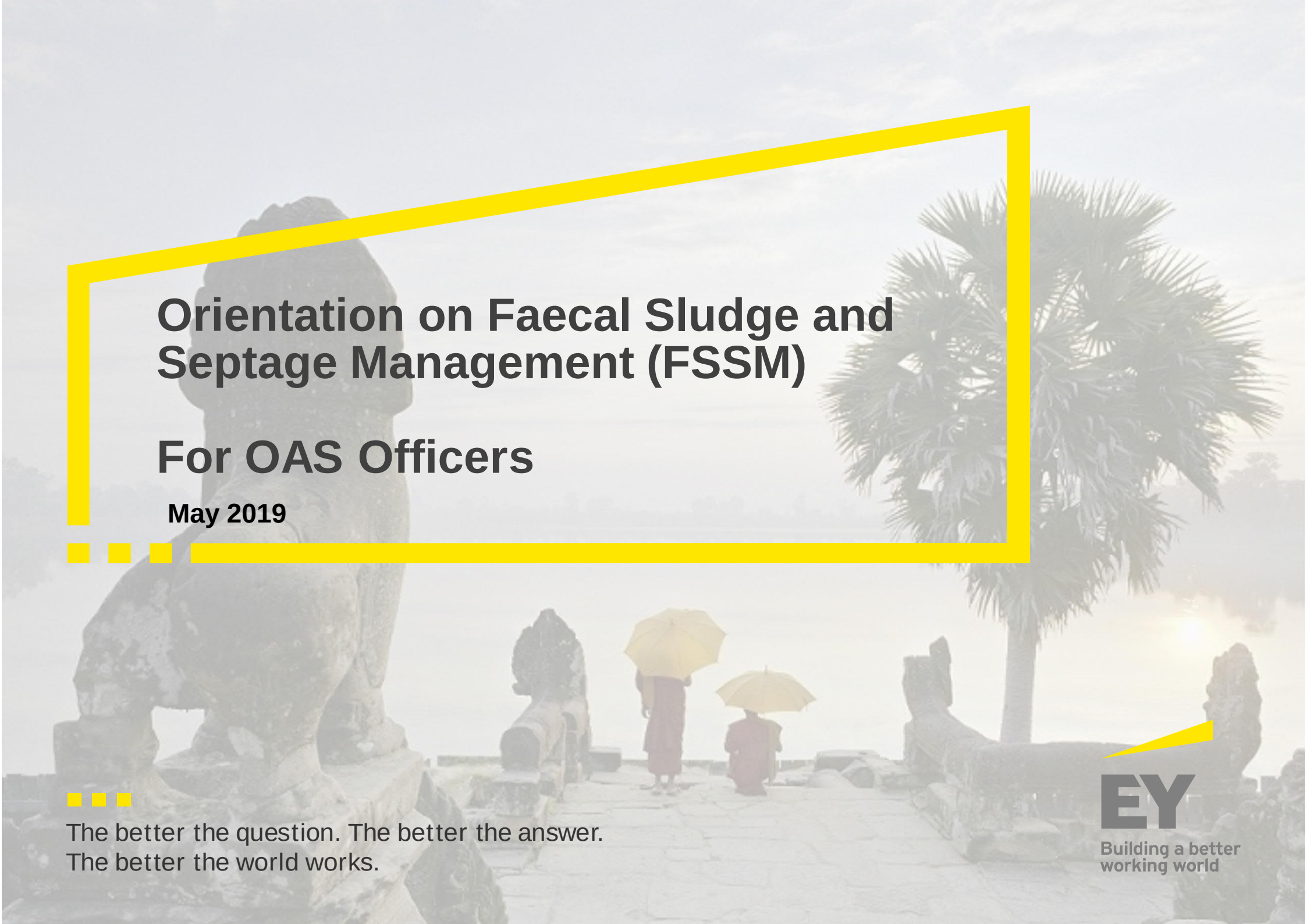
Orientation on Faecal Sludge and Septage Management (FSSM)

For OAS Officers

May 2019



The better the question. The better the answer.
The better the world works.

Building a better working world

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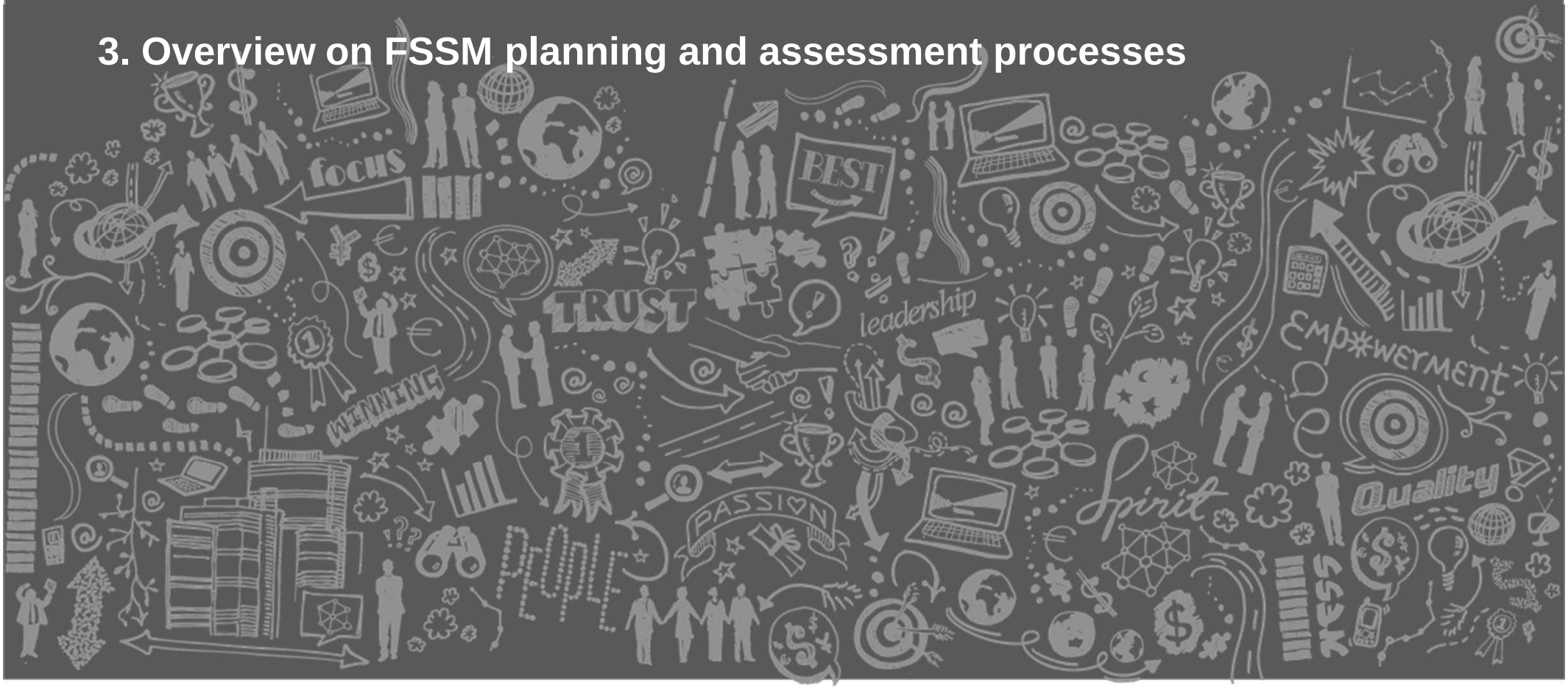
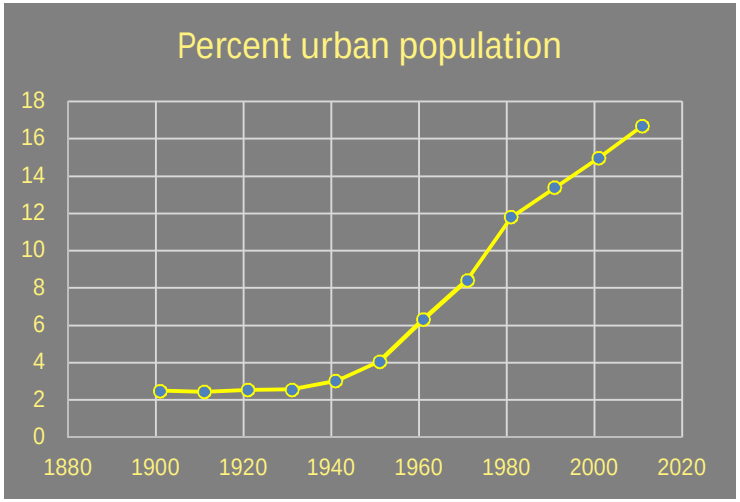


Introduction to FSSM

Urbanization and Sanitation situation of Odisha

SN	Description	Data
1	Urban population	7 million
2	% Urban population	16.7%
3	Total no. of ULBs	114
4	Urban households	~1.5 million
5	Cities with partial sewerage system	1

Source: Census 2011



Source: Rural- Urban Distribution of Odisha, Census of India

Sanitation situation of Urban Odisha

2011	2019
Sewerage network 11.46%	Sewerage network 10.30%
Individual Septic Tank 45.05%	Individual Septic Tank 40.46%
Community Toilets 2.05%	Community Toilets 6.24%
Other on-site measures 8.27%	Other on-site measures 53.3%
Open Defecation 33.17%	Open Defecation 0%

Understanding frequently used terms

Black water	Grey water	Sullage	Sewage
Septage	Faecal Sludge	FSSM value chain	Sanitation value chain

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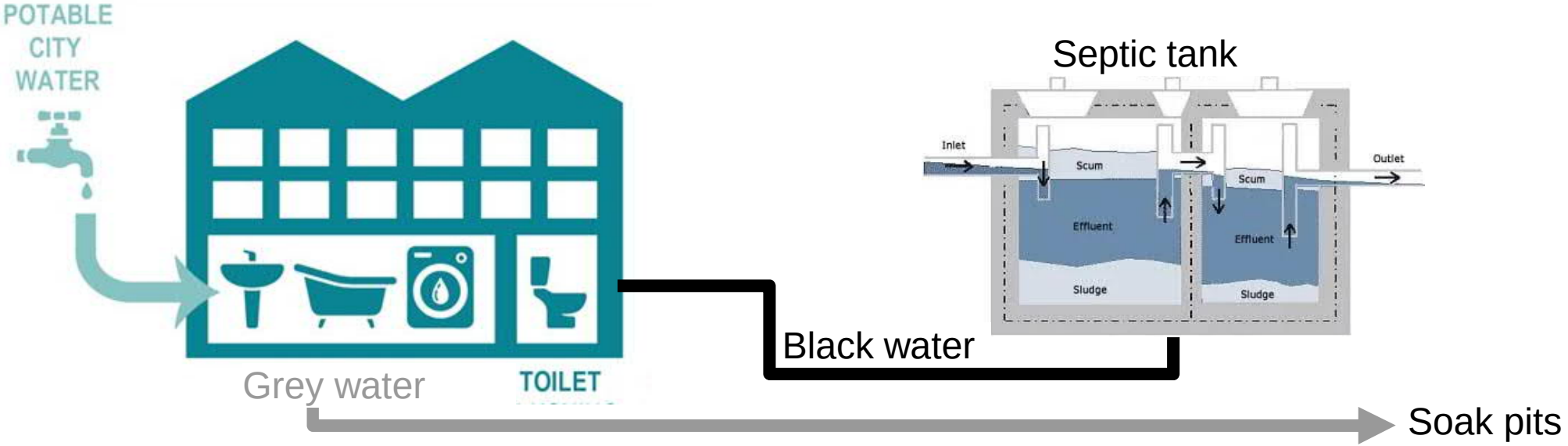


Sewage is the waste water containing solid and liquid excreta coming from communities, households, factories and industries

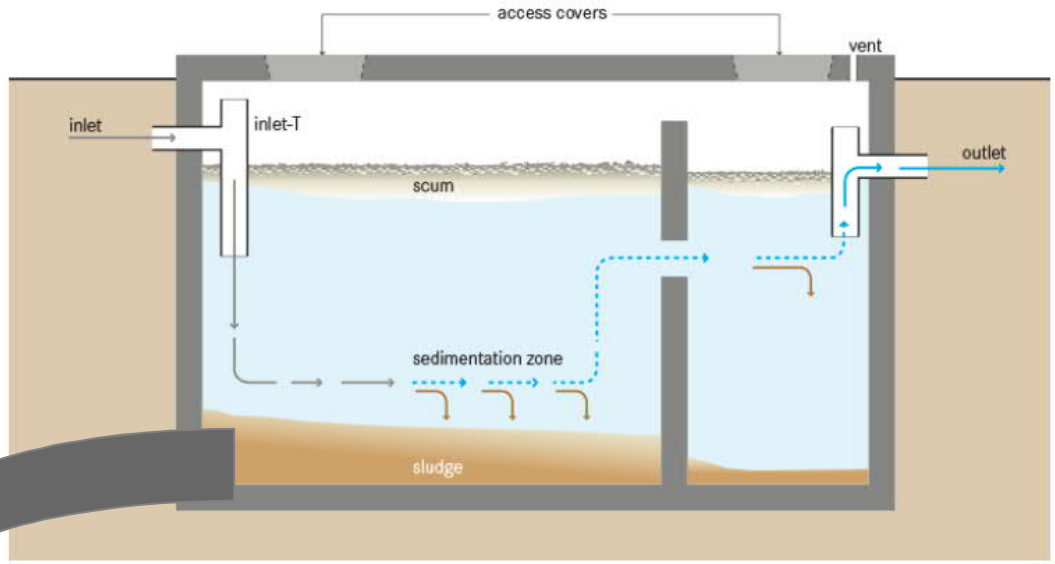
Black water

Grey water/Sullage means wastewater which does not contain excreta. For ex: Wastewater from kitchen and bathrooms

Grey water

Understanding frequently used terms

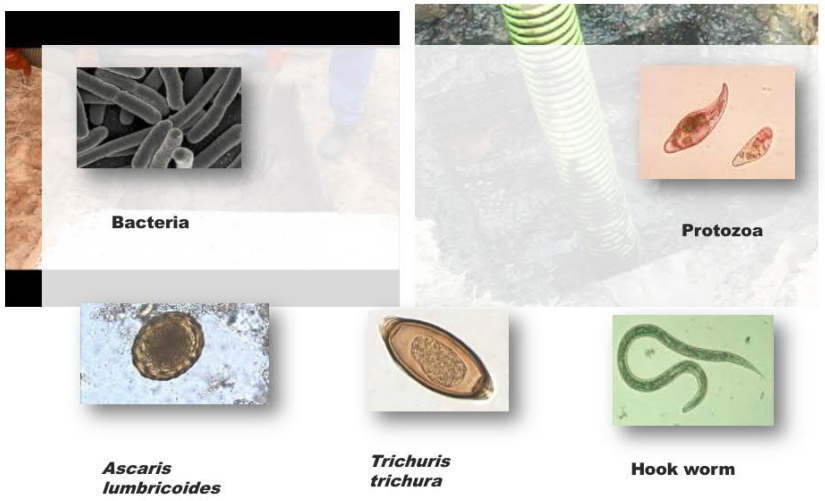
Black water	Grey water	Sewage	Sullage	Septage	Faecal Sludge	FSSM value chain	Sanitation value chain



Septage is the liquid and solid material that is pumped from septic tank or onsite treatment facility after it has accumulated over a period of time. It is the combination of sludge, scum and liquid that has accumulated in the septic tank

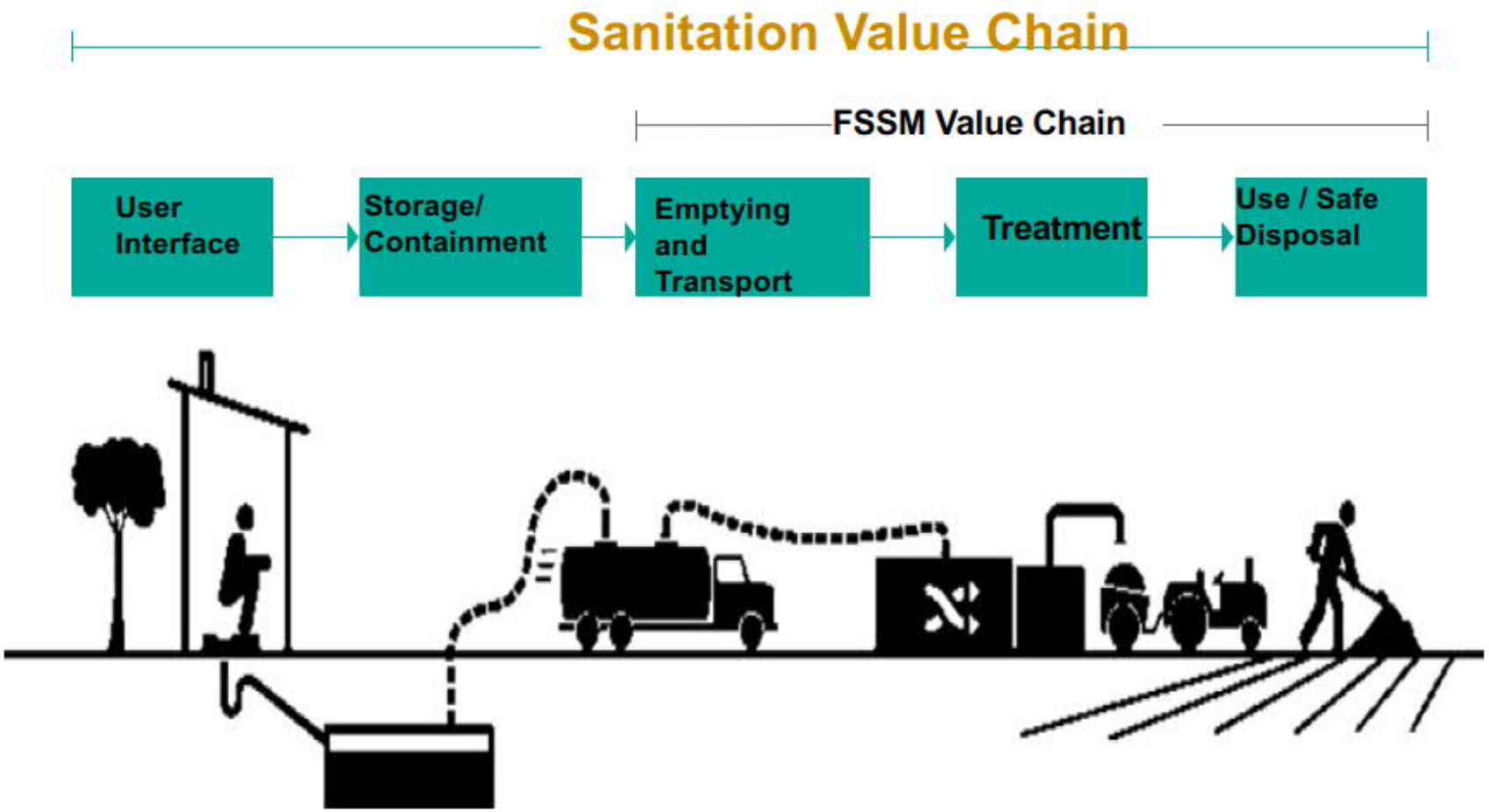
Faecal sludge is the solid or settled content of pit latrines and septic tanks

Microorganisms present in septage



Understanding frequently used terms

Black water	Grey water	Sewage	Sullage	Septage	Faecal Sludge	FSSM value chain	Sanitation value chain



ODF, ODF+ and ODF++ protocol

	Elimination of OD practices	Access to toilets	Conveyance and treatment of faecal waste
ODF City	ï Not a single person found defecating in the open ï No traces of faeces are visible in the city at any time of the day.	ï All the properties in the city have access to either own toilet or functional community/ public toilet ï Floating population in the city has an access to sufficient and functional public toilets	ï All toilets are connected to a disposal system
ODF+ City	ï Not a single person found defecating in the open ï No traces of faeces are visible in the city at any time of the day.	ï At least 80% of residential properties in the city have access to own toilets ï Remaining properties and floating population in the city have access to functional community/ public toilets	ï All toilets are connected to a disposal system ï Regular and safe collection, conveyance and treatment of all the feacal matter
ODF++ City	ï Not a single person found defecating in the open ï No traces of faeces are visible in the city at any time of the day.	ï At least 95% of residential properties in the city have access to own toilets ï Remaining properties and floating population in the city have access to functional community/public toilets	ï All toilets are connected to safe disposal system ï Regular safe collection, conveyance and treatment of all feacal matter and waste water including septic tank effluent and grey water

Why FSSM??

Faecal Sludge and Septage Management

- As per Census 2011, only 2.5% of Odisha had access to sewer networks; 97.5% of the population was dependent on pits and septic tanks
- Conveyance of waste through cesspool emptier vehicles
- Treatment of black water in non-sewered areas
- Technology option can be natural and gravity based; reducing operations and maintenance
- Per capita waste generation of only ~70 L per annum of faecal sludge vs 39,420 L per annum of sewage: less area requirement for treatment facility

Less expensive

Neither CAPEX nor OPEX intensive:

Cost of INR 250 - 800 per person depending on cost of land and size of plant vs INR 8000 - 20000 per person of conventional sewerage system with same variables

1

Less implementation time

Only treatment plant needs to be constructed (1 year). No need of laying sewer network

2

Less land requirement

Because only black water is treated, land required per person is much lesser. As such, facilities can be set up in towns with land constraints

3

Challenges in FSSM

Challenge in collecting sludge

Septic tanks are below the toilets and don't have access covers

Inaccessible septic tanks with sealed tops

Septic tanks located near drains and sealed from the top

Single pit toilets

Oversized septic tanks

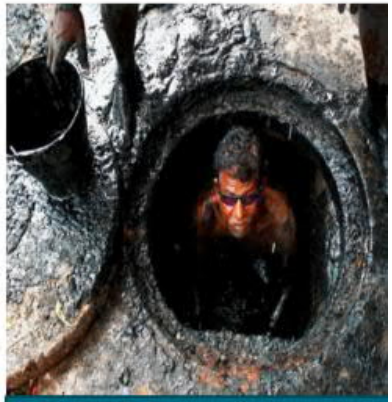
Toilets directly connected to drains

Challenges in FSSM

Challenge in conveyance system

Services mainly provided by city governments

Unsafe handling of septage



Informal Private sector

Emptying when the tank is full

- No monitoring mechanism for informal sector
- Cleaning cycle greater than 8-10 years against recommended cycle of 2-3 years
- Due to infrequent cleaning, septage begins to solidify in tanks and septic tank fills up, faecal matter along with effluents is released into the drains

Challenges in FSSM

Challenge in disposal

Disposal of septage at dump site

NO TREATMENT OF FAECAL SLUDGE & SEPTAGE

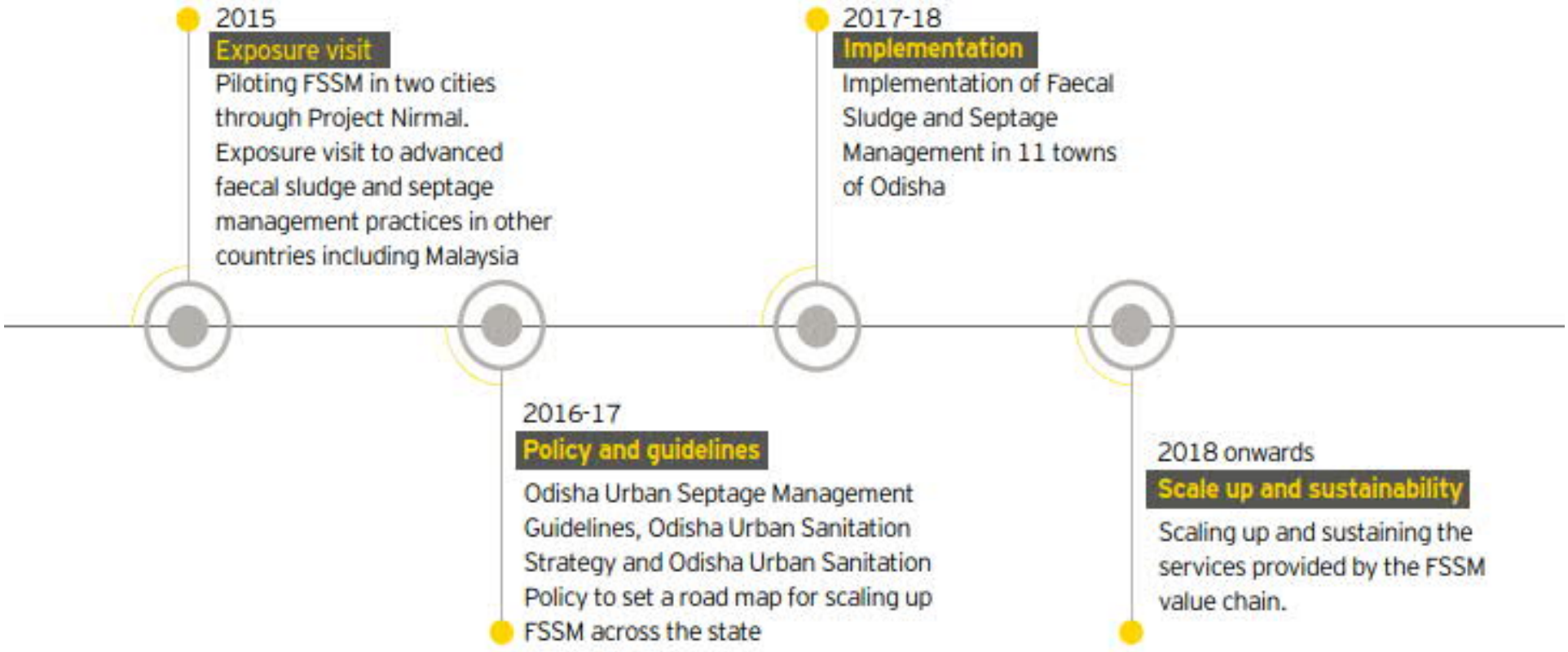
Disposal of septage in open land

Disposal of septage in water bodies

Policy and regulation on FSSM

Odisha’s intervention to manage faecal sludge and septage

Odisha is a front runner in the country to implement FSSM services in all the 114 ULBs across the state



Policies, guidelines and regulations on FSSM in Odisha

Odisha Urban Sanitation Strategy & Policy (OUSS, OUSP) 2017

The Odisha Urban Sanitation Strategy & Policy 2017 defines a clear vision and goal to make all cities and towns in the state totally clean, sanitised, safe, healthy and liveable, managed by ULBs with active citizen and stakeholder participation

Key Outcomes

1. Urban areas are open-defecation and discharge free
2. Municipal Solid Waste is safely managed and treated
3. Sewage, septage / faecal sludge and liquid waste is safely managed, treated, and disposed
4. Safety standards and guidelines are followed in the physical handling and management of waste
5. Women and girls have access to safe menstrual hygiene management (MHM)
6. Cities/towns do not discharge untreated waste (solid, liquid, and faecal waste) into the water bodies

Outcome 1: Urban areas are open-defecation and discharge free

- No observed open defecation
- All city residents have access to & use of household, community, and/or public latrines
- There is adequate access and use of latrines in all institutions
- All insanitary latrines (including single pit latrines)are converted to sanitary latrines, and no incidence of Manual Scavenging observed
- All city residents are engaged in safe hygiene practices, including hand washing

ULBs to ensure

- All households have adequate household or community sanitation Infrastructure
- Adequate and equitable public sanitation infrastructure
- Safe technology is used in the construction, maintenance & management of sanitation Infrastructure
- Operations & Maintenance
- Behaviour Change Communication

Outcome 2: Municipal Solid Waste is safely managed and treated

- Reduction of solid waste
- Door-to-door collection of MSW and segregation at source
- Secondary storage points / depots / transfer stations
- Scientific transportation of MSW to a processing site
- Scientific processing of MSW
- Disposal through common Sanitary Landfill Sites (SLF)
- The informal sector as a service provider under MSWM in Odisha
- Engaging the public as responsible citizens for MSWM
- Enforcement of SW Rules & Monitoring

Outcome 3: Sewage, septage/faecal sludge & liquid waste is safely managed, treated & disposed

City Sanitation Plans (CSPs)

State through ULBs to ensure provision of these services to both household, and non-household facilities

Sewerage & septage management guidelines

- Safety standards for septic tanks & other OSS
- Safe Transportation of sludge
- Setting standards and norms for safely treated septage/sewage & effluent, & safety and public health service delivery standards
- Engagement of non-government stakeholders
- Regulation, coordination and ULB primacy
- O&M and Monitoring & evaluation (M&E)
- IEC and BCC
- Capacity building and training

District administration to ensure

- Provision land for development of sanitation infrastructure for ULBs based on technological & environmental considerations
- Ensure M&E for septage / sewage management of all ULBs within district

ULBs to ensure

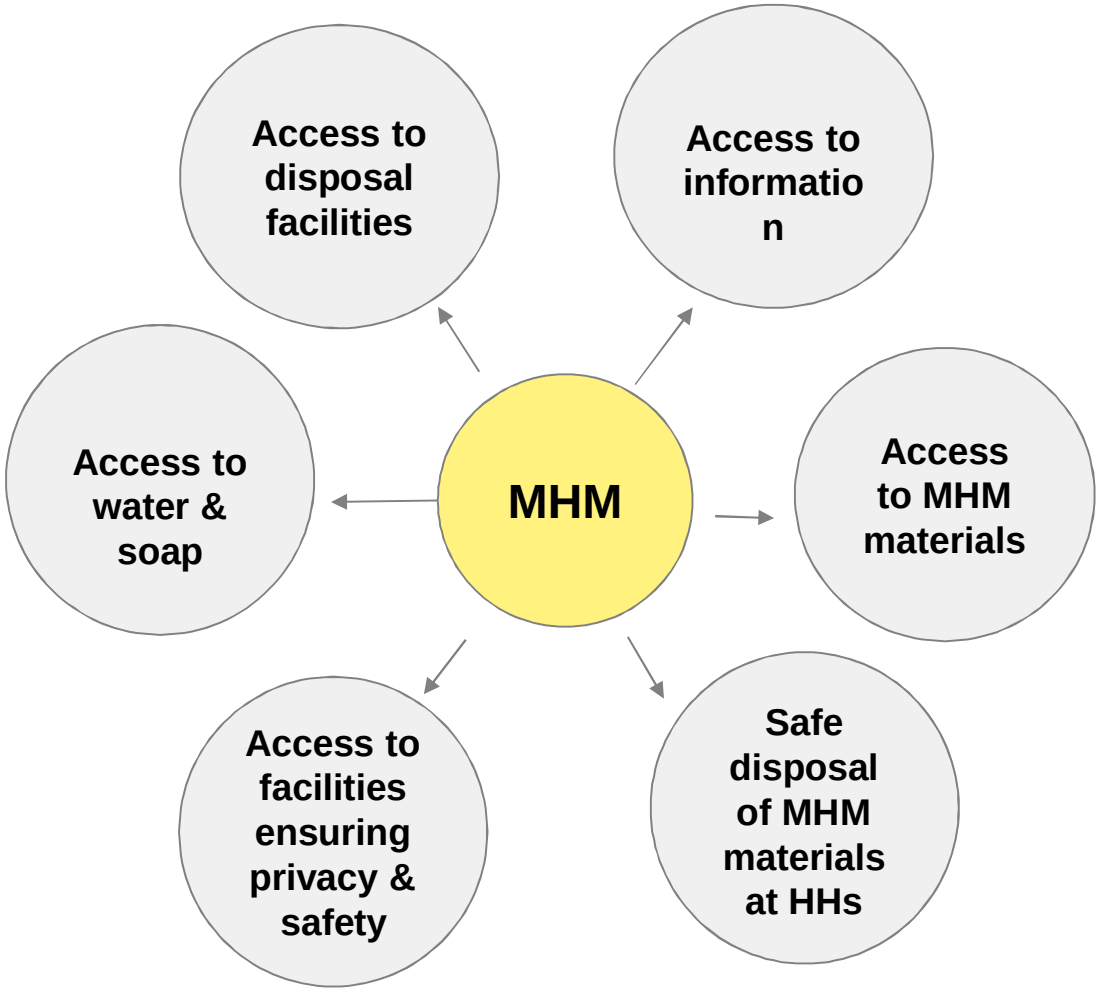
- Nomination of a nodal officer for septage/sewage management in city.
- Extension of full support for capacity building initiatives,
- Ensure sanitation infrastructure is operated and maintained
- Engagement of general public under this plan
- Facilitation of engagement of the private and informal sector in infrastructure creation, O&M & service delivery in the city
- Ensure adequate budgetary provision for city-wide sanitation delivery under the CSP

Outcome 4: Safety standards & guidelines are followed in physical handling & management of waste

State & ULB to ensure:

- State rules under the MSA 2013 are passed with clear indications of responsibilities & roles for State Government departments & ULBs.
- All relevant State Government & ULB officials (including law enforcement) elected representatives are familiar with provisions of MSA 2013 & relevant rules.
- Identify insanitary latrines in State for conversion into sanitary latrines.
- The urban public are sensitised to provisions of law & come forward voluntarily to convert insanitary latrines into sanitary latrines & refrain from employing MS.
- Take necessary steps (including legislation, resolutions & fines) to ensure in the future no insanitary latrines are constructed in State & MS are not engaged for these latrines.
- Ensure guidelines for sanitation infrastructure at household and non-household institutional levels covers construction of sanitary & ecologically safe toilets (and sub-structures) that require neither manual scavenging, nor hazardous cleaning.

Outcome 5: Women and girls have access to safe menstrual hygiene management (MHM)



The state government shall promote the access of women and girls to safe Menstrual Hygiene Management in public, community, and private institutional sanitation facilities

Outcome 6: Cities/towns do not discharge untreated waste (solid, liquid, and faecal waste) into water bodies

Elimination of urban pollutants – septage / faecal sludge, and municipal solid waste – into the rivers and river basins of Odisha from urban and peri-urban areas thus ensuring the protection, conservation restoration, regeneration and integrated development of river sand river basins in Odisha.

Elimination of Open Defecation & Insanitary toilets

HH, community, public & institutional site sanitation to be provided with and follow standards of FSM / septage Management

ULBs to ensure constructed drains repaired at vulnerable points to prevent leakages into environment

Waste water treatment facilities at community, city-levels to be explored to ensure no waste water (grey or black) reaches open environment untreated

MSW dumped into constructed, natural drains to be cleaned, & waste collected, scientifically treated & disposed as specified. Storm water drains to be constructed as per approved norms

ULBs to ensure disposal of human & animal body wastes are properly monitored, follow set norms, & do not result in pollution of water bodies

Waste management in cities/ towns to be such that no solid and/or liquid waste is disposed of into the water bodies. The waste is scientifically processed & only treated effluent meets environmental discharge norms

OUSS – Institutional Framework

State level institutional set up

- High Powered Committee (HPC)
- State Sanitation Directorate (SSD)

District level institutional set up

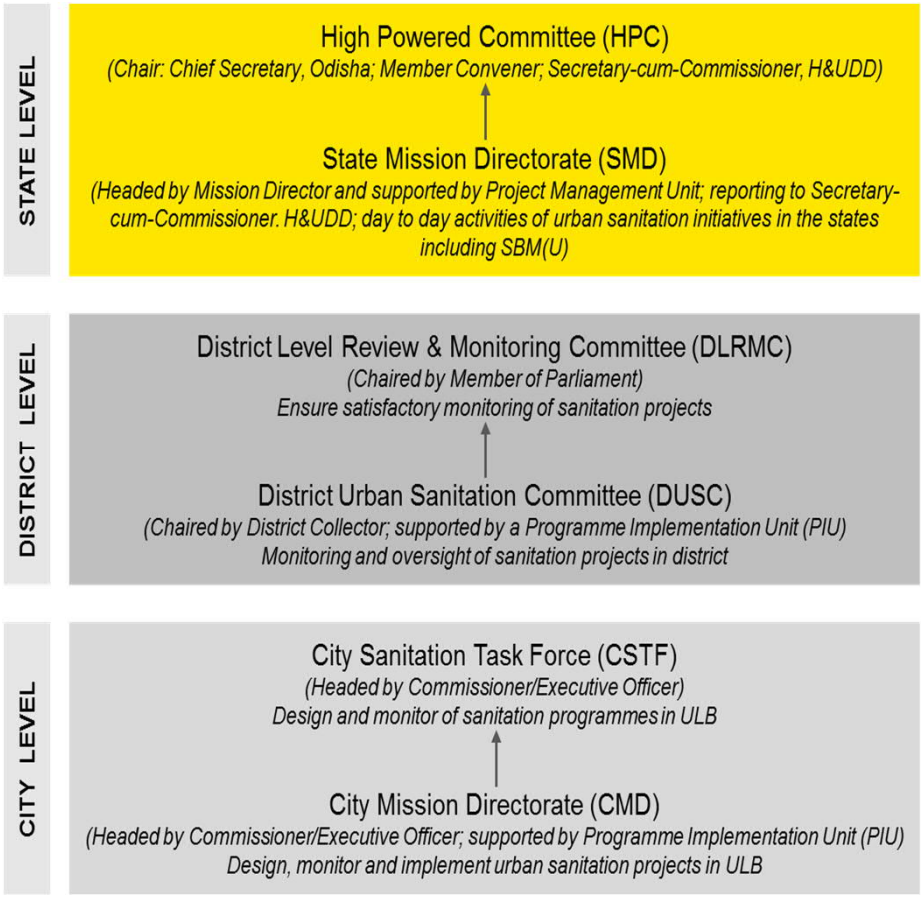
- District-level Review & Monitoring Committee (DLRMC)
- District Urban Sanitation Committee (DUSC at DUDA)

ULB level institutional set up

- City Sanitation Task Force (CSTF)

Sub-city level institutional set up

- Ward Committees/Area Committees
- Other Support Organisations



OUSS - Implementation

Setting the standards

- Environmental standards
- Technical standards and guidelines for on-site/off-site technologies and management
- Public Health indicators and standards
- Safety standards for workers involved in safe sanitary disposal and management

Service delivery

- ULB to be accountable for service delivery & for assets created and managed
- All service providers to confirm to SLB standards stipulated by the GoI. & report accordingly.
- All asset-creation from CSP to be inventoried and ownership made clear. Service delivery through agencies contracted by the ULB

Regulation, coordination &ULB primacy

- ULB as having the key regulatory role over all properties & agencies, households in the city in respect of outcomes and stipulated process standards subject to due cognisance of law
- Strengthening existing State level institutions that are charged with ensuring compliance of ULBs to all standards

Capacity building & Training

- **Build capacities of the existing ULB structure – political and executive**
- **Equip suitable institutions to build capacities in ULBs; State training institute for urban leaders/managers is urgently recommended**
- **ULBs will also need to provide training on sanitation to their own staff using identified State level resource agencies**
- **Utilize Govt. of India (including NUSP) & State Government Schemes for training and capacity building**
- **Capacity building not be limited to government functionaries, but also to frontline sanitation workers working at the city, ward, and household-levels.**

Odisha FSSM Regulations 2018

Management and disposal of waste water	• Management and disposal of waste water from premises
Containment & desludging	• Design, construction & maintenance of containment units • Desludging only by registered operators • Safety measures for desludging
Manner of registration of septage transport vehicle & responsibilities of operator	• Application for registration • Approval or rejection of application • Registration of vehicle & GPS in vehicle • Suspension & cancellation of vehicle • Issue of license to operator • Responsibilities of vehicle operator • Safety measures for desludging • Accidental spillage
Septage treatment & disposal	• Treatment • Responsibilities of the operator • Violations and penalties • Disposal
Administration & enforcement	• Special powers for inspection • Violation & penalties • Appeal • Disposal

Odisha FSSM Regulations 2018- Key features

- The Regulations focuses on **containment** (septic tanks/pits), its **cleaning**, **septage transport vehicles**, **designated disposal sites**, **septage treatment plants, violations and penalties**.

- It provides a **regulatory framework** and an **enforcement mechanism** for proper onsite sanitation activities inside the municipal boundaries.

- It mentions that every latrine should be connected to either a septic tank,pit or a sewage treatment plant through sewer connection.

- It mentions that every septic tank/pit has to be in accordance with the **standards and guidelines** as may be prescribed and the owner or occupier of the premises has to ensure upkeep of the facility. Owner has to ensure that there is no direct discharge of toilet waste to the open and ensure that the pit/tank is clean periodically, as decided by the ULB, through septage transport vehicles only.

Odisha FSSM Regulations 2018- Key features

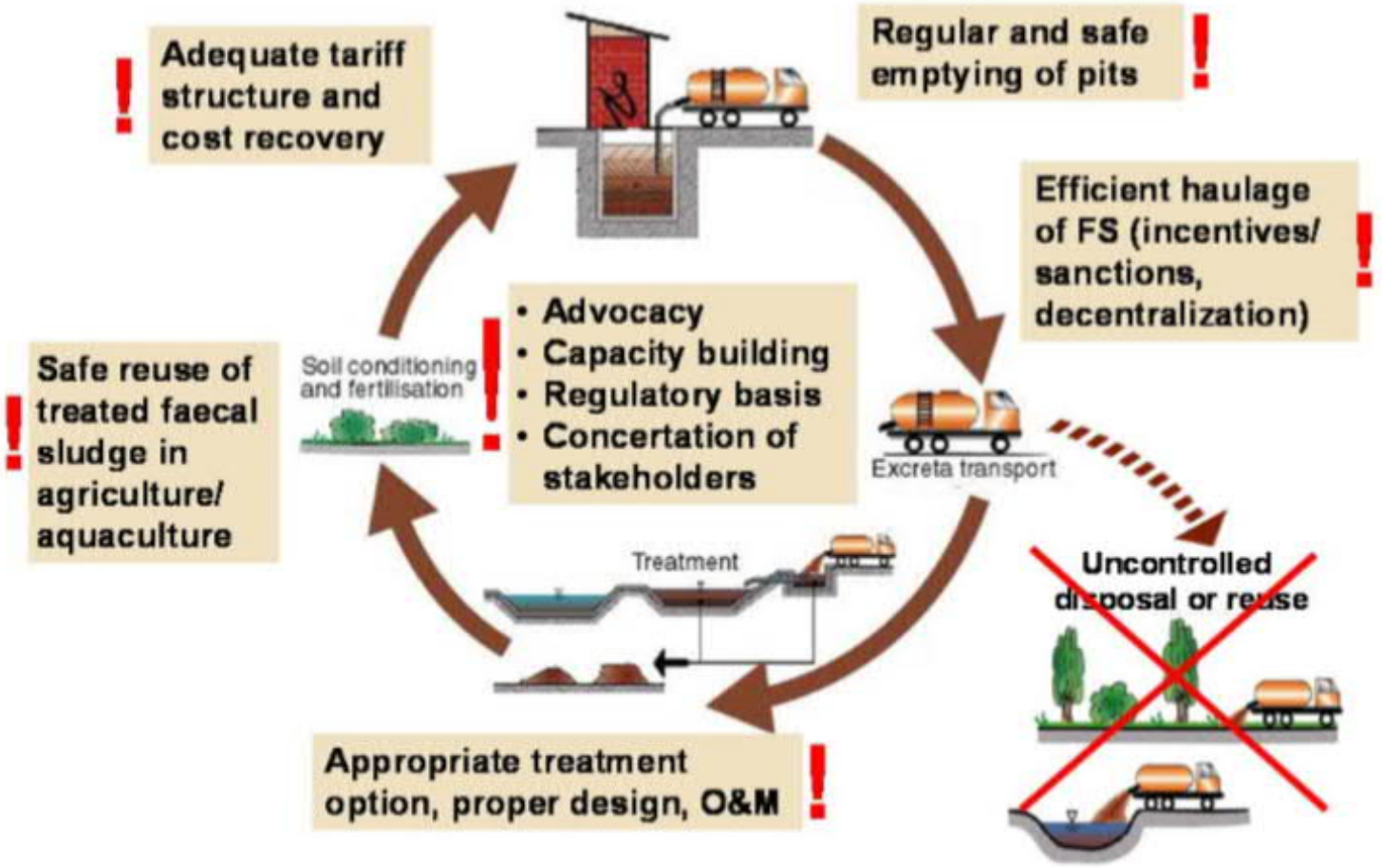
- Septic tank/pit to be cleaned through only **registered vehicles by workers wearing personal protective equipment** like gloves, boots, etc. All septage transport vehicles to be registered with the ULB.

- **No one to deploy manual methods for emptying the pits or tanks**. The regulations will ensure that the septage treatment plant operator is responsible to ensure that the treatment is optimal and is as per standards and guidelines.

- Gives **powers of inspection to the ULBs** to ensure that the latrines, septage transport vehicles and treatment plants are working appropriately. In cases of contravention of the regulation, power to ULB to levy penalties and fines.

Overview on FSSM planning and assessment processes

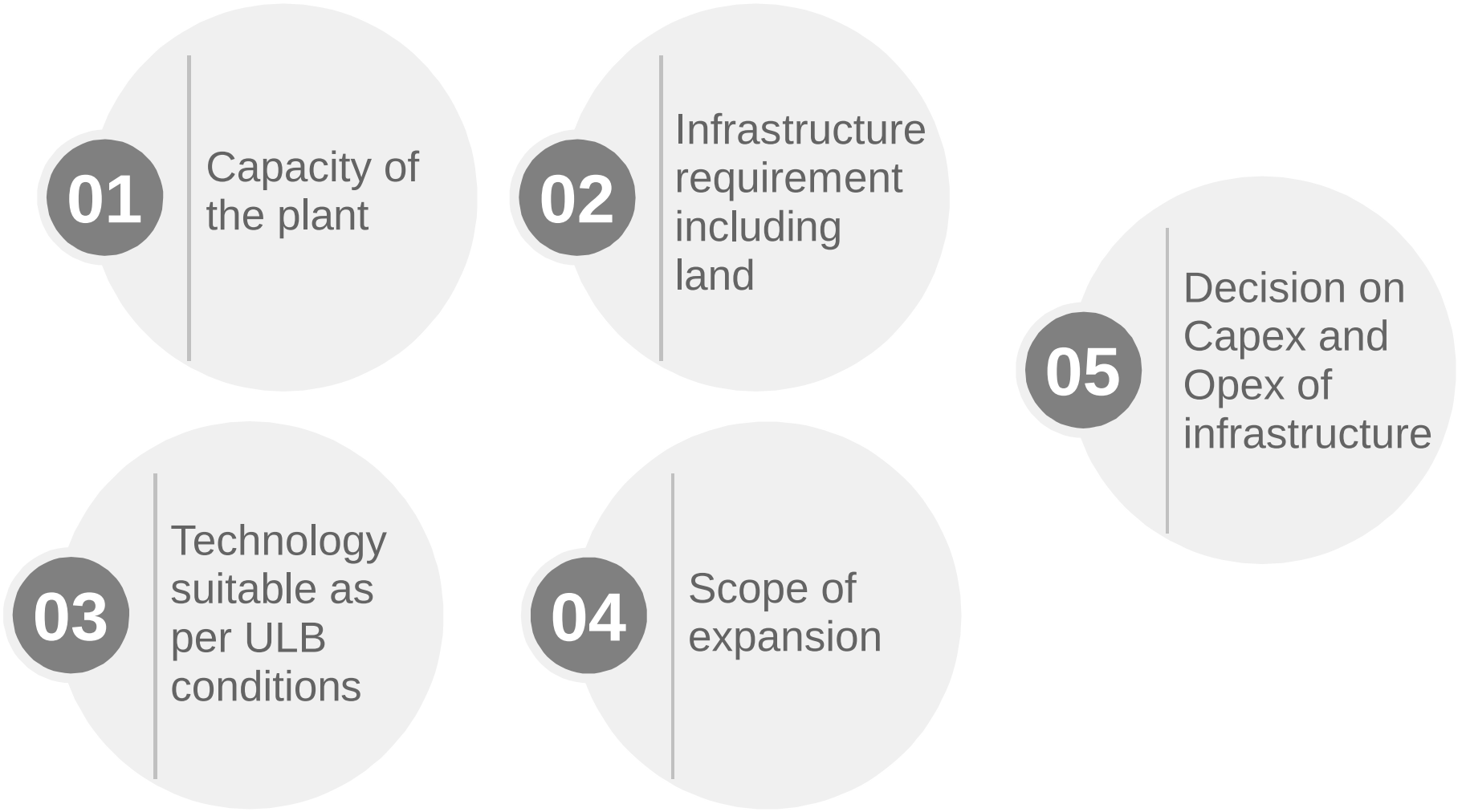
Overview on FSSM planning and assessment processes



When trying to improve FSSM, a whole set of factors, covering technical and non-technical aspects as well as involving stakeholders on all levels have to be considered

Decision making priorities

Financial and contracting approach



Decision making priorities

Contracting models	Investment requirement across FSSM value chain	Revenue generation avenues
Engineering Procurement Construction (EPC)	New toilets (IHHL, CT, PT)	Sanitation tax
Hybrid Annuity Model	Retrofitting and upgradation of toilets	Tipping fee
Build Operate Transfer (BOT)	Refurbishment of septic tanks	Rent from using space at CT and PT for Commercial Purpose
Built Lease Transfer (BLT)	New and retrofitting of vacuum trucks	User fee
Design Build Finance Operate Transfer (DBFOT)	Capacity building of plumbers, masons, operators, SHG etc.	CSR Funding
		Budgetary allocation at State level for FSSM Projects

Overview on FSSM planning and assessment processes

Containment

Guidelines of constructing septic tank

SIZES OF SEPTIC TANK

A-1. Recommended sizes of septic tanks for 20 users are given in Table 5.

TABLE 5 RECOMMENDED SIZES OF SEPTIC TANK FOR 20 USERS

No. of Users	Length	Breadth	Liquid Depth (Cleaning Interval of)	
			1 Year	2 Year
(1)	(2)	(3)	(4)	(5)
	m	m	m	m
5	1·5	0·75	1·0	1·05
10	2·0	0·90	1·0	1·40
15	2·0	0·90	1·3	2·00
20	2·3	1·10	1·3	1·80

Note 1 — The capacities are recommended on the assumption that discharge from only WC will be treated in the septic tank.

Note 2 — A provision of 300 mm should be made for free board.

Note 3 — The sizes of septic tank are based on certain assumptions (*see* 3.4), while choosing the size of septic tank exact calculations shall be made.

TABLE 6 RECOMMENDED SIZES OF SEPTIC TANKS FOR RESIDENTIAL COLONIES

No. of Users	Length	Breadth	Liquid Depth (Cleaning Interval of)	
			1 Year	2 Year
(1)	(2)	(3)	(4)	(5)
	m	m	m	m
50	5·0	2·0	1·0	1·24
100	7·5	2·65	1·0	1·24
150	10·0	3·0	1·0	1·24
200	12·0	3.3	1·0	1·24
300	15·0	4·0	1·0	1·24

Note 1 — A provision of 300 mm should be made for free board.

Note 2 — The sizes of the septic tank are based on certain assumptions (*see* 3.4) while choosing the size of septic tank, exact calculation shall be made.

Note 3 — For population over 100, the tank may be divided into independent parallel chambers for case of maintenance and cleaning.

TABLE 7 RECOMMENDED SIZES OF SEPTIC TANKS FOR HOSTELS AND BOARDING SCHOOLS

No. of Users	Length *L*	Width *B*	Liquid Depth (*D*) for Stated Intervals of Sludge Withdrawal	
			Once in a Year	Once in 2 Years
(1)	(2)	(3)	(4)	(5)
	m	m	m	m
50	5·0	1·6	1·3	1·4
100	5·7	2·1	1·4	1·7
150	7·7	2·4	1·4	1·7
200	8·9	2·7	1·4	1·7
300	10·7	3·3	1·4	1·7

Note 1 — A provision of 300 mm should be made for free board.

Note 2 — The sizes of the septic tank are based on certain assumptions (*see* 3.4), while choosing the size of septic tank exact calculation shall be made.

Note 3 — For population over 100, the tank may be divided into independent parallel chamber for ease of maintenance and cleaning.

Attention:

1. ***Inclusion and monitoring of size of septic tank as per CPHEEO/SBM guidelines in the building bye laws***
2. ***The ULB should begin by assessing existing properties in the city, which are connected with On Site Sanitation Systems (OSS) and inventorize these properties into a database. The ULB can also run awareness campaigns using IEC and BCC methods, targeting all stakeholders.***

Overview on FSSM planning and assessment processes

Emptying and transportation

- Registration of public and private cesspool vehicle
- Installation for GPS in cesspool vehicle for monitoring
- Usage of Personal Protective Equipment's by cesspool operators
- Maintaining records of services provide in the city

Personal Protection Equipment (PPE) name	BIS Standard	Pictorial representation (for illustration only)
Neoprene gloves	IS 15354:2003 Rubber/neoprene gloves	
Rubber boots	IS 3976:2003 Protective rubber canvas boots IS 15298:2011 Personal protective equipment Part II and III	
Face mask	IS 14746:1999 Respiratory protective devices-half masks and quarter masks IS 8520:1977 Guide for Selection of Industrial Safety Equipment for Eye, Face and Ear Protection	
Eye protection	IS 5983:1980 Specification for Eye-Protectors IS 8520:1977 Guide for Selection of Industrial Safety Equipment for Eye, Face and Ear Protection	
Jumpsuit		

Overview on FSSM planning and assessment processes

Disposal and Treatment

Temporary disposal – Deep Row Entrenchments

Land Selection Criteria for Deep Row Entrenchments

- ❑ Not flood prone or should be above recorded flood level
- ❑ Not water-logged
- ❑ Low water table
- ❑ Soil type – should be porous and allow soak away
- ❑ Reasonably flat
- ❑ Sufficient buffer distance to habitable properties (200 m minimum)
- ❑ Not close upstream of water intake, well, exposed aquifer (at least 2 km), no ground water
- ❑ use for potable or contact or agriculture purposes et. downstream (of aquifer)
- ❑ Accessible by vehicles (road strength, width, bridges, headroom, slope)
- ❑ Tanker movement should not cause nuisance to neighborhood
- ❑ Compatible to adjacent and neighboring properties usage
- ❑ Close enough to allow logistics of sludge transportation

Overview on FSSM planning and assessment processes

Disposal and Treatment

Septage Treatment Plant

Inlet chamber and screen

Settling cum thickening tank

Sludge drying beds

Anaerobic baffle reactor

Planted gravel filters

Polishing pond with aeration

Link to video of BBSR plant

The facilities are based on DEWATS™ and installed with solar panels at Bhubaneswar, that are connected to the grid. Resultantly, the facility is energy surplus due to minimal energy usage for O&M

Overview on FSSM planning and assessment processes

Reuse

Sludge drying bed

Sludge drying beds produces a solid product. In most cities, the solids removed from the drying beds after a determined period (several weeks to a few months) require further storage and sun drying to attain the hygienic quality for unrestricted use.

Co-composting

Composting is the process with which biodegradable waste is biologically decomposed by microorganisms (mainly bacteria and fungi) under controlled aerobic and thermophilic conditions. Co-composting of FS and municipal solid waste is a most appropriate process, since the two materials complement each other. Sludge from drying bed proportionally mixed with solid waste creates a valuable soil conditioner-cum-fertiliser.

Behaviour Change Communication – Information Education Communication

Mass Media:
paintings, hoardings, banners and posters

Interpersonal communication:
CBOs and citizen groups

Mid media:
Jingles, Mike Announcements

COLLATERALS

ACTIVITIES

THANK YOU


HELLO
Hola
trade
think
US
Stock
interconnected
finance
email
ORDER
DEAL
RECEIPT
HOLA
HELLO