

Technology Choices for Sustainable Operation and Maintenance

O&M considerations for selecting sewerred and non-sewerred options.

Guidance Note	10
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Note for ASD 2021

Related GNs:	9 Types of sanitation system 11 Alternative sewerage systems 12 Options for wastewater, septage and fecal sludge treatment
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Outline

1. Why bother? Why is operation and maintenance so important?
2. Operation and maintenance (O&M) requirements
 - sewerer services
 - non-sewerer services
3. Selecting technology for sustainable O&M
 - basic considerations
 - requirements for advanced technology
4. Ladder of O&M requirements
 - sewerer services
 - non-sewerer services

Why bother?

Why management, operation and maintenance is so important

- Ensures safe, reliable services that customers are willing to pay for
- Revenue supports continuity and quality of operations
- Safe and continuous operation is essential for achieving:
 - Health benefits
 - Environmental protection
 - Service targets
 - Regulatory requirements

Achieves intended returns from infrastructure investments



**A wasted
capital
investment?**

Operation and maintenance requirements

Sustainable management, operation and maintenance



Infrastructure

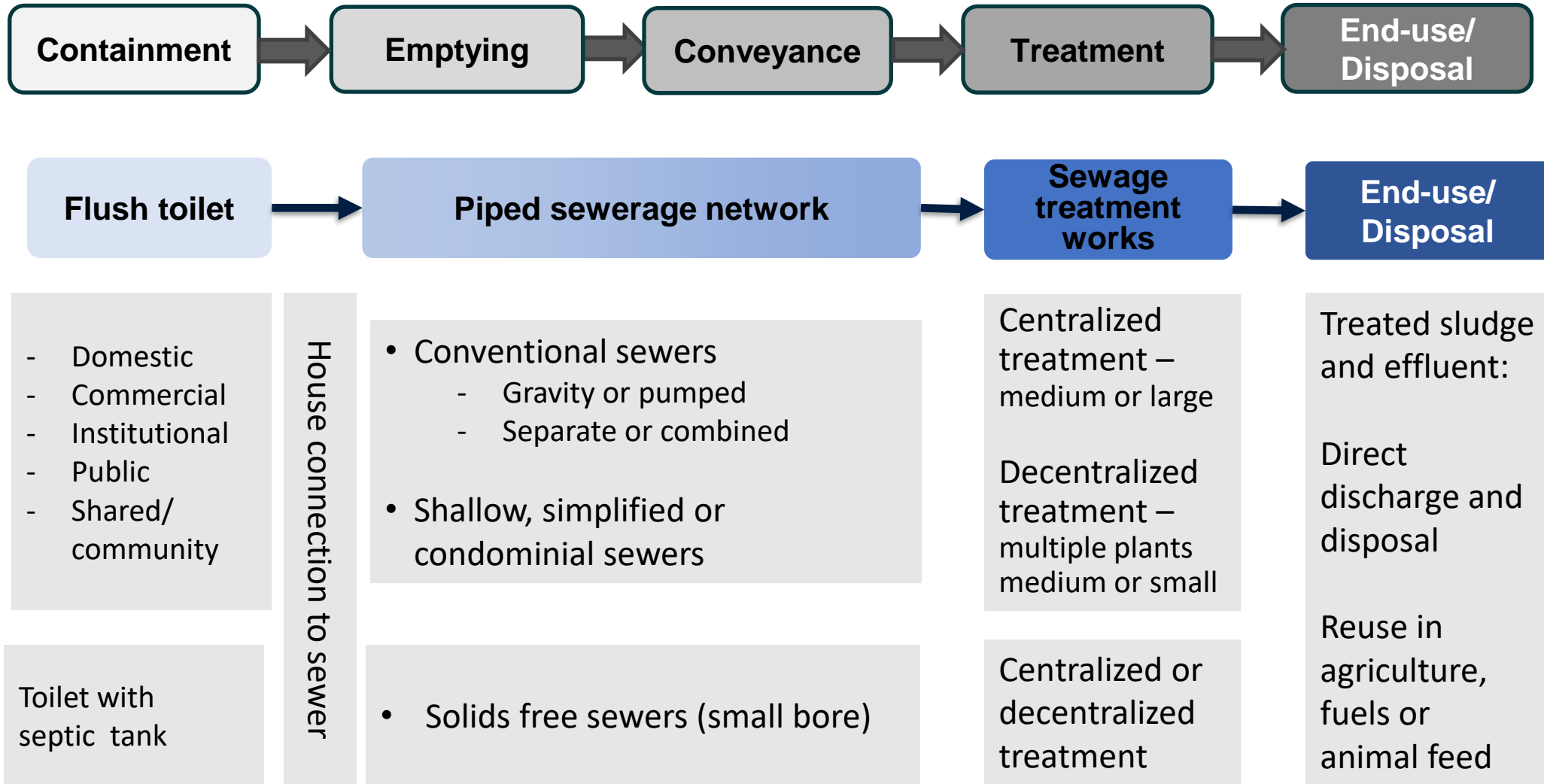
- System checks, maintenance and monitoring
- Regular servicing of pumps and other equipment
- Influent/effluent flow and quality monitoring
- Emergency repairs
- Reliable supply of utility services, equipment, tools, spares, chemicals

Customer services:

- Billing and revenue collection
- New services / expansion
- Service level monitoring and reporting
- Information technology (IT) systems
- Responsive hotline for trouble-shooting, response
- Customer forums and public relations

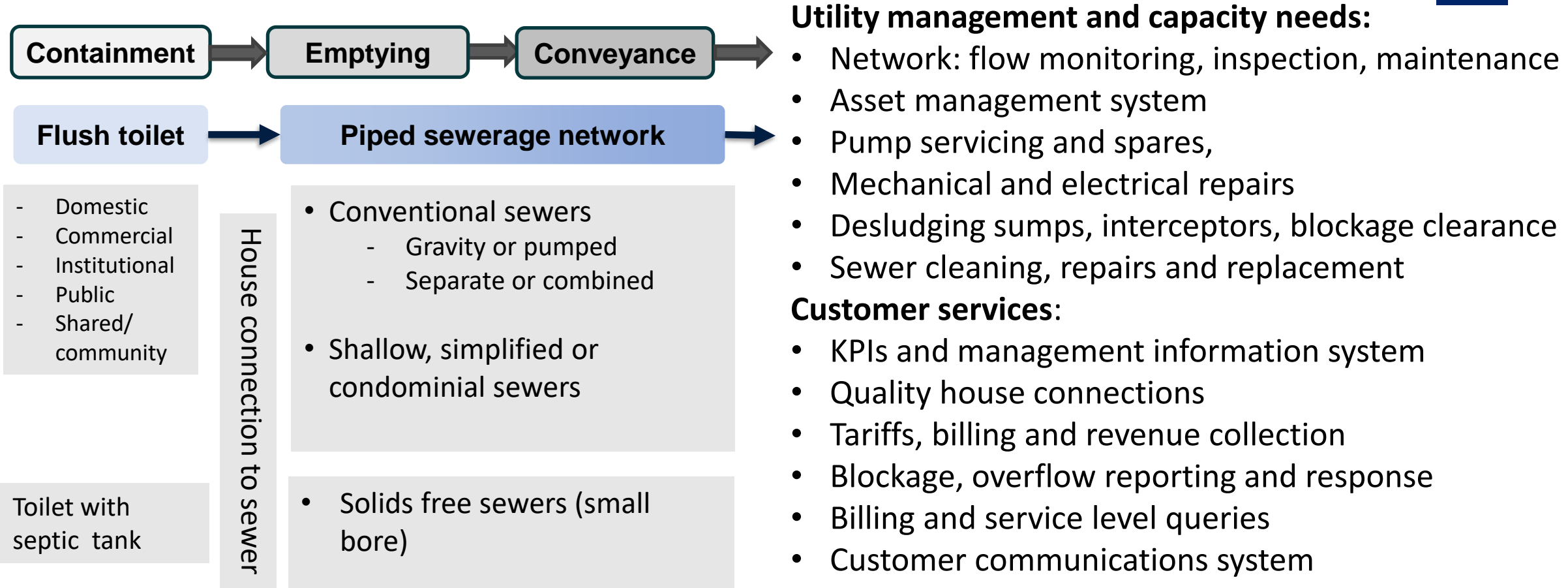
Sanitation services are only as sustainable as the management quality, capacity and resources in the institutions responsible for them

1. Sewered sanitation systems



See GN 11: Alternative of sewerage systems

Sewered Systems (1) – Overview of basic level O&M



See GN 11: Alternative of sewerage systems

- Does this O&M capacity exist?
- Who will undertake O&M? How will it be financed?
- How will capacity be increased and incentivized to operate effectively?

Sewered Systems (2) – Overview of basic level O&M required

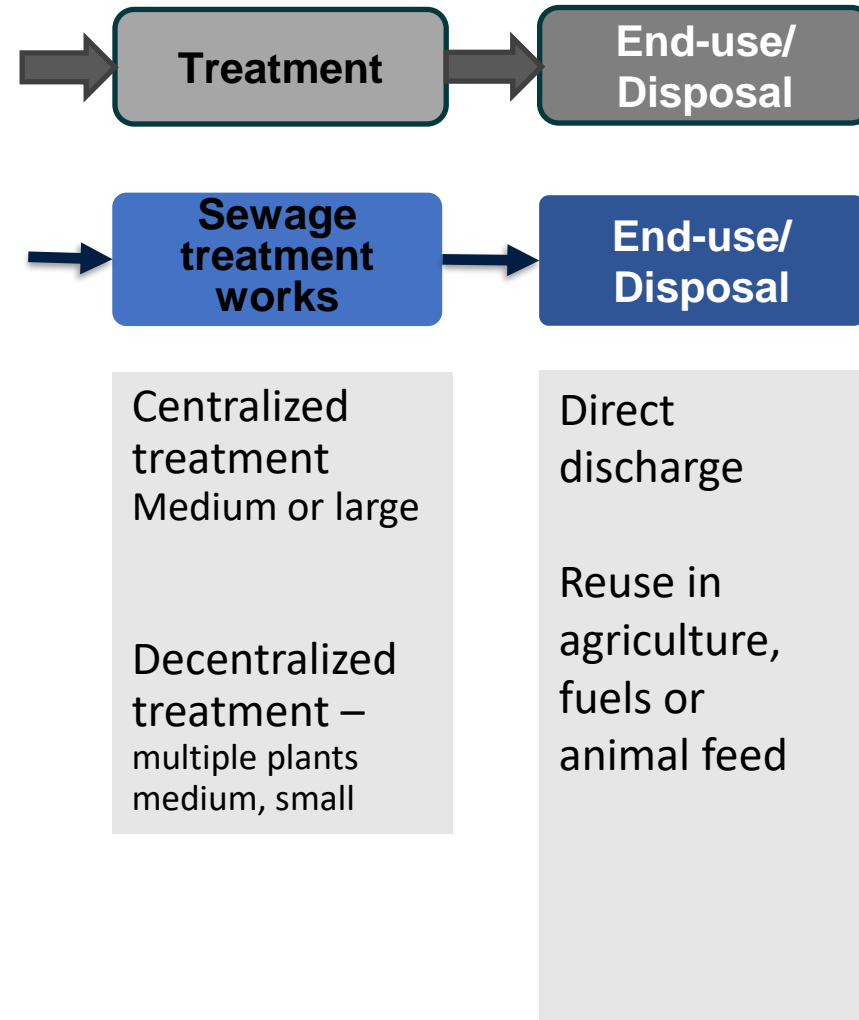
Utility management and capacity for:

- Influent and effluent monitoring
- Treatment system inspections, repairs
- Computer systems for monitoring
- Desludging of ponds and reactors
- Reliable power and water
- Purchasing: spares, chemicals

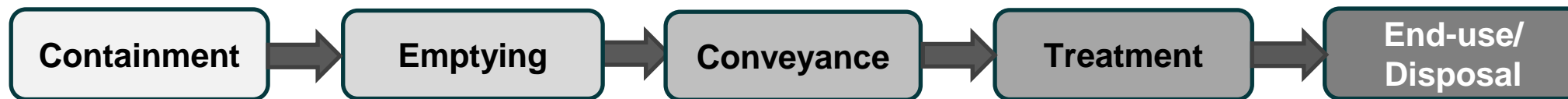
Reuse and disposal

- Establishing a viable market, marketing
- Product standards, quality monitoring
- Process capacity to product
- Packaging, distribution and sales
- Solids removal and safe disposal

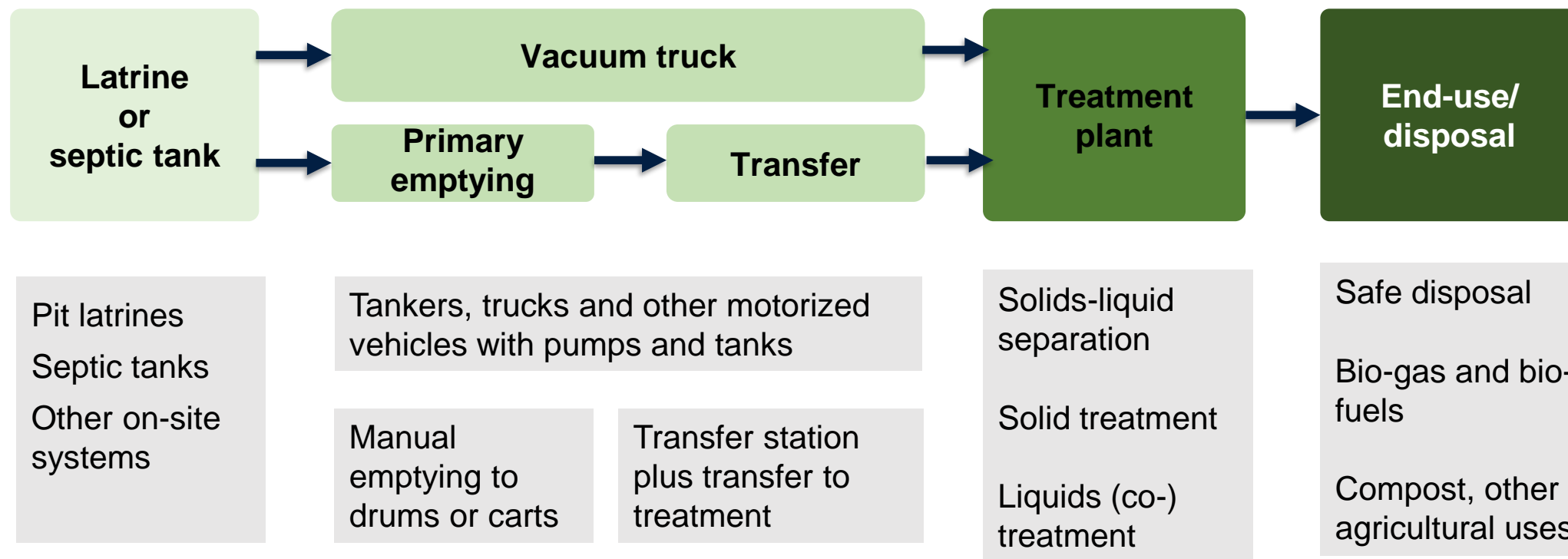
- Does the capacity for O&M exist?
- Who will undertake O&M? How will it be financed?
- How will the project increase capacity and incentivize it?



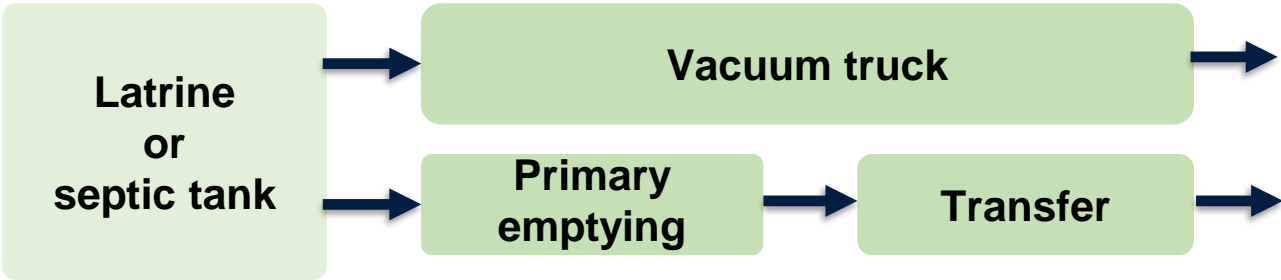
Non-networked systems



Non-sewered or non-networked: On-site sanitation and faecal sludge management (FSM)



Non-sewered sanitation (1) - Overview of basic O&M



Pit latrines
 Septic tanks
 Other on-site systems

Tankers, trucks and other motorized vehicles with pumps and tanks

Manual emptying to drums or carts

Transfer station and transfer to treatment

- Public services** (Utility, Local Govt)
- Regulation: public health, building regs
 - Viable private sector service providers
 - Monitoring: service access and quality
 - Promotion of regular desludging
 - Workforce: incentives, health and safety

- Customer services**
- Hardware supplies and products
 - Quality latrine and septic tank builders
 - Viable desludging service providers
 - Transfer stations, if needed
 - Customer guidance, support, communications

- Does the capacity for O&M exist?
- If not, who will do it? How will it be paid for?
- How will capacity be developed and incentivized?

Non-sewered sanitation (2) - Overview of O&M

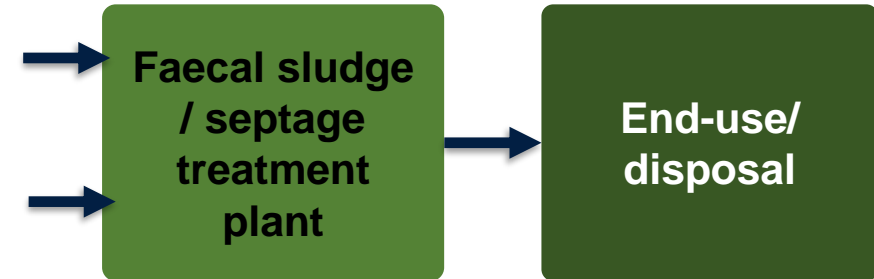
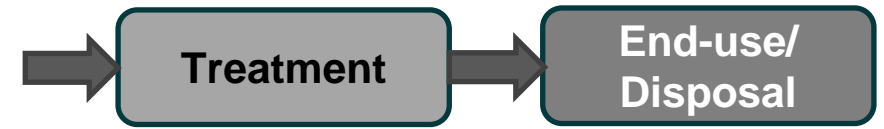
Public services (Local Govt, utility)

- Management systems and capacity
- Effluent testing and monitoring
- Power and water services
- Purchasing: tools, spares, chemicals
- Repairs and replacement
- Computer systems for monitoring & response
- Desludging of ponds, reactors etc
- Mechanical and electrical skills

Reuse and disposal

- Effluent quality monitoring
- Processing into a reuse product
- Marketing and distribution
- Solids removal and safe disposal

- Does the capacity for O&M exist?
- Who will do it? How will it be paid for?
- How will capacity be developed and incentivized?



Solid-liquid separation (SLS)

Solid treatment

Liquids (co-) treatment

Safe disposal

Bio-gas and bio-fuels

Compost, other agricultural use

Selecting technology for improved O&M

1 - Basic considerations for technology choices

to suit the local context

Institutional and Financial

- **Regulatory** requirements, mandates, roles
- **Management** capacity and experience
- **Staffing** levels, experience, skills mix, incentives
- **Reliable water supply:** >60 l/p/day?
- **Lifecycle cost, Internal Rate of Return (IRR):**
Capex and opex
- **Annual revenue:** User tariffs and Govt subsidies
- **Land availability, access, cost:** treatment, sewers
- **Reliability, cost** electricity, piped water, spare parts, chemicals, etc.

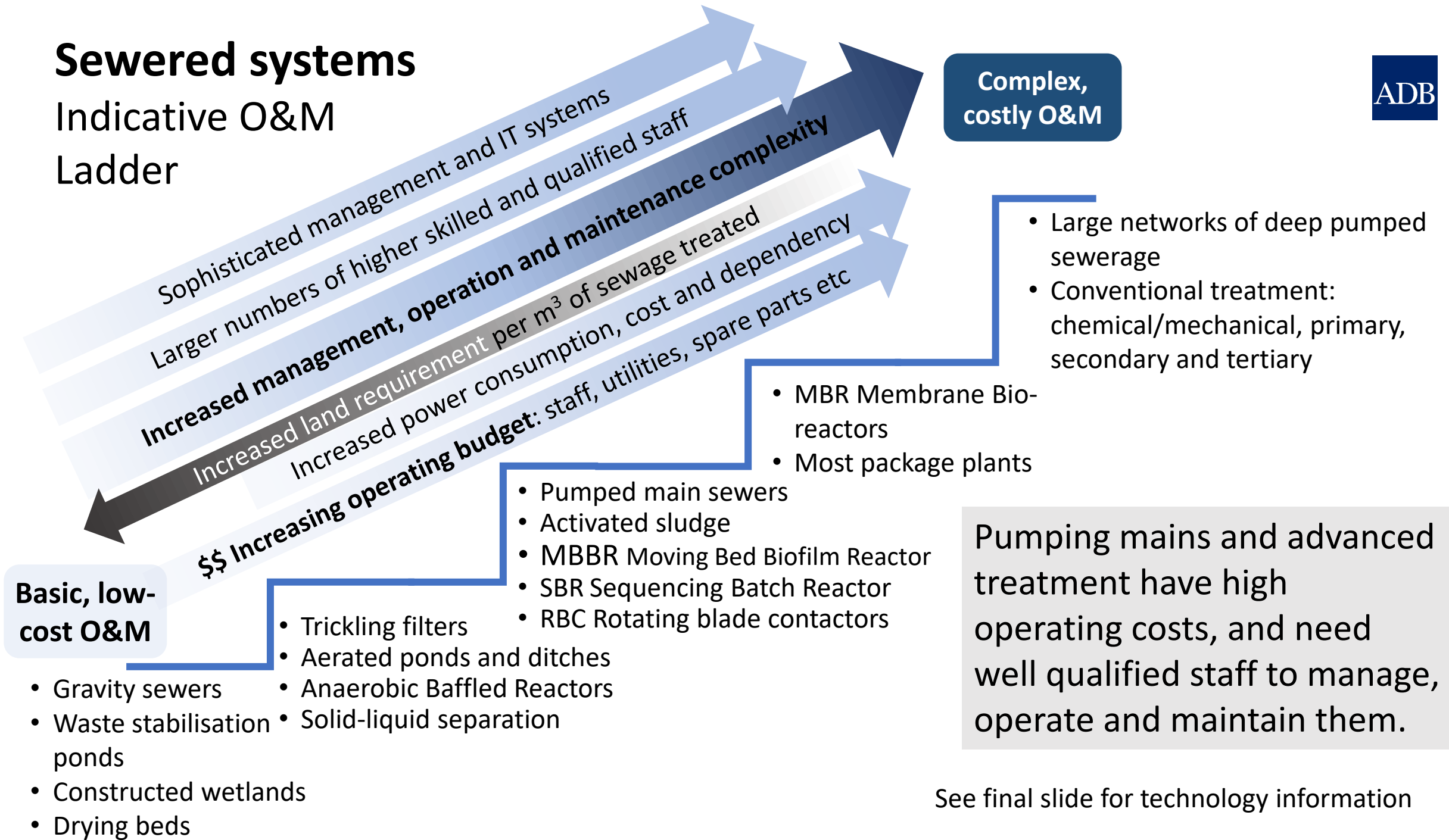
Services and Demand

- Does the service address a current problem in the sanitation chain?
- Will users receive a service level improvement? And be willing to pay for it?
- Standards, service level required, no. users, wastewater and septage characteristics, etc.

Sewered systems

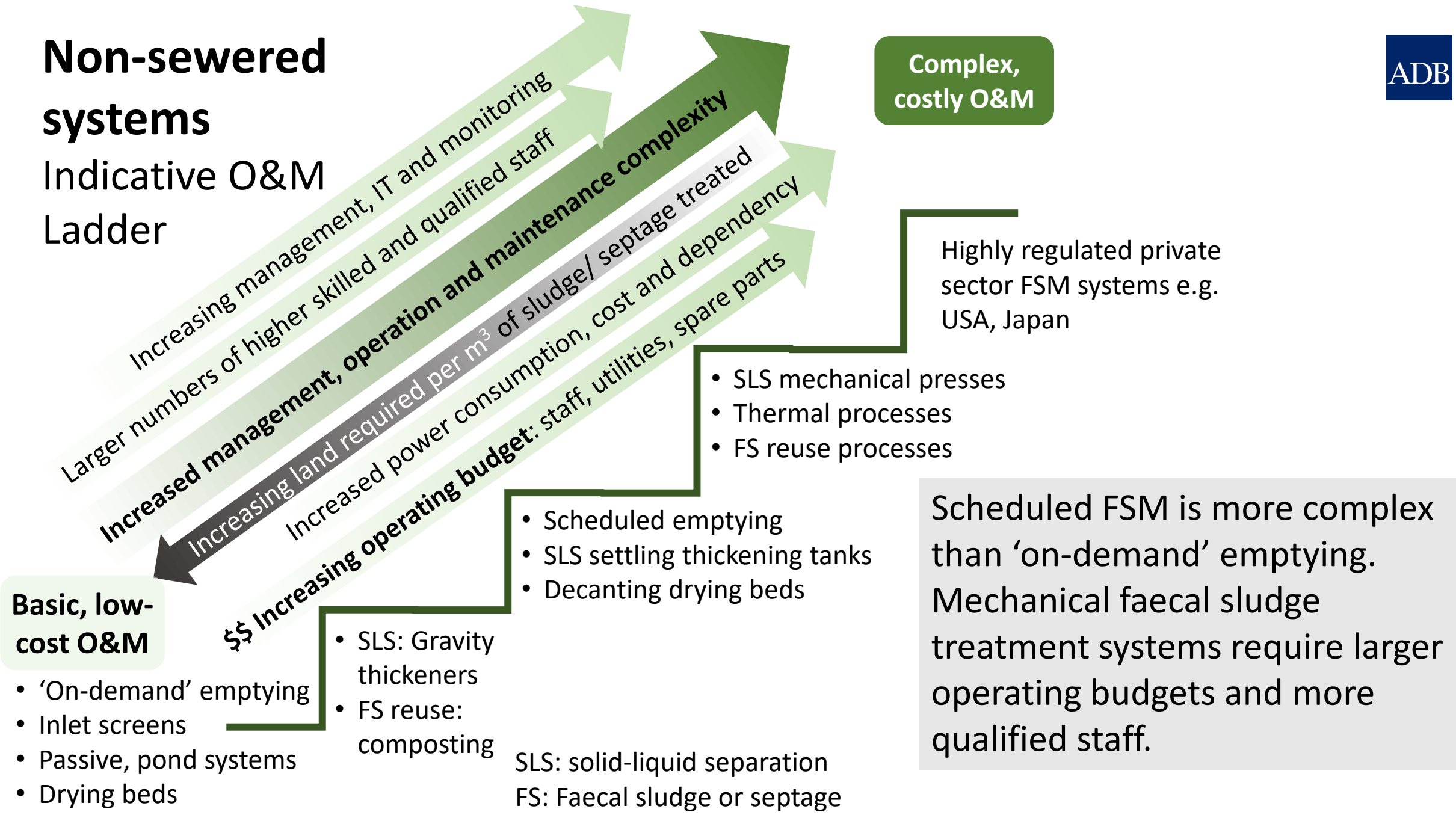
Indicative O&M

Ladder



Non-sewered systems

Indicative O&M Ladder



2 Deeper O &M considerations for technical choices



Institutional and Financial

- Is the mandated institution or utility **accountable** for maintaining service levels?
- Does the responsible institution/utility have a **good O&M record** with the existing system?
- Can **operational capacity** (management, systems, skills, staff) be adequately and affordably expanded?
- Are **customer revenues & funds transfers adequate** to maintain the existing systems? And how will they be funded for the new or expanded system?
- Is there **political willingness to adjust standards and charge realistic tariffs** to operate more complex technology?

For more complex technology the answers need to be ‘Yes’.

If answers are mostly ‘no’, select as simple technology as available land allows.

Services and Demand

- Will the service level provide users with a service improvement?
- Are users willing to pay tariffs for improved, higher levels of service and treatment?
- Are effluent standards realistic compared to operational revenues?
- Are standards enforced?

Summary

- Sustainable services require management, infrastructure and customer services along the whole sanitation chain
- Basic considerations for technology choice include management and staff capacity, water supply, lifecycle cost, annual revenue, land and electricity
- More complex technologies require
 - High capacity of management, systems and staffing
 - Committed political support to require increased tariffs
 - Increased annual operating budgets
 - Reliable, affordable power supplies, spares and equipment
 - Strong computer-based, customer services and monitoring systems
- Where these are not yet available
 - start by managing simpler technologies well
 - build capacity through experience and revenue from delivering improved customer services.

References and resources

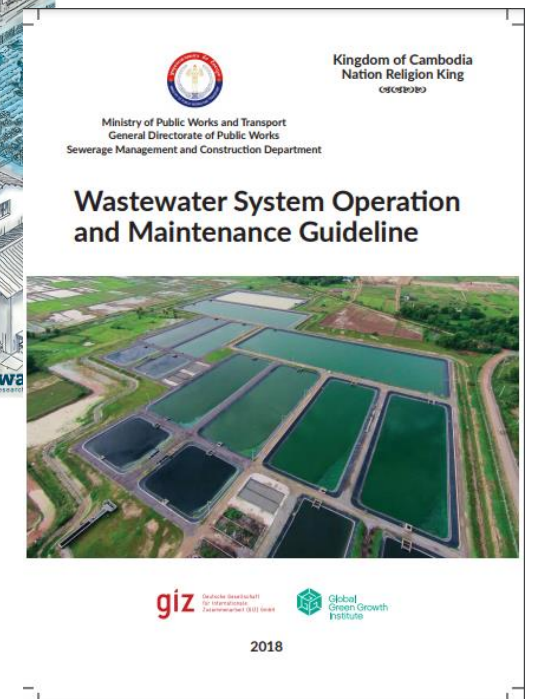
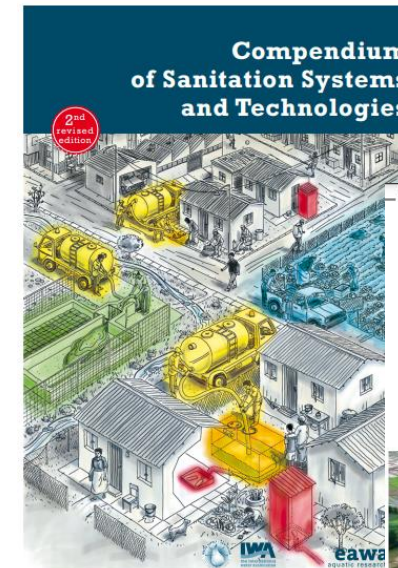
[Compendium of Sanitation Technologies](#)

A comprehensive online book of seweraged and non-seweraged technologies, with advice on advantages and disadvantages and consideration for management, operation and maintenance.

[Planning and Design of Sanitation Technologies.](#)

Free online courses from EAWAG, including on Faecal Sludge Management and Sanitation Technologies

[Wastewater System Operation and Maintenance Guide](#), GGGI-GIZ, Cambodia, 2018



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Thank You