

# Water & Wastewater Industry in Vietnam



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  - State-of-art. Challenges. Combating measures.
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  - State-of-art. Challenges. Combating measures.
- **Water supply in rural areas:**
  - State-of-art. Challenges. Combating measures.
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  - State-of-art. Challenges. Combating measures.
- **Selected topic and case studies**
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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 m<sup>3</sup>/day (increased from 5.8 million m<sup>3</sup>/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 water safety plan



# New Approaches and Trends in Water Supply

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- **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

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- 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 m<sup>3</sup>/day
- >30 MUNICIPAL WWTPs IN PLANNING/CONSTRUCTION, with total capacity 1.5 million m<sup>3</sup>/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

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- **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

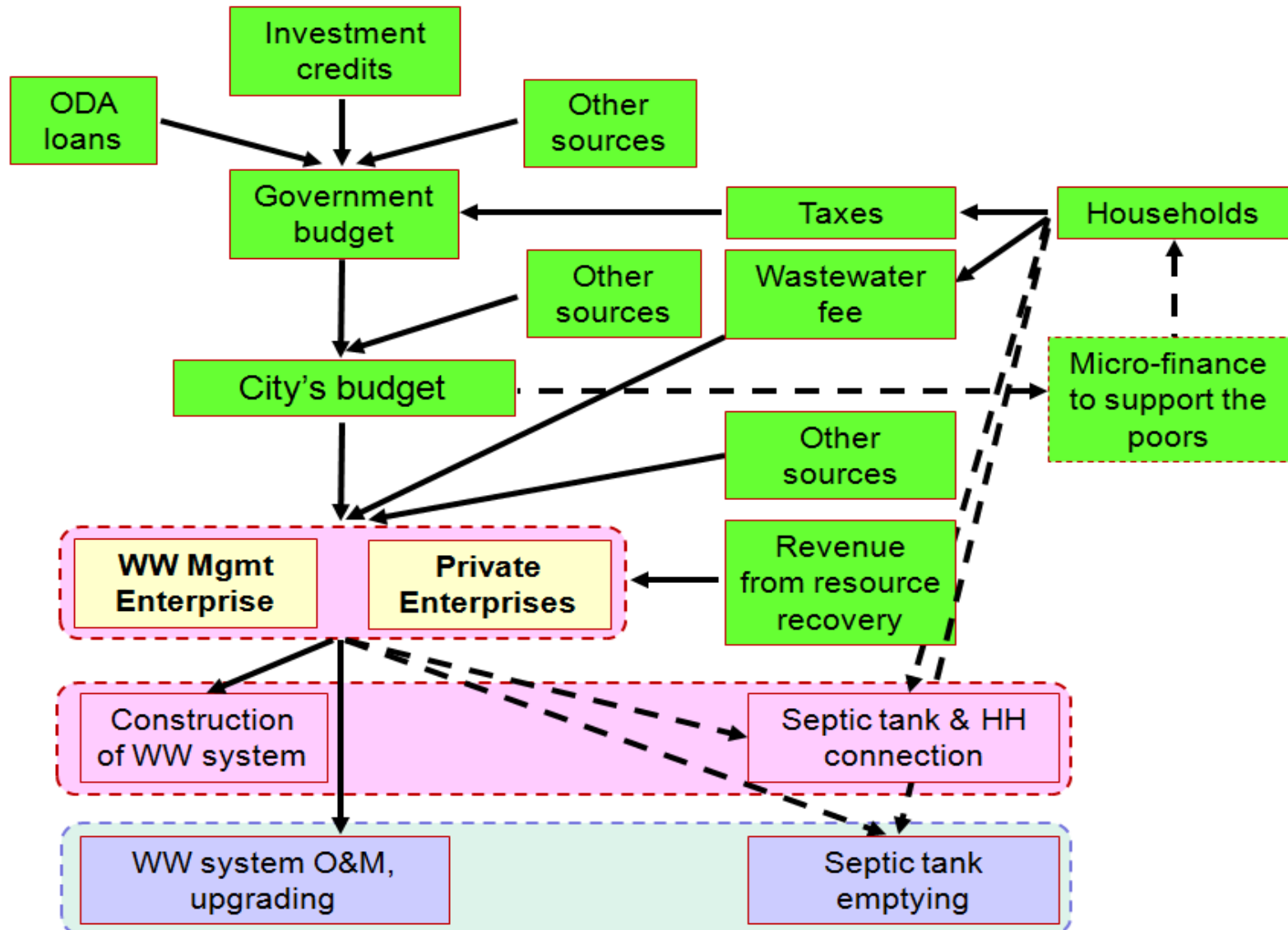


# Some Combating Measures

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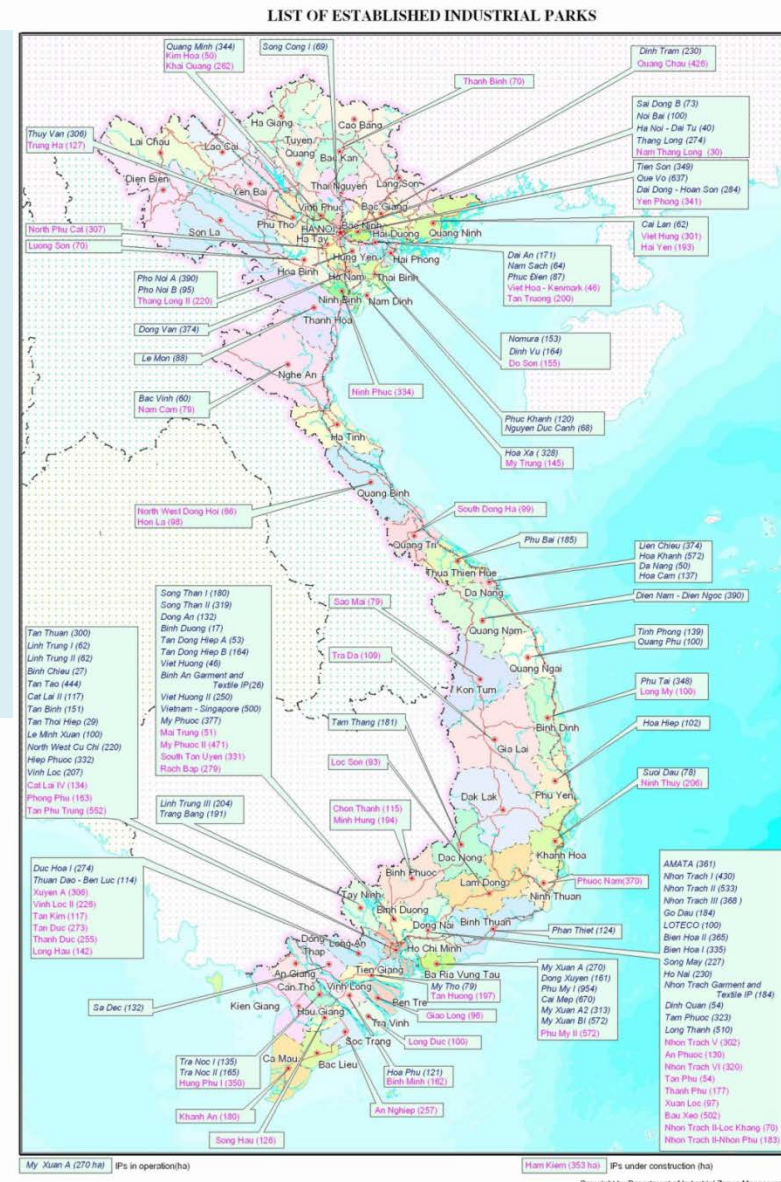
- **Policy and legislations:**
  - Revised Environmental Protection Law (2015)
  - New Decrees 25/ND-CP, 80/ND-CP;
  - Piloting Urban sanitation planning (ADB)
  - Revision/Updating of effluent standards
- **Finance:**
  - PPP: Phu Dien Co.: Investor & Operator (Hanoi, Da Nang, HCMC, Nha Trang cities)
  - Gradual increase Water and wastewater tariffs
- **Management capacity:**
  - Inclusion of Household connection into project design

# Financing Mechanisms for Wastewater Management



# Wastewater Management in Industrial Areas

- 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

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- 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

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- **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), ...





# Rural Water Supply: State-of-Art

- **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)



# Rural Water Supply: Counter-measures Applied

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- 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

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- **Measures:**
  - Rural Sanitation Planning
  - Combination of wastewater collection – treatment – reuse
  - **Balance** among Water Supply and Sanitation financing
  - Guidance. Standard design. Manual. Etc.
  - 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

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# TOPIC 1: CO-TREATMENT OF IRON, MANGANESE, AMMONIUM AND ARSENIC IN GROUNDWATER

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- ✓ Conventional groundwater treatment plants in Vietnam: Production well - Aeration - Contact chamber for iron oxidation (with or without lime 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



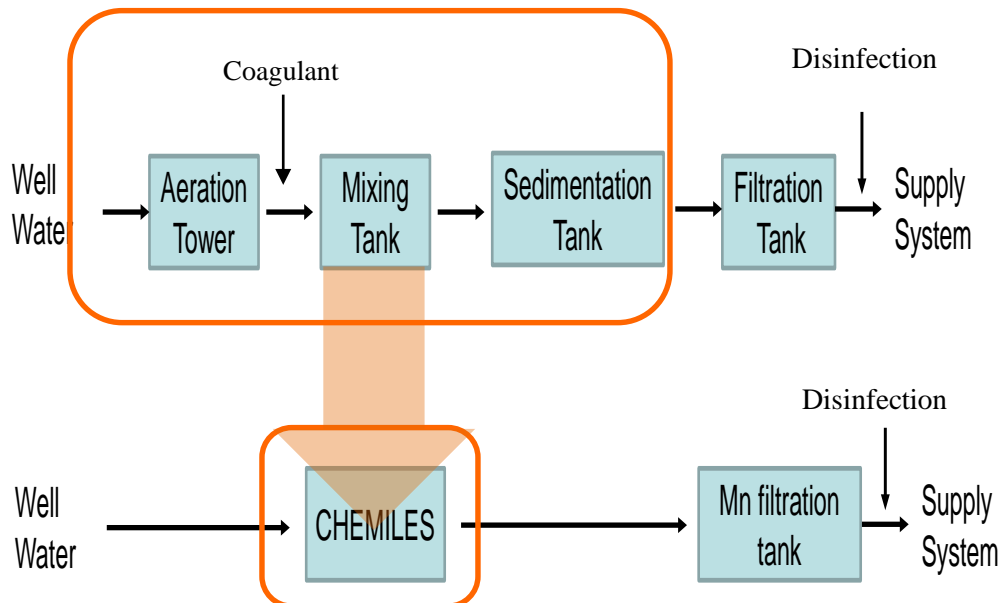
Conventional GW treatment plants  
In Vietnam



# 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

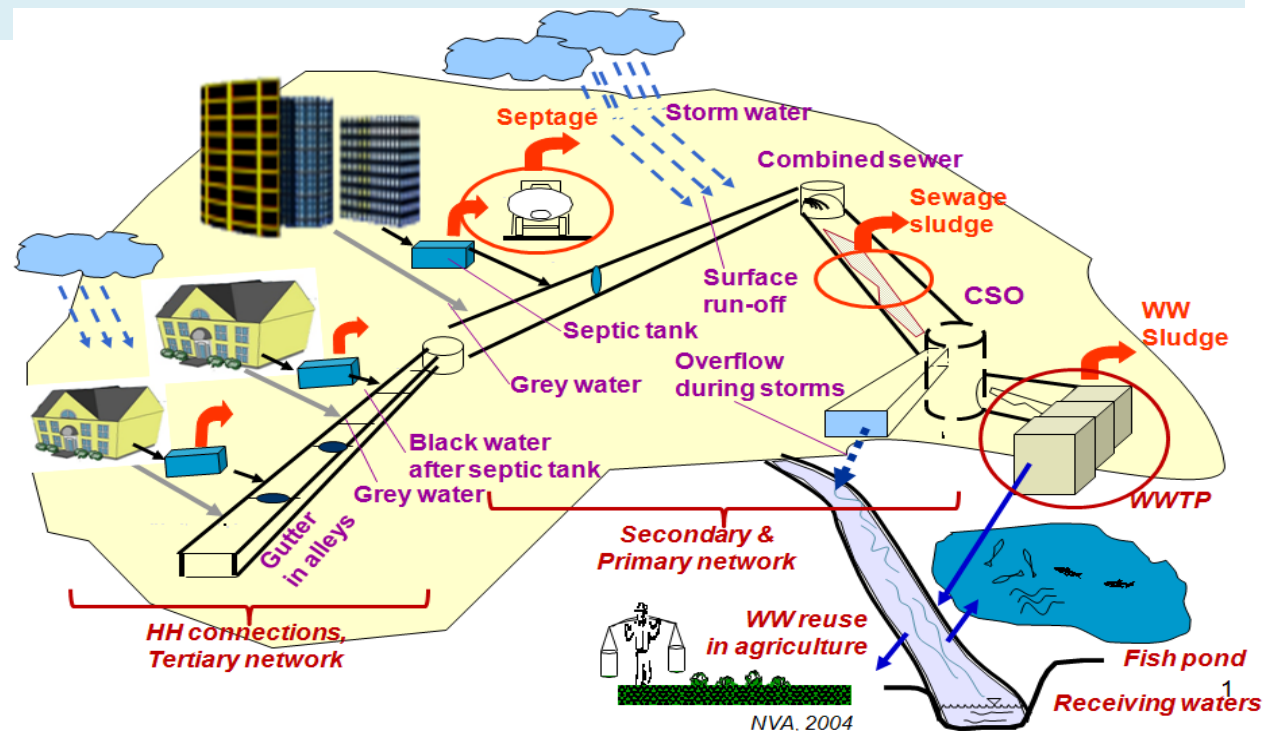
## Treatment process before and after applying new technology



CHEMILES system in Hanoi Water Limited Company

## 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

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- ✓ 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.



Surface water intake point



Chemical usage in SW treatment

## TOPIC 5: ENERGY EFFICIENT TECHNOLOGY FOR SLUDGE DEWATERING FROM WATER TREATMENT PLANTS

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✓ 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





## TOPIC 6: SUSTAINABLE URBAN DRAINAGE AND RAINWATER HARVESTING

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- ✓ 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

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- ✓ Agricultural use: irrigation, fish farming
- ✓ Industrial use: different purposes
- ✓ Treated wastewater use in urban areas
  
- ✓ 5<sup>th</sup> 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

# CONCLUSIONS AND RECOMMENDATIONS

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- ✓ 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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