

Technology and Management situation of decentralized domestic wastewater in Vietnam

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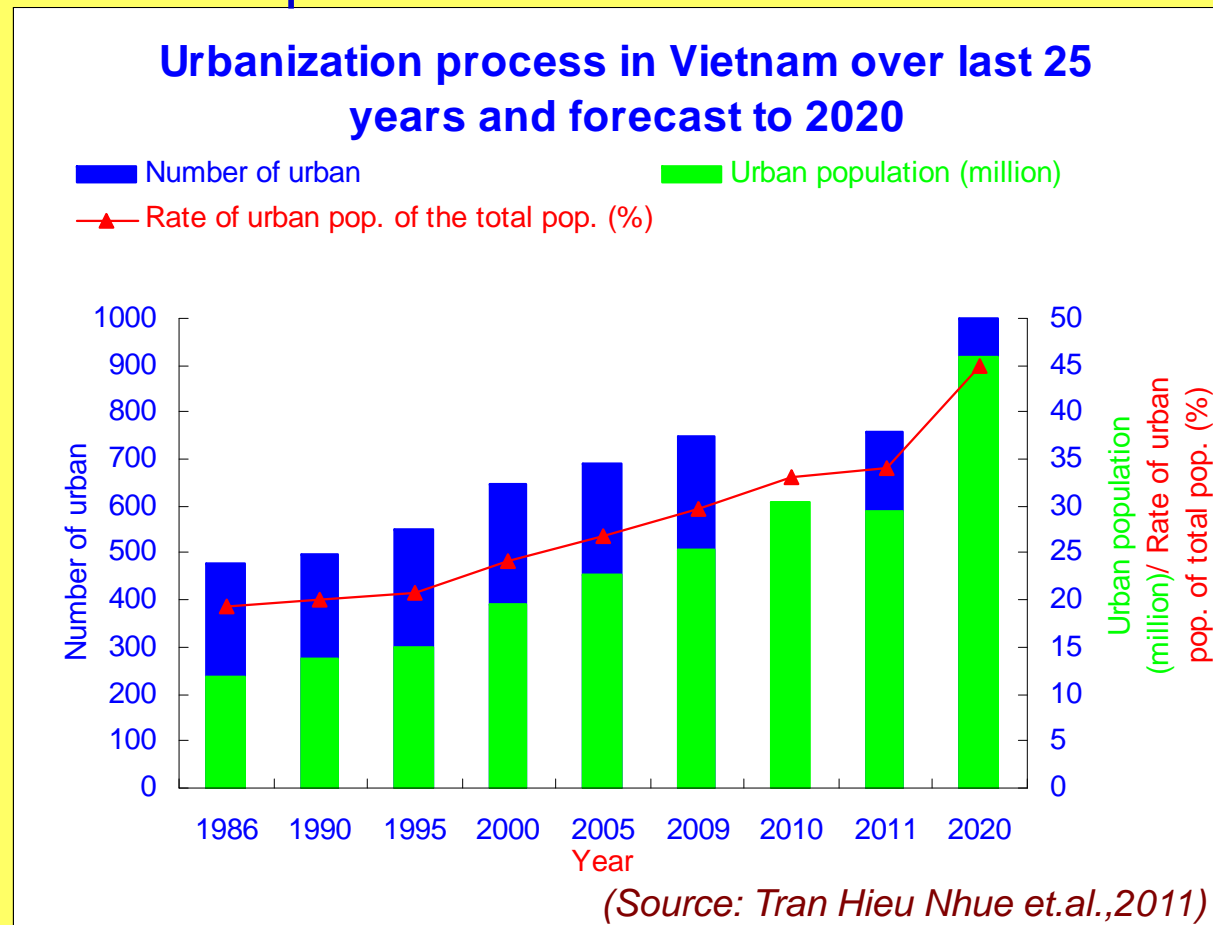
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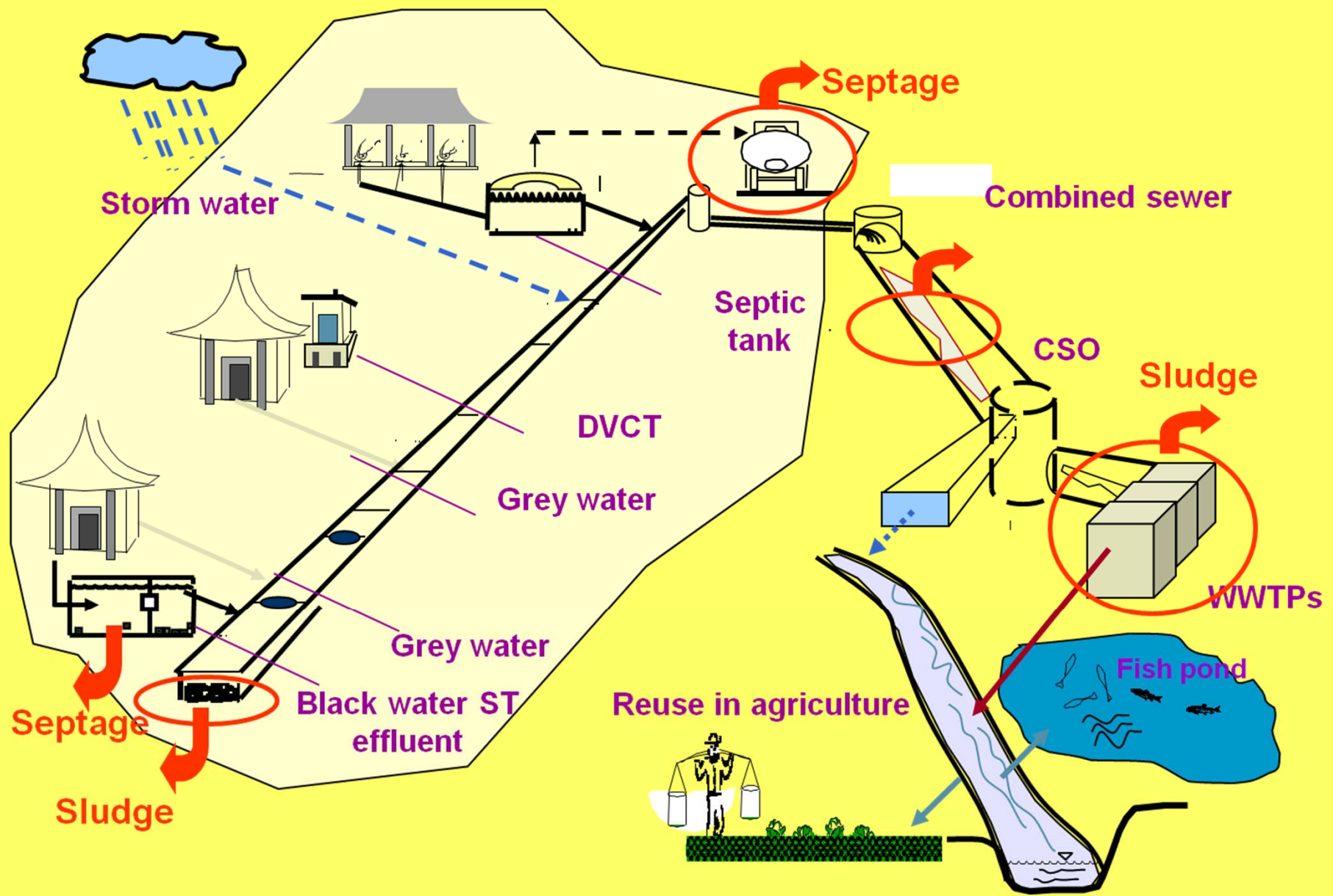
1. INTRODUCTION

- Oct. 2013: 766 cities and towns, with 30% of total population
- Nov, 1st 2013: 90 million people.
- Fast urbanization process



2. Situation of sanitation in Vietnam

- Combined sewerage system
- 32 cities have executed sewerage and sanitation projects funded by ODA
- Access to toilets: > 90%
- 40 - 70% population have access to sanitation service (sewerage and drainage network)
- Majority of existing sanitation works in urban areas is septic tank: 80%
- Only > 10% of urban wastewater is treated
- 18 WWTPs only treat app. 345,000m³/d of total 3,080,000 m³/d domestic WW generated
- Diversified technologies
- Difficulties in O&M (cost recovery, skills, etc)



List of centralized WWTPs in Vietnamese cities

No	Plants	City	Start up Year	Capacity, m3/d		Sewer type	Treatment process/technology
				Design	Operation		
1	Kim Lien	Hanoi	2005	3,700	3,700	CSS	A2O (AS)
2	Truc Bach		2005	2,500	2,500	CSS	A2O (AS)
3	North Thang Long		2009	42,000	7,000	CSS	AO with nitrification
4	Yen So		2012	200,000	120,000	CSS	SBR
5	Binh Hung	HCM City	2009	141,000	141,000	CSS	CAS
6	Binh Hung Hoa		2008	30,000	30,000	CSS	Aer. Ponds + Mat. Ponds
7	Canh Doi (Phu My Hung)		2007	10,000	10,000	SSS	OD
8	Nam Vien (Phu My Hung)		2009	15,000	15,000	SSS	A2O (AS)
9	Son Tra	Da Nang	2006	15,900	15,900	CSS	Ana. Pond w/float cover
10	Hoa Cuong		2006	36,418	36,418	CSS	Ana. Pond w/float cover
11	Phu Loc		2006	36,430	36,430	CSS	Ana. Pond w/float cover
12	Ngu Hanh Son		2006	11,629	11,629	CSS	Ana. Pond w/float cover
13	Bai Chay	Quang Ninh	2007	3,500	3,500	CSS	SBR
14	Ha Khanh		2009	7,000	7,500	CSS	SBR
15	Da lat	Da Lat	2006	7,400	6,000	SSS	Imhoff tank + Trick. Filt.
16	Buon Ma Thuot	BMT	2006	8,125	5,700	SSS	Stab. Ponds (AP,FP,MP)
17	Bac Giang	Bac Giang	2010	10,000	8,000	CSS	OD
18	Phan rang	Ninh Thuận	2011	5,000	5,000	CSS	Facultative. Ponds + Mat. Ponds

Sanitation status in Vietnam

Areas	Percent, %		
	No toilet	Public toilets	Separate toilets
Rural areas	13,50	17,10	69,40
Urban areas	3,78	3,31	82,91
Average	11,20	16,20	72,0

Government policies

- Over the last two decades: about **USD 2 bio.** for water and sanitation infrastructure improvement.
- Great efforts are to be acknowledged:
 - projects and activities of DESA group, IESE,
 - projects of GTZ and KfW, other donors,
 - BORDA, etc.
- Effluent Standard for not connected to the sewers, and small flows: **QCVN 14:2008/BTNMT.**

Vietnamese National Code for wastewater effluent quality QCVN 14:2008/BTNMT

No	Parameters	Column A ^(a)	Column B ^(b)
1	pH	5 - 9	5 – 9
2	BOD ₅ (20°C), mg/l	30	50
3	TSS, mg/l	50	100
4	NH ₄ -N, mg/l	5	10
5	NO ₃ ⁻ , mg/l	30	50
6	PO ₄ ³⁻ , mg/l	6	10
7	Total Coliforms, MPN/100 ml	3,000	5,000

(a) - Maximum allowable values for wastewater discharged to water bodies serving domestic water supply purpose.

(b) - Maximum allowable values for wastewater discharged to water bodies serving another purposes (irrigation, water transport, etc.).

3. Technical and Management aspects of decentralized sanitation

3.1. On-site sanitation

- **On-site dry sanitation**

- Dry eco-san toilet Reuse of urine and compost
- VIP

- **On-site wet sanitation**

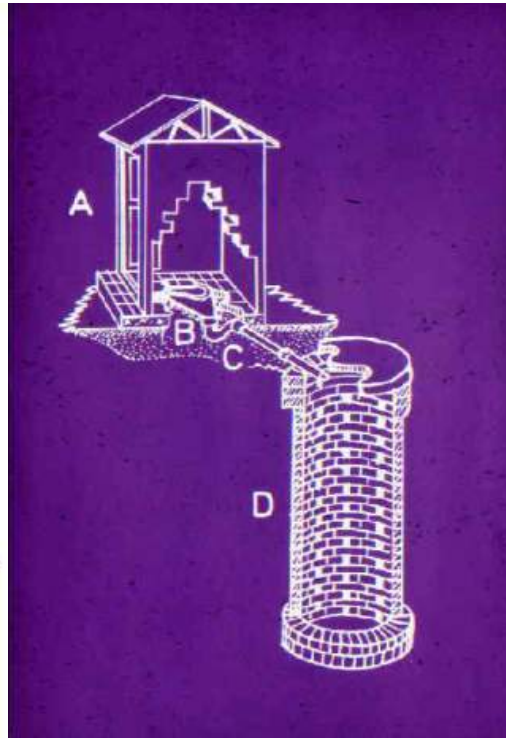
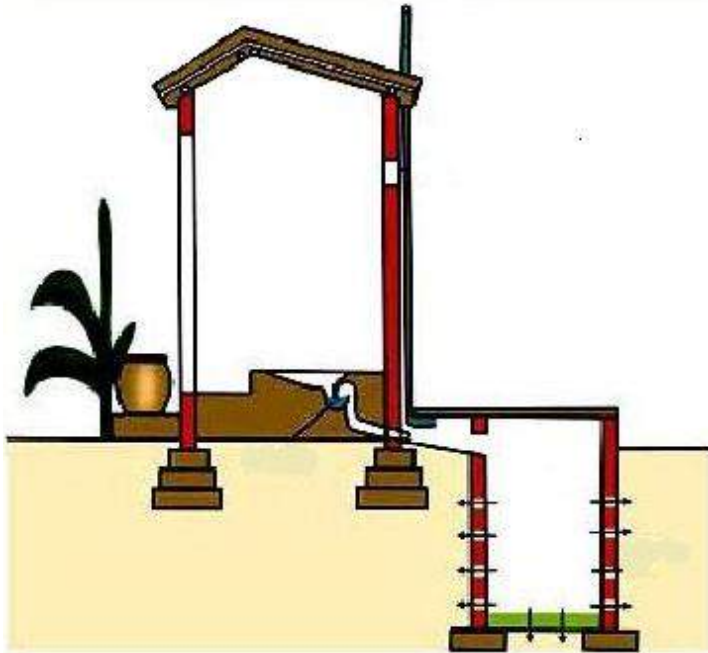
- PF toilet + infiltration pit/trench
- PF toilet + Anaerobic treatment: Biogas digester/Septic tank/Improved septic tank
- Anaerobic treatment + subsurface filtration (Infiltration trenches, sand filter, constructed wetlands)

Dry ecosan toilet



- No flushing water.
Separating faeces and urine
- To add lime or ash
- Diluting urine for irrigation
- 6 – 12 months compost for disinfection before fertilizer
- Low-cost

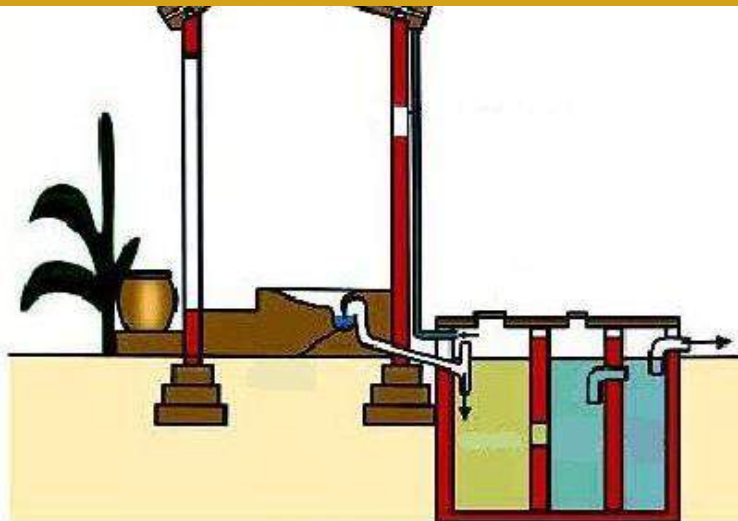
Pour flush toilet



Siphon
for odor
control



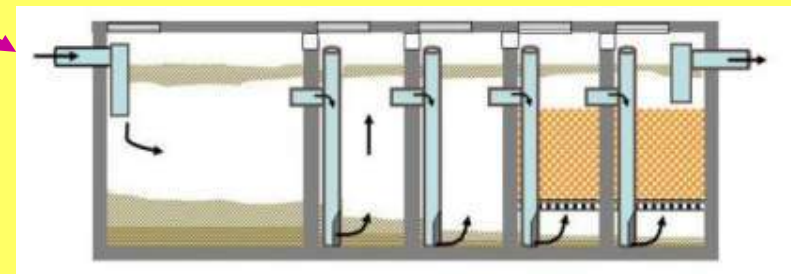
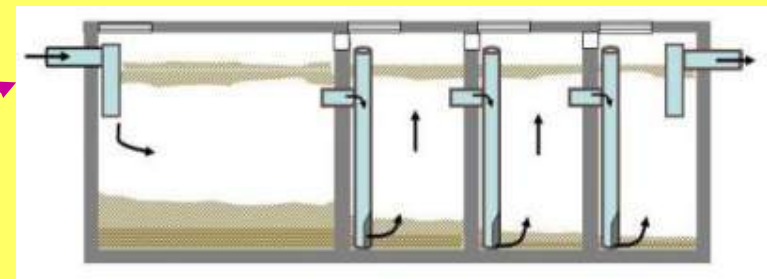
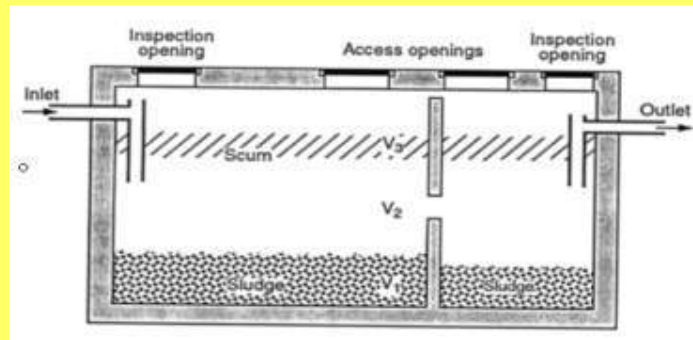
Pour flush toilet + septic tank



■ **Baffled septic tank with anaerobic filter BASTAF**
(IESE – SANDEC, 1998 - 2007)

ST < BAST < STAF < BASTAF (HRT = 48 h)

50 – 60% 70 – 80% 80 – 85% 80 – 90% (COD, COD_f, TSS)



- ST – Septic tank
- BAST – baffled septic tank
- STAF-septic tank with anaerobic filter
- BASTAF – baffled septic tank with anaerobic filter.

PRE-FABRICATED WASTEWATER TREATMENT SYSTEMS

AFSB® and BASTAFAT®



3.2. Decentralized w/w treatment technologies

Location	Technologies applied
Hospitals, hotels, apartments, office buildings in the urban centers ^(a)	Activated sludge process, MBR Tricking filter, RBC Submerged aerated filter A ² O Jokashou and other packaged pre-fabricated plants
Pig farms ^(a)	Biogas digester
Vietnam Friendship Village in Xuan Phuong commune, Tu Liem district, Hanoi (2008) ^(b)	Combined sewerage and drainage with CSOs, BASTAF + HF CW
Low-income residential area in Vinh Yen town, Vinh Phuc province (2007) ^(b)	Combined sewerage and drainage with CSOs, BASTAF

- A²O – anaerobic – anoxic – oxic treatment process.
- ABR – anaerobic baffled reactor.
- BASTAF – baffled septic tank with anaerobic filter.
- CSO – combined sewerage with overflow chambers.
- HF CW – horizontal flow constructed wetland

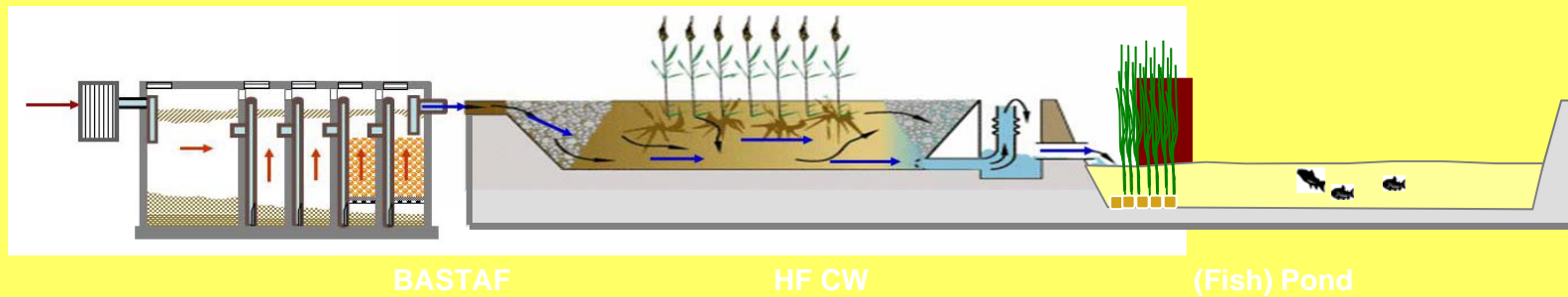
- (a) – implemented by different service providers.
- (b) – by DESA team, IESE.
- (c) – by BORDA Vietnam

Location	Technologies applied
Xuan Mai concrete factory residential quarter, Chuong My district, Hanoi (2007) ^(b)	Combined sewerage and drainage with CSOs, BASTAF
Lai Xa village, Kim Chung commune, Hoai Duc district, Hanoi (2006 – 2007) ^(b)	Combined sewerage and drainage with CSOs, BASTAF + HF CW
Ta Thanh Oai and Huu Hoa communes, Thanh Tri district, Hanoi (2005) ^(b)	Combined sewerage and drainage with CSOs, BASTAF
Tam Da village, Tien Son district, Bac Ninh province (2002) ^(b)	Combined sewerage and drainage with CSOs, BASTAF

- A²O – anaerobic – anoxic – oxic treatment process.
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DWWM in small towns and peri-urban areas



Lai Xa village, Hoai Duc,
Hanoi



Bac Ninh – living quarter



Bac Kan – small town

- Type of sewerage and drainage system?
- Coverage? HH connection?
- Wastewater fee collection?
- Investment?

4. Opportunities and Challenges in decentralized wastewater management

Financing mechanisms for sanitation projects

- Work order for O&M: paid by city's budget. Part of it: collected w/w fees
- Urban w/w fee: **10%** surcharge to water bill. Hai Phong city: **15%**. Other cities are preparing to increase.
- For not connected households: environmental fee (10%). (Decree No. 67/2003 to be revised)

Major challenges in sanitation projects

- Lack of knowledge of decentralised options
- Quality of design and construction, associated with
 - consultants' competency,
 - administrative appraisal procedures,
- Low rate of household connection,
- Financial sustainability,
- Shortage of qualified work force and skills for O&M.
- Out-sourcing services are often not available or not affordable in the area.

- **Technical aspects**
 - There are still very **few decentralized technical options** developed and applied.
 - **Systematic review** has not been conducted:
 - DEWATS system performance, public acceptance, etc.
 - Balancing of investment, and O&M costs, including required space, manpower, energy and chemicals.
 - Collection of wastewater: little national and international experience in combined drains + septic tanks.
 - Design guidelines are still lacking.
 - etc...

- **Financial aspects**

- Wastewater fees is still very low in urban areas, and zero in rural areas (Decree 88...)
- Private sector is till not interested in this business.

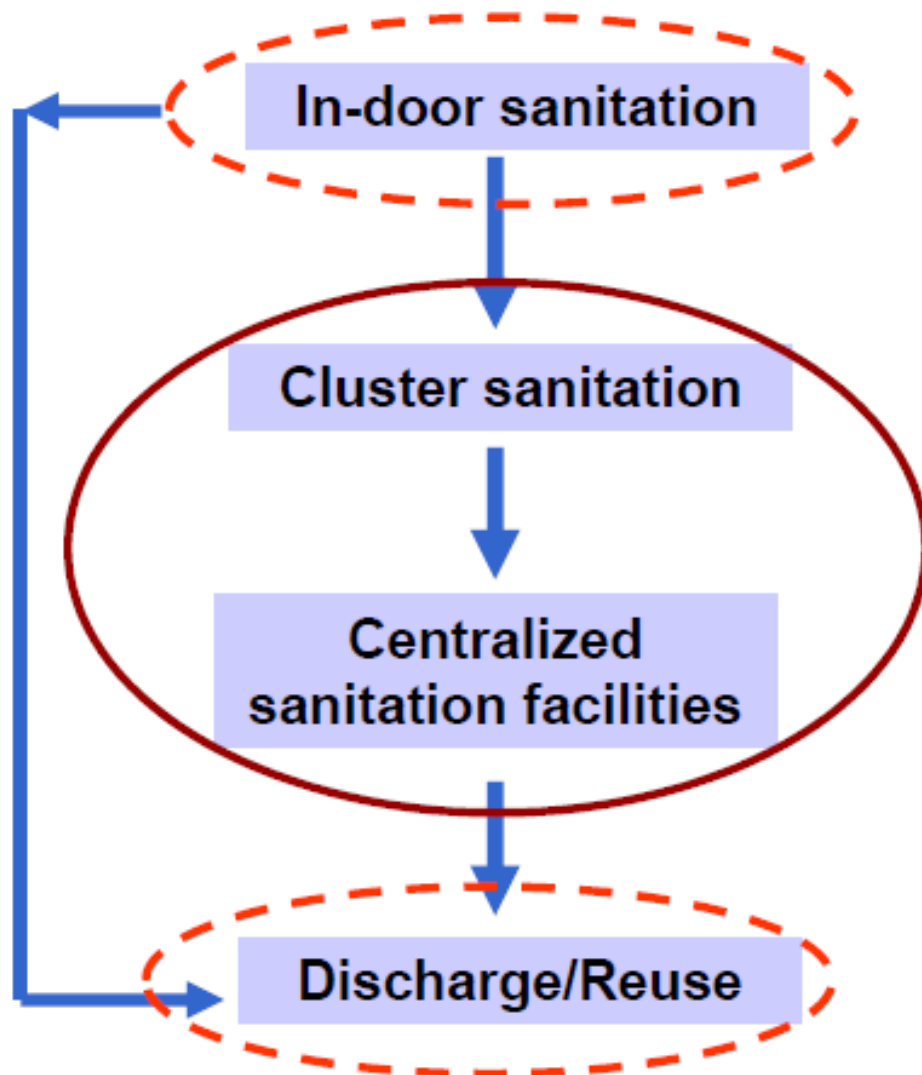
- **Social aspects**

- Traditional acceptance of untreated wastewater disposal by most of people.
- Wastewater reuse attitudes of the public and policy makers hinder the adoption of wastewater treatment and safe reuse systems.
- The main challenge is to create informed demand for improved sanitation.

5. Conclusions and Recommendations

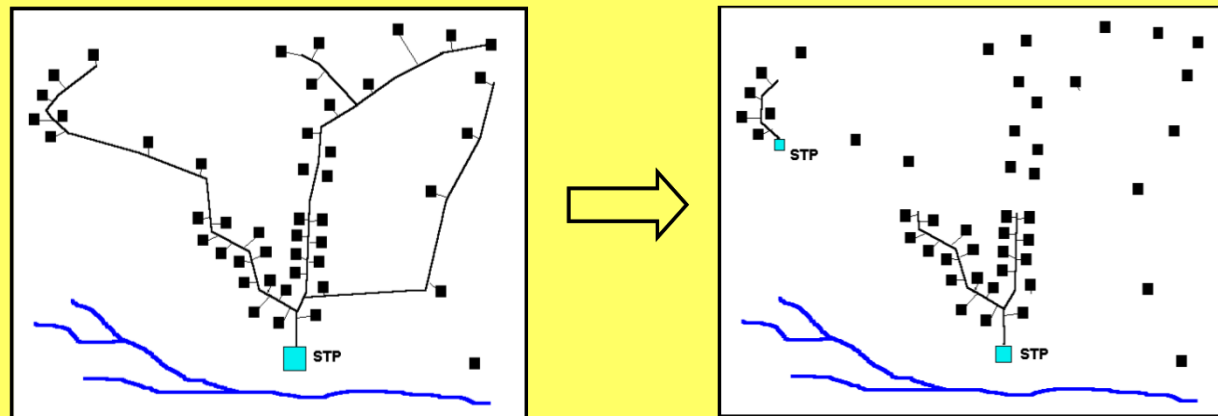
- **Sanitation improvement should start from household**
- **Ecosan concept**
- **Technical aspects**
- **Wastewater management regulations**
- **Sustainable sanitation model**

Sanitation has to be started from the household !

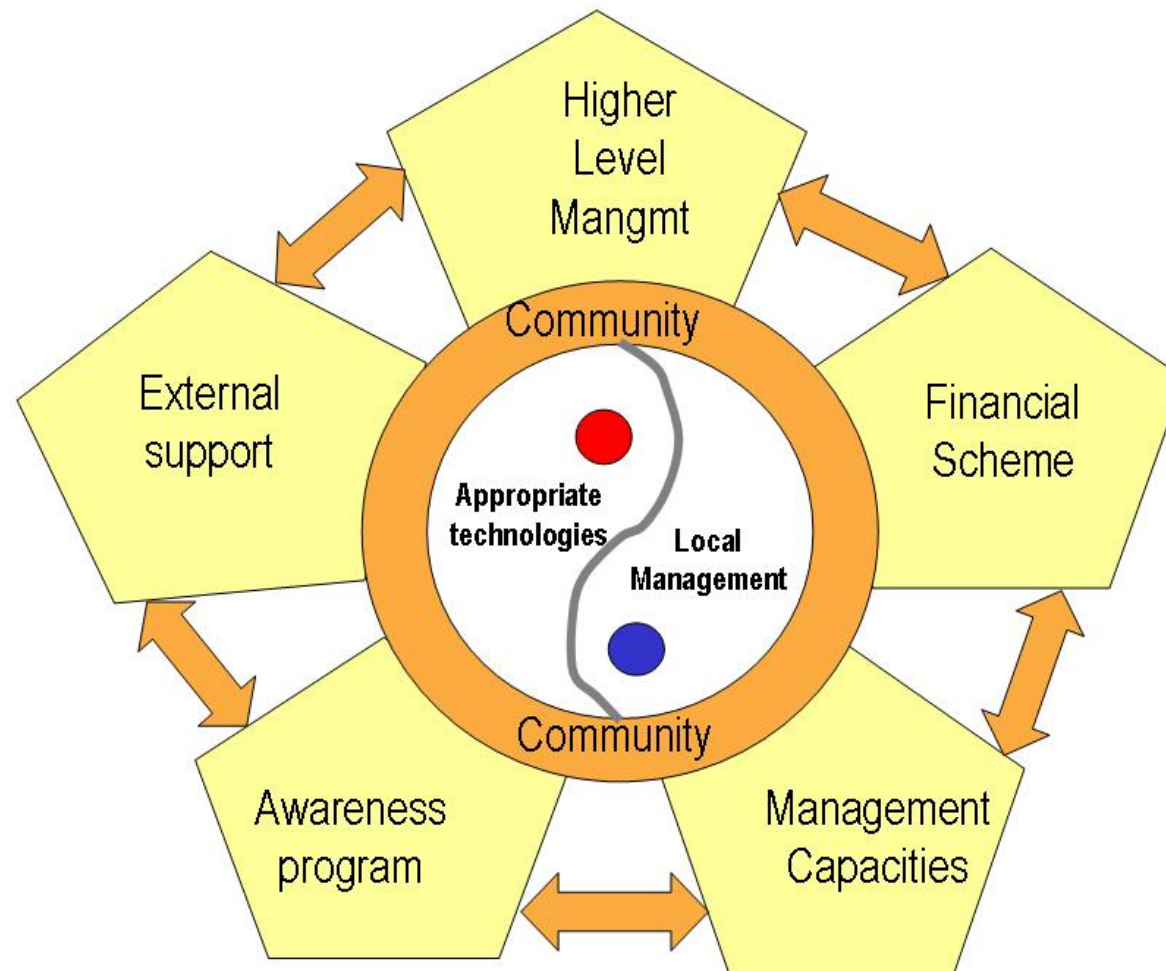


- **Technical aspects**

- Combination of different options
- Cost-benefit analysis of different sanitation options should be developed.
- We need information of unit costs of different sanitation options, in different local contexts



- **Sustainable Sanitation Model**





Thank you very much for
your kind attentions !

