Strengthening Solid Waste Management to Protect Marine Environments

The role of the World Bank’s Pollution Management and Environmental Health (PMEH) Trust Fund

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Overview and Examples of WB work in Solid Waste Management (SWM)

Overview:
• Since 2000, $4.5bn in World Bank lending for SWM supporting 329 programs (often combined with advisory).

Examples:
• Africa:
  – Liberia: emergency intervention focused on financial and contract management, procurement.
  – New waste infrastructure built, illegal dumps removed, and waste collection from 13 to 50%.
• East Asia and the Pacific:
  – China: municipal SW collection surged from 31 million tons in 1980 to 157 million tons in 2009, to a projected 585 million tons by 2030, triggered by rapid urbanization and population growth.
  – WB is financing a new solid waste project in Ningbo, introducing household-level waste separation for more than 2M people, and a PPP to finance construction of a treatment plant to process kitchen waste.
• Europe and Central Asia:
  – Move away from city-based to regional approaches in waste treatment and disposal, taking advantage of economies of scale.
• Latin America and the Caribbean:
  – Project in three Argentinean cities to reduce massive food waste, e.g. working with food bank networks to encourage food donation and enhancing separation and treatment of food waste to create high-quality compost.
• Middle East and North Africa:
  – New landfill facilities, recycling initiatives, and improved conditions for waste pickers.
  – E.g. Morocco: emphasis on waste-to-resource initiatives to increase amount of material recovered, harness energy from waste, and provide safe opportunities for informal recyclers.
• South Asia:
  – E.g. Nepal: innovative project bridging financial gap between costs of SWM services and revenues collected.
How Pollution Management and Environmental Health (PMEH) is embedded in the World Bank

PMEH as one of five critical Business Lines within the Environment and Natural Resources Global Practice
Structure of the PMEH, and the place of SWM within it

PMEH Components with Major Activities Planned

Component I — International Collaboration for Strengthening Air Quality Management Planning (AQMP)
1. Support selected large-scale cities in selected countries to develop AQMP
2. Provide Assistance to selected cities (e.g. in China) to meet their new Air Quality targets.
3. Facilitate South South Cooperation (SSC) on AQMP

Component II — Management of Chemicals and Toxic Pollution
1. Expand Toxic Sites Identification Programs; following national consultations focusing on Africa and South Asia
2. Develop National Toxic Action Plans and mainstream plans for contaminated site management in country programs
3. Conduct City-level TA on brownfield remediation

Component III — International Collaboration for Strengthening Land-based Pollution Management to protect the Marine Environment
1. Development of Water Quality Management Reports in selected marine areas
2. Development of plastic waste management programs
3. Facilitate SSC on Marine Pollution Management

Component IV — Conduct Research and Strengthen Analytics for improved PMEH
1. Conduct research on optimizing local air quality, public health and climate change objectives through participation in AQMP
2. Conduct analytical work to better understand the role of environmental degradation and pollution management in prosperous cities
3. Develop a better understanding of human health risks associated with hazardous and toxic pollution sites in LMICs
4. Identify management and environmental remediation solutions for selected forms of rural and urban-based pollution

Component V — Promote Dissemination, awareness, and research uptake for improved PMEH
1. Disseminate knowledge products and guidance materials, including promotion of uptake and use of evidence by planners and policy makers
2. Raise public awareness through mass media and large-scale cultural events
3. Develop a Like-Minded Nation and Organization Alliance focusing on PMEH

Component VI — Program Development and Implementation Support
1. Coordination of Global PMEH activities
2. Coordination of PMEH activities within the regions
3. Overall PMEH program Development
4. Support of Recipient Executed-activities
Progress to date in the PMEH

Component 1 (AQM): full-scale AQM planning in 7 cities / countries: “Jingjinji” region, China; Hanoi, Vietnam; city cluster tbd, India; Cairo, Egypt; Lagos, Nigeria; Accra, Ghana; Johannesburg, South Africa.

Component 2 (Chemical and Toxic Pollution Management): Toxic Sites Identification Program developed in three country clusters: Nigeria and Ghana; (South) East Africa; Pakistan and Bangladesh.

Re component 3 (Land-based Pollution Management to Protect the Marine Environment): finalizing reports to increase awareness of land-based pollution management to protect the marine environment:

(i) management principles to reduce the inflow of plastic waste into the marine environment, including case studies from Colombia, South Africa and Vietnam.

(ii) developed solution models for waste water, agro-run offs and plastic waste management.

(iii) water quality management report for the Wider Caribbean.

(iv) report on application of integrated management of the marine ecosystem in developing countries building upon European (incl. EU) practices.

Once funding is secured, start developing plans for both plastic/marine litter management and overall water quality management plans in selected geographic locations. Include communities of practice for south-south collaboration.

Re component 4 (PMEH Research): research proposals being finalized for:

- AQM planning through better application of combined satellite and ground-level monitoring data.
- better understanding of health impacts from contaminated sites pollution.
- how pollution and environmental health conditions impact competitiveness of cities.

Re component 5 (PMEH Awareness and Dissemination):

- Launch during Earth Day 2015.
- full website (June / July 2016).
- Awareness events in China and Nigeria in 2016.
Role of PMEH MDTF vs larger financing for pollution management

PMEH MDTF has limited grant money to provide TA and some capital goods:

- Supports, for example, full scale pollution management planning; (ii) filling knowledge gaps; (iii) monitoring equipment and analytical instruments; (iv) dissemination and awareness raising.
- MDTF helps identify a client’s investment, policy and institutional needs required to address PMEH issues effectively.

To achieve effectiveness at scale, clients need larger financing. Key WB instruments:

- **IPF**: Financing of specific transactions for a wide range of activities for physical and social infrastructure.
  - Example: SWM infrastructure / hardware investments.
- **PforR**: Financing focused on results and capacity building, disbursing upon achievement of program results.
  - Example: Pollution Management Action Plans or SWM infrastructure investments.
- **DPF**: Financing to support policy and institutional reform through rapidly-disbursing non-earmarked general budget financing that is subject to the borrower's own implementation processes and systems.
  - Example: Supporting national, regional, municipal or sectoral policy and institutional reforms for SWM such as adopting SWM standards or creating SWM agencies.
Environmental Impacts:
- Contamination of groundwater and surface water by leachate.
- Air pollution from burning of waste that is not properly collected and disposed.

Health:
- Solid waste as breeding ground for insects, vermin, and scavenging animals → air- and water-borne diseases.
- In areas with infrequent waste collection, incidence of diarrhea is twice as high and acute respiratory infections six times higher than in areas where collection is frequent.
- Plastic litter bonds with toxic waste such as POPs, volatile organic compounds and endocrine disruptors → carcinogens

Climate Change:
- Climate effects of traditional solid waste management processes produce significant amounts notably of CH4 (90%) and N2O (8%).
Land-based focus of marine pollution

Plastic waste inputs from land into the ocean in 2010

The 192 countries with a coast bordering Atlantic, Pacific, and Indian oceans, Mediterranean and Black seas produced a total of 2.5 billion metric tons of solid waste. Of that, 275 million metric tons was plastic, and an estimated 8 million metric tons of mismanaged plastic waste entered the ocean in 2010.

**Mitigation options:**
- Reduce plastic in waste stream
- Improve solid waste management infrastructure
- Increase capture

Generated by 2 billion people within 50 km (30 miles) of the coast

6,350-245,000 metric tons**

Estimated mass of plastic waste floating at the ocean surface

*Plastics Europe, "Plastics—the Facts 2013" (2010 data)
**Cózar et al., 2014; Erikson et al., 2014
Sources of plastic and 5 gyres

Based on the following sources:
(1) Global map with each country shaded according to the estimated mass of mismanaged plastic waste [millions of metric tons (MT)] generated in 2010 by populations living within 50 km of the coast. We considered 192 countries. Source: Jenna R. Jambeck et al. Science 2015.
(2) The “heat” zones show expected densities of floating plastic debris. The densest areas correspond to the five major oceanic gyres. Source: Michael Gross, Current Biology – 18 February 2013.
Plastics Pilot Study Magdalena River / Colombia

Focus

- Magnitude and effects of plastic marine litter
- Role of the cities
- Solid Waste Management (SWM) policies, programs and technology solutions

Pilot study of The Magdalena River Basin, Colombia

- **3 cities** within the Basin: Neiva, Barranquilla and Bogota
- **Interviews** with government agencies, NGOs, private companies, trade organizations, recycling cooperatives
- **Site visits** to recycling facilities & plastic litter hot spots
- **Review** of solid waste management plans, market studies and reports
## Plastics study: Cost Comparison of Plastic Waste Management Strategies

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<tbody>
<tr>
<td>Education and Public Outreach ($/person/year)</td>
<td>0.10 - 0.18</td>
<td>202 - 354</td>
</tr>
<tr>
<td>Waste Collection and Transportation</td>
<td>26</td>
<td>51,743</td>
</tr>
<tr>
<td>Landfill Disposal</td>
<td>27</td>
<td>53,226</td>
</tr>
<tr>
<td>Street Sweeping</td>
<td>101</td>
<td>197,800</td>
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<tr>
<td>Plastics to Fuel</td>
<td>127 - 152</td>
<td>249,019 – 298,039</td>
</tr>
<tr>
<td>SCS or UWEM type litter traps</td>
<td>261 - 783</td>
<td>511,764 - 1,535,294</td>
</tr>
<tr>
<td>Recycling</td>
<td>594</td>
<td>1,164,049</td>
</tr>
<tr>
<td>Stormdrain grates (coupled with street sweeping)</td>
<td>754</td>
<td>1,478,431</td>
</tr>
<tr>
<td>Other litter traps</td>
<td>2,611 – 6,526</td>
<td>5,119,608 - 12,796,078</td>
</tr>
<tr>
<td>Removal of litter by hand from the riverbanks</td>
<td>2,611 - 3,916</td>
<td>5,119,607 - 7,678,431</td>
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Data based on Neil Armitage, “The removal of urban solid waste from storm water drains”, Department of Civil Engineering, University of Cape Town.
PMEH Component III going forward

Magdalena-Cauca River Basin, Colombia

Ganges river basin: Nepal and Bangladesh

West Africa:
Nigeria, Ghana, Ivory Coast, Senegal, ...

Guanabara Bay, Brazil

South China Sea: Vietnam, (Cambodia), China and Indonesia
Choosing Interventions based on the Solid Waste Management (SWM) Hierarchy: Preference for Upstream Interventions

- Source Reduction and Reuse
- Recycling / Composting
- Waste to Energy
- Landfill with Energy Recovery
- Landfill w/o Energy Recovery
- Controlled Dump

Most Preferred Option

Least Preferred Option

Adapted from USEPA
Choosing Regional Foci: Waste Generation Projection for 2025 by Region and Income

Regions:
- Main focus on expansion in EAP and LMI.
- 44% of increases in EAP, 63% in LMI.

Income Levels:
- Much higher organic waste in LI and LMI countries compared to UMI and HI countries.
- Pollution related to Organic Waste by far the highest in LI and LMI countries (methane/SLCPs).
- Plastic Waste: Highest share in LMI.
- Highest plastic waste accumulation in LMI as a source for “plastic gyres” in marine areas surrounded by LMIs (e.g. South China Sea).

Key upcoming investment: marine litter-relevant SWM hot spots in Indonesia, up to 1bn in WB lending.
Effectiveness through complementary types of responses

- **Investment/lending programs**, for example, Brazil (Rio de Janeiro), Belarus, China (Beijing, Zhejiang), Colombia (Magdalena River), Mexico, Moldova, Morocco, and many more.

- **Individual SWPM projects or integrated in larger Municipal Environmental Management Programs** (if prioritized by recipient country/municipality → drive: SWM often single largest budgetary item in cities in Low Income/LI countries.

- **Major Analytical and Political Advisory initiatives** (e.g. “What a Waste – A Global Review of Solid Waste Management” – WB perspectives towards 2025).

- **Increased focus on linking SWPM** to contaminated/brownfield site management and reduced inflow of litter into the marine environment (WB, GEF, PMEH etc).

- **Cross-sectoral effort** between Global Practices for Environment, Urban & Social, Health and Climate Change.

- ** Likely priorities going forward:**
  - Internal portfolio review, reshaping WB lending portfolio on marine-litter relevant SWM work.
  - Determine “toxic” & “contaminated” waste parts of SW accumulation.
  - Improve understanding of health impacts of SWP
  - Increase finance into LIs and ULI through combined approaches e.g. TA+ upfront financing (e.g. from development impact bond) + ongoing finance (e.g. programmatic lending schemes).
  - Build further pilot SWPM cases in West Pacific (China, Indonesia, Vietnam) other LMI countries with highest SWM accumulation.