Water & Wastewater Industry in Vietnam

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Water Supply in Urban Areas in Vietnam

- 63 provinces. 7 different ecological zones. 94 million population.
- 780 cities and towns. 35.5% of total population.
- Total design capacity of urban water systems: 7.5 million m³/day (increased from 5.8 million m³/day in 2010).
- Urban population served with centralized water supply systems: 81% (from 57 to 98%).
- Intensive growth over last 20 years
- Investment over last 5 years: USD 550 million (USD 110 million/year)
Urban Water Supply: State-of-Art

- ~650 centralized WS systems. ~100 urban water supply companies.
- Average water consumption rate: 101 l/cap/day (from 33 to 213 l/cap/day)
- Non-revenue water: 24.5 % (8 – 30%) (decreased from 31% in 2010).
- Operators: Water Supply One Member Co. Ltd, JSC, JSC with foreign share holders, …
Emerging Concerns and Combating Measures

- **Water source:**
  - Climate change, surface water scarcity, salt intrusion, usage conflict, groundwater depletion

- **Water pollution:**
  - Surface water: NOMs, industrial and agro-chemicals, pathogens, chlorine disinfection, ...
  - Ground water: organics, hardness, ammonia, arsenic...

- **Financial Sources and Business efficiency.**
  - Financial sources for water projects
  - Cost recovery.

- **Needs of effective technologies**
  - Removal of ammonium, arsenic, organics from groundwater
  - Membrane filtration for desalinization
  - Energy efficiency in water system
  - Automation, remote control for waster safety plan
New Approaches and Trends in Water Supply

• **Equitization, privatization** is taking place: 70/100 water companies have been equitized.

• Water supply service is being improved. Water quality improvement. Water Safety Plan: **shifting from quantity to quality of service**

• Water pricing and Non-revenue water management;

• **Application of new technologies** and equipment in water treatment, distribution, leakage control, asset management, business management with application of IT and new management technology; Process optimization & Energy savings; low operation cost.

• **PPP in water industry**: New Decree No. 15/2015 has been issued to encourage Public – Private Partnership in infrastructure development.
  – BOT, BOO, DBL modes in water projects: Binh An BOT; Thu Duc BOO; Dong Tam BOO; Minh Duc DBL, etc
  – Foreign Share holders: Song Da WTP; Kenh Dong WTP; etc.
Urban Wastewater Management

- 90% OF HHs HAVE SEPTIC TANKS
- 4% OF SEPTAGE DISPOSED SATISFACTORILY
- 70-80% OF HHs HAVE ACCESS TO PIPED DRAINAGE/SEWERAGE SYSTEMS
- ~15% OF COLLECTED DRAINAGE/SEWERAGE TREATED BY CENTRALIZED WWTPS
- 45 MUNICIPAL WWTPs CURRENTLY IN OPERATION, with total capacity ~750,000 m³/day
- >30 MUNICIPAL WWTPs IN PLANNING/CONSTRUCTION, with total capacity 1.5 million m³/day
- Investment over last 5 years: >USD 1 billion (USD 220 million/year) (>80% is ODA, rest is from state budget)
Barriers & Challenges in Urban W/w Management

- **Policy and legislations:**
  - Integrated approach, river basin management concept
  - Urban sanitation planning
  - Effluent standards

- **Technology selection:**
  - Centralized versus decentralized systems
  - CSS versus SSS
  - Appropriate WWTP technologies, Sludge management

- **Finance:**
  - Mobilization of funding sources
  - O&M Cost recovery

- **Management capacity:**
  - Household connections
  - O&M: Capacity of operators. Ownership of assets
  - IEC. Customers awareness
Some Combating Measures

- **Policy and legislations:**
  - Revised Environmental Protection Law (2015)
  - New Decrees 25/ND-CP, 80/ND-CP;
  - Piloting Urban sanitation planning (ADB)
  - Revision/Updating of effluent standards

- **Finance:**
  - PPP: Phu Dien Co.: Investor & Operator (Hanoi, Da Nang, HCMC, Nha Trang cities)
  - Gradual increase Water and wastewater tariffs

- **Management capacity:**
  - Inclusion of Household connection into project design
Financing Mechanisms for Wastewater Management

- ODA loans
- Investment credits
- Other sources
- Government budget
  - Taxes
  - Wastewater fee
  - Other sources
  - City's budget
  - Micro-finance to support the poors
  - Household

- WW Management Enterprise
  - Construction of WW system
  - Septic tank & HH connection

- Private Enterprises
  - Revenue from resource recovery
  - WW system O&M, upgrading
  - Septic tank emptying
• Nearly 300 IZs have been established. 208 IZs are in operation, with ~7,000 factories. Average coverage ratio: 70%.

• Centralized WWTPs: at 180 IZs (>65%) (increased from 30% in 2005).

• Some provinces have managed to have 100% coverage of wastewater treatment plants in IZs.
Challenges in Industrial WW Management

- Control of incoming flows and O&M of CETPs
- On-site wastewater treatment + Cleaner production at Factories
- Energy efficiency
- Sludge Management
- Financing for Industrial wastewater projects: Investment, Cost recovery
- Pollution control of thousands of Industrial Clusters and Individual Industries; 3,300 handicraft villages.
Combating Measures

- Industrial WW management: Polluter-Pay-Principle
- Supporting Policies for Financing, Technologies, Monitoring & Evaluation, etc. (VIPMP project, WB)
- Effluent standard for CETPs and for industries: Class A, B
- Installation of AMS. Application of EIA; Post EIA; Discharge License; Inspection, Environmental Police; Public hearing; etc.
- Green IZ development
Other New Approaches and Trends

- **National Strategy on Green Growth** for the period 2020, vision 2030 (2012)
- **National Strategy** on development of **Green Buildings**: drafted.
- **Green city Plans**.
- **Green urban and industrial developments**: Ecopark (Hung Yen), Nam Long, Five Star, Happy Land, Everluck Residence (Long An), different resort areas, Hi-Tech part (Hanoi), …
• **2016**: 88% of rural population are provided with “hygienic” water supply.

• 45% of HHs are provided with “clean” water meeting domestic water quality regulation QCVN 02/2009:BYT.

• **Financial sources:**
  – Government budget
  – Favor loans
  – ODA loans and grants
  – Private sector
  – Households

• **Challenges:**
  – Water shortage in remote and coastal areas
  – Water safety (water quality) at HHs
  – Professional management models.
  – Sustainability of rural water supply systems (technical, financial)
• New management models: PCERWASS, PPP, PSP;... Number of water supply systems have full cost recovery accounting.
• IEC campaigns
• M&E system.
• Results-based projects (PfR - WB, NGOs)
• Centralized water supply system for groups of communes
• Transfer of rural water supply systems to provincial water supply companies
Rural Sanitation and Hygiene

• 2016 (VHEMA - NTP3):
  – >80% of HHs are with toilets, among them 60% are “hygienic”.
  – 80-90% schools, clinics, PC buildings are with WS&S facilities.
  – 50% live-stock breeding are considered as hygienic, including 0.3 mio. biogas digesters.
  – 40% communes are with solid waste collection and disposal.

• Challenges
  – Open defecation, unhygienic latrines, especially at poor HHs.
  – Unsafe reuse of feces in farming (30% of rural HHs practice reuse, in which 20% keep fecal materials for more than 6 months)
Rural Sanitation and Hygiene

• **Measures:**
  – Rural Sanitation Planning
  – Combination of wastewater collection – treatment – reuse
  – **Balance** among Water Supply and Sanitation financing
  – Promotion via seeding and demonstration projects
  – IEC campaigns

• **New Sanitation Initiatives:**
  • CLTS, Sanitation Marketing, New Low-cost Hygienic Latrines
  • Different sources
Selected Topics and Case Studies
TOPIC 1: CO-TREATMENT OF IRON, MANGANESE, AMMONIUM AND ARSENIC IN GROUNDWATER

☑ Conventional groundwater treatment plants in Vietnam: 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.
TOPIC 1: CASE STUDY OF APPLYING JAPAN’S TECHNOLOGY FOR GROUNDWATER TREATMENT IN VIETNAM

- **Technology Name:** Extremely High Speed Chemical-less Groundwater Treatment System – “CHEMILES” (™) (Developed by Nagaoka International Corporation, Japan)

- **Advantages:**
  - High efficiency for Ammonia, Iron, Manganese and Arsenic removal
  - No chemical injection
  - High filtration speed → small footprint
  - Low operation cost, simple management

- **Application place:** Hanoi Water Limited Company, Hanoi City, Vietnam (2016)

- **Purpose:** Improving water quality

Treatment process before and after applying new technology
TOPIC 2: 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)
TOPIC 3: TREATMENT OF SLUDGE GENERATED FROM SEWERAGE AND DRAINAGE SYSTEM

- DREGDED SLUDGE FROM SEWERAGE AND DRAINAGE NETWORK
- SEWAGE SLUDGE FROM WWTP
  - Dumping is a most common method.
  - Open questions:
    - Composting; Anaerobic (Co-)Digestion; Drying and Incineration; Carbonization; etc.
TOPIC 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.
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.
Many cities are still suffering from floods. Floods are becoming more and more unpredictable due to climate change.

Comprehensive countermeasures are needed.

Eco-city and green growth are being encouraged.

Good models are needed.

Rainwater harvesting can be realized at household scale, city and basin scale.

Big market.
TOPIC 7: WASTEWATER REUSE – A NEW INTEREST

✓ Agricultural use: irrigation, fish farming
✓ Industrial use: different purposes
✓ Treated wastewater use in urban areas

✓ 5th water source (surface water, groundwater, rainwater, saving water, reclaimed water)

✓ Effluent quality standard should be developed
✓ New plumbing code and appropriate equipment are needed
✓ Strict control, WSP should be set up
Vietnam Water Industry is in the intensive development period: expansion of service area, improvement of service quality, with different stakeholders involved.

Government policy: PSP is encouraged.

Wastewater reuse should be brought up to national policy, along with guidelines, case studies, demonstration and implementation projects.

High efficiency, reasonable cost technologies is needed.

Cooperation is needed:
- Vietnam’s water industry networks
- Current problems and needs, project information
- Common parts fabrication/procurement in Vietnam for reducing initial cost
Thank you very much for your attention

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