Regional Policy Workshop on Waste Water Management in South-East Asia

Lessons learnt and waste water management and sanitation strategy in Cambodia

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Cambodia’s Profile

Population: 14.8 millions
Land Area: 181,035 km²
Density: 81.8 person/km²
Capital: Phnom Penh (1.4 millions)
Number of labour force: 7,035,398 (53%)
(Female : 3,608,345)
Strategy and Goal

- **Rectangular Strategy-Good Governance:** Promotion of Economic Growth; Generation of Employment; Implementation of Governance AP; and Enhancing Efficiency and Effectiveness in implementing the reform programs.

- **The Government of Cambodia (GOC) has adopted the Millennium Development Goal (MDG) targets** for water supply and sanitation, specifying that, by 2015, 80% of the urban population and 50% of the rural population should have access to safe water, and that 74% of the urban population and 30% of the rural population should have access to improved sanitation.
## Previous & Ongoing Project

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Name</th>
<th>Funding Agency</th>
<th>Loan Amount for Civil Works only</th>
<th>Project Cover Area</th>
<th>Loan Agreement Year</th>
<th>Completion Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency Rehabilitation Project for Water Supply and Sanitation in Battambang</td>
<td>EU</td>
<td>Grant (N.A)</td>
<td>East Part of Town Center about 200 ha.</td>
<td>1992</td>
<td>1994</td>
</tr>
<tr>
<td>2</td>
<td>Provincial Towns Improvement Project, (Part C: Wastewater Management System, and Part D: Local Governance and Resource Mobilization, in in Sihanoukville</td>
<td>ADB Loan No.: 1725 - CAM (SF) and 2013 - CAM (SF)</td>
<td>USD 11.19 Million</td>
<td>Cover an area of 221.5 ha with 3,368 service connections</td>
<td>02 Feb. 2000</td>
<td>31 March 2007</td>
</tr>
<tr>
<td>4</td>
<td>Siem Reap Urban Development Project Drainage &amp; Wastewater Master Plan Study, Priority Works</td>
<td>AFD, French Grant: US$ 4 millions</td>
<td></td>
<td>East Part Siem Reap Town Drainage</td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>5</td>
<td>Siem Reap Sewerage System and Improvement of Siem Reap River</td>
<td>Korea Eximbank</td>
<td>USD 30 M</td>
<td>Cover total area of 934 ha (East 365ha+ West 569ha)</td>
<td>2011</td>
<td>2014</td>
</tr>
<tr>
<td>6</td>
<td>GMS: Southern Economic Corridor Towns Development</td>
<td>ADB</td>
<td>USD 60 M</td>
<td>Cover 4 Corridor Towns</td>
<td>2014</td>
<td>2018</td>
</tr>
</tbody>
</table>
Phnom Penh Zoning Area

CIPUTRA PROJECT

BOENG PONG PEAY PROJECT

BOENG KAK PROJECT

Secondary centre

CHROY CHANGVA PROJECT

KOH PICH PROJECT

BOENG SNAU PROJECT
Sihanoukville Waste Water Management
Siem Reap Sewer Flow Process

Improving Flow Condition

Wastewater Generation by both districts

<table>
<thead>
<tr>
<th>Description</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>East</td>
<td>3,915</td>
<td>4,907</td>
<td>6,049</td>
<td>7,379</td>
<td>8,909</td>
</tr>
<tr>
<td>West</td>
<td>7,484</td>
<td>9,250</td>
<td>11,310</td>
<td>13,716</td>
<td>16,526</td>
</tr>
<tr>
<td>Total</td>
<td>11,399</td>
<td>14,157</td>
<td>17,359</td>
<td>21,095</td>
<td>25,435</td>
</tr>
</tbody>
</table>
Basic Design Concept

- **Anaerobic Pond**
  - Scum Layer
  - Supematate
  - Sludge Blanket

- **Facultative Pond**
  - Re-aeration by wind action
  - Algae
  - Bacteria
  - Wastewater
  - Settle Solids
  - Anaerobic Decomposition bacteria
  - Organic acid
  - CO₂
  - H₂S

- **Maturation Pond**
  - Clouds
  - Sun

- **Sludge Drying Beds**

- **Construction of Siem Reap Sewerage System & Improvement of Siem Reap River**

- **Discharge**
Pipeline Project

- **Environmental Master Plan**: MOE (S.Korea) was conducting the FS (Water Supply, Wastewater, Solid Waste & Air Quality) to cover Siem Reap, Phnom Penh & Sihanoukville Towns in 2010.

- **Water and Sanitation Sector Financing Strategy for Cambodia**: WB was conducting the study & projecting to finalize in 2010.

- **Coastal Sustainable Development**: MLMUPC and related institution to develop the Coastal Master Plan Development Study including the water and sewerage infrastructure in 2010 (JICA).

- **Kampot Wastewater Treatment System**: MPWT was conducted the FS in 2011 (S.Korea).

- **Phnom Penh Sewage Treatment Plant**: MOE & MPWT were conducted the FS in 2011 (S.Korea).

- **Southern Economic Corridor Towns Development Project**: ADB was conducted the FS in 2011.

- **Integrated Urban Environmental Management in Tonle Sap Basin Project**: ADB was conducted the FS in 2013.

- **Second Corridor Towns Development Project**: ADB was conducted the FS in 2014.
<table>
<thead>
<tr>
<th>Title</th>
<th>Objectives</th>
<th>Provisions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1993 Royal Decree on Creation and Designation of Protected Areas</strong></td>
<td>Protect the environment, manage natural resources, conserve biological diversity and ensure sustainable development in the national system of protected areas.</td>
<td>Prescribes the responsibility for the national protected areas system, which includes planning, development, and management; designation of national parks, wildlife sanctuaries, protected landscape, and multiple use areas; amendment and application.</td>
</tr>
<tr>
<td><strong>1996 Law on Environmental Protection and Natural Resource Management</strong></td>
<td>Protect, manage and enhance the environment, and to promote socioeconomic development in a sustainable way.</td>
<td>National and regional environmental plans; environmental impact assessment; natural resources management; environmental protection; monitoring, record-keeping and inspection; public participation and access to information; environmental endowment fund; and penalties.</td>
</tr>
<tr>
<td><strong>1997 Sub-Decree No. 57 on the Organization and Functioning of the Ministry of Environment</strong></td>
<td>Supervise and manage the environment throughout the Kingdom of Cambodia. In particular: protect and promote environmental quality and public health through the prevention, reduction and control of pollution; assess the environmental impact of all proposed projects prior to the issuance of a decision by the Royal Government; ensure the rational and sustainable conservation, development, management and use of the natural resources of the Kingdom of Cambodia; encourage and enable the public to participate in environmental protection and natural resources management; suppress acts that cause harm to the environment.</td>
<td>A National Environmental Plan and Regional Environmental Plans are required to be decided by the Royal Government and reviewed and revised once every five years. Planning and management of protected areas, supervision and coordination of protection and conservation of the environment are the responsibility of the Dept. of Nature Conservation and Protection. Provincial department of environment is under the direct control of the Ministry of Environment, responsible for the supervision and management of environment in its province/municipality.</td>
</tr>
<tr>
<td><strong>1999 Sub-Decree No. 27 on Water Pollution Control</strong></td>
<td>Determine water pollution in order to prevent and mitigate water pollution in public waters, and thus ensures human health and conservation of biodiversity.</td>
<td>Prescribe disposal of waste and hazardous substance, permit of effluent, pollution control, and procedures of inspection; the standards of discharge/disposal of waste.</td>
</tr>
<tr>
<td><strong>Relevant Environmental Laws and Regulation in Cambodia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1999 Sub-Decree No. 72 on Environmental Impact Assessment</strong></td>
<td>Determine environmental impact assessment on private and public projects and activities, which are reviewed and assessed by the Ministry of Environment before the Royal Government’s approval; determine type and size of proposed, existing projects and activities of both private or public sectors, which are subject to EIA; promote public participation in EIA process and public hearings in the process of project approval.</td>
<td>Prescribes institutions’ responsibility; EIA requirements for proposed project, procedures for the process of review and assessment of proposed projects, and existing activities, and terms of project approval. Note subsequent 2000 Prakas on Guidelines for Conducting EIA Report.</td>
</tr>
<tr>
<td><strong>1999 Sub-Decree on Solid Waste Management</strong></td>
<td>Regulate solid waste management to ensure the protection of human health and the conservation of biodiversity.</td>
<td>Applies to all activities relating to the disposal, storage, collection, transport, recycling, dumping of garbage and hazardous waste, and includes household waste management, hazardous waste management and monitoring and inspection of hazardous waste management.</td>
</tr>
<tr>
<td><strong>2007, 29 June Water Resources Management Law in Kingdom of Cambodia</strong></td>
<td>For managing and monitor the use of Water Resources on Land, under ground and in the Climate.</td>
<td>Applies to all activities relating with water resources in Cambodia.</td>
</tr>
</tbody>
</table>
## Surface Water Quality Standard

Water quality standard in public water areas for bio-diversity conservation in Cambodia

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameters</th>
<th>Unit</th>
<th>Standard value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>pH</td>
<td></td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>2</td>
<td>BOD&lt;sub&gt;5&lt;/sub&gt;</td>
<td>mg/l</td>
<td>1-10</td>
</tr>
<tr>
<td>3</td>
<td>Suspended Solid</td>
<td>mg/l</td>
<td>25-100</td>
</tr>
<tr>
<td>4</td>
<td>Dissolved Oxygen</td>
<td>mg/l</td>
<td>2-7.5</td>
</tr>
<tr>
<td>5</td>
<td>Coliform</td>
<td>MPN/100ml</td>
<td>&lt;5000</td>
</tr>
<tr>
<td><strong>Lakes and Reservoirs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>pH</td>
<td></td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>2</td>
<td>COD</td>
<td>mg/l</td>
<td>1-8</td>
</tr>
<tr>
<td>3</td>
<td>Suspended Solid</td>
<td>mg/l</td>
<td>1-15</td>
</tr>
<tr>
<td>4</td>
<td>Dissolved Oxygen</td>
<td>mg/l</td>
<td>2-7.5</td>
</tr>
<tr>
<td>5</td>
<td>Coliform</td>
<td>MPN/100ml</td>
<td>&lt;1000</td>
</tr>
<tr>
<td>6</td>
<td>Total Nitrogen</td>
<td>mg/l</td>
<td>0.1-0.6</td>
</tr>
<tr>
<td>7</td>
<td>Total Phosphorus</td>
<td>mg/l</td>
<td>0.005-0.05</td>
</tr>
<tr>
<td><strong>Coastal water</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>pH</td>
<td></td>
<td>7-8.3</td>
</tr>
<tr>
<td>2</td>
<td>COD</td>
<td>mg/l</td>
<td>2-8</td>
</tr>
<tr>
<td>3</td>
<td>Dissolved Oxygen</td>
<td>mg/l</td>
<td>2-7.5</td>
</tr>
<tr>
<td>4</td>
<td>Coliform</td>
<td>MPN/100ml</td>
<td>&lt;1000</td>
</tr>
<tr>
<td>5</td>
<td>Oil content</td>
<td>mg/l</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Total Nitrogen</td>
<td>mg/l</td>
<td>0.2-1</td>
</tr>
<tr>
<td>7</td>
<td>Total Phosphorus</td>
<td>mg/l</td>
<td>0.02-0.09</td>
</tr>
</tbody>
</table>

Source: Annex 4, Sub-Decree on Water Pollution Control, 1999
Lessons

- Distinction between “urban” vs “rural” still unclear; many small towns are still rural in character. Urban and rural development are intertwined and therefore cannot be separated.
- Major constraints: lack of a framework for urban development, limited capacity to manage urban areas, deficient infrastructure, lack of coordination across agencies and sectors, and reliable data for planning and monitoring
- Participatory and community-based approaches have potential for further replication/upscaling
- Secondary and small towns play important roles in linking rural areas and larger towns. Previous investments in Siem Reap, Battambang and other provincial capitals are expected to develop synergies to stimulate its surrounding areas
- Development of urban sector capacity is imperative in ensuring economic growth
- Future operations to focus on local economic development, private sector participation/PPP, community involvement
- Long-term multi-sector commitment is needed to support an urban development program rather than individual, stand-alone loans
Problem and Constraint

- The present situation of sewerage and drainage is alarming, flooding during the raining season, climate resilience and requires urgent intervention to address the issues;
- A further deterioration is expected through rapid town development, land use & zoning development and the basic infrastructures (flood protection, water flow regulation system, town center drain, diver channel …);
- At present, there is no sewerage and drainage sector master plan for the towns or country,
- Not adequate human resources, empowerment and financial resources for O&M and management of the sewer system;
Necessary Countermeasure

• Establishment of *legislation and laws* for wastewater management institutions for the empowerment/enforcement, Capacity building and resources mobilization.

• Master plan for the waste water management & related basic infrastructure of each urban area and towns throughout the country is urgently required;

• Encouragement of *Private Sector Participation*. 
National vision by Cambodia

The government of Cambodia has clear set of national policies for wastewater treatment development and sanitation services in the major cities and urban areas through short-term, middle, and long-term strategies.

- **Short Term:** (a) MPWT need to develop the Sewerage Law in 2015, (b) Septic tanks/DEWATS are expanded in scale for households by 2025.
- **Medium Term:** Septic tanks/DEWATS from household are connected to centralized septic tank by 2030.
- **Long Term:** Wastewater management and sanitation services provided for all by 2050.
Implementation Strategies

There is a need to set up the National Program and Financing Schemes, covering three major ways of implementing strategies for the Cambodia. Government would need to:

1) Clarify the list of implementing drivers, namely: institutions, policies, regulations and service providers as follows:
   - clarification of the responsible focal points for a wastewater treatment plan, including the service provider and formulate a policy and a strategy,
   - development of the national policy and a regulatory frameworks, such as law and regulations on the management of wastewater,
   - financial assistance, as well as technical assistance in law and regulations are to be mobilized,
   - stakeholder participation is essential including cooperate with line ministries (MPWT, MOE, MIH, MEF, MRD, MoWRAM) as well as sub national committees/taskforce and other development partners, and
   - service providers have strengthened their capacity and have access to the new technologies, monitoring and evaluation of the construction.

2) Formulate sustainable funding and financing strategy, which includes:
   - list all the source of funding from government, donor, private sectors, micro-finance, loans and other sources,
   - clear national policies and financial program on wastewater treatment, and
   - regulations, which may subsidize the poor.

3) List the related technologies in wastewater treatment systems, which would follow with the selection of the appropriate technologies, based on specific situations, for example, for Phnom Penh and Siem Reap. Technological choices should be based on mixed system of both centralized and decentralized, depending on the local conditions. An effective monitoring and evaluation plan is required.

4) Raise awareness and educate citizens on the importance and benefits of wastewater treatment water reclamation as well as sanitation services.
Thank you very much for your precious time!!