Opportunities for Wastewater and Resource Recovery in the Philippines, Viet Nam, and Indonesia

Presented by:
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On behalf of:
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Wastewater & Resource Recovery Initiative
PEMSEA – ARCOWA co-operation

Partnership: PEMSEA and ARCOWA (supported by GEF and UNDP)

Geography: East Asia – 3 countries (The Philippines, Vietnam & Indonesia)

Focus: accelerate the uptake of and investment in advanced wastewater treatment and resources recovery (urban and industrial) to create a positive impact on the environment
Wastewater and resources recovery cover 7 of the 17 Sustainable Development Goals - importance

**6 CLEAN WATER AND SANITATION**
Contributes to the entire SDG 6 and in particular 6.3 reducing pollution and halving the proportion of untreated wastewater and increasing recycling, and 6.4 Water use & Water Scarcity

**3 GOOD HEALTH**
Contributes to SDG 3.9 reducing the exposure to hazardous chemicals in water

**7 RENEWABLE ENERGY**
Contributes to 7.2 to increase in share of renewable energy and 7.3 improvement in energy efficiency

**9 INNOVATION AND INFRASTRUCTURE**
Contributes to 9.1 to develop sustainable and resilient infrastructure and 9.4 to upgrade infrastructure to make them sustainable and efficient

**11 SUSTAINABLE CITIES AND COMMUNITIES**
Contributes to 11.6 reducing environmental impact of cities, especially through addressing municipal waste management

**13 CLIMATE ACTION**
Contributes to 13.1 fulfilling commitments made under the UNFCCC and Paris agreement by reducing carbon emissions related to (untreated) wastewater

**14 LIFE BELOW WATER**
Contributes to 14.1 reduce marine pollution from land-based activities, incl. nutrient pollution

**Note:** SDG 6.3 By 2030, improve water quality by **reducing pollution**, eliminating dumping and minimizing release of hazardous chemicals and materials, **halving the proportion of untreated wastewater** and substantially increasing recycling and safe reuse globally

**THIS REQUIRES:** Adding NEW wastewater treatment infrastructure for 500,000 people per day every day until 2030
The Challenge
Waste Water pollution of water ways, coasts and oceans
The Challenge: eutrophication & algal blooms - East Asia
Human health, socio-economic and environmental impact
Untreated and inadequate treated wastewater is leading to significant GHG emissions (CH4, NOx) (ca. 3% of global emissions). Wastewater treatment cost are ca. 40 – 80% (fossil fuel – based) energy costs.
The Opportunity: Turning Waste Water Facilities into Resource Factories

WATER: from Used Water

ENERGY: from Bio Gas

Bio-polymers: from sewage

FERTILIZER: from Nutrients
From Waste Water Facility to Resource Recovery Factory
Drivers and Opportunities – Summary Overview

### Water Re-use
**Water re-use:**
Drivers of change:
- Water scarcity demands new water sources
- Regulation prohibits potable water re-use

**New - Water production:**
Opportunities:
- New technologies produce high quality water
- Cost effective technologies
- Growing public acceptance

### Energy Production
**Energy in-efficiency: 10-50%**
Drivers of change:
- Old pumps, aeration (i.e. wear from use, age)
- Changed conditions (i.e. need for different treatment)
- High energy costs

**Energy production Opportunities:**
- New technology to produce bio-energy from wastewater
- Addition of organic waste to improve energy production
- Energy efficiency in treatment
- Towards energy positive plants

### Nutrients, Fertilizers & Materials
**Nutrients**
Drivers of Change:
- Stringent water quality norms require additional treatment
- Wastewater sludge disposal too expensive

**Fertilizer production Opportunities**
- New technologies available to create struvite
- Demand for grassland slow release fertilizer
- Additional source of income

Reductions in energy use and cost savings of 50 – 80% can be achieved in many wastewater systems
Wastewater to resource recovery: Overall process used to identify initial investment case(s)

Goal
Improved water quality in coastal areas for sustainable development

Final Outcome
Mobilize investments in advanced waste water treatment and resource recovery that generate public and private benefits and returns

Results current phase:
Sound country assessments
Scoping of initial investment cases

1. Country level diagnostics for selected countries
   • Waste water and Resource Recovery as Opportunity

2. Project long-list scoping in selected countries
   • Initial potential and focus

3. Project Level Opportunity
   • pre-feasibility studies
Current Status and Opportunities: Vietnam, Indonesia, The Philippines background
Philippines: Del Monte Philippines, Inc. (Cagayan de Oro)
Food processing - wastewater & bio-energy

- **Company:** Del Monte DMPI
- **Type of contract:** BT
- **Capacity:** 16,000 m³/day (16 MLD)
- **Technologies:** Anaerobic digestion in four (UASB type) methane reactors, SULFURIX™, BIOSULFURIX™ process for sulphur removal, followed by GASODRIX™ biogas drying – CHP – gas turbines
- **Operations:** 1 year operation contract after construction’s completion
- **Finance:** Return on investment is projected: 2-5 years.
Vietnam: Phu My Hung (HCMC)
Water re-use in urban development

- **City:** Ho Chi Minh City
- **Developer:** Phu My Hung
- **Year of delivery:** 2007 - 2009
- **Capacity:** 10,000 & 15,000 m3/day
- **Technologies:** water re-use / sludge for landscaping
- **Finance:** CAPEX USD 5.8 million
Indonesia: PT Autsindo Nusantara Jaya (Belitung)
Wastewater - POME & Bio-energy

- **Client:** PT Austindo Aufwind New Energy (AANE)
- **Type of contract:**
- **Capacity:** 0 – 900 m³ / day
- **Energy generated:** 1.2 MW (2012) - 1.8 MW (2016).
- **Technologies:** Anaerobic digestion - CHP
- **Finance:** USD 750,000 loan (LIBOR+2.75percent - 3 years)
**Initial investment case**
**Industrial Zone (Philippines): Current wastewater treatment**

**Main drivers for upgrade:**
- Non-compliant with new wastewater effluent norm
- Potential for water re-use
- Expansion of activities

**Area:** 12 hectares
**Design Capacity:** 27 MLD

<table>
<thead>
<tr>
<th>WWTF ponds</th>
<th>No. of tanks</th>
<th>Dimensions per tank</th>
<th>Total Volume</th>
<th>Total Surface Area</th>
<th>Computed Hydraulic Retention Time (HRT) day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activated Sludge Ponds</td>
<td>2</td>
<td>85 46.5 3.5</td>
<td>3,945.5</td>
<td>7,905</td>
<td>1</td>
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<tr>
<td>Aerated Partial Mixed Ponds</td>
<td>2</td>
<td>180 147.5 2</td>
<td>106,200</td>
<td>53,100</td>
<td>4</td>
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<tr>
<td>Maturation Ponds</td>
<td>2</td>
<td>180 155 1.5</td>
<td>83,700</td>
<td>55,800</td>
<td>3</td>
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</tbody>
</table>
## Initial investment case

### CAPEX - OPEX

<table>
<thead>
<tr>
<th>WWTF Enhancement Options</th>
<th>CAPEX (PHP Million)</th>
<th>OPEX (PHP Million / Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retrofitting Options</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 1: A²O Process</td>
<td>71</td>
<td>91.2</td>
</tr>
<tr>
<td>Option 2: Bardenpho Process</td>
<td>78.5</td>
<td>137.7</td>
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<tr>
<td>Option 3: Chemical Phosphorus Removal</td>
<td>68</td>
<td>64.4</td>
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<tr>
<td><strong>New Systems Options</strong></td>
<td></td>
<td></td>
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<tr>
<td>Option 4: Membrane Biological Rector (MBR)</td>
<td>1,012</td>
<td>67.7</td>
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<tr>
<td>Option 5: Sequence Batch Reactor (SBR)</td>
<td>681</td>
<td>55.5</td>
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</tbody>
</table>
### Initial investment case

#### Preliminary Financial Analysis

<table>
<thead>
<tr>
<th>WWTF Enhancement Options</th>
<th>Return on Investment (ROI)</th>
<th>Payback Period (Year)</th>
<th>Net Present Value (NPV) (PHP)</th>
<th>Internal Rate of Return (IRR)</th>
</tr>
</thead>
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<tr>
<td><strong>Retrofitting Options</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Option 1: A²O Process</td>
<td>4.04</td>
<td>4.01</td>
<td>130,838,010</td>
<td>31 %</td>
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<tr>
<td>Option 2: Bardenpho Process</td>
<td>-2.41</td>
<td>&gt; 10</td>
<td>-227,492,881</td>
<td>-</td>
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<tr>
<td><strong>Option 3: Chemical Phosphorous Removal</strong></td>
<td>8.15</td>
<td>1.54</td>
<td>333,017,824</td>
<td>71 %</td>
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<tr>
<td><strong>New Systems Options</strong></td>
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<td></td>
</tr>
<tr>
<td>Option 4: Membrane Biological Reactor (MBR)</td>
<td>-0.65</td>
<td>&gt; 10</td>
<td>-1,619,431,631</td>
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<td>Option 5: Sequence Batch Reactor (SBR)</td>
<td>-0.13</td>
<td>&gt; 10</td>
<td>-832,109,461</td>
<td>-</td>
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CONCLUSIONS
Waste Water & Resources Recovery as Opportunity

Conclusions:
• Technology available and ready to be applied
• Costs vs. returns need careful analysis
• Requires top management willingness to incorporate new technologies

Next steps:
• Focused efforts on specific industries / larger urban areas
• Investment in (pre-) feasibility studies & portfolio development required
• Private sector involvement needs: tariff reviews, new PPP models, new financing vehicles
OPPORTUNITIES FOR WASTEWATER AND RESOURCE RECOVERY IN THE PHILIPPINES, VIET NAM, AND INDONESIA

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