Pollution Management and Environmental Health (PMEH) pursues three strategic objectives: (1) support developing countries to significantly reduce air, land, and water pollution through pollution management planning and investment; (2) generate and share knowledge on pollution and its health impacts in urban, rural, and marine areas; and (3) promote awareness of pollution management and environmental health issues among policy makers, business partners, city leaders, and the general public.
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Air, land, and water pollution caused 9 million premature deaths in 2015, accounting for 16 percent of all deaths worldwide. About 92 percent of all pollution-related mortality is seen in low-income and middle-income countries, with the poor, marginalized, and young hardest hit by the health effects of the contamination. \(^1\) The economic burden is immense: in 2016, ambient air pollution alone cost the global economy $5.7 trillion—4.4 percent of global gross domestic product (GDP).

The World Bank is committed to supporting countries most severely affected by pollution, by providing technical assistance on pollution management, facilitating knowledge generation and sharing, and raising awareness about the detrimental impact on global health.

World Bank lending commitments that address pollution management and environmental health issues grew to $4.28 billion in FY2016 from $1.81 billion in FY2008; the results of this increase included air pollution reduction in Mongolia and China and an easing of contamination on land and in rivers in a number of developing countries. This work is in part supported by the Pollution Management and Environmental Health Multi-Donor Trust Fund (PMEH) within the World Bank’s Environment and Natural Resources Global Practice.

PMEH, launched at a Global Citizen Earth Day event in Washington, DC, in April 2015, is organized into five operational components, including one for administration. In the 12 months ended September 30, 2017, PMEH’s work on air quality management planning was focused on seven cities and regional clusters with some of the most challenging pollution levels in the world. PMEH assessed the air quality monitoring and sampling capabilities of these cities and regions. Meanwhile, the contaminated and toxic site management component began initial field work in Tanzania, the research component started to produce preliminary results, and the knowledge dissemination component supported several learning events.

**AIR QUALITY MANAGEMENT**

A significant achievement was PMEH Business Week, a series of four events in Beijing that PMEH hosted with environmental divisions of the Chinese national government and the city of Beijing in December 2016. The events—which included a training session about China’s experience in ambient air quality management—drew international pollution management professionals from all PMEH participating countries, as well as countries that may participate in the future. Consultations with experts on the ground in each case also found that most countries want to strengthen their analytical-based understanding of pollution sources so that they can determine cost-effective abatement solutions.

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\(^1\)“The Commission on Pollution and Health,” The Lancet, 3 February 2018, pp. 462-512.
The health effects of exposure to ambient PM$_{2.5}$ cost the equivalent of 4.4% of global GDP in 2016.
Another important initiative was to encourage South-South collaboration on pollution management—an opportunity to amplify PMEH’s impact and disseminate its partners’ expertise. Via PMEH, China has been a leader, sharing its technical and institutional knowledge on air quality management, particularly with Nigeria but also with India, both of which face similar obstacles as they seek to accelerate growth while at the same time addressing serious public health and environmental health problems.

There was more international exchange of knowledge when two dozen environmental experts from the Chinese government attended the first PMEH-organized international policy study tour in Europe to learn about the experiences of Austria, Germany, the Netherlands, and the United Kingdom in managing air quality.

PMEH also established a technical advisory group of external experts from academic and governmental institutions, and the group convened several times to review and provide advice on project concept notes and work plans.

CONTAMINATED AND TOXIC SITE MANAGEMENT

PMEH’s work on toxic land pollution took off. The contaminated and toxic site management component was fully conceptualized and work began, focusing on Bangladesh, Nigeria, Pakistan, and Tanzania. Field work started in Tanzania.

RESEARCH AND STRENGTHENED ANALYTICS FOR IMPROVED POLLUTION MANAGEMENT AND ENVIRONMENTAL HEALTH

The World Bank’s Environment and Natural Resources Global Practice and the U.S. Environmental Protection Agency (U.S. EPA) jointly hosted a workshop, entitled Filling the Gaps, about the issues of satellite remote sensing, ground-level monitoring, and emerging air sensors—all part of PMEH’s air quality monitoring research project. In the fall of 2017, the workshop’s findings were being summarized in a white paper about how low- and middle-income countries were coming together to fill geographic gaps in air quality monitoring and to establish common policies for monitoring.

The toxic land pollution research project also got under way, with an exercise to identify key gaps in data and methodology that could be overcome with PMEH support. PMEH also refined the scope of its cutting-edge research into the linkage between environmental pollution and the prosperity and competitiveness of cities in low- and middle-income countries.

KNOWLEDGE DISSEMINATION AND PUBLIC AWARENESS RAISING

PMEH’s communications staff supported the adaptation by the China Environment Culture Promotion Association of the play An Enemy of the People, which attracted 600,000 online viewers at a performance in Beijing during PMEH Business Week. The play raises awareness about the importance of sound environmental health policy. To monitor this and other learning events and to collect participant feedback to assess knowledge exchange and participant engagement, the team also established a standardized mechanism.

REPORT STRUCTURE

This report provides an overview of PMEH’s activities from October 2016 through September 2017. Chapter 2 provides highlights of activities for air quality, toxic land pollution, research, and knowledge dissemination and public awareness raising. The financial report is detailed in Chapter 3.
PMEH’s contaminated and toxic site management component has begun focusing on Bangladesh, Nigeria, Pakistan, and Tanzania.
Air quality management

Air pollution caused 4 million premature deaths in 2016, making it the seventh largest cause of global deaths that year.\(^2\) Furthermore, the economic burden of air pollution—in terms of both damage to health and loss of productivity—is immense for the world and for individual countries. Ambient particulate matter (PM\(_{2.5}\)) air pollution alone cost the global economy $5.7 trillion, or 4.4 percent, of global GDP in 2016.\(^3\)

To combat this threat, PMEH has two interconnected goals. The first is to develop robust air quality management plans, driven by quality data, which will provide the basis for implementing projects that will reduce high levels of air pollutants in a cost-effective manner. The second is to simultaneously reduce short-term climate pollutants and levels of greenhouse gases. PMEH does so by including in its target pollutants several short-lived climate pollutants—such as black carbon—that have negative impacts on both human health and the global climate and by showing how reducing local air pollution also reduces climate pollutants.

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\(^2\) Global Burden of Disease study 2016.

\(^3\) World Bank.
4.1M
people died from ambient particulate matter (PM$_{2.5}$) in 2016.

7TH
largest cause of global deaths in 2016 was ambient PM$_{2.5}$

$5.7T$
was the cost of the global health effects of exposure to ambient PM$_{2.5}$ in 2016. That's almost 4.4% of global GDP.

Ambient particulate matter (PM$_{2.5}$) in the air kills.
Among the year's major accomplishments was assessing the capabilities of participating cities and urban agglomerations to conduct air quality monitoring and sampling.

**ASSESSMENT OF AIR QUALITY MONITORING AND SAMPLING**

PMEH works with seven major cities and urban agglomerations in Africa and Asia to support their development of air quality monitoring networks and to guide them in developing full-scale management plans. PMEH has designed a planning flowchart (Figure 2) that each local jurisdiction can use as a template to develop a customized management plan. In the past year, PMEH began assessing the capabilities of its participating cities and urban agglomerations to conduct air quality monitoring and sampling.

**PMEH’s Progress**

Table 1, at the end of this section, summarizes PMEH’s focus and progress in the last year in each city or urban agglomeration:

- **China**—the cities of Beijing, Tianjin, Hebei, and surrounding provinces (the expanded Jingjinji Metropolitan Region,4 the national capital region of China)
- **Egypt**—the Greater Cairo area
- **Ghana**—the Greater Accra Metropolitan Area
- **India**—the city of Delhi and the National Capital Region
- **Nigeria**—the city of Lagos
- **South Africa**—the cities of Johannesburg, Ekurhuleni, and Tshwane
- **Vietnam**—the greater Hanoi Metropolitan Area, including the city of Hanoi and the provinces of Bắc Ninh and Hưng Yên

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4 Refers to the cities of Beijing, Tianjin, and Hebei, plus surrounding areas of Shanxi, Henan, and Shandong provinces and Inner Mongolia.
OTHER MAJOR ACCOMPLISHMENTS

PMEH Hosted Business Week in Beijing

PMEH, together with China’s Foreign Economic Cooperation Office in the Ministry of Environmental Protection and the Beijing Municipal Environmental Protection Bureau, hosted PMEH Business Week in Beijing, December 5–10, 2016. The week featured a series of events that brought together Chinese and international pollution management professionals from all PMEH participating countries, as well as potential future PMEH countries, to share experiences and practices in their pursuit of a cleaner environment. The week included three key events:

- An international training program to share China’s experience in ambient air quality monitoring, analysis of air pollutant sources, and public dissemination of air quality information.
- An international policy workshop on air quality management, focusing on the experience from the Jingjinji region, whose invited guests included the Jingjinji Air Quality Coordination Office, Chinese research institutions, and global experts on air quality control.
- The second PMEH Steering Committee meeting, to share the multi-donor trust fund’s progress and plans for the coming year.

Approximately 40 people from 16 countries attended the training, and more than 250 participated in the policy workshop, which was broadcast on Chinese television. Overall feedback from participants was positive.

Knowledge Exchange at PMEH Business Week in Beijing

- Participants walk from administrative offices to the coal-fired power plant.
- Participants observe plant operations.
- The plant’s air quality managers present on how the plant complies with regional emissions standards.
- Plant staff work in its monitoring room.

Photo credits: Meg Walker, PMEH
China and Nigeria Built Collaboration on Pollution Management

Since PMEH Business Week, a dialogue has been ongoing to establish South-South cooperation between Beijing, China, and Lagos, Nigeria, on air quality management—and, more broadly, on pollution management. As part of this effort, PMEH supported the visit of two Chinese delegations from the Ministry of Environmental Protection to Lagos in July 2017, to share China’s air quality management experience, especially in the Jingjinji region, and to identify potential areas for mutual collaboration. As a next step, a delegation from Nigeria, led by the governor of Lagos State, planned a study tour in Beijing and Tianjin in November 2017 to learn about the Chinese government’s experience in addressing air quality management and policy approaches implemented at the city, regional, and national levels. The intention was that Lagos and Tianjin, two large-scale coastal cities, could work together via PMEH to address their similar air quality management challenges. Both countries planned to demonstrate the positive outcomes of their collaboration at the Fourth Investing in Africa Forum, scheduled for Changsha, China, in the fall of 2018.

Chinese Experts Studied Air Quality Management Policy in Europe

Two dozen environmental experts from the Chinese government attended PMEH’s first air quality management policy study tour, to learn about Europe’s experience in managing air quality, from May 30 to June 8. Experts and officials from China’s Ministry of Environmental Protection, the Jingjinji Air Quality Coordination Office, and the environmental protection bureaus of Beijing, Tianjin, and Hebei, toured Austria, Germany, and the Netherlands. A session about the United Kingdom’s experience in air quality management was held on June 5, featuring presentations by the mayor of London and scholars from the University of West England. It was the first time that these Jingjinji region institutions participated jointly in an international technical mission to support the region’s air quality management program.

Two dozen environmental experts from the Chinese government attended PMEH’s first air quality management policy study tour, to learn about Europe’s experience in managing air quality, from May 30 to June 8.
PMEH Advanced Technical Aspects of Air Quality Management Planning

PMEH applied its air quality management planning flowchart to guide the planning process in each city and urban agglomeration. In 2017, the focus was on the following work:

- **Protocol development**—Finalizing the development of protocols for chemical speciation and pollution source apportionment, using receptor modeling (identifying air pollution sources and quantifying their contribution to pollution levels by statistically apportioning the measured mass of pollutants to the emission sources in the area). This is an important step in gathering information that helps determine air quality control options. PMEH experts shared the source apportionment-receptor modeling protocol with representatives of participating countries during PMEH Business Week. The protocol provides guidelines to perform source apportionment analysis based on the international standard methodology for particulate matter sampling, which can be applied to all participating jurisdictions. The protocol, which was being updated by PMEH international experts in the fall of 2017, describes the source apportionment-receptor modeling method and lays out the procedures to prepare and perform filter sampling—as well as laboratory analysis for chemical speciation of the collected samples—so that the generated data are sufficiently reliable for modeling (Box 1).

- **Particulate matter sampling**—Collecting filter samples of PM$_{2.5}$ (atmospheric particulate matter that have a diameter of less than 2.5 micrometers) to conduct chemical composition analysis.

- **Air quality monitoring**—Establishing or improving ambient air quality monitoring networks to monitor pollutants in real time.

- **Source apportionment**—Conducting pollution source apportionment in each urban agglomeration.

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**Box 1. Quality Assurance and Quality Control in Air Quality Management**

The importance of quality assurance (QA)* and quality control (QC)** in air quality management cannot be overstated. If there is no system in place to ensure confidence in air quality data, the cost and efforts involved in data collection may be undermined.

The key QA/QC elements in air quality monitoring involve the establishment of data quality objectives (for example, data completeness), standard operating procedures for instrumentation and analytical laboratory processes, appropriately trained staff, data management, and data reporting.*** A successful air quality management strategy therefore requires a rigorous QA/QC system and ongoing training of staff involved in collection, analysis, and dissemination of air quality data.

PMEH’s air quality management planning framework addresses the importance of QA and QC by aiming to build or strengthen the capacity of the staff and institutions responsible for air quality monitoring and analytical processes and to support participating governments’ efforts to develop effective air quality management plans based on reliable data.

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* The external system that verifies the precision, accuracy, and validity of air quality measurements.

** The internal system for estimating and maintaining the precision, accuracy, and validity of air quality measurements.

Participating Jurisdictions Began Work on Air Quality Monitoring and Particulate Matter Sampling

China, Ghana, Nigeria, South Africa, and Vietnam took the first steps toward conducting air monitoring and sampling for chemical speciation. Experts from the Desert Research Institute completed assessments of existing capacities in each country between May and September 2017 and provided recommendations for the type of equipment, as well as areas for capacity building, to strengthen the jurisdictions’ air quality monitoring. In addition, PMEH continued working with experts from the International Institute for Applied Systems Analysis (IIASA) and local technicians in China, Nigeria, and Vietnam to establish Greenhouse gas–Air pollution Interactions and Synergies (GAINS) modeling databases, to be able to analyze cost-effective options for reducing air pollution.  

PMEH Established a Technical Advisory Group

In December 2016, PMEH formed a technical advisory group of relevant external experts from academic and governmental institutions to ensure that its air quality management component is strong and technically rigorous. The group convened several times between December 2016 and May 2017 to review and provide advice on project concept notes and work plans. In its most recent report, the group provided technical comments on air quality management proposals from China, Egypt, Ghana, Nigeria, South Africa, and Vietnam. In addition to scholars and practitioners, the group includes experts from other international organizations—such as the World Meteorological Organization, World Health Organization (WHO), and relevant European Union (EU) organizations—that offer experience with initiatives in low- and middle-income countries.
Air quality monitoring equipment in Beijing.
World Bank and U.S. EPA Developed an Air Quality Management E-Learning Program

The World Bank’s Environment and Natural Resources Global Practice (with partial support from PMEH) worked with the U.S. Environmental Protection Agency to develop an online training course on air quality management. The course will be provided through the World Bank Open Learning Campus platform, with free and open access to the public. It was designed for development professionals, government officials, and partners in low- and middle-income countries. The course will be launched in June 2018 (Box 2).

Box 2. Online Introduction to Air Quality Management Training

The World Bank’s new online training course on air quality management examines the key approaches for reducing air pollution and provides the foundation for designing an air quality management program in low- and middle-income countries. The course will be free and available in both facilitated and self-paced formats at https://olc.worldbank.org/.
Air pollution obscures the IFC skyscraper in Hong Kong’s Central district.
<table>
<thead>
<tr>
<th>Country</th>
<th>City/Region</th>
<th>Implementing Agency</th>
<th>Goals</th>
<th>Progress (October 2016 to September 2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>Beijing-Tianjin-Hebei and the surrounding provinces (the expanded Jingjinji Metropolitan Region)</td>
<td>Foreign Economic Cooperation Office under the Ministry of Environmental Protection, Jingjinji Air Quality Cooperation Office, Local environmental protection bureaus in the expanded Jingjinji region, Chinese Research Academy of Environmental Sciences and local Research Academy of Environmental Sciences in the expanded Jingjinji region</td>
<td>Development of mid- and long-term regional air quality management plans (2018-2020, 2022, 2025, and 2030) based on cost-effective abatement options identified through the GAINS model, Support for immediate actions of the 13th (2016-2020) Five-Year Plan on Air Quality Management, Sharing of international knowledge and experience, and South-South cooperation</td>
<td>Air quality management officials from the Jingjinji region visited Europe for a policy study tour, Air quality technicians adopted the PMEH protocol for chemical composition analysis and receptor modeling, and applied it to work on particulate matter sampling and source apportionment, The Chinese Research Academy of Environmental Sciences began work on an emissions inventory and analysis of cost-effective emission control strategies for the expanded Jingjinji region, The Ministry of Environmental Protection and PMEH jointly organized two workshops, focusing on air quality management experiences for the Pearl River Delta in Guangzhou and the Lower Yangze Delta in Yancheng</td>
</tr>
<tr>
<td>Vietnam</td>
<td>Hanoi and two satellite provinces, Bạc Ninh and Hưng Yên (greater Hanoi Metropolitan Area)</td>
<td>Ministry of Natural Resources and Environment and its Pollution Control Department, Provincial and city departments of natural resources and environment</td>
<td>Improved ambient air quality monitoring capacity in the three urban cities, Support for follow-up on the National Action Plan on Air Quality Management, and development of technical guidelines to strengthen regulatory enforcement</td>
<td>PMEH and the government of Vietnam held a multi-sector workshop targeted at the Greater Hanoi Metropolitan Area, and presented preliminary results of GAINS modeling to discuss and define next steps, PMEH experts visited to assess the local capacity for work on particulate matter sampling and air quality monitoring, and to provide procurement recommendations for monitoring and sampling equipment and laboratory instruments</td>
</tr>
<tr>
<td>India</td>
<td>Delhi and the National Capital Region (under consideration in ongoing discussions with the government of India)</td>
<td>Ministry of Environment, Forestry, and Climate Change (MOEFCC), the Central Pollution Control Board (CPCB), and the Delhi Pollution Control Committee (DPCC) (key agencies under consideration in ongoing discussions with the government of India)</td>
<td>Agreement with MOEFCC, CPCB, and DPCC on World Bank support and areas of focus, which may include: Air quality forecasting and emergency response, Work on source structures and health impacts in the National Capital Region, Review of existing air quality management plans and analytical support for prioritization of control measures, Mid- to long-term support to enhance local capacity to analyze air quality, Improving the National Clean Air Program, Integration of India into international collaboration on air quality management</td>
<td>PMEH experts visited three times to build collaboration with MOEFCC, CPCB, and DPCC. This collaboration includes work on the National Clean Air Program, the National Capital Region, the cities of Delhi and perhaps Hyderabad, and international air quality management</td>
</tr>
</tbody>
</table>
### Table 1. Summary of Progress (continued)

<table>
<thead>
<tr>
<th>Country</th>
<th>City/Region</th>
<th>Implementing Agency</th>
<th>Goals</th>
<th>Progress (October 2016 to September 2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td>City of Lagos</td>
<td>• Lagos State Ministry of Environment and its Environmental Protection Agency&lt;br&gt;• Lagos State Ministry of Economic Planning and Budget&lt;br&gt;• Lagos State Ministry of Health&lt;br&gt;• Federal Ministry of Environment (provided support)</td>
<td>• Establishment of a real-time ambient air quality monitoring network in the City of Lagos&lt;br&gt;• Establishment of a particulate matter sampling network and laboratory capacity to undertake chemical composition analyses&lt;br&gt;• Future development of an air quality management plan for Lagos&lt;br&gt;• Future development of multi-pollutant and multi-pathway control strategies that will eventually integrate air quality management, contaminated and toxic site management, and integrated solid waste management</td>
<td>• PMEH held a first technical workshop to launch work on particulate matter sampling, air quality monitoring, source apportionment, and analysis of cost-effective emission control strategies.&lt;br&gt;• PMEH experts visited to assess the local capacity for air quality monitoring and to develop procurement recommendations.&lt;br&gt;• PMEH started initial work on an emissions inventory, health impact assessment, and analysis of cost-effective emission control strategies.&lt;br&gt;• The Lagos state government developed an institutional structure to implement projects by successfully involving an extensive network of stakeholders.&lt;br&gt;• The World Bank facilitated the development of South-South cooperation between Nigeria and China. This included air quality management experts and officials from Nigeria visiting China, and vice versa.</td>
</tr>
<tr>
<td>Ghana</td>
<td>Accra Metropolitan Area</td>
<td>• Ghana Environmental Protection Agency&lt;br&gt;• Ghana Health Service</td>
<td>• In collaboration with the U.S. Environmental Protection Agency, support for strengthening of local capacity to conduct air quality monitoring and sampling and source apportionment.&lt;br&gt;• Inclusion of indoor air pollution in the air quality management plan for Accra</td>
<td>• PMEH experts visited to assess the local capacity for air quality monitoring, particulate matter sampling, and chemical composition analysis and to develop procurement recommendations.&lt;br&gt;• The Ghana Environmental Protection Agency identified two new monitoring sites to install real-time monitors.</td>
</tr>
<tr>
<td>South Africa</td>
<td>Johannesburg, Ekurhuleni, and Tshwane (Greater Johannesburg Metropolitan Area)</td>
<td>Department of Environmental Affairs</td>
<td>• Establishment of a Center of Excellence for air quality management at North-West University, as a regional knowledge-sharing and training hub&lt;br&gt;• Further strengthening of the local ambient air quality monitoring network, particulate matter sampling, and lab facility to conduct chemical composition analysis</td>
<td>• PMEH experts visited to assess the local capacity for air quality monitoring, particulate matter sampling, and chemical composition analysis and to develop procurement recommendations.</td>
</tr>
<tr>
<td>Egypt</td>
<td>The Greater Cairo Area</td>
<td>Environmental Affairs Agency of the Ministry of Environment</td>
<td>• Improved local capacity to conduct particulate matter (PM$<em>{2.5}$) monitoring and a complete emission inventory, in addition to the well-established PM$</em>{10}$ monitoring&lt;br&gt;• Development of a pilot/model case study to reconcile satellite-based and ground-level air quality management in developing countries</td>
<td>• PMEH and the Environmental Affairs Agency agreed on the dates for PMEH visits in late 2017.</td>
</tr>
</tbody>
</table>

* The plan is to create separate Centers of Excellence for air quality management in South Africa, Ghana, and Nigeria.
CONTAMINATED AND TOXIC SITE MANAGEMENT

PMEH held a first technical workshop, in September 2016, with two primary objectives:

1. The first was to determine the focus of its research on toxic and hazardous waste and to initiate scoping work to identify the important research questions to be addressed for low- and middle-income countries.

2. The second objective was to expand and improve the existing Toxic Sites Identification Program (TSIP) database of contaminated sites in low- and middle-income countries where public health is at risk.

Toxic land pollution is just as much of a health threat as major diseases, with toxic substances found at levels noxious to health in drinking water, soil, air, and food. Countries around the world give this issue low levels of attention and investment, largely because they lack data or robust estimates of the health impacts and related economic costs of toxic and contaminated sites.

This area of work addresses the many facets of the threat posed by toxic land pollution in low- and middle-income countries. It aims to support governments in strengthening their ability to manage toxic and hazardous waste and in elevating the political priority when risks require action. The component also works to build knowledge about the health impacts and related economic costs of pollution and to increase the number of innovative and cost-effective mitigation and remediation alternatives for toxic and hazardous waste (see Research Project 2). An additional goal is to increase governments’ ability to prepare or update policies, regulations, and management plans for hazardous and toxic waste pollution. See Figure 3 for the operational structure.

The nongovernmental organization Pure Earth began this work with PMEH in April 2017. PMEH and Pure Earth conducted several workshops and surveys in the first half of 2017, culminating in a July 2017 World Bank–organized review of the protocol to quickly screen the contaminated sites.

Trash in yard of high school in Lagos, Nigeria.
In the last year, PMEH made progress in a number of activities.

**Conducted Research Aimed at Improving a Contaminated Sites Database**

PMEH held a first technical workshop, in September 2016, with two primary objectives. The first was to determine the focus of its research on toxic and hazardous waste and to initiate scoping work to identify the important research questions to be addressed for low- and middle-income countries. PMEH set up a research team to ensure the technical robustness of the work and completed expert consultations along with a review of relevant literature.

The technical workshop’s second objective was to expand and improve the existing Toxic Sites Identification Program (TSIP) database of contaminated sites in low- and middle-income countries where public health is at risk. The TSIP program uses a global data collection protocol for the rapid initial screening of these sites, the Initial Site Screening (ISS) protocol. The workshop examined the benefits of enhancing the protocol and updating the TSIP database and its user interface. The nongovernmental organization Pure Earth began this work with PMEH in April 2017. PMEH and Pure Earth conducted several workshops and surveys in the first half of 2017, culminating in a July 2017 World Bank–organized review of the protocol. The invited international partners and scholars included private sector and university-based technical experts, the UN Environment Programme, the UN Industrial Development Organization, the U.S. Agency for International Development, the U.S. Environmental Protection Agency, and WHO. The revised protocol was expected to be available in November 2017. PMEH planned to submit the document to a peer-reviewed publication to ensure that the improved knowledge and methodology are publicly available.

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**Figure 3. Operational Framework**

PMEH reached out to a wide range of partners to ensure a strong institutional basis for this area of work. The goal was to establish a cross-sectoral network of experts, thereby linking environmental, health, and socioeconomic aspects of the issue, to allow for a comprehensive design of solutions.
PMEH reached out to a wide range of partners to establish a cross-sectoral network of experts—linking environmental, health, and socioeconomic aspects of the issue—to allow for a comprehensive design of solutions and to build awareness about land-based pollution in low- and middle-income countries.

To improve the user interface of the TSIP database, PMEH organized several consultations with World Bank experts in geographic information systems and information technology who provided inputs to Pure Earth to transform the database into a user-friendly global data service.

**Began Field Work in Tanzania**

Contracted by PMEH, Pure Earth reviewed and updated the existing information about Tanzania in the TSIP database. By the end of September 2017, a total of 10 sites had been updated. Working jointly with the World Bank, Pure Earth shared the enhanced TSIP protocol and work plan with the Tanzanian government to get its feedback, adjust accordingly, and prepare for implementation of field work. The goal is to identify at least 10 sites by March 2018.

**Engaged With Cross-Sectoral Experts**

Given the generally low level of awareness about land-based pollution in low- and middle-income countries, PMEH reached out to a wide range of partners to ensure a strong institutional basis for this area of work. The goal was to establish a cross-sectoral network of experts, thereby linking environmental, health, and socioeconomic aspects of the issue, to allow for a comprehensive design of solutions. In March 2017, PMEH began a dialogue with relevant experts from major bilateral and multilateral partners—the EU, Germany, Norway, Sweden, and WHO’s global and European environmental health teams. The areas discussed included exposure factors, assessment of health and economic impacts, and mitigation and management solutions that are appropriate for low- and middle-income countries. PMEH also leveraged these contacts to seek comments on its planned research into the health impacts of pollution (see Research Project 2), to share terms of reference for its research, and to invite experts to participate in the modification of the ISS protocol under the TSIP database.
Smog fills the sky over the city of Hanoi, Vietnam.

PMEH, working with experts from the International Institute for Applied Systems Analysis (IIASA) and local technicians in Vietnam, analyses cost-effective options for reducing air pollution.
RESEARCH AND STRENGTHENED ANALYTICS FOR IMPROVED POLLUTION MANAGEMENT AND ENVIRONMENTAL HEALTH

All three of PMEH’s active research projects were in full implementation. PMEH staff working on them built strong relationships with donors, clients, and technical partners, and the projects received increasing attention from both clients and partners, which requested more support and collaboration.

This section provides a summary of the objectives, activity highlights, and challenges of each research project.

RESEARCH PROJECT 1: Improving Air Quality Monitoring and Estimating Health Risks and Other Effects of Ambient Air Pollution in Low- and Middle-Income Countries

Objectives
This research aims to strengthen knowledge and develop guidance that will help low- and middle-income countries generate reliable air quality monitoring data; the data will be used as a basis for the design, implementation, and enforcement of policies and actions to improve air quality management. Another goal is to test the application of satellite-derived air quality measurements and explore their use in countries where air quality monitoring networks are weak or non-existent. Finally, the research aims to generate knowledge about methodologies for estimating the health risks and effects of ambient air pollution, including a better understanding of health effects from exposure to particles from both natural sources and combustion processes.

Activity Highlights
1. Pilot studies to integrate satellite-derived and ground-level measurements. PMEH received proposals from various global institutions and completed the selection process to award a contract in October 2017 to launch the studies.

2. Harmonized air quality monitoring methods and procedures. PMEH produced a background report to inform the design of its work on harmonization of air quality monitoring methods and procedures.

3. Technical papers estimating health impacts of ambient air pollution in low- and middle-income countries. PMEH produced the following papers:
   - Assessing the Global Burden of Disease Estimates: Strengthening the Foundation for Estimation of Health Impacts of Ambient Air Pollution in Low- and Middle-Income Countries. This first-ever review of the estimates for different Global Burden of Disease years (2010, 2013, and 2015) examines how changes in factors such as concentration-response functions and exposure methodology have affected the estimates and highlights the implications for low- and middle-income countries. PMEH submitted an article based on the paper for publication in a peer-reviewed journal in the fall of 2017.
   - Health Effect Associations with Short- and Long-Term Exposures to PM2.5 Constituents and Source Components. This paper reviews the epidemiological literature to better understand which PM2.5 constituents and sources are most closely associated with the most severe adverse health effects, notably mortality and hospital admissions. Based on a review of short- and long-term studies, the paper finds that mortality from cardiovascular disease, especially ischemic heart disease, has shown the most consistent associations with PM2.5 derived from fossil fuel combustion—particularly coal, diesel, and gasoline. In contrast, respiratory disease mortality is less consistently associated with PM2.5, its constituents, or specific source components.
Deaths from ischemic heart disease are most consistently associated with PM$_{2.5}$ derived from fossil fuel combustion—particularly...
A Review of the Global Health Effects of Dust and Soil. This paper reviews the epidemiological evidence for including the effects of dust on mortality and morbidity in quantitative estimates of the global burden of air pollution. It highlights some of the challenges associated with estimating the health impacts of immediate and downwind exposures to dust. It specifically examines the challenge of determining the independent effect of dust, including lack of or limited ground-level monitoring to measure concentrations and exposures; variations in methods used for measuring dust-related contribution to particulate matter; and differences in statistical methods, exposed populations, and co-pollutants in such studies.

4. **Multistakeholder technical workshop.** The World Bank and the U.S. Environmental Protection Agency jointly organized a technical workshop, Filling the Gaps: Improving Measurement of Air Quality in Developing Countries, in July 2017. More than 50 participants from low-, middle-, and high-income countries—representing governments, academic and research institutions, the private sector, and multilateral organizations—discussed and shared state-of-the-art knowledge about current practices and latest findings on air quality monitoring and on satellite and remote-sensing technologies. The participants’ feedback strongly supported the need for standardized and harmonized technical guidance on air quality measurement for developing countries, and reflected agreement that defining local air quality monitoring objectives is critical to inform the choice of monitoring technology. The feedback also highlighted the importance of strengthening ground-level monitoring in developing countries as a basis for identifying economically efficient control interventions and for calibrating satellite measurements.

5. **Knowledge dissemination.** PMEH and the World Bank’s Environment and Natural Resources Global Practice presented the findings of the first paper that PMEH produced, Assessing the Global Burden of Disease Estimates, at a technical workshop at the World Bank in July 2017. More than 25 people from multiple global practices of the World Bank attended. Also, a major outcome of the Filling the Gaps workshop was the initiation of a collaborative white paper, led by the World Bank and the U.S. Environmental Protection Agency. The draft white paper was to be presented for feedback at the UN Global Science-Policy-Business Forum on the Environment during the third session of the UN Environment Assembly in December 2017.

**Challenges**

**Obtaining local data.** In certain cases, it can be challenging to persuade countries to participate in data-intensive research, particularly when it is critical to obtain and make publicly available city-level data related to pollution and environmental health.

**Balancing the geographic focus of donor countries with the readiness of participating countries.** For example, middle-income countries are more likely to have the type of extensive pollution challenges and quality of data that is required for research purposes, and in some cases, they are better prepared to explore state-of-the-art technologies (for example, satellite and remote sensing for research). However, some donors’ specific geographic focus, particularly on certain low-income countries, may not necessarily match the technical and political readiness of those countries for conducting this research.
RESEARCH PROJECT 2: Assessing the Health Impacts and Related Economic Impacts of Toxic Land Pollution

Objectives

A major barrier to reducing exposure to toxic contaminated sites in low- and middle-income countries is a lack of robust data about these sites’ impacts on human health and the related economic costs. Assessing the health risks of toxic land pollution is one approach to estimating the health impacts; however, there are some knowledge gaps that make it difficult to apply this approach in low- and middle-income countries. Some of the methodological uncertainties involve applying exposure factors that were estimated using environmental conditions in high-income countries, assessing the underlying health and nutritional status of affected people in low- and middle-income countries, and obtaining reliable environmental sampling data in these countries. To close these gaps, PMEH launched ongoing work on research methodologies that can assess both the health impacts and the related economic costs of toxic land pollution, along with mitigation and remediation options. The objective of this research is to improve existing methodologies and knowledge, and ultimately to support countries’ efforts to reduce people’s exposure to land-based toxic pollution and to develop proposals that can lead to remediation.

1.1%-2.38%

Mental retardation, measured as a lower IQ, translates to a reduction in earnings. Each IQ point lost to pollution results in a decrease in median lifetime earnings of 1.1%-2.38%.

Annually, as many as 600,000 children suffer from mild to moderate mental retardation as a result of exposure to lead.
Activity Highlights

In the past year, PMEH commissioned two research papers:

- An extensive literature review and gap analysis of the impacts of human-made pollution on human health in low- and middle-income countries. The paper, "Assessing Current and Emerging Threats to Human Health from Land-Based Pollution in Low- and Middle-Income Countries: Data Gaps and Research Needs," provided recommendations to guide in-depth research at two to three contaminated toxic sites per country in Bangladesh, Ghana, Nigeria (the city of Lagos), Pakistan, and Tanzania, and to address selected gaps in data. The research, which began in 2017, was chiefly focused on refining exposure factors in low- and middle-income countries and on designing simplified methods to estimate the actual morbidity and mortality rates from exposure to land- and water-based toxic sites.

- A paper on the links and potential synergies between PMEH activities and the international conventions on chemicals and toxic waste. The four agreements—the Basel, Minamata, Rotterdam, and Stockholm conventions—are a point of reference for existing international work on chemicals and hazardous waste. The author of the PMEH paper conducted an extensive literature review and an extended survey of experts at relevant institutions: the secretariats of the four conventions, representatives of participating countries (including Denmark, France, Norway, Sweden, and the United Kingdom), the EU and European Commission, the Global Environment Facility, UN agencies, and the World Bank Group. The paper will identify institutional, financial,

When PMEH presents government officials with data from their own countries—particularly about health impacts from contaminated and toxic sites—the officials begin to take interest and want a more comprehensive assessment of land pollution issues.

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World Bank meeting with Nigerian officials in Lagos to discuss pollution.

7 The paper was expected to be released as a World Bank research paper, and findings were being shared at relevant forums. A poster describing the paper was accepted for presentation at the December 2017 Annual Meeting of the Society for Risk Analysis, a multidisciplinary, interdisciplinary, and academic international society that provides an open forum for all those who are interested in risk analysis.
and knowledge gaps, derive the links between PMEH and the four major international conventions on chemicals, and describe the conventions’ potential synergies with PMEH.

**Challenges**

**Lack of information and attention.** Countries around the world often give toxic land pollution low levels of attention and investment, largely because they lack data or robust estimates of the health impacts and related economic costs of toxic and contaminated sites. This lack of information makes the problem invisible. However, once PMEH presents government officials with data from their own countries—particularly about health impacts from contaminated and toxic sites—the officials begin to take interest and want a more comprehensive assessment of land pollution issues.

**Lack of resources.** Once governments are aware of the scope of the issue, they also want support in finding monitoring and decision-making tools and cost-effective solutions. For example, in South Asia, there is strong demand for help in strengthening relevant government institutions and regulations. The main challenge for this rapidly evolving research is additional resources to begin identifying decision-making tools and solutions and to strengthen regulations. Furthermore, several countries are interested in a more integrated approach to pollution, which this research project does not yet have the resources for. At a minimum, these countries want to look at toxic land- and water-based waste generated by industry, and possibly also air pollution from the same sources. This type of integrated approach may allow these countries to make the overall PMEH agenda a higher priority.

Countries around the world often give toxic land pollution low levels of attention and investment, largely because they lack data or robust estimates of the health impacts and related economic costs of toxic and contaminated sites.
RESEARCH PROJECT 3: Pollution Management and the Development of Prosperous Cities

Objectives
This research aims to investigate the linkage between environmental pollution and the prosperity and competitiveness of cities, providing new evidence of the impact of pollution on productivity and its economic implications in fast-growing cities in Africa and Asia. Through evidence-based case studies, the project will generate outputs ranging from academic publications to a tool that will support practical decisions by policy makers and urban planners. The research has three main components: empirical analysis that makes observations at the levels of cities and businesses for all countries (Component A); city deep dives examining the drivers of city competitiveness in relation to pollution (Component B); and development of a tool to support decision making and plan the implementation of environmental management to boost competitiveness (Component C).

Activity Highlights
1. Scoping workshop. PMEH organized a workshop to refine the scope of this cutting-edge research and invited five renowned experts in the field. About 20 core PMEH team members and senior managers of the World Bank attended the event, held in October 2016. It outlined the work program below.

2. Review paper identifying key gaps in the literature (Component A). A survey paper that provides an extensive review of literature linking productivity and pollution was in progress as of September 2017. This paper, produced by PMEH in collaboration with the University of Southern California, was envisioned to provide a conceptual framework for the impact of pollution on city competitiveness. It will study the relevant literature, concentrating on factors affecting city growth and how pollution plays a role in making cities more attractive to workers and businesses. The paper will also identify key gaps in the literature, with a focus on developing countries, where this topic has not yet been widely explored. The target audience for this report is researchers and practitioners of both pollution management and city competitiveness. PMEH will publish it as a World Bank report and seek publication in peer-reviewed journals.

3. Initial results that show more air pollution associated with lower city GDP (Component A). PMEH began joint work with the University of Southern California on the link between pollution management and city competitiveness. Initial findings of the empirical analysis showed an overall negative correlation between PM2.5 and city GDP—which means that more air pollution is associated with lower city GDP. More analysis was expected to find an inverted-U relationship at the city level, similar to the national-level relationship. For cities in Africa, although the correlation is negative, the strength of this correlation has been decreasing over time, suggesting that recent economic growth can be associated with increasing pollution. Middle Eastern and Latin American cities showed a positive correlation between PM2.5 and city GDP. The report is expected to be finalized in March 2018.

4. Paper about pollution impact on company productivity in Africa (Component A). The PMEH paper, in progress as of September 2017, will use enterprise survey data to analyze productivity measures at the company level for several African countries. It will use total factor productivity to assess the impact of pollution on company productivity, linking pollution to city competitiveness.

5. Popular blog post. A February 2017 post authored by PMEH about air pollution and productivity was featured on the World Bank’s main website. The post received 549 views between February and October 2017—higher than the average number of views for World Bank blog posts—and attracted many comments.
6. **Best practices note for city deep dives (Component B).** PMEH began initial work to identify international best practices in cities and deep-dive tools to address the pollution/productivity nexus. These findings will help define the structure and scope of the tool to support decision making and will be summarized in a background note. This best-practices note will highlight a few case studies of cities that have addressed specific pollution issues, thereby providing the necessary context for developing a template for deep dives. The note will also establish links between successful pollution management and city competitiveness. PMEH expects to begin deep dives in several cities in 2018.

7. **A support tool for decision management (Component C).** PMEH drafted a report that surveyed existing tools and next steps, analyzed the applicability and usefulness of various tools to the PMEH prosperous cities research, and proposed next steps.

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**Challenges**

**Availability of data at the city level.** Building a foundation for the empirical analysis of this research required tremendous effort. The PMEH team compiled a composite data set to start the analysis and collect the necessary data and collaborated with various experts and institutions internally and externally, such as the European Space Agency.

**Engaging municipal officials.** City officials are very concerned with measures of productivity such as jobs and growth, but less so with the issue of pollution. By providing evidence of the links between productivity and pollution, PMEH aimed to attract interest in a more holistic approach to city development.

**Identifying overlaps between development priorities and thematically important cities.** Low-income cities are a priority for both international development and PMEH. However, initial analysis suggests that the best case studies will largely be in middle-income countries such as China and India, where there already have been many efforts to overcome pollution.

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Photo credit: Momoe Kanade, PMEH.

Air and land pollution in Accra, Ghana.
KNOWLEDGE DISSEMINATION AND PUBLIC AWARENESS RAISING

This component provided ongoing communications support for PMEH’s three main areas of work, and supported two types of events: large-scale awareness raising and tailored learning.

The highlight of PMEH’s awareness-raising activity was supporting a theater production by the China Environment Culture Promotion Association of The Story of Yesterday, an adaptation of Henrik Ibsen’s An Enemy of the People, during PMEH Business Week in Beijing in December 2016. The play attracted 400 in-person attendees and 600,000 online viewers. Also, PMEH staff distributed material explaining how artists can inspire meaningful environmental action at a concert honoring legendary rock music keyboardist Keith Emerson in the United Kingdom in July 2017 (Box 3.)

A key accomplishment in learning was establishing a standard approach for evaluating learning events. The feedback form was used at events including PMEH Business Week, the policy study tour in Europe, and the Filling the Gaps workshop.

All documents from the workshops are available via the PMEH web page on the World Bank website.

Online Activities

PMEH’s web pages attracted more than 18,000 page views in the 12 months ended September 30, 2017. PMEH communications specialists supported production of various pollution-related content, including World Bank news features and blog posts.

The multi-donor trust fund coordinates communications and awareness-raising activities with partners including WHO, the Climate & Clean Air Coalition, the Global Alliance on Health and Pollution, and Global Citizen. In the past year, @WBG_Environment, @WBG_Cities, @WBG_Energy, and @WorldBank contributed more than 50 tweets to the #AirQuality, #AirPollution, #SoICanBreathe, and #WeCanFightPollution conversations on Twitter, jointly resulting in more than 1,330 interactions (likes, replies, and retweets). (See Box 4.)

Given this component’s integration with the rest of PMEH, some of the knowledge dissemination and awareness raising is mentioned in this report under other areas of work.

World Bank blog post: http://blogs.worldbank.org/sustainablecities/all-i-need-air-i-breathe
Box 3. Honoring Keith Emerson and the Role of Artists in Inspiring Environmental Action

PMEH was invited to distribute material explaining how artists can inspire meaningful environmental action at a Keith Emerson Tribute Concert in Birmingham, United Kingdom, in July 2017. PMEH prepared pamphlets and distributed them to an audience of 2,200 people.

This unique opportunity arose because the celebrated rock music keyboardist had previously collaborated with PMEH on cross-cultural awareness-raising events. This included featuring his music at the PMEH segment of the Global Citizen 2015 Earth Day in Washington, DC.

Box 4. Coordinating with Partners for Social Media Campaigns via Twitter

PMEH coordinates with partner organizations on communications activities, including reviewing, re-posting and replying to each other’s content on social media when appropriate throughout the year.

PMEH coordinated with WHO’s BreatheLife and the Climate & Clean Air Coalition to support the BBC’s #SoIcanBreathe social media campaign, which provided a platform for experts and the general public to share innovative solutions to pollution. The campaign ran March 6–12, 2017. @WBG_Environment posted 8 tweets to #SoICanBreathe, which resulted in 16 interactions.

PMEH also supported the Global Alliance on Health and Pollution’s #WeCanFightPollution campaign, which highlighted the importance of pollution management to achieve the Sustainable Development Goals (SDGs). The campaign ran May 1 to August 25, and featured one goal per week. @WorldBank, @WBG_Environment, and @WBG_Cities posted 28 tweets to #WeCanFightPollution, and inspired 224 interactions.
The PMEH multi-donor trust fund (MDTF) was set up in November 2014 with Norway’s Ministry of Foreign Affairs as the initial donor, with a pledged commitment of NOK 80 million. In October and November 2015, both DFID and DECC (now BEIS) of the United Kingdom joined the MDTF, with respective pledges of GBP 7.6 million and GBP 12.5 million. In December 2016, BMUB of Germany also joined the MDTF, with a pledge of EURO 8 million. PMEH, which was established as a six-year MDTF and scheduled for completion in December 2020, had a total donor pledged amount of $47.7 million as of the end of September 2017.

Based on total contributions received under the Original Trustee (US$14.3 million), close to 5% (per Annex 2, paragraph 3.2 of the Administrative Agreements with Norway, UK-DFID, and UK-BEIS) was allocated to administrative work. Meanwhile, activities for air quality management began to increase, particularly in 2017, with several extensive expert engagements and preparation in the seven participating countries. The contaminated and toxic site management component began its initial field work, in Tanzania.

A breakdown of the fund allocation in the amount of US$12.7 million to individual disbursing grants, as well as their actual disbursements and contractual commitments, is provided in Table 3.

Since PMEH was affected by a long transition from recipient execution to World Bank execution in the air quality management component, total disbursements and commitments were still low (21.2% of the contributions received).
### Table 2. PMEH Financial Summary

Data as of end September 2017

<table>
<thead>
<tr>
<th></th>
<th>ORIGINAL TRUSTEE TF072335</th>
<th>PARALLEL TRUSTEE TF072732</th>
<th>TOTAL</th>
<th>in %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Total Donor Pledges as per signed AA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway Ministry of Foreign Affairs</td>
<td>9,718,824</td>
<td>9,718,824</td>
<td>19,437,648</td>
<td>78%</td>
</tr>
<tr>
<td>United Kingdom: DFID</td>
<td>10,738,120</td>
<td>10,738,120</td>
<td>21,476,240</td>
<td>88%</td>
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<tr>
<td>United Kingdom: BEIS - Department of Business, Energy &amp; Industrial Strategy (in form of Promissory Note)</td>
<td>18,826,875</td>
<td>18,826,875</td>
<td>37,653,750</td>
<td>153%</td>
</tr>
<tr>
<td>Germany: BMUB</td>
<td></td>
<td>8,408,000</td>
<td>8,408,000</td>
<td>34%</td>
</tr>
<tr>
<td><strong>B. Actual Funds Received from Donors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway Ministry of Foreign Affairs</td>
<td>7,313,764</td>
<td></td>
<td>7,313,764</td>
<td>31%</td>
</tr>
<tr>
<td>United Kingdom: DFID</td>
<td>4,526,280</td>
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<td>4,526,280</td>
<td>19%</td>
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<tr>
<td>United Kingdom: BEIS - Department of Business, Energy &amp; Industrial Strategy (1st Tranche of Promissory Note)</td>
<td>2,463,945</td>
<td></td>
<td>2,463,945</td>
<td>10%</td>
</tr>
<tr>
<td>Germany: BMUB</td>
<td></td>
<td>8,408,000</td>
<td>8,408,000</td>
<td>35%</td>
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<tr>
<td><strong>C. Other Adjustments</strong></td>
<td>194,058</td>
<td>99,844</td>
<td>293,902</td>
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<tr>
<td>Admin Fees to WB Central Units [-] *</td>
<td>(286,080)</td>
<td></td>
<td>(286,080)</td>
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<tr>
<td>Other Receipts (+)</td>
<td>235,785</td>
<td></td>
<td>235,785</td>
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<tr>
<td>Investment Income (+)</td>
<td>244,353</td>
<td>99,844</td>
<td>344,197</td>
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<tr>
<td><strong>D. Total Funds Available (B+C)</strong></td>
<td>14,498,047</td>
<td>8,507,844</td>
<td>23,005,891</td>
<td></td>
</tr>
<tr>
<td><strong>E. GRANTS - Allocations</strong></td>
<td>12,746,274</td>
<td></td>
<td>12,746,274</td>
<td>55%</td>
</tr>
<tr>
<td><strong>F. GRANTS - Disbursements &amp; Commitments</strong></td>
<td>6,078,815</td>
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<td>6,670,693</td>
<td>48%</td>
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<td>Funds Disbursed</td>
<td>4,367,125</td>
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<td>34%</td>
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<tr>
<td>Funds Committed to be Disbursed</td>
<td>1,711,690</td>
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<td>1,711,690</td>
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<td><strong>G. Funds Available (Trustee &amp; Grant Level)</strong></td>
<td>7,591,560</td>
<td>8,507,834</td>
<td>16,099,394</td>
<td>71%</td>
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<tr>
<td>at Grant Level after Disbursements &amp; Commitments</td>
<td>6,075,581</td>
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<td>6,670,693</td>
<td>48%</td>
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<tr>
<td>at Trustee Level after Allocation to Grants</td>
<td>1,515,979</td>
<td>8,507,834</td>
<td>10,023,813</td>
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</tr>
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</table>

*a. standard 2% fees deducted by the World Bank as per Annex 2 para 3.1 in the Agreement.*
<table>
<thead>
<tr>
<th>Component: Air Quality Management (AQM) - Country Work - Phase 1</th>
<th>Actual Grant Allocation</th>
<th>Total Disbursed To-Date</th>
<th>Committed To-Date</th>
<th>Available Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component: Contaminated &amp; Toxic Site Management</td>
<td>4,750,000</td>
<td>503,875</td>
<td>226,756</td>
<td>4,019,369</td>
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<tr>
<td>Component: Research &amp; Analytics</td>
<td>1,050,000</td>
<td>263,554</td>
<td>391,605</td>
<td>394,841</td>
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<tr>
<td>Component: Knowledge Dissemination &amp; Awareness Raising</td>
<td>3,000,000</td>
<td>576,641</td>
<td>399,967</td>
<td>2,023,392</td>
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<td>Component: Program Development, Management &amp; Implementation Support</td>
<td>1,499,435</td>
<td>1,406,686</td>
<td>16,684</td>
<td>76,065</td>
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<tr>
<td>TOTAL</td>
<td>12,746,274</td>
<td>4,367,126</td>
<td>1,410,518</td>
<td>6,968,630</td>
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<tr>
<td>Funds with the Trustee not yet allocated</td>
<td></td>
<td></td>
<td></td>
<td>9,987,791</td>
</tr>
<tr>
<td>TOTAL - Funds Available at Trustee and Grant levels</td>
<td>12,746,274</td>
<td>4,367,126</td>
<td>1,410,518</td>
<td>16,956,421</td>
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</tbody>
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Sources and Credits

Sources
Air pollution deaths (page 9) from Global Burden of Disease Study 2016.
Air pollution cost (page 9) from World Bank.

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