



# TN

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# SP

SUPPORT PROGRAMME

**iihs**<sup>TM</sup>  
INDIAN INSTITUTE FOR  
HUMAN SETTLEMENTS

**Keystone**  
A GROUP FOR ECO-DEVELOPMENT INITIATIVES



**CDJ** Consortium for  
DEWATS  
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# Engineer's training on FSM

Technology options for  
conveyance of Faecal Sludge

# Factors influencing efficiency of conveyance of FS



- Type: manual / cart / small motorised / tanker
- access issues
- size of vehicle / tank
- leakage / control, illegal dumping
- other sludge inclusion

# Sludge Collection and Transportation

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Motorized  
collection &  
transportati  
on

Manual  
collection &  
transportatio  
n

Other  
methods of  
emptying

# Technology options along the FSM value chain





# Emptying technologies



Emptying by vacuum pump (< 100 m sucking pipe) and truck



Hand pump and threewheeler

# Transportation options



Type	Distance	Passingwidth	Capacity	Cost
Truck	> 5 km	2.3 m	3 – 10 m <sup>3</sup>	high
Tractor or power tiller with trailer	< 5 km	2.3 m	1 – 3 m <sup>3</sup>	medium



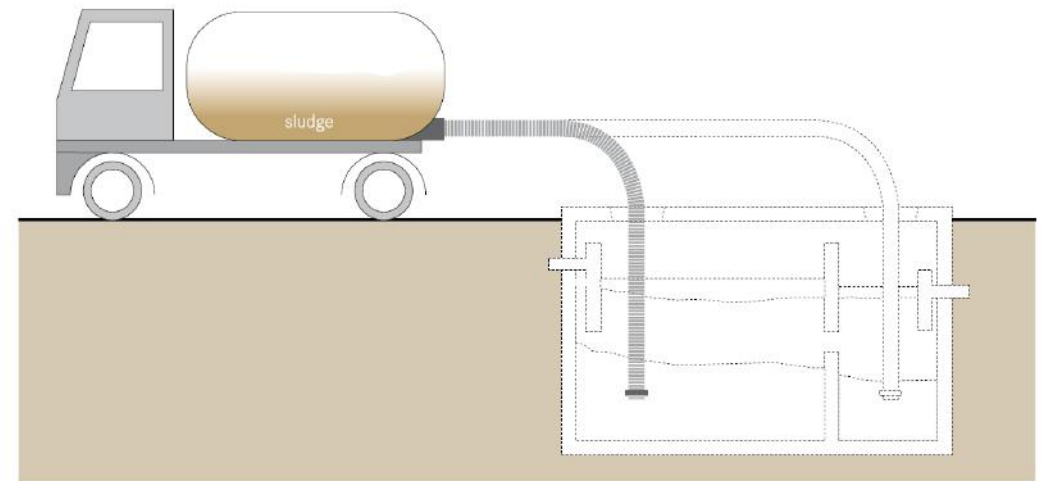
Three wheeler	< 5 km	1.6 m	0.5 – 0.7 m <sup>3</sup>	low
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Handcart	< 1 km	1.0 m	< 0.5 m <sup>3</sup>	very low
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# Motorized Emptying and Transport

- Vehicle equipped with a motorized pump and storage tank.
- Humans required to operate the pump and manoeuvre the hose, but sludge is not manually lifted or transported.





# Motorized Emptying and Transport

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- **Pros & Cons**

- + Fast, hygienic and effective
- + Efficient transport possible with large vacuum trucks
- + Potential for local job creation and income generation
- - Cannot pump thick, dried sludge (must be thinned with water or manually removed)
- - Garbage in pits may block hose
- - Cannot completely empty deep pits due to limited suction lift
- - Very high capital costs; variable operating costs
- - May have difficulties with access

# Motorized Emptying and Transport



## Conventional septic tank: Truck

These are used in many cities in India but are **expensive** and have difficulties in accessing densely populated areas



## Narrow-wheel base truck

Essentially the same as the above but with a smaller wheel capacity and wheel axle, enabling them to enter narrower lanes



## Trailer mounted desludger attached to a separate vehicle

In South Asia, this system has been developed and promoted by the nongovernmental organization Dushtha Shasthya Kendra in Bangladesh specifically to serve low-income communities in Dhaka.



## UN-HABITAT Vacutug

The Vacutug is designed to provide a simple and inexpensive method for emptying pit latrines in areas where access by other forms of desludging equipment is not possible. The nongovernmental organization, Sulabh International, has been piloting the Vacutug in India.

## *Vacutug*: small vacuum tugs for areas of difficult access, used with intermediate-storage-tanks



# Transfer Station (Underground Holding Tank)

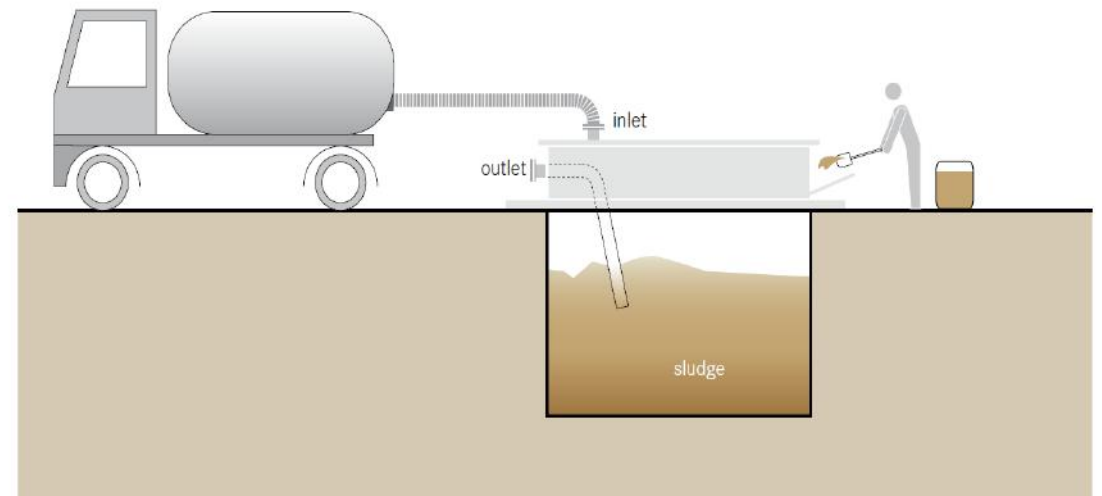
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- intermediate dumping points for faecal sludge
- Human-Powered or small-scale Motorized Emptying Equipment discharge the sludge at a local transfer station
- vacuum truck is required to empty transfer stations when they are full
- have to be carefully located, otherwise odours could become a nuisance

# Transfer Station (Underground Holding Tank)

## Pros and Cons

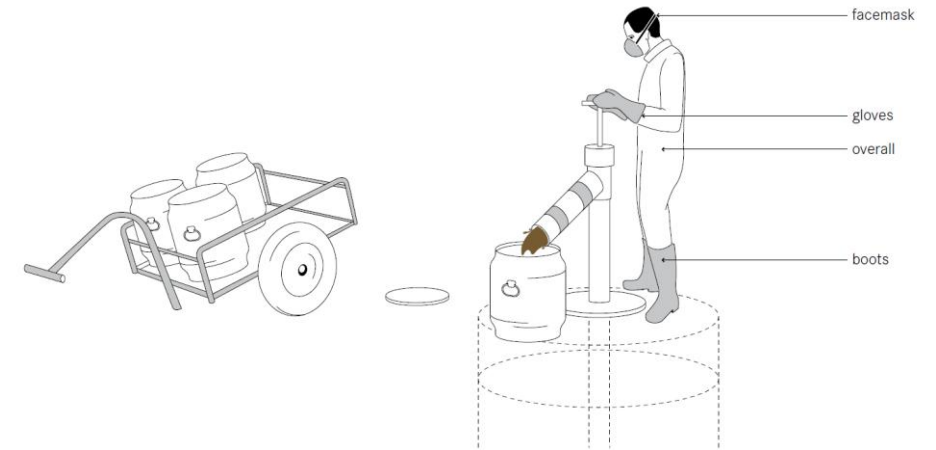
- + sludge transport more efficient
- + May reduce the illegal dumping of faecal sludge
- Requires expert design and construction
- Can lead to odours if not properly maintained





# MAPET: Manual Pit Emptying Technology

- comprises a hand-pump connected to a vacuum tank mounted on a pushcart
- hose connected to the tank is used to suck sludge from a pit
- depending on sludge consistency, can pump the sludge from a max. depth of 3m



# MAPET: Manual Pit Emptying Technology

## Pros & Cons

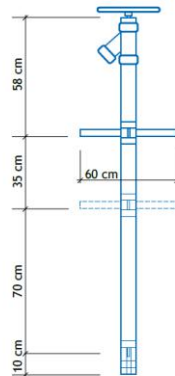
- + local job creation and income generation
- + Simple equipment: built and repaired with locally available materials
- + Low capital costs / operating costs
- Spills : health risks and smells
- Time consuming
- Garbage in pits may block pipe



Photo 5: MAPET equipment in the D.R. of Congo. (Source: WASTE, Holland)

## Other collection methods:

- Cartridge containment devices: replaceable and sealable cartridge waste tank. Collectors remove and seal a full cartridge to be transported decanted
- Direct lift: collection of FS from latrines or tanks by using long handled buckets and long handled shovels.
- Manually Operated Mechanical Collection - human powered mechanical devices



Sludge Gulper : low-cost manually driven pump



Figure 4.7 Manual diaphragm pump operation in Bangladesh (photo: Georges Mikhael).

Manually operated diaphragm pumps

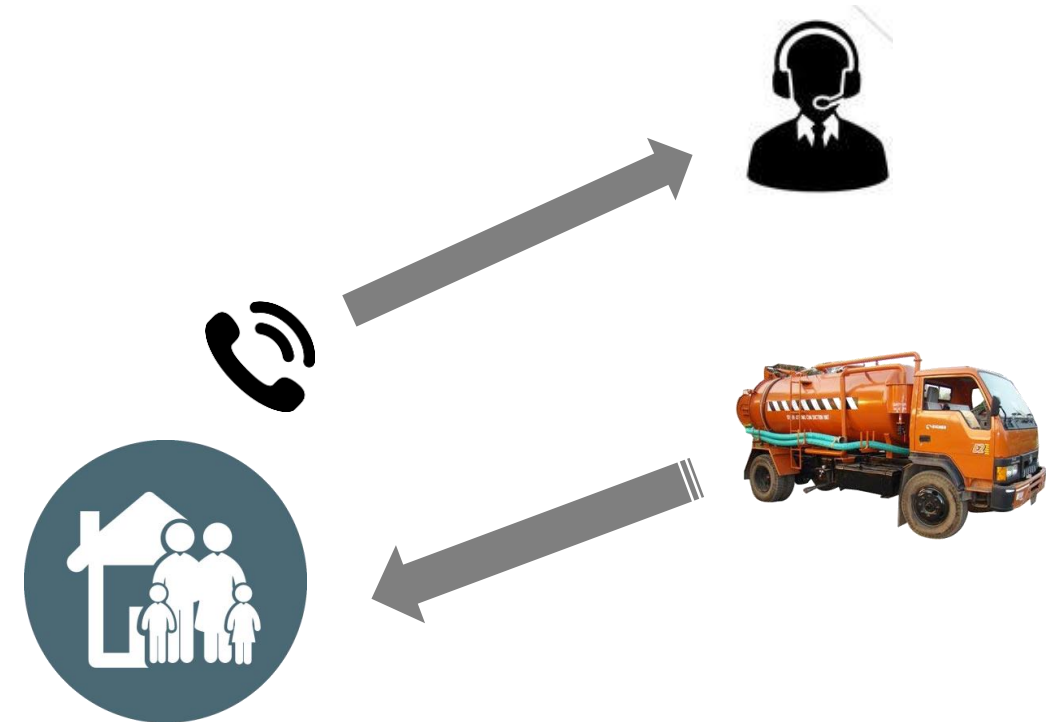
# New inventions in collection and transportation infrastructure

With the rapid growth in FSM in India, several new intentions are made in how FS is collected and transported. Two such inventions are

- GPS and GIS tracking of Cesspool trucks
- Call centre infrastructure for booking Cesspool trucks



GPS tracking of Cesspool trucks



Call center infrastructure

# To optimise FS Collection and transportation

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- Scheduling and routing for trucks
- Customer service protocols
- Locating tanks and cleanouts
- Probing tanks to determine sludge levels
- Proper pumping equipment operation and worker safety



# To optimise FS Collection and transportation

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- Site control, including post-pumping clean-up
- Transportation requirements, including rules of the road
- Disposal procedures at the treatment facility
- Routine service of equipment – greasing and oiling, minor repairs
- Recordkeeping for all tanks pumped and wastes discharged at the disposal facility

# FS Emptying guideline

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- Park tanker in proper place, place cones to mark hazard if on road. Ensure no obstruction. Ensure parking brake engaged. If on slope, place blocks to avoid sliding of vehicle.
- Seek permission from premise owner for all activities. Follow customs (removing shoes etc)
- Be courteous, polite, explain all matters clearly. If in doubt, contact office staff.
- Fee payment

# FS Emptying guideline

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- Locate OSS / septic tank and covers
- Determine accessibility
- Ensure personal protection equipment used
- Ensure all health and safety procedures followed
- Handle covers with care
- Sludge spillage cleaned up immediately. If there is hazard, notify relevant road authority through relevant officer

# FS Emptying guideline

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- Cordon off area to ensure unauthorised persons do not enter
- Lay hoses with care with absorbent / protective sheets if inside premises
- Ensure no spillage, and if it occurs, immediately clear and clean and disinfect
- Ensure 90% of septic tank emptied, leaving 10% as seed material

# FS Emptying guideline

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- Close and seal covers and clean the whole area to owners satisfaction
- Minimise noise and disturbance
- Thank premise owner.
- Update log, transport sludge to authorised disposal / treatment site
- final inspection / report



# Thank You