Presentation from the

Workshop on Innovations for Scaling up to Citywide Sanitation

October 16-17, 2012, Ahmedabad

p a s performance assessment system

Organised by PAS Project, CEPT University

SANITATION WORKSHOP

Innovations for Scaling up to Citywide Sanitation

October 16-17, 2012
Ahmedabad, India

Shyamal Sarkar, New Delhi

Settled Systems
Small Bore Sewerage

Sewers and Sewerage

- Sanitary Sewers – A system of buried pipes to transport human waste (excreta)
- Sewerage – It refers to the infrastructure that conveys sewage. It begins at house/property connections and ends at the entry of STP
- Conventional Gravity Sewer – Transports solids in permanent suspension. Needs high per capita water supply (125-135 lpcd)
- Modified Gravity Sewers - (a) Shallow Sewerage, Simplified Sewerage, Condominial Sewerage and (b) Small Bore Sewers, Solids-free Sewers, Small Dia Gravity Sewers (USA) and Septic Tank Effluent Drainage (Australia)

Modified Gravity Sewers

- **Shallow Sewers**: Laid at shallower depth and gradients than conventional sewers and are generally of smaller diameters. It allows solids to move down the pipe in a series of movements. Prone to blockage. Needs much higher participation of the community in operation and maintenance.
- **Small Bore Sewers**: Designed to receive only liquid portion of household wastewater. Grit, grease and other solids which might cause obstruction in the sewers are separated in Interceptor Tanks installed upstream of every connection to the sewers. Solids are periodically removed.

Small Bore Sewers (SBS)

The SBS has FOUR principal advantages over the Conventional Sewers:

- Reduced water requirements (since solids are separated before wastewater enters into sewers, large quantity of water for transportation of solids is not required)
- Reduced excavation costs (designing for self-cleansing velocity is not required)
- Reduced materials costs (low peak factor reduces the pipe size, needs simpler pumps, small number of manholes)
- Reduced treatment requirements (interceptors performs part of the biological treatment required)

Small Bore Sewers (SBS)

- The principal disadvantage of the SBS is the need for periodic evacuation and disposal of solids from each interceptor tank
- In spite of its obvious advantages it must be used judiciously and adopted only in situations where sufficient provision to ensure a strong arrangement for maintenance can be placed. This arrangement must also be able to exercise effective control over connections to the system
- Special precautions are necessary to prevent illegal connections, since it is likely that interceptor tanks would not be installed in such connections, thereby introducing solids into a system which is not designed to handle
- Manholes should not be located in areas which get flooded as people may remove manhole cover to drain out accumulated water, thereby introducing solids into a system which is not designed to handle

Recent Experiences from the World Bank assisted Punjab Rural Water Supply and Sanitation Project (PRWSSP)

Community Sanitation under PRWSSP

Target

- To upgrade existing on-site sanitation in 100 villages by introducing off-site system

Selection of Project Village

- Resolution passed by Gram Sabha demanding sewerage system and confirming contribution (10% of capital cost or 5% of capital cost in special cases) by the village community, and their agreement to pay user charges to cover operation and maintenance cost
- A minimum of 70% households having septic tanks or have program to achieve the threshold number before construction is taken-up
- Water supply services are operated by Gram Panchayat (GP) or Gram Panchayat Water Supply and Sanitation Committee (GPWSC)
- Water Supply is operated with technical (leakage and wastage, system breakdown, preventive maintenance of pumps and disinfecting equipment) and financial (billing and collection) sustainability

Community Sanitation - Pilots

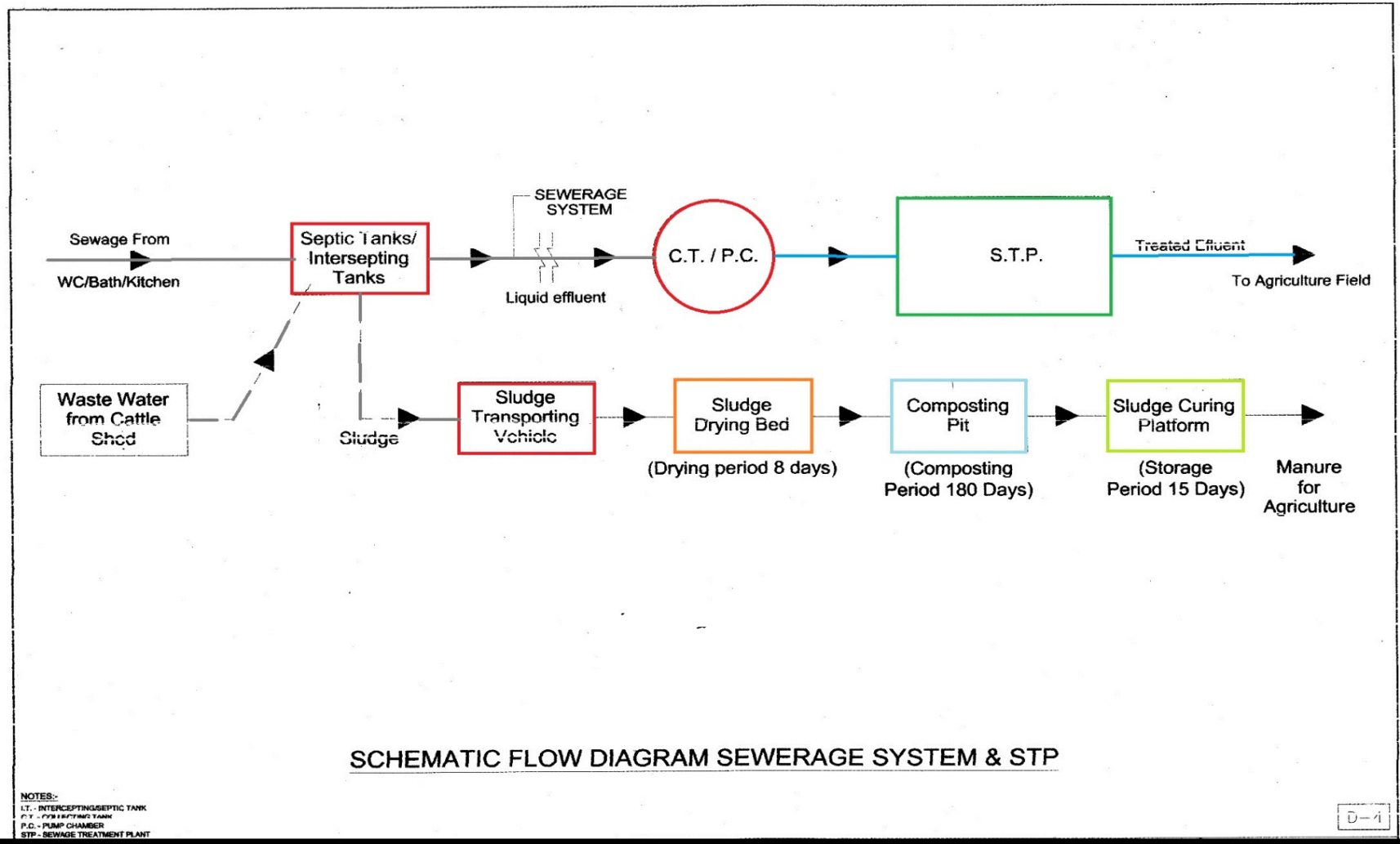
- The Project laid out arrangements to draw lessons from 5 pilot sanitation schemes and build-up implementation based on the lessons learned
- 1. Conventional sewerage (Chawa, Gurdaspur district)
- 2. Solids-free sewer with 100 mm minimum pipe size and connections. O&M of the built system by the contractor for three years (Baba Bakala, Amritsar district)
- 3-5. Solids-free sewer with 150 mm minimum pipe size and connections. O&M of the built system by the contractor for seven years (Khadoor Sahib, Goindwal Sahib and Chola Sahib in Tarn Taran district)

Solids free Sewerage Scheme at Baba Bakala, Amritsar

- No. of households: 1628
- Design Population: 11680
- Per capita water supply: 90 lpcd
- Designed system capacity: 870 Kl/d
- SW pipe (200-400 dia): 9597 m
- uPVC pipe (100 and 150 dia): 20,623 m
- Capital cost including STP: Rs. 408 lakhs (per capita cost Rs. 3493)
- Household connections achieved: 1250 (77%)
- Annual O&M contract value: Rs. 35,000
- Sewerage tariff: Rs. 35 per household/month. Will come down to Rs. 20 per household/month when 100% connections achieved

Solids free Sewerage Scheme at Khadoor Sahib, Tarn Taran

- No. of households: 1650
- Design Population: 10000
- Per capita water supply: 135 lpcd
- Designed system capacity: 1400 Kl/d
- Capital cost including STP: Rs. 449 lakhs (per capita cost: Rs. 4490)
- Annual O&M contract value: Rs. 65,000
- Sewerage tariff: Rs. 60 per household/month. Will come down to Rs. 40 per household/month when 100% connections achieved



Layout Plan of Solids free Sewerage System

Comparative Analysis of Sewer Systems

Sl.No.	Parameter	Conventional Sewers	Solids Free Sewers	Effect
1	Excavation	Deeper	Shallow	+ve for Solids free
2	Water Supply	More w/s (125-135 lpcd) required for self-cleansing	Less w/s (40lpcd) is sufficient	+ve for Solids free
3	Capital Cost	High	Low	+ve for Solids free
4	Individual Septic tanks	Not required	Required	+ve for Conventional
5	O&M cost	Very high	Very low	+ve for Solids free
6	People's perception	More preferred	Less preferred	+ve for Conventional

PRWSSP - Current Status of Progress

- Sewerage schemes in 100 villages are to be completed by December 31, 2013
- 3 of them have been completed and construction nearing completion in 2 villages
- Detailed Engineering Reports completed for a further 40 Solids free sewerage schemes
- Bids are being invited for 25 Solids free sewerage schemes
- 800 villages are being considered for sewerage in the proposed follow-on water/sanitation project

Cost Info of a few SBS Schemes

Sl. No.	Sewerage Scheme	Cost (Rs. In Lakhs)				Population		Cost per Capita	
		Pipe Sewer	STP	MTC	Total	Present (2012)	Prospective (2027)	Total (2012)	Sewers (2012)
1	Abiana Kalan & Abiana Khurd, Ropar	123.5	73.16	19.75	216.41	2131	2557	9232	5798
2	Boje Majra, Ropar	91.8	59.28	17.30	168.38	1166	1399	12959	7872
3	Chitamali, Ropar	127.5	82.56	19.57	229.63	1415	1699	14838	9008
4	Bhajouli, Mohali	61.5	61.49	15.20	138.19	1161	1393	10808	5295
5	Singhpura, Mohali	88.0	55.85	15.14	158.99	822	986	17497	10703
6	Jaula Kalan, Mohali	127.0	59.80	17.59	204.39	1852	2223	10083	6854

Conclusions

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- SBS provides an economic option for off-site sanitation in (a) small towns, (b) expanded area of towns, and (c) fringe area of larger towns
- Both SBS and conventional systems could be used in a sewer network with SBS discharging into the conventional system
- Solids removed from the interceptors/septic tanks could be treated at septage treatment facility, disposed off at the solid wastes treatment/ disposal site of the municipality or could be used to produce compost

Thank You