower lateral, located under public domain; and a visible and accessible manhole or cleanout, also located in public domain, as near as possible to the limit of the premises to be connected, that allows control and maintenance of the connection. The public portion of the connection will be undertaken by the SDO at their expense. The private portion of the connection comprises the works that join the cleanout with the indoor plumbing installations of the building and is located under private property. This portion will be undertaken by the owner entirely at the owner's expense although arrangements of subsidies or reimbursements may be set up with the local government. The joints between the pipes have to be totally watertight, and the works will have to be carried out by licensed contractors and will be controlled and/or verified by the SDO. A typical sewer connection arrangement is shown in Figure 3.

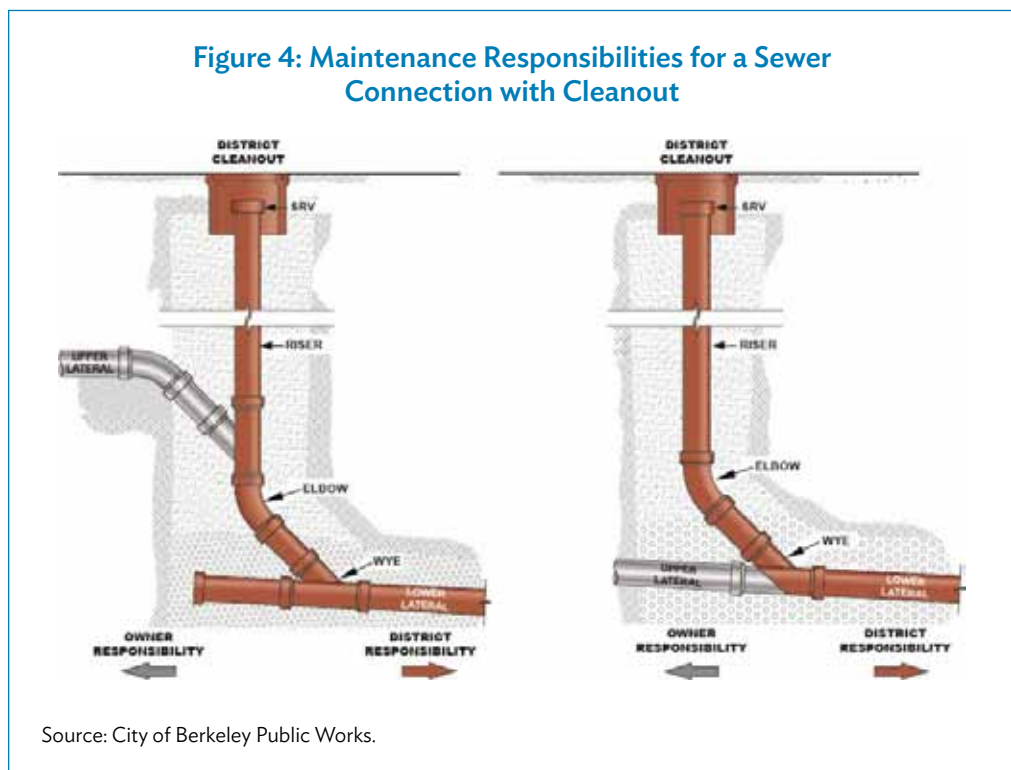


The technical characteristics of the building sewer connection, namely the size, slope, alignment, materials of construction of a building sewer, and the methods to be used in excavating, placing of the pipe, jointing, testing, and backfilling the trench, will conform to the requirements of the building and plumbing laws, regulations, and standards, or other applicable rules and regulations of the local government.

8.4 Maintenance of Domestic Sewer Connections

The wastewater management service user has the responsibility for clearing stoppages, inspecting, maintaining, and repairing the private portion of the sewer connection, i.e., the upper lateral, including backflow prevention devices, and to maintain it in an appropriate condition to avoid negative impacts on the operation and maintenance of the public sewerage system.

Typically, the responsibility delineation between the upper and lower lateral is at the cleanout or, in the absence of a cleanout, at the limits of the property or easement (Figure 4).



8.5 Prohibited Activities and Discharges

To safeguard public health and safety, prevent damage to sewers and the treatment plant, and protect the environment, a local government regulation on urban wastewater management has to specify which activities relating to the public sewerage system and which discharges into the system are prohibited.

Thus, the prohibited activities encompass the following:

- (i) Access or discharge into manholes, cleanouts, or other openings in the sewer network unless specifically authorized by the local government.

- (ii) Damaging, breaking, destroying, defacing, or tampering with the sewer network.
- (iii) Obstructing flow in the sewer network facilities. This prohibition includes, but is not limited to, obstruction originating from the cleaning of a private or lateral sewer, which results in an obstruction in the public sewerage system.
- (iv) Creating a condition that pressurizes the lower lateral.
- (v) Creating conditions in the sewer network that endanger the health and safety of any person.
- (vi) Interfering or impairing the operation or maintenance of the sewer network.

As regards the prohibited discharges, the main rule is that no pollutant or wastewater, which causes interference or pass through in the sewer network and/or in the treatment process, is allowed into the system, neither directly nor indirectly. This general prohibition should apply to all users of the public sewerage system whether or not the user is a significant industrial or commercial user or subject to any national or local effluent discharge standards or requirements. In particular, no user will discharge, or cause to be discharged, into the sewer network and the wastewater treatment plant (WWTP) the pollutants, substances, or wastewater included in the following list (usually attached in an annex to the regulation, which allows for an easy identification and/or modification of substances):

- (i) Pollutants that create a fire or explosive hazard in the sewerage system;
- (ii) Any pollutants which, by themselves or as a consequence of chemical reactions, result in the presence of toxic gases, vapors, or fumes within the sewerage system in a quantity that may cause acute health and safety problems for workers and the public in general and, in particular, result in concentrations higher than the following limits:
 - a. Carbon dioxide 15,000 parts per million
 - b. Sulfur dioxide 5 parts per million
 - c. Carbon monoxide 25 parts per million
 - d. Chlorine 1 part per million
 - e. Hydrogen sulfide 10 parts per million
 - f. Hydrogen cyanide 4.5 parts per million
- (iii) Solid or viscous substances in amounts which will cause obstruction of the flow in the sewer network, resulting in interference and/or impeding conservation and maintenance activities;
- (iv) Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin, in amounts that will cause interference or pass through;
- (v) Any wastewater having a pH less than 5.0 or more than 12, or wastewater having any other corrosive property capable of causing damage to the sewerage system or equipment;
- (vi) Any wastewater containing pollutants, including oxygen-demanding pollutants (biological oxygen demand, etc.) in sufficient quantity of flow or concentration, either singly or by interaction with other pollutants, to cause interference with the WWTP;
- (vii) Any wastewater having a temperature greater than 70°C, or which will inhibit biological activity in the WWTP resulting in interference, but in no case wastewater which causes the temperature at the introduction into the treatment plant to exceed 40°C;

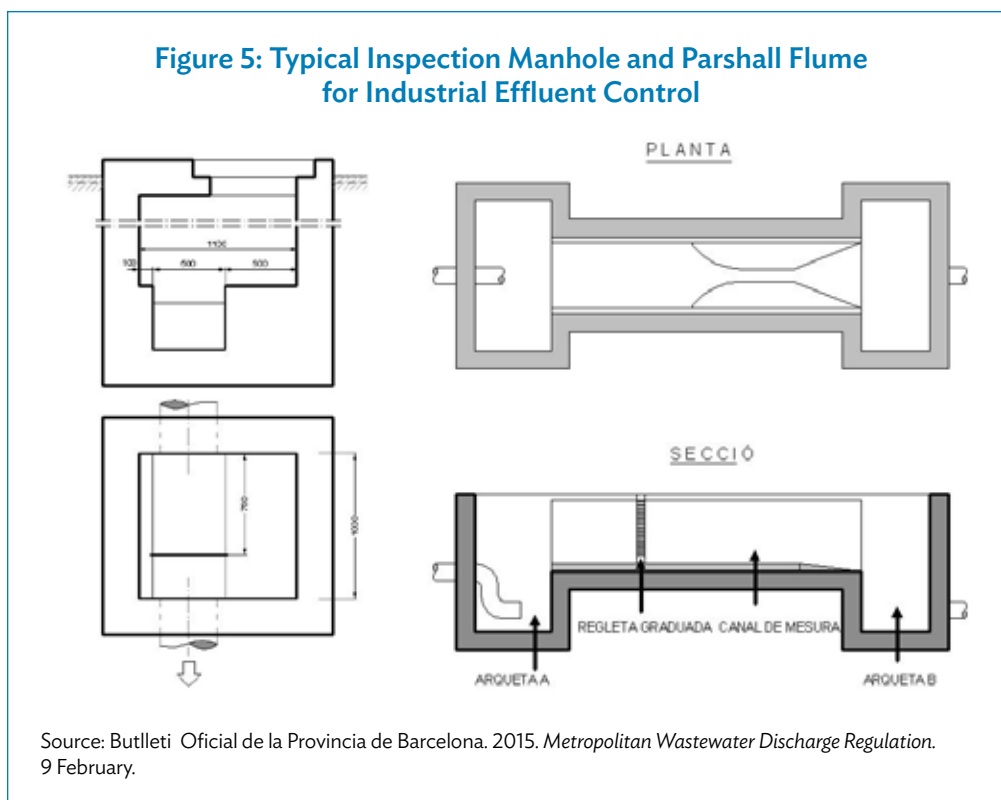
- (viii) Any trucked or hauled pollutants, particularly those originating from the desludging of septic tanks and other on-site wastewater treatment systems, except at discharge points designated by the local government in accordance with Article 25.4 of this regulation;
- (ix) Any noxious or malodorous liquids, gases, or solids or other wastewater which, either singly or by interaction with other wastes, are sufficient to create a public nuisance or hazard to life or are sufficient to prevent entry into the sewers for maintenance and repair;
- (x) Any substance which may cause the WWTP's effluent or any other product of the WWTP such as residues, sludges, or scums, to be unsuitable for reclamation and reuse or to interfere with the reclamation process;
- (xi) Any wastewater which imparts color that cannot be removed by the treatment process, including, but not limited to, dye wastes and vegetable tanning solutions, which consequently imparts sufficient color to the treatment plant's effluent to render the waters injurious to public health or secondary recreation or to aquatic life and wildlife, or to adversely affect the palatability of fish or aesthetic quality or impair the receiving waters for any designated uses;
- (xii) Any wastewater containing any radioactive wastes or isotopes;
- (xiii) Rainwater drains, storm water, surface water, groundwater, artesian well water, roof runoff, subsurface drainage, swimming pool drainage, condensate, deionized water, noncontact cooling water, and unpolluted industrial wastewater, and, in general, any other source of clean water, i.e., waters that have not undergone any process of transformation in a way that they have no potential impact on safety, health, or the environment, unless specifically authorized by the local government;
- (xiv) Floating fats, oils, or greases of animal or vegetable origin;
- (xv) Any sludges, screenings, or other residues from the pretreatment of industrial wastes;
- (xvi) Any medical wastes, except as specifically authorized by the local government in a wastewater discharge permit;
- (xvii) Any livestock and poultry wastes;
- (xviii) Any material containing ammonia, ammonia salts, or other chelating agents which will produce metallic complexes that interfere with the municipal wastewater system; and
- (xix) Any wastes containing detergents, surface active agents, or other substances which may cause excessive foaming in the municipal wastewater system.

The pollutants, substances, wastewater, or other wastes listed here will not be processed or stored in such a manner that they could be discharged later into the public sewerage system. All floor drains located in process or materials storage areas must discharge to the industrial or commercial user's pretreatment facility before connecting with the system.

The discharge of trucked or hauled wastewater containing septic tank sludge or septage into the WWTP may be carried out only if explicitly authorized by local government by means of an appropriate permit. Under no circumstances can these discharges contain industrial wastewater or wastes that do not comply with the effluent limits included in the list and in Tables 1 and 2. All septage haulers have to be registered with the SDO.

8.6 Sewer Connections of Commercial and Industrial Effluents

The sewer connection of commercial or industrial users have certain specific characteristics with respect to domestic connections; as in each connection, a suitable control manhole and, when required by the SDO, a flow measurement device and other appurtenances to facilitate observation, sampling, and measurement of the quality of wastewater, have to be installed. Such a manhole, when required, should be accessibly and safely located, and has to be constructed in accordance with plans attached to the permit application and approved by the SDO. The manhole has to be installed by the user at the user's expense, and will be kept safe and accessible at all times by the user. Typical design sketches for an inspection manhole with sampling and flow measurement and a flow measurement device (a Parshall flume) are given in Figure 5.



All commercial or industrial effluent discharges to be made in the public sewer network have to be subject to a permit that will establish the technical, administrative, and financial conditions of the acceptability of the effluent (Section 9.3). This permit should consist of a mayor's decision or decree that is completed by a discharge requirement establishing the physicochemical characteristics (in concentration and in pollutant load, in accordance with the list of substances and parameters in Tables 1 and 2) the commercial or industrial effluent should have to be admitted into the public sewerage system, as well as the relating monitoring conditions.

8.7 Commercial and Industrial Effluent Discharge Limits

Local governments need to control the discharge of pollutants that are likely to cause damage to the wastewater collection and treatment system and/or, in case of substances that cannot be removed at the WWTP, harm the environment. Therefore, local government wastewater regulations should set limits for the substances that are likely to be present in commercial and industrial effluents discharged into the system. Tables 1 and 2, contain a fairly comprehensive list of these substances with indicative limit values. Local governments are entitled to establish their own list of substances and set the values of the limits. These limits apply at the point where the wastewater is discharged to the sewerage system and, as noted earlier, are subject to a permit and, when exceeded, to enforcement actions.

Table 1: Pollutants Susceptible to Be Treated at Wastewater Treatment Plant and with Low Impact on Water Quality Targets in Receiving Waters

Parameters	Values	Units
Temperature	40	°C
pH	5–12	
Suspended solids	750	mg/l
Chemical oxygen demand (unsettled) (O ₂)	1500	mg O ₂ /l
Total organic carbon (C)	450	mg/l
Oils and fats	250	mg/l
Chloride (Cl ⁻)	2500	mg/l
Electric conductivity (at 25°C)	6000	mS/cm
Sulfur dioxide (SO ₂)	15	mg/l
Dissolved sulfide (S ²⁻)	0,5	mg/l
Total sulfide (S ²⁻)	1	mg/l
Sulfate (SO ₄)	1000	mg/l
Nitrate (NO ₃)	100	mg/l
Ammonia (NH ₄₊)	60	mg/l
Kjeldahl nitrogen (organic N and ammonia) (N)	60	mg/l
Total phosphorus (P)	50	mg/l

°C = Celsius, l = liter, mg = milligram.

Source: Reglament metropolita d'abocament d'aigues residuals (Metropolitan Wastewater Discharge Regulation. Area Metropolitana de Barcelona, Butlletí Oficial de la Província de Barcelona, 9 February 2015.

Table 2: Pollutants Difficult to Be Removed at Wastewater Treatment Plant and with High Impact on Water Quality Targets in Receiving Waters

Parameters	Values	Units
Total cyanide (CN ⁻)	1	mg/l
Phenol index (C ₆ H ₅ OH)	2	mg/l
Fluoride (F ⁻)	12	mg/l
Aluminum (Al)	20	mg/l
Antimony (Sb)	1	mg/l
Arsenic (As)	1	mg/l
Barium (Ba)	10	mg/l
Boron (B)	3	mg/l
Cadmium (Cd)	0.5	mg/l
Copper (Cu)	3	mg/l
Hexavalent chromium [Cr (VI)]	0.5	mg/l
Total chromium (Cr)	3	mg/l
Tin (Sn)	5	mg/l
Iron (Fe)	10	mg/l
Manganese (Mn)	2	mg/l
Mercury (Hg)	0.1	mg/l
Molybdenum (Mo)	1	mg/l
Nickel (Ni)	5	mg/l
Lead (Pb)	1	mg/l
Selenium (Se)	0.5	mg/l
Zinc (Zn)	10	mg/l
Metals (B+Cr+Cu+Ni+Zn)	15	mg/l
Nonylphenol (NP)	1	mg/l
Total pesticides	0.1	mg/l
Hydrocarbons	15	mg/l
Chloroform (ClCH ₃)	1	mg/l
Trichloroethylene (Cl ₃ C ₂ H)	0.4	mg/l
Tetrachloroethylene (Cl ₄ C ₂)	0.4	mg/l
Trichlorobenzene (Cl ₃ C ₆ H ₃)	0.2	mg/l

°C = Celsius, l = liter, mg = milligram.

Source: Butlletí Oficial de la Província de Barcelona. 2015. *Metropolitan Wastewater Discharge Regulation*. 9 February.

The substances and limits to be adopted by the local government should be adjusted to the industries present in the regency or city area and to their importance. Therefore, substances may be added or removed from the list according to the criteria of the local government. Biological oxygen demand and total suspended solids, generally admissible to WWTPs without any problem, are not included in the list (see Table 1). However, if in a regency or city, there are certain industries (e.g., a large slaughterhouse or a number of textile plants)

that produce effluents which are likely to cause prejudice or hamper the operation of the WWTP, a limitation on BOD and/or total suspended solids might be envisaged.

The local government, in common agreement with the Ministry of the Environment and Forestry and the Ministry of Public Works and Housing, may adopt different limits to those included in the regulation, provided that, with the application of Best Management Practices, the user concerned demonstrates that he or she discharges the same pollutant load with a lower flow achieved as a result of water saving. At the same time, the local government may reserve the right to establish, by regulation or via individual wastewater discharge permits, more stringent limits or requirements on discharges into the sewerage system consistent with the purpose of this regulation.

It is explicitly prohibited to use process water or any other source of clean water to dilute a discharge, as a partial or complete substitute for adequate treatment to achieve compliance with the limits listed in the tables, except in the event of an emergency or an imminent danger, and/or if expressly authorized by the local government.

8.8 Pretreatment Program

All commercial or industrial effluent discharges into the public sewer network are subject to a discharge permit, as described in section 9.4. In the permit, the SDO may require adequate pretreatment facilities to remove the specific pollution and comply with national effluent standards, wherever available, and the effluent limits set out in Tables 1 and 2. Detailed plans describing such facilities and operating procedures should be submitted to the SDO for review, and will be approved before such facilities are constructed in the framework of the local government's permitting procedure. The review of such plans and operating procedures will in no way relieve the user from the responsibility of modifying such facilities, as necessary, to produce a discharge acceptable to the local government under the provisions of this regulation.

The pretreatment facilities have to be designed applying Best Management Practices and according to the state-of-the-art technology and implemented, operated, and maintained at the user's expense. They will be located to be readily and easily accessible for inspection and cleaning. All such devices and facilities must be available for inspection by the SDO at all reasonable times.

Notwithstanding the dispositions provided for in the permits, gas stations, car washes, and car repair workshops have to be equipped with at least a sediment trap and an oil separator. Moreover, grease interceptors or grease traps may be required for any facilities used and operated for the sale or preparation of food due to the potential of discharging significant amounts of fats, oils, and greases into the sewer collection system. These facilities include restaurants, cafes, fast food outlets, pizza outlets, sandwich shops, and any other kinds of food vending establishments in which any food preparation takes place on the premises, including heating or defrosting in or by means of any kind of oven or heating device.

In case of noncompliance with the requirements of the discharge permit by an industry, seriously disturbing either the conveyance of wastewater through the public sewer network

or the treatment process at the WWTP or affecting the safety of the operating staff, the repair of possible damage or harm suffered by the SDO will be charged to the permittee. The SDO may give a formal notice to the user, via registered letter with acknowledgment of receipt, to stop all irregular discharges within a deadline of 48 hours. After this deadline, the sewer connection might be sealed. In case of emergency, or when the effluents may constitute an immediate danger, the discharge might be sealed right away.

8.9 Indoor Sanitation Installations

The indoor sanitation installations of buildings comprise

- (i) the plumbing fixtures of the building that collect sewage from the different parts of the building and convey them to the outlet pipe;
- (ii) the private portion of the sewer connection, also called upper lateral;
- (iii) the backflow prevention device, wherever available; and
- (iv) a flushing device to clean the lateral, wherever available.

Once a property is connected to the public sewerage system, the old septic tanks and other on-site treatment facilities will be taken out of service or rendered useless.

A backflow prevention device should be installed in the private portion of the sewer connection or upper lateral of every building in which the lowest room containing a plumbing fixture has a floor elevation less than 5 centimeters above the elevation of the cover of the nearest manhole located on the public sewer serving the building. The backflow prevention device is to be installed and maintained by the owner at the owner's expense. The SDO will not be responsible for the costs associated with a backflow into the structure if a backflow prevention device is not installed or not maintained.

All sanitary fixtures connected to the plumbing fixtures of the buildings should be equipped with siphons to prevent the odor emanations from the public sewerage system and the clogging of the fixtures by the introduction of solid objects. No other sanitary fixture should be connected on the pipe that connects the toilet bowl with the downpipe. The toilets should be fitted with a siphoned bowl and a flush that provides enough flow to drag away the fecal material.

The indoor installations should be implemented and maintained under the owner's sole responsibility, although the SDO has the right to examine and control indoor installations, when appropriate, to check if they comply with the local wastewater management regulation and all relevant building and plumbing standards in Indonesia. Defects found by the SDO should be rectified by the owner at the owner's expense.

9. Permitting

9.1 Principle of Permitting

Wastewater management, encompassing wastewater collection, treatment, and disposal, is, in all of its forms and activities, both on-site and off-site, a public service provided by the local government through the service delivery organization (SDO). Water users, both residential and commercial or industrial, are at the same time producers of wastewater and automatically become users of this public wastewater management service. To control the access of users to the service and set out the conditions thereof, the local government has to issue permits.

Taking into consideration the current status and the planned development of wastewater management in Indonesia's regencies and cities, the implementation of three classes of permits is recommended:

- (a) On-site wastewater treatment and disposal permits
- (b) Residential building sewer connection permits
- (c) Commercial or industrial sewer connection and effluent discharge permits

These three types of permits, which can be found in many existing local wastewater regulations in other countries are intended to cover the entire scope of activities of wastewater management being carried out in the regency and city, and allow for an overall control over wastewater management as a whole.¹³ To obtain a permit, users should submit a written application using a form provided by the SDO.

9.2 On-Site Wastewater Treatment and Disposal Permits

In case of new buildings or existing buildings lacking wastewater treatment and disposal systems, the owner has to obtain, before the commencement of construction of an on-site treatment and disposal system, a written permit issued by the local government.

¹³ For example, Government of France, Bordeaux Urban Community. 2013. *Regulation for the Public Service of Off-Site Wastewater Management*. URL; Government of France, Bordeaux Urban Community. 2013. *Regulation for the Public Service of On-Site Wastewater Management*. URL; Government of the United States, County of Sacramento, California. 2014. *Sacramento Area Sewer District Sewer Ordinance*. URL; Government of the United States, County of Sacramento, California. 2013. *On-site Wastewater Treatment System Guidance Manual*. URL; 25; 31.

The application for such a permit will be made on a form furnished by the SDO, which the applicant has to supplement by any plans, specifications, and other information, as required by the local government. The application implies the commitment to pay the on-site wastewater management fee and, at the time the application is filed, the fee relating to the first period will have to be paid to the SDO. The works carried out will be verified by the SDO which may order modifications and additional works.

In case of existing on-site treatment and disposal systems, the owner or the owner's agent will also have to apply for scheduled desludging and septage treatment services to be provided by the SDO directly or through licensed waste hauler contractors. For the application, the same form may be used, in which the applicant has to specify the main characteristics of the facilities, accompanied by a plan of the property showing accurately all existing on-site treatment and disposal systems such as septic tanks, wells, percolation areas, outlets, drains, etc. Before issuing the permit, the SDO will inspect the facility and may order some modifications to be carried out as appropriate.

Existing and new community-based systems that serve a group of houses connected to a common treatment and disposal system will also have to apply for an on-site wastewater management permit under the same conditions as individual users.

9.3 Residential Building Sewer Connection Permits

Whenever a public sewer becomes available to a property served by an on-site wastewater treatment and disposal system, a direct connection will have to be made to the public sewer within 1 year from the date of its commissioning, and any septic tanks, cesspools, and similar on-site facilities will have to be abandoned and filled with suitable material.

To make any connections with a public sewer or appurtenances thereof, it is necessary to obtain a written permit from the local government. To do it, the owner or the owner's agent will have to submit an application using a special form to be furnished by the SDO. The permit application should be supplemented by any plans, specifications, or other information considered pertinent in the judgment of the SDO and/or the local government. The application implies the commitment to pay a sewer use fee and, at the time the application is filed, the fee relating to the first period should be paid to the SDO.

The applicant for the building sewer permit will notify the SDO when the private portion of the building sewer connection is ready for inspection and connection to the public portion and the sewer. The connection will be made under the supervision of the SDO or its representative.

9.4 Commercial or Industrial Sewer Connection and Effluent Discharge Permits

Discharge of a commercial or industrial effluent into the sewerage system may only be made with the permission of the local government. Permission will be given through a discharge permit, a legal document that authorizes a discharge, subject to the compliance of the limits described in section 8.7 and in Tables 1 and 2, as well as other conditions the local government may establish.

If a discharge permit is required, the commercial or industrial user must file a wastewater discharge permit application using a form provided by the SDO, and receive approval before commencing discharge. Upon evaluation, the SDO will issue a wastewater discharge permit to the user subject to certain terms and conditions.

To support the application, the user will have to submit all information that may be deemed necessary to evaluate the application. This information includes at least the documents, information, and data required in the said template. Furthermore, the SDO may require complementary identifying information such as flow rates, time and duration of discharge, discharge amounts, specific pollutant concentrations, wastewater characteristics, location of all discharge points, and description of activities and facilities affected. Commercial or industrial effluent discharge permits require the user to comply with all terms and conditions of the wastewater management regulation, including the following factors:

- (i) Limits on the average and maximum rate and time of discharge or requirements for flow regulation and equalization.
- (ii) Specific maximum flow and loading rates.
- (iii) Requirements that the discharger notify the SDO before any proposed bypass other than those that result from accident or emergency.
- (iv) Requirements to have emergency spill plans.
- (v) Requirements for providing access to SDO personnel at all reasonable times to conduct inspection.
- (vi) Other conditions, as deemed appropriate by the SDO, to ensure compliance with this wastewater management regulation.

The applicant for the commercial or industrial sewer connection permit will notify the SDO when the private portion of the connection is ready for inspection and connection to the public portion and the sewer. The connection will be made under the supervision of the SDO or its representative.

Wastewater discharge permits are to be issued to a specific user for a specific location and operation. They may not be reassigned, transferred, or sold to a new owner, new user, different premises, or a new or changed operation without the prior approval of the local government. However, the terms and conditions of the wastewater management regulation, including enforcement penalties, may be applied to a succeeding owner or a successor in interest.

10. Financial Provisions

10.1 Principle and Categories of Wastewater Management Fees

On the assumption that the investments relating to wastewater system development will be supported by external sources such as national government and international financing bodies, for the time being, the service delivery organization (SDO) needs to cover at least the annual operating costs of the public wastewater management services both on-site and off-site. For this aim, the local government has to adopt different categories of fees. It is worth mentioning that in the current international practice, fees may be defined in different manners, and local governments often break down their revenues according to a number of different concepts. By way of example, in California, United States, the Sacramento Area Sewer District Sewer Ordinance (only off-site collection and treatment systems) has the following fees:¹⁴

- (a) Sewer impact fees, aimed to finance the investments in sewerage infrastructure, by far the most important of all fees defined;
- (b) Sewer connection fee, to cover the construction of the entire lateral;
- (c) Newly constructed district facilities inspection fee;
- (d) Information technology fee, to recover the costs of the database development and maintenance;
- (e) Wastewater discharge permit fee, charged for the costs to process capacity evaluations as part of a wastewater discharge permitting process;
- (f) Technical services fee, to cover special projects, if any; and
- (g) Water meter reading fee, when a water meter exists and the sewer user fails to submit the water usage data as required.

A similar fee pattern is found in a specimen ordinance of the Joint Municipal Water and Sewer Commission in the United States.¹⁵ In France, in municipalities such as Bordeaux, the pattern is much simpler: for on-site wastewater management, there is a uniform fee (*redevance*) for all users, which covers the activity of inspection and control of the service provider (desludging is done at the expense of the users), while for off-site wastewater

¹⁴ Sacramento Area Sewer District Sewer Ordinance, Sacramento, California, 2014; http://www.sacsewer.com/sites/main/files/file-attachments/sasd_ordinance_4-25-14_0.pdf

¹⁵ Sewer Use Ordinance, Joint Municipal Water & Sewer Commission, American Engineering Consultants, Inc., January 2001; <http://www.lcjmwsc.com/Data/Sites/1/media/documents/specifications/seweruseordinance.pdf>

management, there are three types of sewer use fees: (i) for domestic users, (ii) for users that discharge an effluent assimilable to a domestic effluent, and (iii) nondomestic, i.e., commercial or industrial discharges.^{16,17}

Based on this analysis and considering the current status and the planned development of wastewater management in the regencies and cities of Indonesia, as well as for the sake of simplicity, the adoption of the following three classes of fees under the wastewater management regulation is proposed:

- (a) On-site wastewater management fees
- (b) Residential sewer use fees
- (c) Commercial and industrial sewer use and effluent discharge fees

These fees correspond to the main categories of wastewater management defined above and subject to permits. The amount of the fees is usually determined by the local government as part of their rate schedule and is updated from time to time (in general, annually). The wastewater management service users will have to pay the appropriate fee according to the rates and the type of service being provided.

10.2 On-Site Wastewater Management Fee

Residential users that treat and dispose wastewater in their own premises by means of on-site treatment and disposal facilities should pay an on-site wastewater management fee. This fee aims to cover the following services provided:

- (a) Mandatory scheduled desludging to be provided by the SDO directly and/or by a licensed private waste hauler contractor once every 2 years, including collection, transport, treatment, and adequate disposal of the extracted sludge. Septage treatment and disposal may be carried out either at an excreta treatment plants or a wastewater treatment plant, or both.
- (b) The initial site inspection and the verification of the design of new on-site facilities and/or the current status of existing facilities applying for an on-site wastewater management permit.

¹⁶ Règlement du service public de l'assainissement collectif (Regulation for the Public Service of Off-Site Wastewater Management), L'eau de la CUB, Communauté Urbaine de Bordeaux (Bordeaux Urban Community), January 2013; <http://www.sgacub.fr/doc/reglement.pdf>; Règlement du service public de l'assainissement non collectif (Regulation for the Public Service of On-Site Wastewater Management), L'eau de la CUB, Communauté Urbaine de Bordeaux (Bordeaux Urban Community), January 2013; http://www.bordeaux-metropole.fr/sites/default/files/PDF/services_proximite/reglements_eau_assainissement/reglement_assainissement_non_collectif.pdf

¹⁷ Government of the United States, County of Lexington, South Carolina. 2001. Joint Municipal Water and Sewer Commission Sewer Use Ordinance. <http://www.lcjmWSC.com/Data/Sites/1/media/documents/specifications/seweruseordinance.pdf>; Bordeaux Urban Community. 2013a. Regulation for the Public Service of Off-Site Wastewater Management. <http://www.sgacub.fr/doc/reglement.pdf>; Bordeaux Urban Community. 2013. Regulation for the Public Service of Off-Site Wastewater Management. http://www.bordeauxmetropole.fr/sites/default/files/PDF/services_proximite/reglements_eau_assainissement/reglement_assainissement_non_collectif.pdf

- (c) Periodic site inspections, at least once every 2 years, to check the status of on-site facilities and the amount of sludge accumulated.

Unscheduled desludging may be carried out by the SDO and/or a licensed contractor. It would not be covered by this fee but would have to be paid to the SDO in accordance with the tariff set up by the local government for this aim, which would be the equivalent of 24 months of the monthly fee.

The tariff of the on-site wastewater management fee will be fixed regularly (in general, once a year) by the local government in the two categories proposed:

- (a) A flat monthly fee for residential on-site wastewater users.
- (b) A uniform flat monthly fee for community-based on-site treatment and disposal systems, generally higher than the household fees as the treatment facilities of community-based systems are usually larger than the individual ones.

10.3 Residential Sewer Use Fee

Residential users connected to a public sewer and discharging domestic effluents into the sewerage system should pay a residential sewer use fee intended to cover the following services provided:

- (a) Wastewater collection, treatment, and disposal, including operation and maintenance of the centralized public sewerage network and the wastewater treatment plant;
- (b) The construction and maintenance of the public portion of the building sewer connection, generally the manhole or cleanout and the lower lateral;
- (c) The initial site inspection and the verification of the private portion of the building sewer connection or upper lateral;
- (d) Periodic site inspections, at least once a year, to check the status of the sewer connection; and
- (e) Cleaning of the sewer connection, whenever necessary, and as requested by the user.

For the residential sewer use fees, setting up a tariff schedule based on customer classification (i.e., their economic background) and affordability is recommended. This schedule is intended to allow for a certain cross-subsidy from high-income consumer groups to low-income groups. Based on the ongoing practice in a number of *Perusahaan Daerah Air Minum* (local government-owned water supply enterprises) throughout Indonesia following a government regulation, the residential customer groups might be as follows:

- (i) Social Services
 - a. General Services
 - b. Special Social Services

- (ii) Non-Commercial Connections
 - a. Residence Class A1
 - b. Residence Class A2
 - c. Household Class A3
 - d. Household Class A4
 - e. Household Class B

The rate of these tariffs should be fixed annually by the regency or city government. The tariffs may be specific wastewater tariffs or a percentage on the water supply fee. In the future, distinctive sewer use fees may be established by the regency or city government based on metered or estimated drinking water consumption or any other criteria used to establish water supply fees, such as the area or the ratable value of the dwellings.

Whenever existing community-based systems become connected to the public sewerage system, a special fee may be adopted. Also, future sewer use fees might be based on metered or estimated drinking water consumption or any other criteria used to establish water supply fees.

10.4 Commercial and Industrial Sewer Use and Effluent Discharge Fee

It is proposed that commercial and industrial users connected to a public sewer and discharging generally pretreated commercial or industrial effluents into the sewerage system pay a commercial and industrial sewer use and effluent discharge fee. In a manner similar to the residential fees, setting up a tariff schedule based on customer classification (with regard to their nature and size) is recommended. The customer groups to be used might be the following:

- (i) Commercial Connections
 - a. Small Commerce
 - b. Large Commerce
- (ii) Industrial Connections
- (iii) Small-Scale/Neighborhood Industry
- (iv) Medium-Scale Industry

The rate of these tariffs should be set annually by the regency or city government. The tariffs may be based on flat monthly tariffs or on the maximum monthly discharge and surcharges due to excess biological oxygen demand and total suspended solids (exceeding 250 milligrams/liter for both parameters) and a combination of parameters of the specific pollutant load discharged into the sewerage system. Both values shall be established on the basis of the sewer connection application and shall be checked during site inspections and, if necessary, updated from time to time. The legal framework for such an arrangement should be established in a local government regulation.

10.5 Billing and Collection

To ensure the revenues necessary to cover the SDO's annual operating costs, all users of the regency's and city's wastewater management services should pay the fees defined in this chapter, according to the local government's rate schedule to be set out annually.

Since the rates of the fees are set annually, it is recommended that all users be billed on a regular basis as follows:

- (a) Residential and community-based users of both on-site and off-site systems should be billed quarterly.
- (b.) Industrial users paying effluent discharge fees should be billed monthly.

The initial fees will be paid upon presentation of the permit applications. It is recommended that regular bills be issued on the first day of the month or quarter succeeding the period for which the service is billed. Bills should be due and payable upon presentation and would become delinquent 60 days after the date of billing for quarterly bills and 30 days after the date of billing for monthly bills. Any delinquent wastewater management fee should incur a penalty charge of the delinquent amount, e.g., 10%. The delinquent amount, including the 10% penalty charge, may incur an additional penalty charge every month, say 1%, 1.5%, or 2% until the delinquent amount is paid. Failure to pay the wastewater management fee after it becomes delinquent could make the premises subject to disconnection from the public sewer network.

11. Enforcement

11.1 Authority

To enforce the fulfillment of the regulation, the service delivery organization (SDO) should have the following authorities and responsibilities necessary to protect the public sewerage system, safeguard health and safety, and protect the environment:

- (a) Authority to monitor on-site wastewater treatment and disposal facilities, and take enforcement action for inappropriate septage handling practices;
- (b) Authority to monitor discharge and take enforcement action for inadequate control of fats, oil, and grease and ineffective facility maintenance practices;
- (c) Authority to limit wastewater discharge temperatures and to impede discharge into the sewer owing to noncomplying parameters, when necessary, to safeguard health and safety or sewerage system integrity;
- (d) Authority to issue and enforce permits to discharge into the public sewerage system and to carry out desludging of septic tanks; and
- (e) Authority to bill and collect fees to cover operating and maintenance costs.

11.2 Right to Enter and Easements

To carry out their task, the SDO should be given the right to enter private property at any time to access the public sewerage system for operation, maintenance, and inspections, and examine private wastewater-related sanitation installations. Failure to allow the SDO access to private property in such cases may be unlawful and may result in civil or criminal fines and penalties, or both.

The local government and its SDO require permanent easements for all publicly owned sewer facilities that are located outside the public domain to carry out the operation, supervision, repairs, and rehabilitation of the pipelines. In public sewers, this easement should be a stripe centered on the axis of the sewer, with a minimum width of 4 meters.

Any use of an easement by the owner or occupants of a building that is not compatible with or interferes with the construction, operation, maintenance, reconstruction, or repair of publicly owned facilities is not allowed. No permanent structure (such as garages, concrete slabs, toolsheds, and similar structures) is to be constructed. Plantations are not allowed on

top of the public sewer collection system facilities or anywhere within any associated sewer or public utility easements.

11.3 Enforcement Mechanisms

The SDO and the local government have to put in place adequate means to achieve a maximum degree of compliance with the wastewater management regulation. These provisions should apply to all classes of users to the extent such users violate any provision of the wastewater management regulation or administrative order of the SDO under the regulation, namely mandatory septic tank desludging, a wastewater discharge permit or order issued, a pretreatment requirement, etc.

The enforcement mechanisms to be set forth range from informal administrative action to formal legal prosecution. The SDO may use, at its discretion, any mechanism or the concurrent use of several mechanisms to enforce the provisions of this regulation. The enforcement mechanisms proposed herein may be cumulative with respect to such other enforcement mechanisms or civil and criminal penalties as may be otherwise available under the laws of Indonesia.

In particular, the following enforcement mechanisms might be foreseen:

- (a) A written Notice of Violation will be sent to the owner or tenant of the premises who will be asked to provide an explanation and a plan for corrective action and prevention.
- (b) Administrative orders urging the affected user to construct, acquire, and install equipment to comply with the requirements will be set out.
- (c) Emergency suspensions and termination of discharge will be enforced whenever necessary to stop an actual or threatened wastewater or septage discharge that appears to present or cause an imminent and substantial endangerment to the environment, or to the health or safety of persons, or to interfere with the operation of the public sewerage system.
- (d) Administrative civil penalty will be issued to any person who violates any provision of the wastewater management regulation, with an amount proportional to the extent of the harm caused by the violation, the economic benefit derived through any noncompliance, the nature and persistence of the violation and the length of time over which the violation occurs, and corrective action. The penalties may be fixed generally “in an amount, that does not exceed Rp[...] per each day of violation.”
- (e) Legal actions may be envisaged under a local government wastewater regulation against any person who willfully or negligently violates any provision of the wastewater management regulation; who knowingly makes any false statements, representations, or certifications in any application, record, report, plan, or other documentation filed; and who falsifies or knowingly renders inaccurate any monitoring device or method required under the wastewater management regulation. The fines to be set may be in terms of “an amount, that does not exceed Rp[...] per each day of violation.”

12. Conclusions

All the efforts and activities aimed to collect, convey, treat, and dispose of wastewater produced in an urban community constitute a wastewater management service. In Indonesia, state laws entitle local governments to carry out this service, while all persons and entities that use water, and thus generate wastewater, are wastewater service users. To provide this service, local governments should develop and adopt a specific regulation, a Wastewater Management or Sewerage Regulation or Sanitation Code. When drafting a local government regulation on wastewater management, it is important to bear in mind that a regulation of this kind should govern the relationship between the local government and/or its service delivery organization (SDO) and the service users, establishing the rights and obligations of both. The regulation should set forth uniform requirements for the users of the regency's or city's wastewater management services, both for existing on-site facilities and for newly developed off-site sewerage systems and wastewater treatment plants (WWTPs), to ensure public health and safety as well as the respect for the environment, in accordance with the legislation in force. The regulation should not contain aspects that fall outside the scope of this relationship, such as wastewater system planning and development, as well as operation and maintenance of centralized sewerage systems and WWTPs.

Wastewater is produced by all water users with waterborne sanitation systems. In urban areas, the origin of wastewater may be essentially domestic, commercial, and industrial, while types of wastewater of agricultural or livestock origin are generally excluded. Industries located within the range of an off-site public sewerage system are also required to connect to the sewer network as it is usually unfeasible to provide adequate treatment and disposal capable of complying with effluent discharge requirements to the receiving water body in each industry. Therefore, local government regulations should address all types of urban wastewater and not limit themselves to domestic wastewater as most existing regulations in Indonesia have done so.

A local government wastewater regulation should set out the mandatory nature of wastewater treatment and disposal users. When the public sewerage system is not within reach, on-site wastewater treatment and disposal systems should be implemented. On-site systems include individual septic tanks and community-based networks and treatment and disposal facilities. Only domestic wastewater or wastewater assimilable to domestic wastewater can be discharged to on-site systems. Septic tanks have to be designed adequately, which is why local government regulations should contain basic design criteria with schematic drawings in an annex and reference existing standards in Indonesia. Septic tank systems should include an adequately designed and implemented percolation area for

effluent disposal and that, by lack of such facilities, discharge into drains or channels should require specific authorization by the local government.

The implementation and maintenance of on-site treatment and disposal systems is the obligation of the users. Regular desludging of septic tanks is critical to prevent water pollution, which is why it is recommended that the SDO undertake the responsibility of scheduled desludging, either directly by their own means or indirectly through licensed waste hauler contractors. The frequency of desludging depends on septic tank capacity and design, but the local government regulation should adopt a fixed interval, usually between 1 and 3 years (e.g., 2 years), and set out that the SDO should carry out regular inspections to examine the sludge level in the tanks and order unscheduled desludging. Both scheduled and unscheduled desludging should be organized and carried out through the SDO.

When a public sewer is available, the local government regulation should oblige all users (domestic, commercial, and industrial) to discharge their effluents into the wastewater collection system. A sewer is considered available when a pipeline is situated within a given distance L of the property line, L being generally from 60 to 100 meters (75 meters is recommended in Indonesia for the time being). The local government regulation should establish the technical requirements for the construction and maintenance of sewer connections or laterals, generally divided into a public portion and a private portion. The public portion or lower lateral, usually located in public domain, should be undertaken by the local government at their expense, while the private portion of the connection, located under private property, should be undertaken by the owner of the premises. The sewer connection of commercial or industrial users may have certain specific characteristics with respect to domestic connections, and the regulation should set out the characteristics of the control devices to be installed by the user to facilitate observation, sampling, and measurement of the quality of wastewater.

Local government regulations should also set up the SDO's right to examine and control indoor installations, when appropriate, to check whether they comply with all of Indonesia's relevant building and plumbing standards and certain requirement that may be included in the local wastewater management regulation in relation to backflow devices, and toilets and flushing devices, where available.

To safeguard public health and safety, prevent damage to sewers and the treatment plant, and protect the environment, local government regulations should specify the prohibited activities in relation to the public wastewater collection network and the prohibited discharges into the system. The regulations should also include a list of effluent discharge limits not to be exceeded by commercial and industrial users, and which also contains the chemicals, heavy metals, and toxic substances users are likely to discharge into the public sewerage system.

To control the access of users to the wastewater management service and set out the conditions thereof, the local government should issue permits and local government regulations should establish the principles and types of permitting. Taking into consideration the current status and the planned development of wastewater management in the regency or city, it is recommended to implement at least the following three classes of permits: (i) on-site wastewater treatment and disposal permits, (ii) residential building

sewer connection permits, and (iii) commercial or industrial sewer connection and effluent discharge permits. To obtain a permit, users should submit a written application on a form provided by the SDO using templates to be annexed to the wastewater management regulation.

All commercial and industrial effluent discharges should be subject to a discharge permit, in which the SDO may require adequate pretreatment facilities to remove the specific pollution and comply with national effluent standards, whenever available, and the effluent limits set out in the regulation. The pretreatment facilities should be designed applying Best Management Practices and according to state-of-the-art technology, implemented, operated, and maintained at the user's expense and located to be readily accessible for inspection and cleaning.

On the assumption that the investments relating to wastewater system development will be supported by external sources such as national government and international financing bodies, for the time being, the SDO needs to cover at least the annual operating costs of the public wastewater management services, both on-site and off-site, by means of adequate wastewater management fees. In consequence, local government regulations should establish the classes of fees to be adopted, which could be, in a first instance, the same as the permit classes indicated above. It is understood that the rates of the fees will be set by the local government annually.

The local government and the SDO have to put in place adequate means to achieve a maximum degree of compliance with the wastewater management regulation, which is why all local government regulations on urban wastewater management should define the necessary enforcement mechanisms. These enforcement mechanisms have to set out the SDO's authority and their right to enter private property for carrying out their task as well as to set forth different administrative and legal actions such as (i) notice of violation, (ii) administrative orders, (iii) emergency suspensions and termination of discharge, (iv) administrative civil penalty, and (v) legal actions.

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Urban Wastewater Management in Indonesia *Key Principles and Issues in Drafting Local Regulations*

One of the major concerns in urban development is proper wastewater management. In many developing countries, the lack of a comprehensive wastewater management law jeopardizes sustainable urban development. This is true in Indonesia where wastewater management regulations at the local level are inadequate. This publication discusses the basic principles of wastewater management services and is designed to be a guidebook for the development of local urban wastewater management legislation. This guidebook's chapters and sections can be readily transformed into the chapters and articles of a local regulation.

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Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

