WIPO

Wastewater management and technology needs in Vietnam

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Water supply in urban areas in Vietnam

- **63** provinces. **7** different ecological zones. **91** million population.
- **770** cities and towns. 33% of total population.
- Total design capacity of urban water supply systems: **6.5** million m^3/day.
- Urban population served with centralized water supply systems: **77%** (from 57 to 80%) **of 32.6 mio. People through 4.7 mio. connections.**

Urban wastewater management

- **90% OF HHs HAVE SEPTIC TANKS**
- **4% OF SEPTAGE DISPOSED SATISFACTORILY**
- **60% OF HHs HAVE ACCESS TO PIPED DRAINAGE/ SEWERAGE SYSTEMS**
- **10% OF COLLECTED DRAINAGE/ SEWERAGE TREATED BY CENTRALIZED WWTPS**
- **20 MUNICIPAL WWTPs CURRENTLY IN OPERATION**
- **>50 MUNICIPAL WWTPs IN PLANNING/CONSTRUCTION**
- **USD 250 MILLION INVESTED ANNUALLY OVER THE PAST 10 YEARS**


Truc Bach, Ha Noi (2005)


Kim Lien, Ha Noi (2005)


Da Lat, Lam Dong (2006)


Buon Ma Thuot, Dak Lak (2006)


Hoa Cuong, Da Nang (2006)

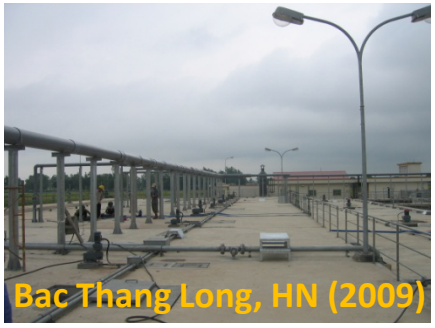

Phu Loc, Da Nang (2006)


Ngu Hanh Son, DN (2006)


Son Tra, Da Nang (2006)


Bai Chay, Quang Ninh (2007)


Binh Hung Hoa, HCMC (2008)

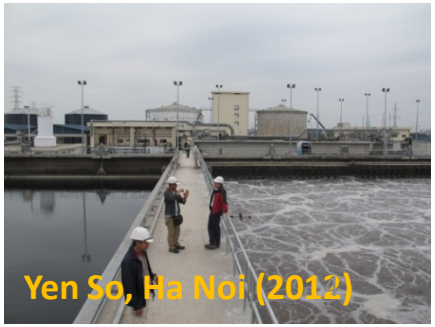

Bac Thang Long, HN (2009)


Ha Khanh, QN (2009)


Nam Vien, PMH, HCMC (2009)

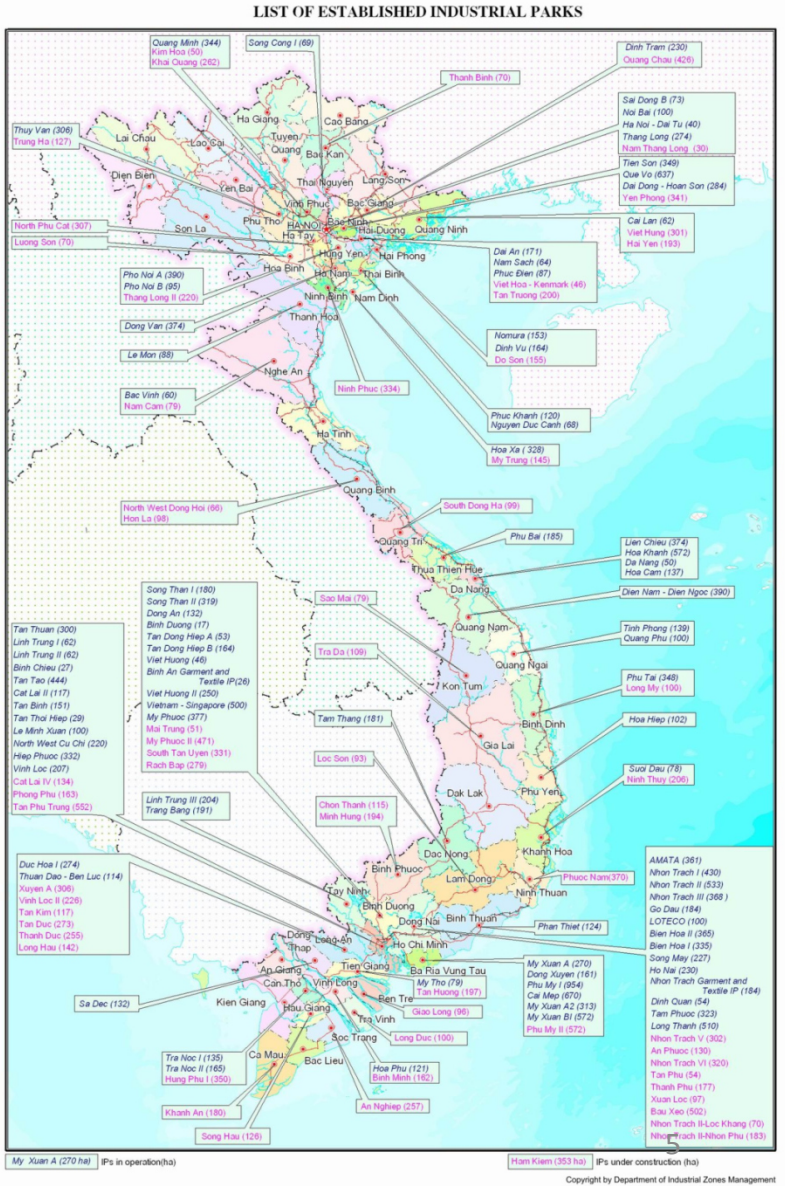

Binh Hung, HCMC (2009)


Bac Giang (2010)


Yen So, Ha Noi (2012)

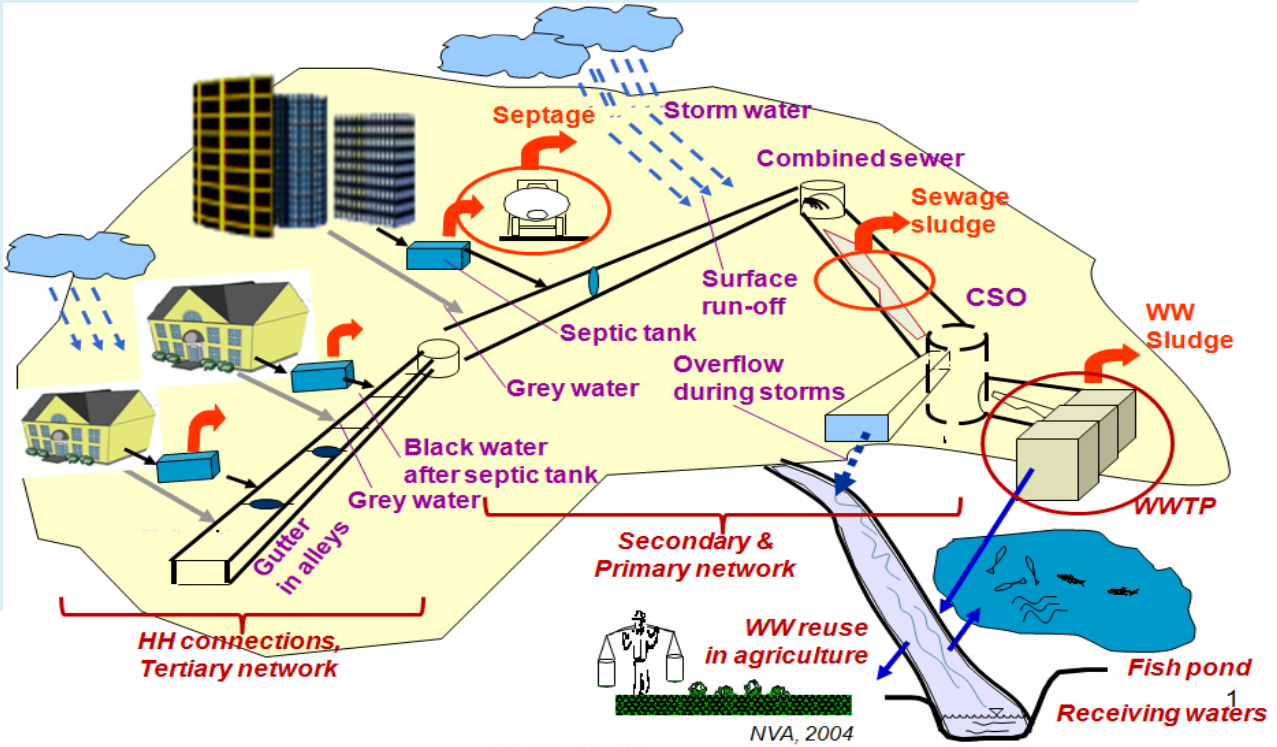
Wastewater management in industrial areas

- Nearly 300 IZs have been established. 180 IZs are in operation, with 6,800 factories. Average coverage ratio: 65%.
- Centralized WWTPs: at 120 IZs (66%).
- Besides: thousands of Industrial Clusters and Individual Industries; 3,300 handicraft villages.



Technology need 1: Appropriate wastewater treatment technology dealing with low C/N ratio in the incoming wastewater flow

- **92% OF WW CONVEYED BY USE OF COMBINED SEWERAGE SYSTEMS (CSS)**
- **CHALLENGES:**
  - **LOW INFLUENT BOD (31 – 135 mg/l: Range of annual average flows, vs. 50 mg/l – NATIONAL CLASS "B" STANDARD FOR EFFLUENT BOD)**



Technology need 2: Appropriate technology for treatment of sludge generated from combined sewerage and drainage system

- DREGDED SLUDGE FROM SEWERAGE AND DRAINAGE NETWORK
- SEWAGE SLUDGE FROM WWTP
  - *Dumping is a most common method.*
  - *Composting*
  - *Anaerobic Digestion*

Technology need 3: Adequate faecal sludge treatment technology

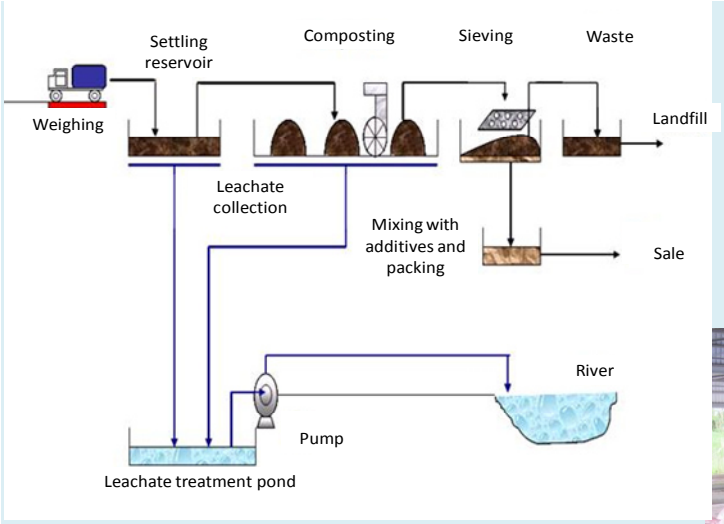
FS treatment technologies applied in Vietnam so far







End-use of treated FS



Technology need 4: Removal of organic matters from surface water

✓Coagulation – Flocculation – Sedimentation – Rapid sand filtration is a conventional water treatment technology.

✓Conventional treatment process can remove 30-50% of organics. Powered activated carbon, Granular activated carbon seem not suitable in terms of cost. Biological carbon filtration (BCF) pre-treatment does not give good results.

✓Inexpensive technology for retrofitting/ upgrading existing treatment plant is needed.

Technology need 5: Equipment to control incoming wastewater flow features for CETPs

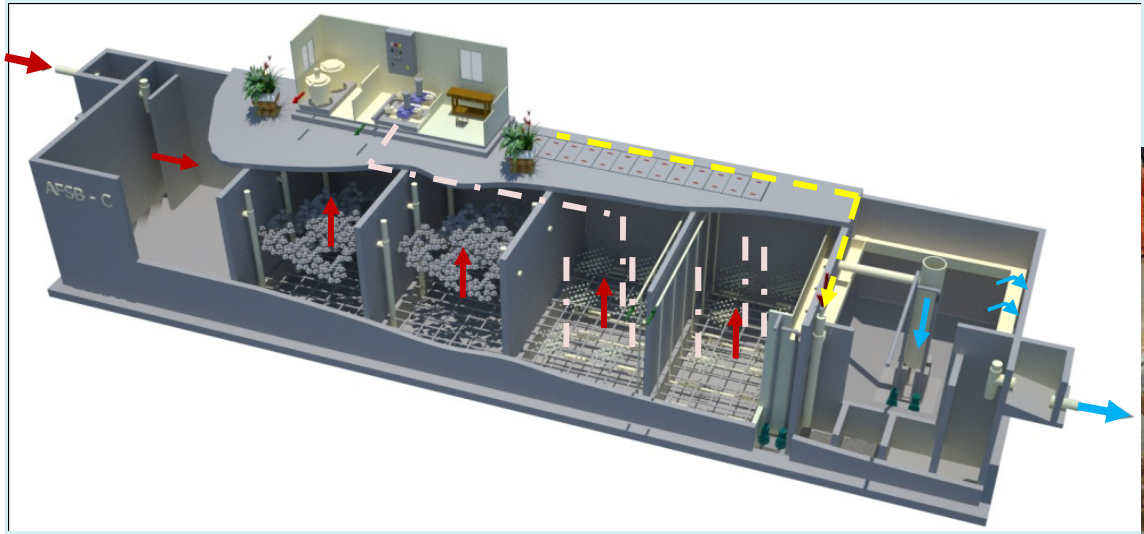
- ✓Operator of CETP required factories to treat their own wastewater to avoid overloading of CETP treatment processes.
- ✓Number of CETPs is facing problem of shock loading of hazards. Failure of CETP operation leads to damage of system, exceeding effluent standard limit, and possible fines.
- ✓On-line monitoring of wastewater flows discharged from factories seems expensive.
- ✓Adequate control measures are needed.

Technology need 6: Technology for decentralized wastewater treatment with small foot-print reactor and shallow reaction zone

✓Decentralized wastewater treatment stations built for hospitals, hotels, apartments, commercial points in urban areas and resorts

✓Installed in the basement or ground floor of the building.

✓Limited foot print, and limited height of floor (around 2.4-2.8 m).



Technology need 7: Technology for flow rate and concentration equalization allowing stable incoming wastewater features at wastewater treatment plants

- ✓(See Technology need No. 5)
- ✓Efficient balancing tank or some other technology allowing equalization of incoming flow rate and concentration is needed

Technology need 8: Technology to improve treatment performance of existing biological CETPs receiving non-degradable substances in incoming flows

- ✓Non-degradable or slowly degradable substances appearing in incoming wastewater flows from such industries as printing ink, traditional medicine materials, cosmetics, paper and pulp, textile, etc.
- ✓Chemically enhanced clarification - Biological treatment processes?
- ✓Measures to remove those substances before, during or after biological treatment steps are needed

Technology need 9: Technology for co-treatment of Iron, Manganese, Ammonium and Arsenic in groundwater

✓Conventional groundwater treatment plants: Production well - Aeration - Contact chamber for iron oxidation (with or without line and alum addition) - Rapid sand filtration – Chlorine disinfection.

✓In case of presence of manganese in groundwater, additional aeration, pH rising, application of green sand is often applied.

✓Ammonium and arsenic? Upgrading of existing water treatment plants is needed where cost effective technologies are required

Technology need 10: Technology for co-treatment of high range of Iron, Manganese and Ammonium in groundwater

- ✓In Red river delta: elevated concentrations of iron, manganese and ammonium.
- ✓For example, in Bac Ninh province, iron concentration in raw groundwater can be > 40 mg/L, manganese > 7 mg/L, ammonium > 10 mg/L.
- ✓Upgrading of existing treatment plant which was designed for iron removal only? Cost effective technologies are required

Technology need 11: Technology (know-how) for quick start-up of biologically based wastewater treatment plant

✓Formation of microbial community (sludge), increase of sludge concentration in biological reactors at commissioning/start up period of newly built wastewater treatment plants, or at re-start period, after wastewater treatment plant shutting down due to hazardous shocking, long term electricity cut, other operation failures.

Technology need 12: Energy efficient technology for sludge dewatering from water treatment plants

✓Conventional methods for sludge treatment are sludge thickening in a gravity thickener, followed by dewatering in sludge drying beds, or mechanical dewatering in machines such as centrifuge, filter press, belt press, etc.

✓Energy efficient sludge dewatering technology is needed in most of water treatment plants in Vietnam treating both ground and surface waters

Technology need 13: Pre-treatment of organic fractions of municipal waste, industrial waste and agro-waste before anaerobic digester for biogas recovery

✓Pre-treat of waste fractions to convert them into easily degradable substrates before anaerobic digestion.

✓Various materials, forms, sizes, shapes, and characteristics of different wastes make their pre-treatment processes like separation, sorting, chopping, maceration, etc. difficult

Technology need 14: Technology for treatment of digested sludge after anaerobic digester for resource recovery

✓Treatment of liquid and solid phase of digested sludge after digester.

✓Solid phase can be used for making of compost fertilizer or fuel.

✓N, P from liquid phase can be used as nutrient source for fertilizer.

✓Energy consumption is a main challenge for solid phase treatment.

✓High concentration of organics, colloids, N, P in liquid phase is main challenge for efficient physic-chemical and biological treatment processes

Technology need 15: Technology for treatment of pig farm wastewater rich of organics and nitrogen (ammonium)

✓Technology for post-treatment after anaerobic digester, or full package of solutions for wastewater treatment and resource recovery is needed, where a cost effective criteria is an important challenge

Technology need 16: Technology to enhance nitrification, or removal of ammonium, in wastewater treatment systems applying natural treatment processes

✓Average TN in wastewater incoming into municipal wastewater treatment plant is 40-50 mg/L: N-NH4: 20-40 mg/L .

✓Required TN in treated wastewater is 20 mg/L (Class A) or 40 mg/L (Class B). Required NH4: Class A is 5 mg/L, Class B is 10 mg/L.

✓ Natural wastewater treatment processes: waste stabilization pond, constructed wetland, tricking rock filter

✓Rate of nitrification or ammonium removal in those systems is quite limited.

✓Enhancement solutions are needed to maximize benefits and overcome limitations of these treatment systems

Thank you very much, for your attention

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