

WEPA

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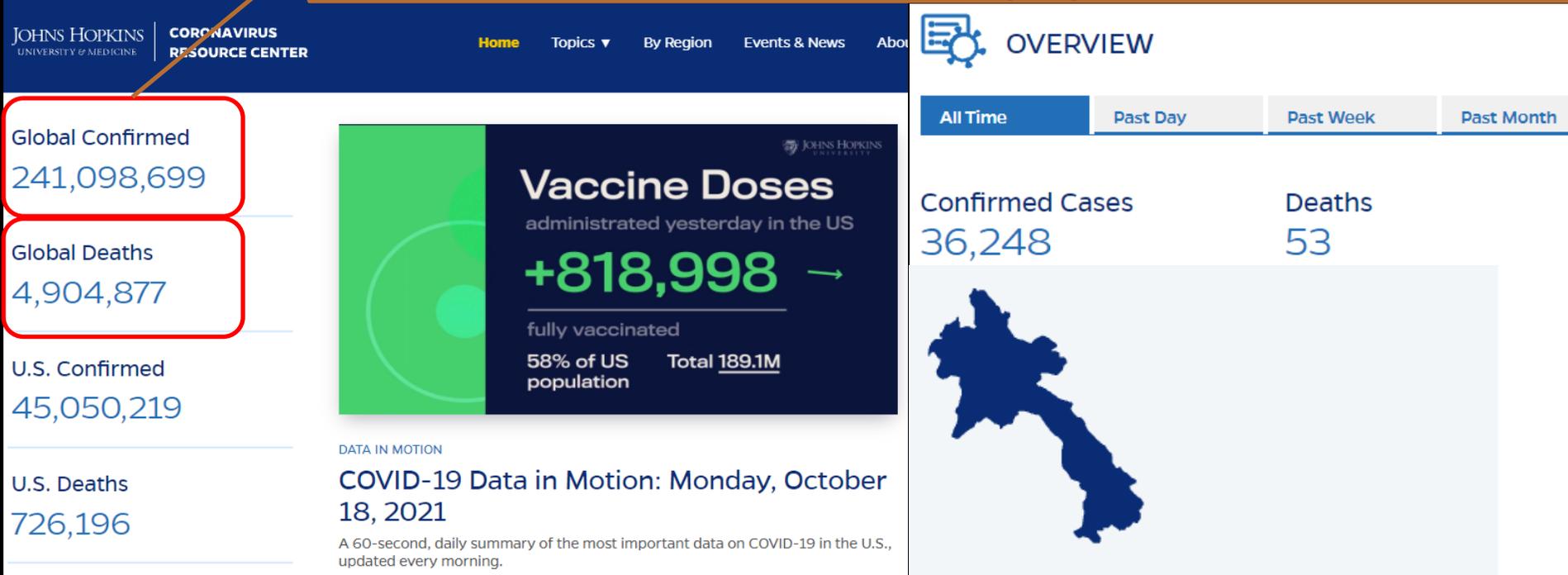
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Toward the Establishment of Sustainable Faecal Sludge Management

– Lessons Learned from WEPA Partner Countries and Japan –

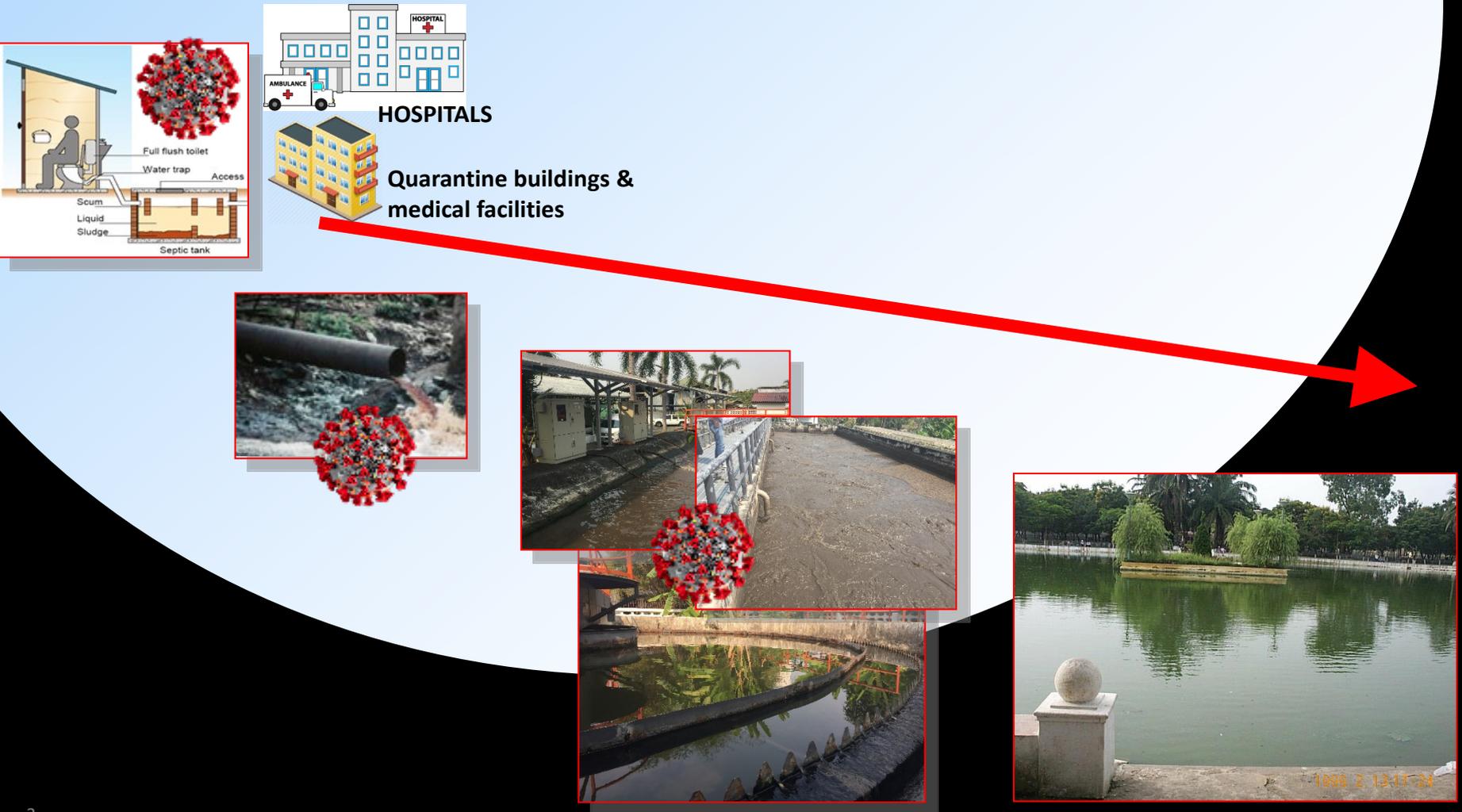
1. BACKGROUND

As of 18th October 2021, a total global confirmed cases exceed: **240 million people**
with a total global deaths: **4,904,877 people**



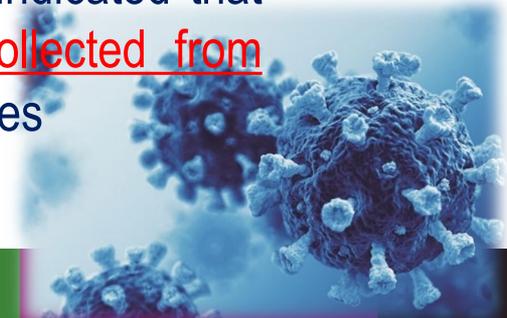
The COVID-19 outbreak has reiterated the need to ensure access to safe and reliable water and wastewater services for all to minimise microbial risks and protect human health during infectious disease outbreaks.

Detection of SARS-CoV-2 in human faecal, domestic and hospital wastewater



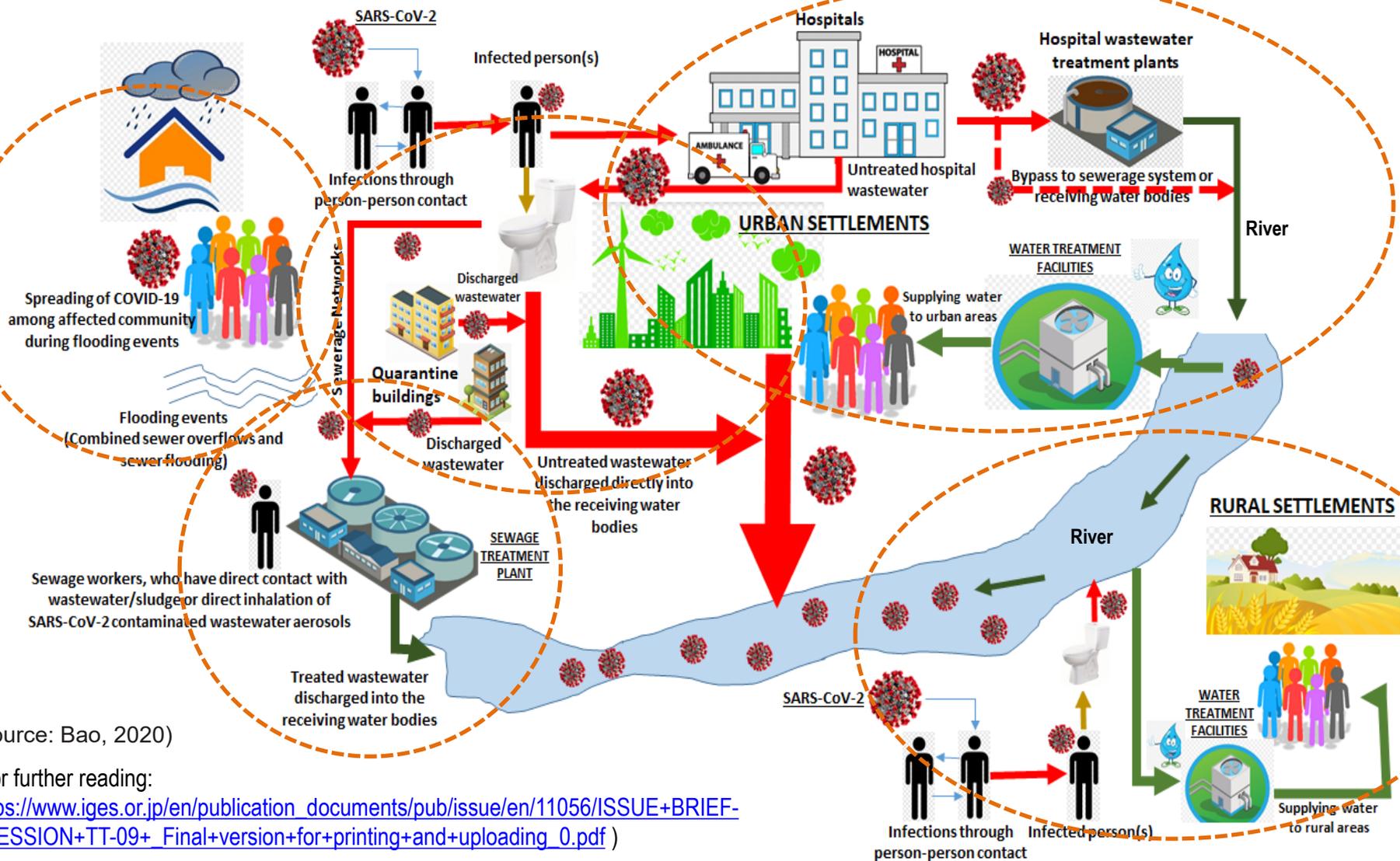
Detection of SARS-CoV-2 in Human Faeces of COVID-19 Patients

- SARS-CoV-2 was found in the stool of COVID-19 patients for a long duration (up to five weeks)
- SARS-CoV-2 RNA was also detected in the faeces of infected people who had mild or even no symptoms
- Regarding concentration of SARS-CoV-2 RNA, up to 10^8 copies/g-faeces were reported; but normally in the range of 10^3 - 10^8 copies/g-faeces, depending on the infection's courses.
- The virus concentration had its highest peak during the first week of symptoms and gradually decreased during the duration of the clinical course
- SARS-CoV-2 are shed in human faeces and urine, which subsequently reach the sewerage systems. There are a growing number of reports indicated that SARS-CoV-2 is detected in both raw domestic wastewater collected from affected areas, sludge from WWTPs and even in river water samples



Possible routes of SARS-CoV-2 infections and contamination across water and wastewater services in Asian countries

More than **240 million infected cases** have been reported and **nearly 5 million deaths** have been confirmed throughout the world



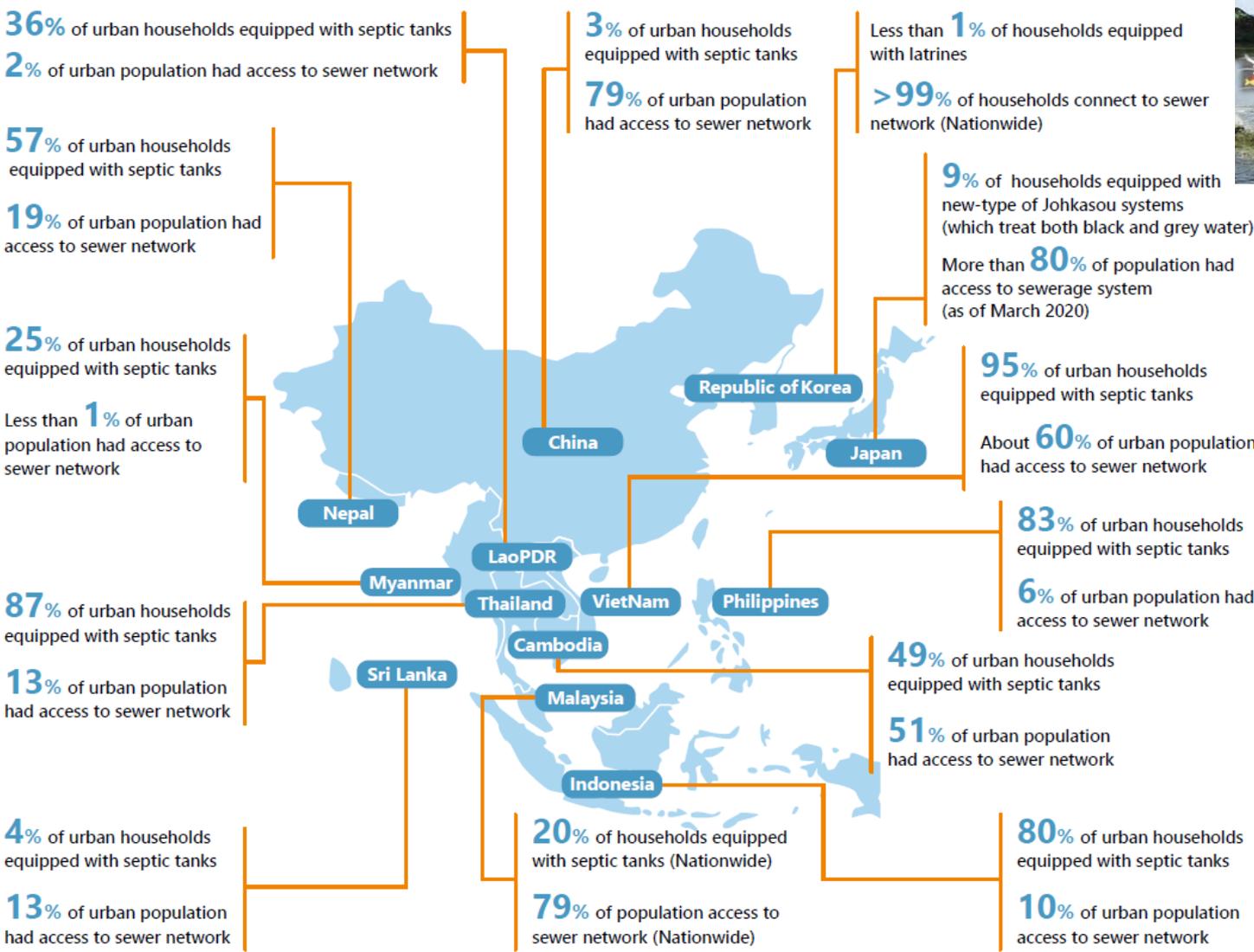
(Source: Bao, 2020)

(For further reading:
https://www.iges.or.jp/en/publication_documents/pub/issue/en/11056/ISSUE+BRIEF-+SESSION+TT-09+ Final+version+for+printing+and+uploading_0.pdf)

Septic Tanks and Sewer Network Coverage in WEPA Partner Countries



Illegal dumping of faecal sludge into receiving water bodies is commonly observed in many countries



The 2030 Agenda: Leave No One Behind



THE GLOBAL GOALS
For Sustainable Development

6 CLEAN WATER AND SANITATION



SDG Global Targets

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

1.4 By 2030, ensure all men and women, in particular the poor and vulnerable, have equal rights to economic resources as well as access to basic services...

4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all

3.8 Achieve universal health coverage (UHC), including financial risk protection, access to quality essential health care services, and access to safe, effective, quality and affordable essential medicines and vaccines for all

SDG Global Indicators

6.1.1 Proportion of population using safely managed drinking water services

6.2.1 Proportion of population using a) safely managed sanitation services and b) a hand-washing facility with soap and water

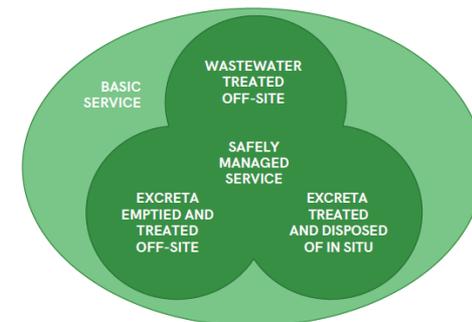
6.3.1 "Proportion of domestic and industrial wastewater flow safely treated"

1.4.1 Proportion of population living in households with access to basic services (including access to basic drinking water, basic sanitation and basic handwashing facilities)

4.a.1 Proportion of schools with access to... (e) basic drinking water, (f) single-sex basic sanitation facilities, and (g) basic handwashing facilities

[Proportion of health care facilities with basic WASH services]

To meet the new SDG criteria for **safely managed sanitation services**, households must use an improved type of sanitation facility that is not shared with other households and the **excreta produced must either be safely treated in situ, or transported and treated off-site.**



Faecal Sludge Management and Its Roles

Box 1. What is faecal sludge?

Faecal sludge (FS) often refers to the partially treated matter, which was stored in and pumped out of a septic tank or other on-site/decentralized sanitation facility (e.g., cesspool, pit latrine, ventilated pit latrine, dry or double-vault latrine). It is raw or partially digested, a slurry or semisolid, which contains three major components: scum, effluent and sludge. Faecal sludge management includes the process of storage, collection, transport, treatment and safe end-use or disposal of FS. FS is highly variable in viscosity, quantity, and concentration, depending on local contexts. (Rohilla et al., 2017)

- Increasing access to improved sanitation is not only a regional (Asian) but also a global priority. As well as the health benefits, **improved sanitation has significant economic benefits.**
- For example, **the return on 1 USD spent on water and sanitation improvements in low-income countries is 5 to 46 USD**, depending on the intervention (Hutton et al., 2007).
- Providing adequate access to sanitation facilities in itself does not ensure such facilities will operate properly or as intended, **if the issue of effective faecal sludge management is ignored.**
- Consequently, **improper management of this faecal sludge in many Asian countries, including WEPA countries, has resulted in significant impacts on human and environmental health in this region.**



Safely managed sanitation system needs to provide protection from exposure to hazards across the sanitation service chain, including proper faecal sludge management

Challenges Faced by WEPA Countries in Effective Faecal Sludge Management

Science seems to be clear...but **Reality & Future is NOT**

5m³ truck load of FS
dumping ~ 5,000 pe.
practicing open
defecation

1g of faeces may contain:

- ✓ 100 Parasite eggs
- ✓ 1000 Protozoa
- ✓ 1,000,000 Bacteria
- ✓ 10,000,000 Virus

More than 150 STP in Indonesia have been constructed, but only **less than 10% are still under operational**...because of **LACK OF APPROPRIATE TECHNOLOGIES???**....**NO**

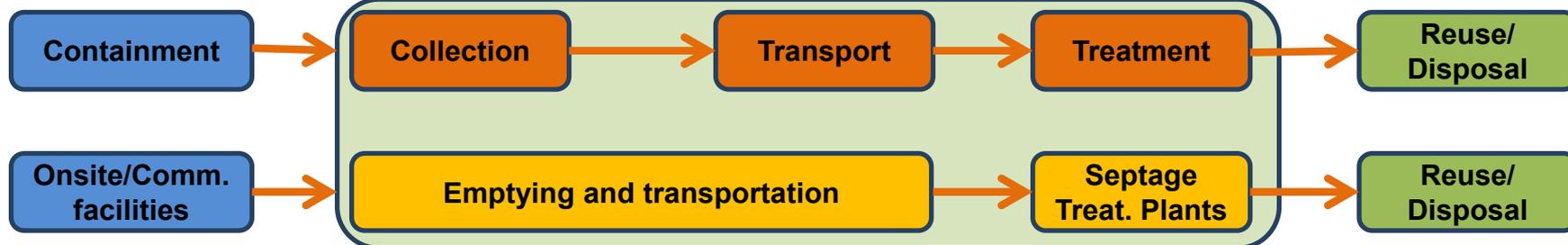


Septage management **requires an integrated system level approach, considering the overall sanitation service chain** and incorporating all relevant aspects (including technological, legal and institutional framework, financial, etc.), and especially there are strong **needs for appropriate business models for septage management in the region**

COMMON ISSUES & CHALLENGES IDENTIFIED ACROSS SANITATION SERVICE CHAIN



On-Site System



- Lack of regulation/enforcement and standard design of the on-site system
- No regular maintenance
- Leaked and low quality septic tank/pit latrines → Limited input to septage treatment facilities
- Open dumping is still popular
- Septic tank only available at middle – class family

- **ON CALL BASE**
- No SOPs
- Lack of regulation/enforcement
- Sludge is often illegally discharged on the way or discharged at collecting points connected to WWTPs
- Lack of appropriate collection facilities
- Limited number of trucks from state sewerage company

- Lack of regulation/enforcement
- No SOPs
- No faecal sludge treatment facilities.
- Lack of technical assistance, management support and private sector involvement
- No plan for reuse of treated sludge
- Low priority on sanitation improvement from both local governments and local communities

Challenges Faced by WEPA Countries in Effective Faecal Sludge Management

- ❑ Institutional framework for faecal sludge management throughout the entire sanitation service chain
- ❑ Guidelines on standard design of septic tanks and faecal sludge management
- ❑ Regulations on regular inspections, desludging and maintenance of on-site sanitation facilities
- ❑ Lack of understanding on effective faecal sludge treatment technologies
- ❑ Lack of effective business models for faecal sludge emptying, collection and transport, treatment and final disposal
- ❑ Financing and incentive mechanisms for cost recovery



EXAMPLE OF CASE STUDY IN BANDUNG AND DENPASAR CITY – INDONESIA

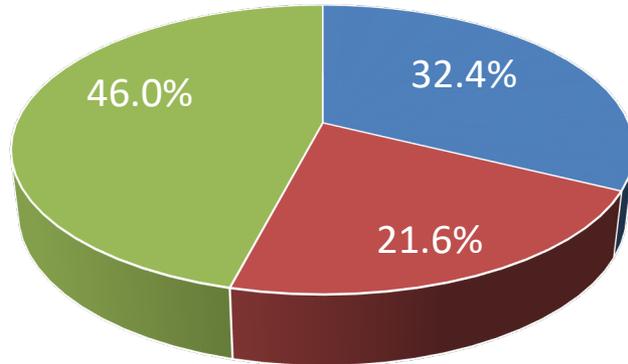
	National	Province	City/ Regency
Planning	National Planning & Development Agency <i>Develop National plan & policy (long term/mid term)</i>	Province Planning & Development Agency <i>Develop plan & policy in province or regional level</i>	City/ Regency Planning & Development Agency <i>Develop plan & policy in city/ regency level</i>
Implementation	Ministry of Public Works and Housing Develop infrastructure, policy, technical assistance (esp. for national strategic program)	Department of Public Works and Spatial Planning Development & Management in regional level	Department of Public Works and Spatial Planning Development & Management in city/ regency
Regulation/ Standard	Ministry of Environment and Forestry Issue environmental protection regulation (effluent standard, environmental permit)	Department of Environment Issue environmental protection regulation i.e. effluent standard (regional/ province level)	Department of Environment Issue effluent standard in City level, environmental monitoring, issue environmental permit
Hygiene Stimulation	Ministry of Health Develop national program for hygiene life, environmental health, community-based sanitation	Department of Health Develop regional/province level program for hygiene	Department of Health Develop city/ regency level program, Socialization of hygiene, air-borne disease protection
Synchronization and Local government coaching	Ministry of Human Affair Initiate Minimum Standard Service, and monitor the compliance, assist institution and regulation formulation		

(Source: Asri, 2021)

CASE STUDIES IN BANDUNG AND DENPASAR CITY – FAECAL SLUDGE MANAGEMENT

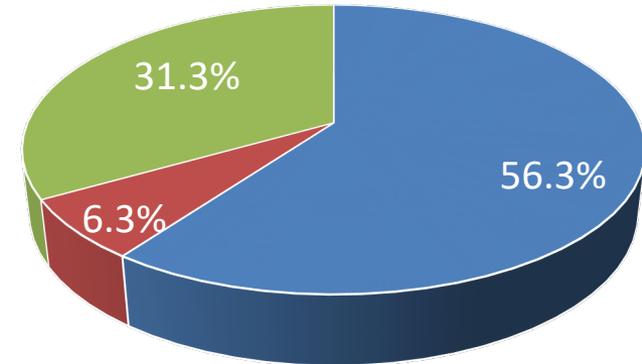
Frequency of Faecal Sludge Emptying at Households in Bandung and Denpasar

Bandung



■ 1-3 years ■ 4-6 years ■ More than 7 years

Denpasar

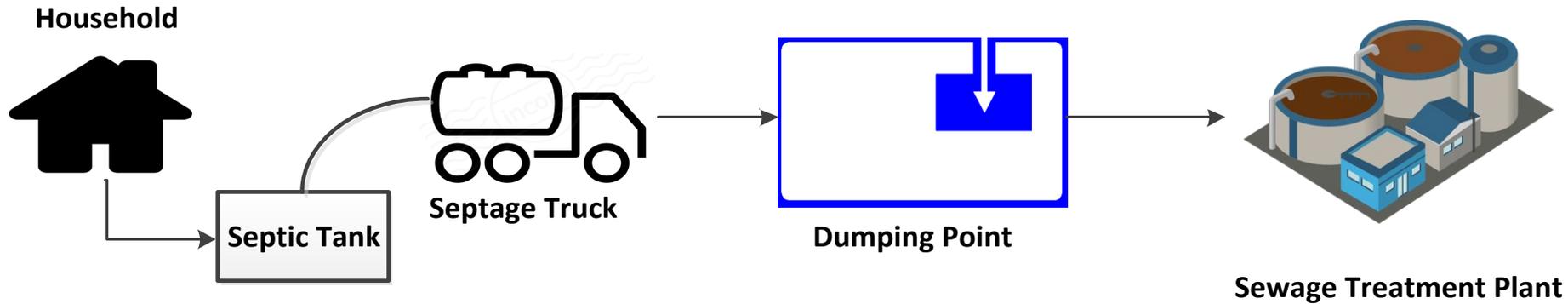


■ 1-3 years ■ 4-12 year ■ Never empty



CASE STUDIES IN BANDUNG AND DENPASAR CITY – SEPTAGE MANAGEMENT

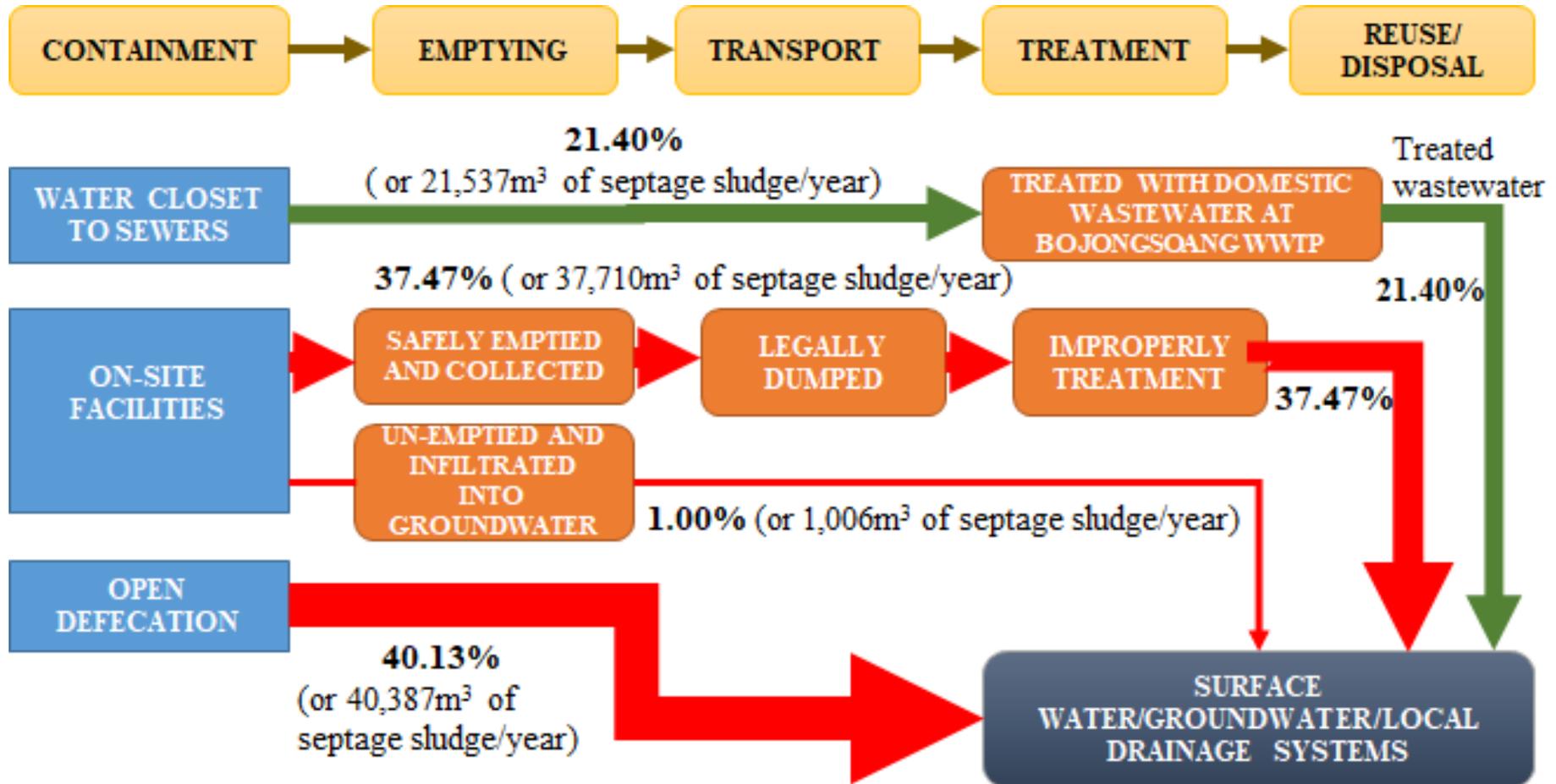
Septage Emptying, Collection and Transport, and Disposal in Bandung



In many cases, householders have to break their floor to access septic tank for sludge emptying

Emptying sequence desludging service section (a) Desludging process (b) Transporting septage to dumping point (c) Sludge dumping process (d) Dumping point that connected to Bojongsoang WWTP

Existing Septage Flow Diagram in Bandung



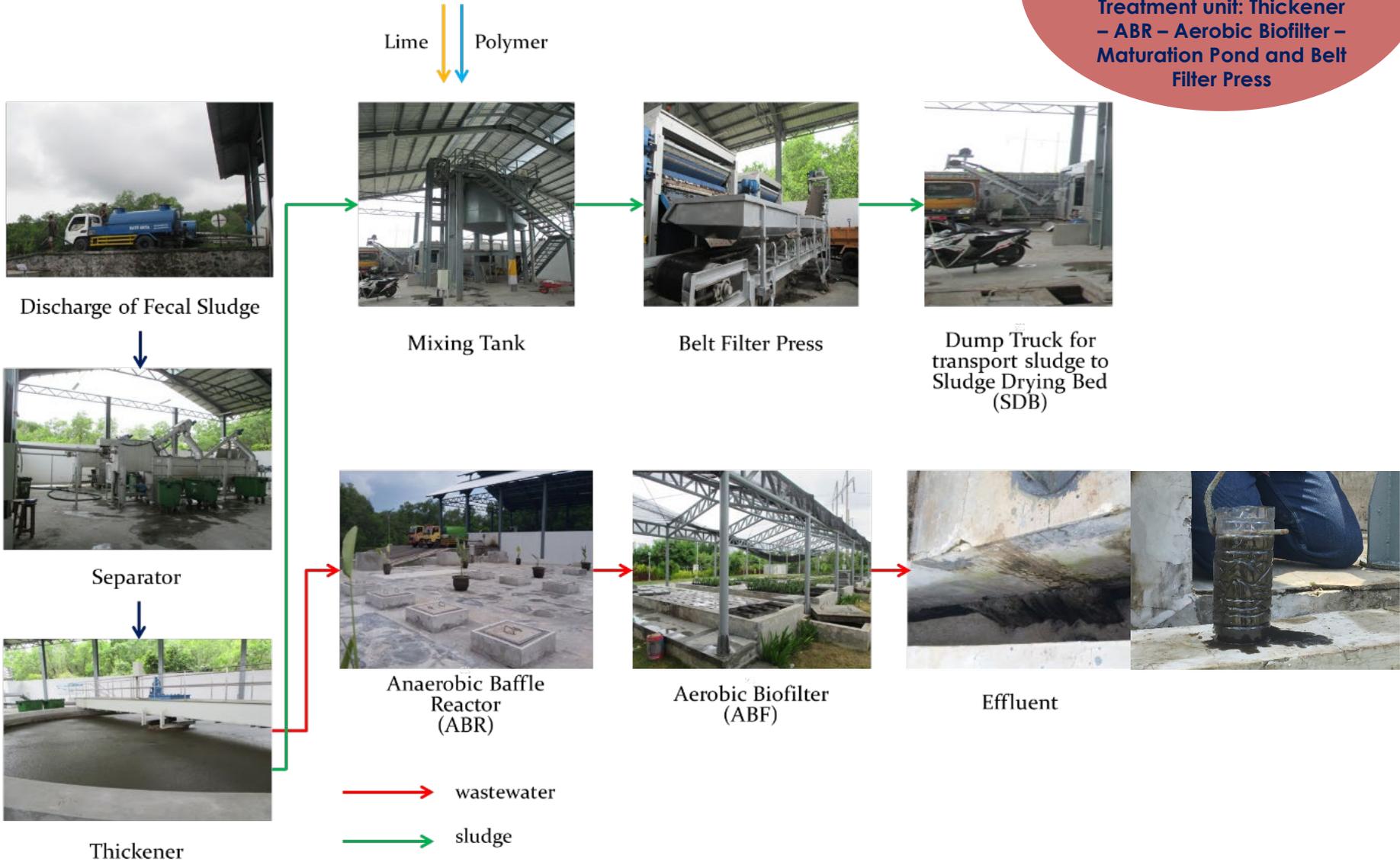
Faecal Sludge Treatment Process in Denpasar

SUWUNG FAECAL SLUDGE TREATMENT PLANT

SUWUNG FAECAL SLUDGE TREATMENT PLANT

Capacity: 400 m³/day

Treatment unit: Thickener – ABR – Aerobic Biofilter – Maturation Pond and Belt Filter Press



(Source: Bao, 2018)

Faecal Sludge Treatment Process in Denpasar

SUWUNG FAECAL SLUDGE TREATMENT PLANT

SUWUNG FAECAL SLUDGE
TREATMENT PLANT

Capacity: 400 m³/day

Treatment unit: Thickener
– ABR – Aerobic Biofilter –
Maturation Pond and Belt
Filter Press

Newly Installed Units – Sedimentation Tanks and Sand Filters



BUSINESS MODELS FOR SUSTAINABLE FAECAL SLUDGE MANAGEMENT

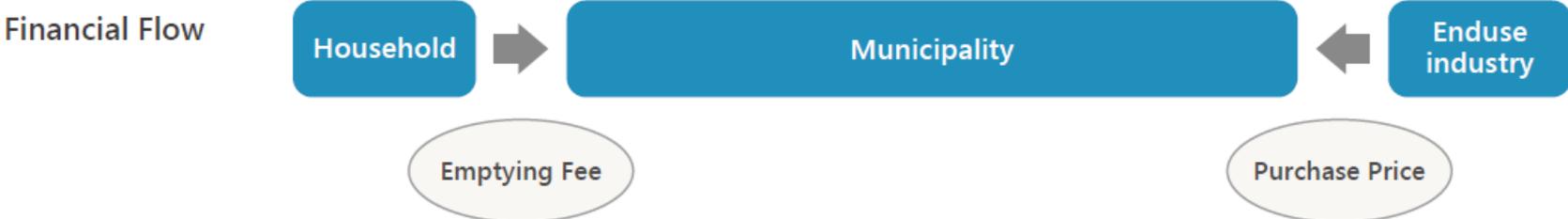
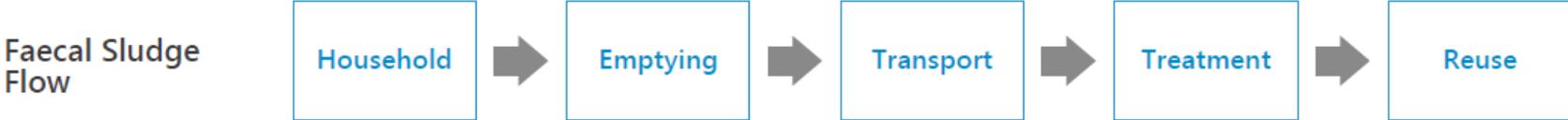
“Business Model” is often used to *describe how a business or service model is structured, financed, institutionally arranged and managed to enable quality services to be delivered to customers.*

Business models can consist of four core elements that describe a firm:

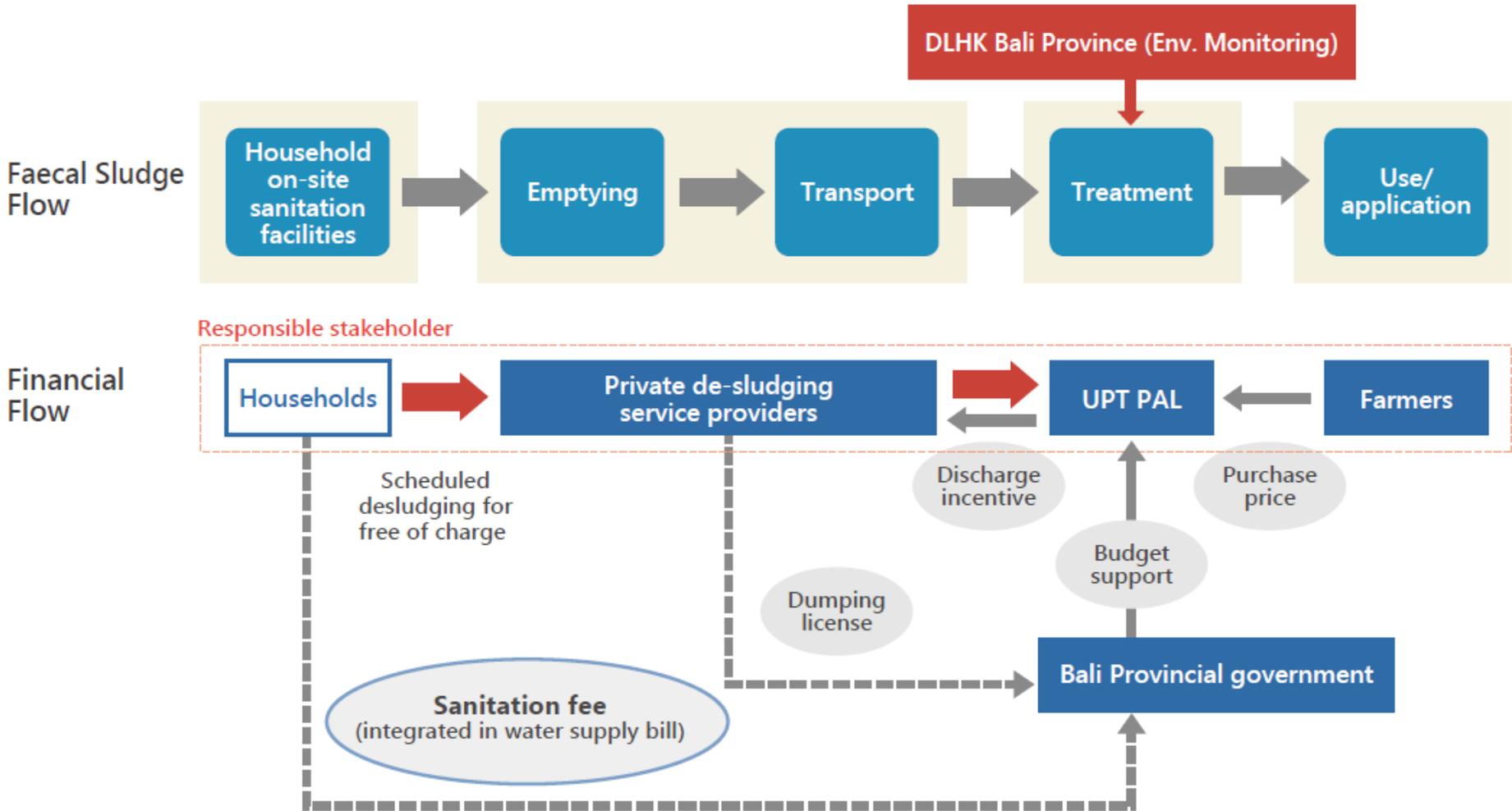
- (i) **Value proposition**, which distinguishes it from other competitors through the products and services it offers to meet customer needs;
- (ii) **Customer segment(s)** the firm is targeting, the channels it uses to deliver its value proposition and the customer relationship strategy;
- (iii) **Infrastructure** comprising the key activities, resources and partnership network that are necessary to create value for the customer; and
- (iv) **Financial aspects** (costs and revenues), which ultimately determine a firm’s ability to capture value from its activities and break even or earn profit.

Business models can be introduced at different stages of the sanitation service chain, including one for faecal sludge emptying, collection and transport, one for operating the faecal sludge treatment plants, and one for reuse or final safe disposal of the treated sludge.

EXAMPLE 1. BUSINESS MODELS FOR FSM IN NONTHABURI CITY- THAILAND



EXAMPLE 2. BUSINESS MODELS FOR FSM IN DENPASAR CITY- INDONESIA



LESSONS LEARNED FROM JAPANESE EXPERIENCE IN MANAGING FAECAL SLUDGE FROM JOHKASOU SYSTEMS

1955~1965

- High economic development phase
- Industrialization and urbanization

● Treatment technology

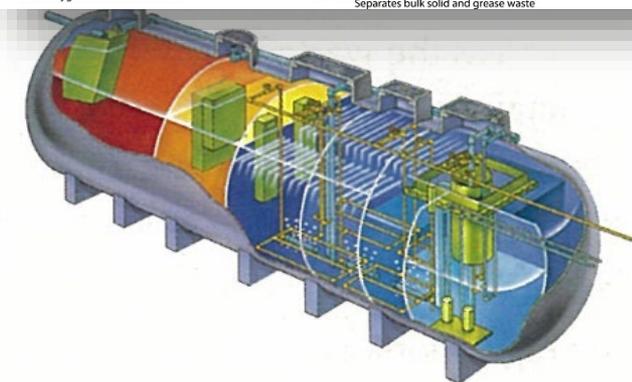
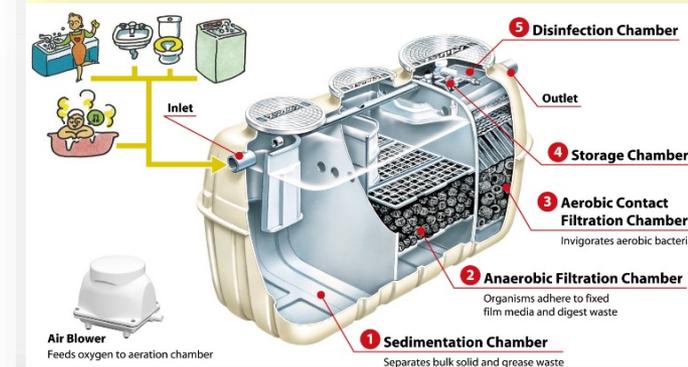
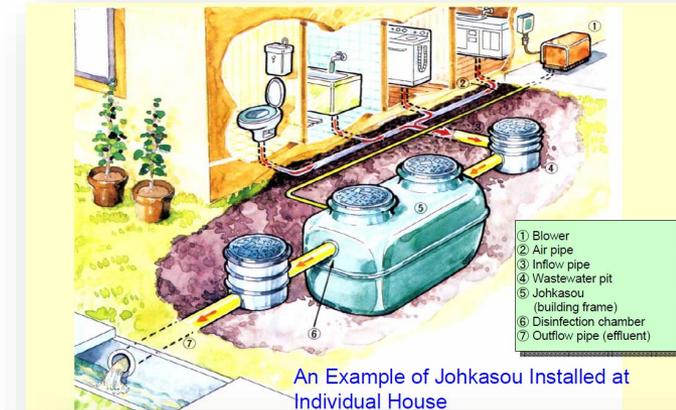
Medium/larger scale Johkasou was developed and was put into market

1985~1995

- Increasing awareness of environment conservation

● Treatment technology

- Household Johkasou with high treatment performance was developed and was put into market (effluent BOD < 20 mg/L)



Medium-scale johkasou (FRP-made)

LESSONS LEARNED FROM JAPANESE EXPERIENCE IN MANAGING FAECAL SLUDGE FROM JOHKASOU SYSTEMS

LESSON 1: Qualification and performance testing systems for on-site sanitation facilities

- ❑ All onsite sanitation facilities introduced **have to be appropriately certified** (Johkasou), especially for newly built houses or buildings that have no access to city or prefecture-based sewerage systems.
- ❑ As part of the building permit process, a municipal construction surveyor is required to check the installed facilities (Johkasou), which **must be standardized through use of a performance testing system to ensure sufficient performance during operations.**
- ❑ Unfortunately, this standardization process for on-site sanitation facilities, particularly for household users, had not yet been introduced in most other WEPA countries as of the time of this report.

LESSONS LEARNED FROM JAPANESE EXPERIENCE IN MANAGING FAECAL SLUDGE FROM JOHKASOU SYSTEMS

LESSON 2: Introduction of effective scheduled desludging programs

- ❑ In order to ensure onsite sanitation systems such as septic tanks perform and function appropriately, they **need to be desludged at certain time intervals** (e.g., 3 to 5 years depending on country).
- ❑ In practice, however, households only use emptying services upon the occurrence of issues with their septic tank (e.g., blockage, bad odor), thus **septic tanks are usually used despite being full of accumulated sludge and scum, which reduces their functionality and performance.**
- ❑ This practice, if continued, can **result in insufficient input amounts of faecal sludge for treatment at plants, forcing plant closure, as has occurred in Indonesia.**
- ❑ Japan introduced a scheduled desludging program for Johkasou systems **as a legal obligation for users, which obligates such be carried out at least once a year, managed by a municipality-certified desludging company.**

LESSONS LEARNED FROM JAPANESE EXPERIENCE IN MANAGING FAECAL SLUDGE FROM JOHKASOU SYSTEMS

LESSON 3: Sound financing mechanism for operation and maintenance costs

- ❑ In Japan, as part of its sanitation policy, a sound financing mechanism has been established to support investment, operation and maintenance costs.
- ❑ In 1987, the Government of Japan introduced the National Subsidy Program to help accelerate installation of the new type of Johkasou, which treats both black and gray water, and conversion of the old-type Johkasou.
- ❑ A number of specific measures and subsidy schemes from the government and municipalities have been implemented, such as the Johkasou Installation Promotion Program (for private installations) and Municipal Johkasou Installation Project (for municipal installations).

LESSONS LEARNED FROM JAPANESE EXPERIENCE IN MANAGING FAECAL SLUDGE FROM JOHKASOU SYSTEMS

LESSON 4: Establishment of training, examination and qualification systems for sludge service providers

- ❑ Desludging services in most WEPA countries are currently provided by either public companies and/ or private companies (formal or informal), which are sometimes not government certified. As a result, their performance is relatively poor, operations do not adhere to any standards, and the sludge collected is often illegally dumped or discharged into lakes, rivers, and sewage systems in order to save on fuel and discharge costs at designated dumping sites.
- ❑ In order to address such issues, an official training, examination and qualification system was established in Japan for desludging business/workers and operators, desludging technicians and vendors engaged in the desludging business, to ensure service quality can be maintained and controlled by the government.
- ❑ Associated costs related to training and examination are covered by trainees themselves or the companies hiring them.

LESSONS LEARNED FROM JAPANESE EXPERIENCE IN MANAGING FAECAL SLUDGE FROM JOHKASOU SYSTEMS

LESSON 5: Selection of appropriate technological solutions for faecal sludge treatment considering local contexts

- ❑ Like other WEPA countries, Japan is also challenged with securing the necessary land for constructing sanitary landfills and for dumping sludge from Johkasou systems and other centralized wastewater treatment plants.
- ❑ Consequently, compact systems for composting as a valuable fertilizer for agriculture or incinerating the sludge have been widely developed and constructed across the country.
- ❑ In 1997, the Government of Japan revised its subsidy policy for night soil and/or sludge treatment facilities through the introduction of a subsidy to eligible facilities, which also included resource recycling facilities. While sludge treatment technologies might be costly and may not be suitable in several WEPA countries, **Japan's wealth of experience in technological processes such as solid-liquid separation, treatment of supernatant (wastewater) and safe disposal of dewatered sludge could be shared with other WEPA countries for their future consideration.**

REMAINING ISSUES AND CHALLENGES FOR IMPROVING THE PERFORMANCE OF SANITATION SECTOR IN WEPA COUNTRIES

Insufficient investment and limited funding for improving wastewater and sanitation infrastructure to address the ongoing challenges , etc.

Low commitment and lack of priority given by local governments on wastewater and sanitation issues

Lack of technical guidelines for local governments and service providers on faecal sludge management

Lack of innovative funding mechanisms and business models for cost recovery

Inappropriate attention on O&M (for both on-site and decentralised systems)

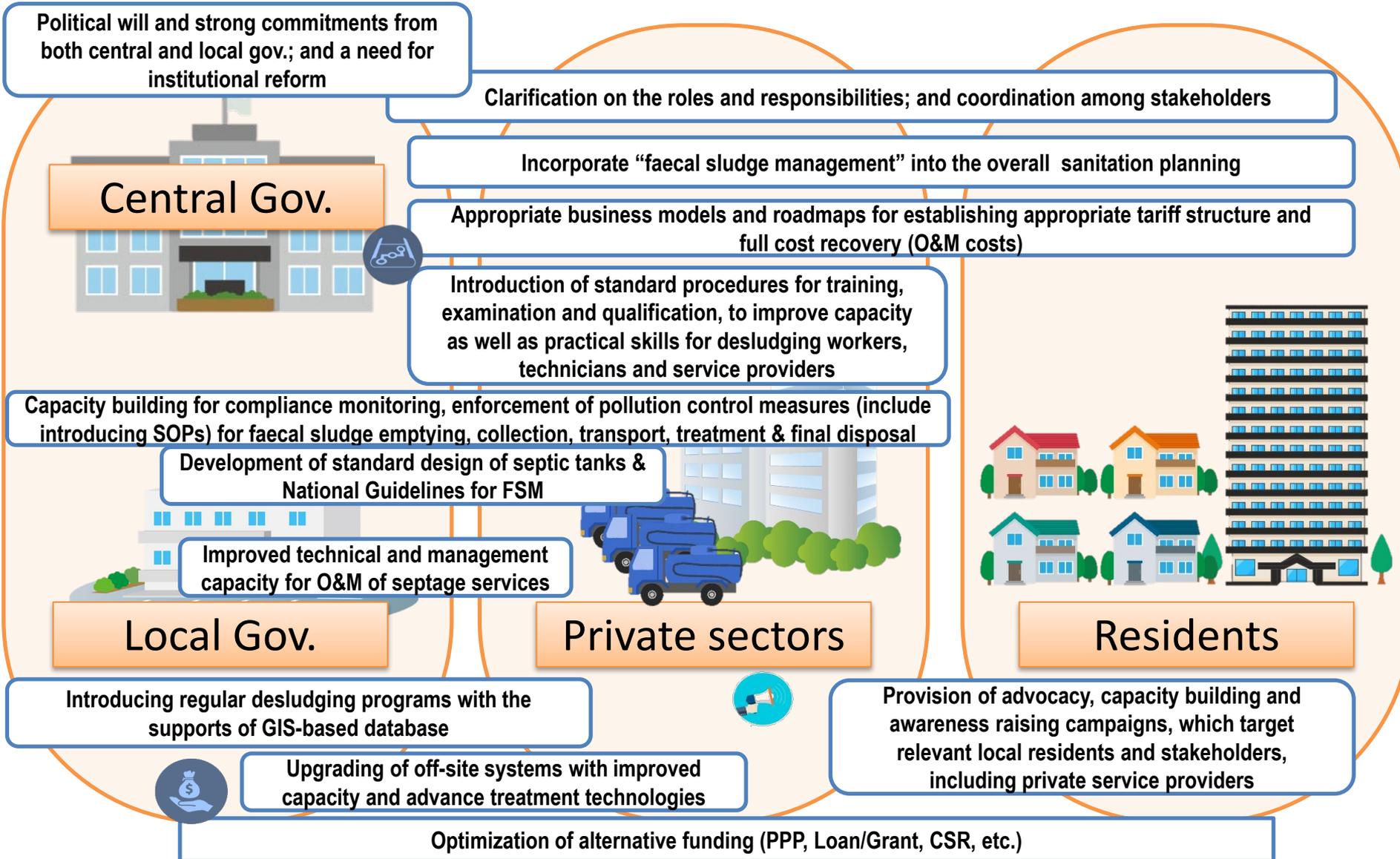
Limited human resources who expert in sanitation (including consultant and construction service providers)

Need a strong coordination among relevant institutions in sanitation sector

It is important to improve technical capacity for local governments (e.g. citywide strategic sanitation planning, sanitation regulations and institutional settings)



THE WAY FORWARD



**THANK YOU VERY MUCH
FOR YOUR ATTENTION!**

