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FINAL REPORT

**Reduction of Toxic Pollution Threatening the Environment and
Health of Vulnerable Communities**

EXECUTED BY

**UNITED NATIONS INDUSTRIAL DEVELOPMENT
ORGANIZATION (UNIDO)**

**FUNDED BY
THE EUROPEAN COMMISSION**

May 2016

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LIST OF ACRONYMS

ACDEV – Action et Developpement Senegal

ADB – Asian Development Bank

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act

CLSA – Credit Lyonnais Securities Asia

DALY – Disability Adjusted Life Year (DALY)

EC – European Commission

ESRI – Environmental Systems Research Institute

FAO – Food and Agriculture Organization of the United Nations

FSU - Former Soviet Union

GAHP – Global Alliance on Health and Pollution

GIS – Geographic Information System

ICCA – International Council of Chemical Associations

IIT – Indian Institute of Technology

ILZDA – India Lead Zinc Development Association

LMICs – Low and Middle Income Countries

OWG – Open Working Group of the Sustainable Development Goals

NPL – National Priorities List (US)

POPs – Persistent Organic Pollutants

PSMS – Pesticide Stock Management System

REA – Rapid Environmental Assessment

SDG – Sustainable Development Goals

TAB – Technical Advisory Board

TSIP – Toxic Sites Identification Program

UNIDO – United Nations Industrial Development Organization

I. PROJECT BACKGROUND

1. Project Context

Industrial pollution in low- and middle-income countries (LMICs) results in number of deleterious health impacts and contributes substantially to the burden of disease. A recent analysis by the World Health Organization found that as many as 7 million premature deaths annually result from exposure to contaminated air. The analysis, which was conducted by reviewing satellite data, found that 84% of those deaths occur in LMICs. Owing largely to the enormous logistical challenges of data collection, similar analyses have not been conducted for other potentially contaminated human exposure pathways (namely soil and water). Geographically and contaminant specific efforts exist. Several high-income countries, beginning with the United States' Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA; commonly known as 'Superfund') and the related National Priorities Lists (NPL) have developed national databases of contaminated sites. Low- and middle-income countries by contrast, have collected very limited data. Exceptions exist, though these are typically confined to individual contaminants or groups of contaminants or are constrained geographically (Persistent Organic Pollutant (POPs) inventories in Africa, for example).

Within this context, Blacksmith Initiative, UK (herein Blacksmith) executed the UNIDO project EE/GLO/08/041 "Global Identification and Evaluation of Polluted Sites," from 2009 to 2010. The contract, supported by the European Commission (EC), endeavored to develop a "Global Inventory" of contaminated sites that posed a risk to human health. The project was based on previous efforts of Blacksmith in India, supported by the Asian Development Bank (ADB) and utilizing a modified risk assessment instrument to rapidly categorize risks a given site. As part of the UNIDO project, Blacksmith contracted and trained 124 site investigators in 40 countries. These investigators visited and assessed more than 841 sites that posed a risk to human health. An online database was developed to store and access collected data and made available to country governments.

From 2010 to 2012 Blacksmith executed a similar effort focused on select Asian countries and supported by ADB. As part of this work, 475 sites were assessed in 16 countries. In addition to site assessment work, this project included supplementary research and capacity building components. The health burden of certain contaminated sites was calculated and published in the peer-reviewed literature and governments were assisted with prioritizing thematic areas or specific sites for further action.

Following on these efforts the current project and its related World Bank project (DGF 107112) were developed. These projects contained significant site assessment, capacity building, research, and intervention components to mitigate health risks posed by sites.

2. Project Summary

The current project 100340 "Reduction of Toxic Pollution Threatening the Environment and the Health of Vulnerable Communities" was executed by Blacksmith over a period of 40 months, from February 2012 to May 2015. The overall objective of the project was to help governments and communities heavily impacted by legacy toxic pollution in Africa and select countries of the Former Soviet Union, Latin America and the Caribbean to take locally-led action to improve the health of those communities by mitigating pollution exposure pathways and preventing future toxic emissions.

The project was organized around the following three Objectives:

- Objective 1: Expand and reinforce the current review of toxic pollution in countries in Africa, Eastern Europe, Latin America and the Caribbean, and create an inventory of pollution hotspots in those regions;
- Objective 2: Build national and local capacity in Africa, and select countries in Eastern Europe, Latin America and the Caribbean to develop national strategic management plans and implement remediation/ clean-up interventions to improve the health of those populations directly affected by legacy or active pollution; and

- Objective 3: Promote awareness regarding the scope of toxic pollution and the need to address the issue globally and assist in the development of an international response.

3. Project Implementation and Execution Arrangements

The project was implemented by UNIDO and executed by Blacksmith Initiative, UK (London, UK). UNIDO focused on the monitoring and evaluation aspects of the project while Blacksmith Initiative managed the day-to-day management of all project components. Blacksmith Initiative received a subcontract from UNIDO and maintained consistent and regular contacts with the UNIDO project manager during project implementation period. Consultants were contracted directly with Blacksmith Initiative and engaged in various capacities including technical expertise, cleanup activity and site assessment.

4. Summary of Progress against Key Indicators

The project performed well across all key indicators. As a result of the project, significantly more is known about the scope and extent of pollution globally. Risks have been significantly reduced or entirely mitigated at some of the worst sites. Measurably more capacity has been developed in target countries to deal with the issue. Some highlights are as follows:

a) *Site Identification and Assessments*

In total 772 sites were assessed during the project; more than 70% more than the project target of 450 sites¹. This has required a significant mobilisation of project staff and in developing the necessary local capacities to carry out site assessment work. Of this total the number of sites assessed in Eastern Europe and Central Asia (FSU) was 281 sites, representing just over 36% of the total number of sites assessed. Africa had the next largest proportion, with some 264 sites assessed, representing 34% of the total number of sites assessed. 227 sites (just under 30% of all sites) have been assessed in Latin America.

Overview Project Site Assessment and TSIP Training Targets vs Results

| Region and Country | No Countries | Project Target | Project Result | Of which Investigators | Of which Gov't. Staff |
|---|---------------------|-----------------------|-----------------------|-------------------------------|------------------------------|
| Total Sites Assessed | | 450 | 772 | | - |
| <i>Site Screening - Regional breakdown:</i> | | | | | |
| No. Sites Screened – Africa | 6 | Not indicated | 264 | 82 | 36 |
| No. Sites Screened – FSU (#1) | 11 | | 281 | 67 | 78 |
| No. Sites Screened – Latin America | 6 | | 227 | 45 | 35 |

Note: Former Soviet Union (FSU) denotes Eastern Europe & Central Asia

Regarding site assessment work in Africa and the types of toxic pollution issues identified there, three primary types of sites have dominated the TSIP work: i) informal e-waste recycling; ii) Artisanal Small-scale Gold Mining (ASGM); and informal Used Lead Acid Battery (ULAB) processing. Pollution and health issues related to informal e-waste recycling activity that have been identified by the project site work include occupational and wider public exposure from open-air burning of mixed wastes. As these waste sites are often in or adjacent to populated urban areas the level of public exposure tends to be high – in the case of the Agbogbloshie waste site in Accra the

¹ The project results have also been complemented by results achieved under parallel projects being carried out by Blacksmith. For example, more than 100 site assessments of pesticide-contaminated locations have been carried out under an FAO-financed project (Project reference number: FAO (GCP/RER/040/EC)), which has involved recruiting and training additional staff in Central Asia and Eastern Europe which have been integrated into the TSIP database and of which 41 sites have been approved.

site is located relatively near the centre of Accra, adjacent to residential areas and bordered by the second largest food market in Accra (see later sub-section in this report chapter on the Agbogbloshie pilot). The exposure to metals in such waste sites results from contaminated soil (primarily lead) migrating throughout the community and this pollution occurs across waste sites in Africa. However, according to Blacksmith, the Agbogbloshie waste site in Accra contains the highest contamination levels identified to-date by the project work. The second pollution area, Artisanal Small-scale Gold Mining (ASGM) has been identified as a priority area by the governments of three African countries governments (Senegal, Tanzania, and Kenya) and is better known as a pollution challenge area. Additional sites have been identified and characterized as part of this project, while the governments of Senegal, Tanzania and Kenya have all identified ASGM as a priority area. The third pollution area of informal Used Lead Acid Battery (ULAB) processing is common across Africa and believed by the Blacksmith Institute to be on the rise.

The types of toxic pollution issues identified in Eastern Europe and Central Asia (FSU territories) the two principal pollution issues identified by the project have been I) legacy mining locations and II) pesticide-contaminated land from former pesticides storages or burial sites. Other pollution issues have also been identified at sub-regional level – for example former poly-metallic mines have been identified as a risk in the Caucasus while pollution from uranium mines has been identified as a risk in Central Asia. The project site screening has also included a number of former industrial facilities such as former lead smelters. Blacksmith have noted that such sites present more challenges, as they are often very large and show high exposure levels across multiple pathways and with intervention in such sites likely to require significant investment in many cases. Regarding the pollution challenge of pesticides sites mentioned above, these sites often offer similar challenges to former industrial sites, insofar as they can have large-scale and complex exposure pathways. During the project Blacksmith partnered with FAO to help develop a better understanding of this pollution risk and to refine their pesticides assessment methodology and conduct assessments at sites contaminated by banned or obsolete pesticides. The data obtained from these site assessments is being entered into an FAO database of pesticides contaminated sites.

In Latin America region, the types of pollutants identified have been lead, chromium and mercury. In the case of Montevideo the main source of toxic pollution is former waste dumps where irregular settlements (“asentamientos”) have been built. In many of these “asentamientos”, informal e-waste recycling is emerging as a significant new source of toxic pollution. According to Blacksmith Institute’s project reporting the sources in other locations vary, and include mining, chemical manufacture, tannery operations, and informal waste recycling. The table below provides a summary overview of key pollution issues in the regions of Africa, Latin America and Eastern Europe and Central Asia.

Overview Key Pollution Issues - Sites

| Region | Overview Key Pollutants | Overview Key Pollution Issues by Economic Activity |
|-------------------------------------|--|--|
| Africa | Lead Used Lead Acid Battery PAH exposure | Informal e-waste recycling Artisanal, small-scale mining Used Lead Acid Battery processing |
| Eastern Europe & Central Asia (FSU) | Heavy metals Chemical waste Pesticides | Legacy mining Former industrial facilities Pesticides storage sites |
| Latin America | Lead Chromium Mercury | Mining Chemical manufacture Tannery operations Informal waste recycling |

Note: Former Soviet Union (FSU) denotes Eastern Europe & Central Asia

b) Refinement of Risk Screening Methodology

The basis for the database of contaminated sites is a rapid risk assessment methodology. The Initial Site Screening (ISS) involves estimation of source, pathway and receptor risks based on the collection of key data at a site. Several important changes were made to the online component of the ISS during the project. Among them, a beta version of a real-time calculator of Disability Adjusted Life Years (DALYs) was integrated. The DALY calculator utilizes a simplified algorithm developed and published as part of the project (see Chatham-Stephens 2014). A separate key modification to the database was the inclusion of geotagged sampling locations. This modification allows users to add longitude and latitude information for each sample collected in the field. These samples are then projected on an ESRI plugin map. As a whole these modifications result in a more accurate and usable product.

c) Recruitment and Training

In terms of capacity building of local stakeholders on site assessment the project has exceeded the target results carried out, and the results are impressive. In total, 345 persons have received training on site assessment.

Of this total of 345 persons, 194 have been researchers/investigators and 151 have been government officials, while regional breakdown has comprised 118 persons trained in Africa, 145 persons trained in Eastern Europe and Central Asia, and 80 persons trained in Latin America. The table below summarises the dates, locations and participant composition of these workshops.

Overview ISS Training Targets vs Results

| Region and Country | No Countries | Project Result | Of which Investigators | Of which Gov't. Staff |
|--|---------------------|-----------------------|-------------------------------|------------------------------|
| Total Persons Trained | 23 | 343 | 194 | 149 |
| <i>Persons Trained - Regional Breakdown:</i> | | | | |
| No. Persons Trained – Africa | 6 | 118 | 82 | 36 |
| No. Persons Trained – FSU (#1) | 11 | 145 | 67 | 78 |
| No. Persons Trained – Latin America | 6 | 80 | 45 | 35 |

Note: Former Soviet Union (FSU) denotes Eastern Europe & Central Asia

The ISS training workshops involve all consultants being trained over two-day workshop held jointly with government representatives. Technical in nature, the training workshop is focussed almost entirely on explaining the ISS approach, and involves a field visit by workshop participants to demonstrate the methodology. As mentioned above total of 23 national Training Workshops had been carried out by the end of April 2015, with already 14 workshops being delivered in 2012 (see table below).

As mentioned earlier, government stakeholders have been consistently involved in the site identification and screening process, and have regularly participated in site visits alongside field investigators. MoUs have been signed or are in the process of being drafted in all countries where a TSIP is being implemented. What is less clear is the nature and scale of use of these skills afterwards for government staff, and the sustainability of such training.

Overview ISS Training Targets vs Results

| Investigator Training Workshops | Number | Regional Breakdown | Workshop Countries |
|--|---------------|--------------------------------|---|
| Trainings: 2012 | 14 | Africa (4) / ECA (5) / LAC (5) | Ghana, Nigeria, Tanzania, Kenya, Azerbaijan, Armenia, Tajikistan, Kyrgyzstan, Russia, Mexico, Chile, Peru, Argentina, Uruguay |
| Trainings: 2013 | 4 | Africa (1) / ECA (2) / LAC (1) | Senegal; Mongolia; Bolivia; Kazakhstan. |
| Trainings: 2014 | 5 | Africa (1) / ECA (4) | Armenia, Georgia, Belarus, Madagascar and Kyrgyzstan. |
| Total (All years) | 23 | | |

Note: Former Soviet Union (FSU) denotes Eastern Europe & Central Asia

d) *Government Participation*

Representatives from government agencies were present at each training workshop and given access to the online database of contaminated sites. Government officials regularly accompanied field investigators on site visits and pilot projects were implemented jointly with local governments in all cases.

e) *Pilot Projects*

Nine pilot projects were implemented successfully; exceeding the originally planned three. Summaries of Pilot Projects are attached as Appendix B.

f) *Raising Awareness*

At least 10 peer-reviewed journal articles focusing on the health impacts of pollution were published in top journals as part of the project. Additionally a journal supported by the project published 30 relevant articles from authors in target countries. The Global Alliance on Health and Pollution (GAHP) was formed during the project, which in turn leveraged the inclusion of pollution and health into the Sustainable Development Goals. Major publications and reports are included in Appendix G.

II. PROGRESS AGAINST KEY INDICATORS

1. Objective 1: Expansion of Contaminated Sites Knowledge

a) *Summary*

A fundamental component of the project was the collection, storage, and organization of primary data related to contaminated sites. Sites were assessed by trained investigators using a unique rapid assessment protocol (Initial Site Screening; ISS) and stored in an online database. As part of the project, 772 sites were assessed, 194 consultants and 151 government staff were trained, and the ISS and database were made appreciably better and more usable. The result is both more knowledge about the current situation and improved capacity to sustain similar efforts.

b) Initial Site Screening (ISS) Methodology

The Initial Site Screening ISS is a rapid risk assessment instrument developed by Blacksmith and refined in practice. By the conclusion of the project more than 2,400 ISS's had been carried out in 49 countries. An ISS is implemented over a 1-2 day visit to a contaminated site by a trained investigator. Key information is gathered on the type and extent of contamination, the source of the pollutant, and the possible receptor risk (population), among other data.

The ISS relies heavily on environmental sampling to determine the risk posed by a given site. Importantly however, sampling for a full site characterization would be prohibitively expensive. As an alternative the ISS relies on a smaller evenly distributed set of samples (defined as 5-10 composite and/ or target samples per site). These samples are taken from a likely human exposure pathway, such as drinking water or contaminated residential soil. The likely number of people in contact with the sampled pathway is taken as the number of possibly affected people.

Completed ISSs are stored in a secure online database with tiered user levels. Each country involved in the project is given its own country-specific database translated into the national language. The basic database architecture currently exists in English, French, Khmer, Russian, Spanish, and Vietnamese.

The database underwent a number of significant revisions during the project. A beta version of a Disability Adjusted Life Years (DALYs) calculator was integrated into the database. DALYs are the standard metric for calculating the burden of disease globally. The calculator utilizes an accepted methodology to estimate the health burden of a contaminated site on a given population (see Chatham-Stephens 2014). An effort was also made to add more sensitivity to the existing approach as well as to more accurately describe the process utilized to determine population estimate. Experts from Blacksmith's pro bono Technical Advisory Board (TAB) were engaged to refine the sampling protocol, resulting in several key changes during the project. These changes are likely best seen in the newly added "Key Pollutant Matrix" which disaggregates population estimates by exposure pathway and sampling data. Additionally, the Key Pollutant Matrix clarifies whether the relevant sample is a targeted (spot) sample or composite sample, indicative of a wider area. Finally, the matrix allows individual sampling locations to be geotagged. These samples are then projected on an ESRI plugin map. Importantly, this final change was adapted from a parallel FAO project where it was first trialed. Its integration into the TSIP database occurred in April 2015. As a result, very few sampling locations are currently geotagged.

| Key Pollutant | | | | | | |
|---|---|------------|--------------------------------------|--------------|-----------|----|
| Lead | | | | | | |
| Sample Sector | Sample Type Sampling Media Pathway | Population | Test Result Latitude Longitude | Units | Rec Level | BI |
| 1 | composite Soil - Residential Dust/soil/inhalation/ingestion | 323 | 4412.74576300 | mg/kg or ppm | 400 | 5 |
| 2 | composite Soil - Residential Dust/soil/inhalation/ingestion | 323 | 5282.64864900 | mg/kg or ppm | 400 | 5 |
| 3 | composite Soil - Residential Dust/soil/inhalation/ingestion | 323 | 2716.36842100 | mg/kg or ppm | 400 | 4 |
| | Select Sample Type Select Sampling Media Select Pathway | 0 | 0 | | | |
| Estimated additional population possibly at risk | | 0 | | | | |
| Total population at risk | | 969 | | | | |
| Calculate BI | | | | | | |

The existing ISS sampling methodology went through several key revisions during the project. Some of these can be seen in the above screen shot of newly added Key Pollutant Matrix from the contaminated sites database.

c) Staffing

Coordination staff was increased over previous related projects. The purpose of this change was to improve interaction with government agencies as well as the quality of data collected. Where previously Regional Coordinators had been responsible for several countries and Field Investigators, National Coordinators now report directly to the Head Office and manage Field Investigators. Several Regional Program Officers and Assistants were also added to Blacksmith staff to support Regional Program Directors and assist with administrative responsibilities full time.

Overview Blacksmith Institute HQ Staff Time Spent on Core Project Work Activity Groups

| Blacksmith Institute Staff Member | NTAPs | TSIP | GAHP | Pilot Projects |
|--|--------------|---------------|---------------|-----------------------|
| Richard Fuller (CEO) | - | - | 4,906 | 345 |
| Meredith Block (Regional Director, Asia) | - | 1,588 | 79 | 1,261 |
| Bret Ericson (Director, Operations) | 886 | 3,417 | - | 511 |
| Andrew McCartor (Regional Director, FSU) | 104 | 4,531 | - | 590 |
| Sandra Gualtero (Regional Director, LAC) | 13 | 3,786 | 12 | 21 |
| Kira Traore (Regional Director, Africa) | - | 4,980 | 103 | - |
| Lina Hernandez Gutierrez (TSIP QC, Program Assistant LAC) | - | 1,636 | - | - |
| Anthony Rivera (Program Assistant Asia) | - | - | - | 290 |
| Megi (Intern, FSU) | - | - | - | 347 |
| Corinne Ahearn (Financial Manager) | - | - | - | 5,206 |
| Rohan Lawrence (Financial Assistant/Bookkeeper) | - | - | - | 4,497 |
| Julius Ngalim (Financial Assisant/ Bookkeeper) | - | - | - | 1,952 |
| Rachael Vinyard (Manager, GAHP) | - | - | 6,139 | 69 |
| Rachel Forkel | - | - | - | - |
| Angela Bernhardt (Director, Communications) | - | - | - | 466 |
| <i>Total</i> | <i>1,003</i> | <i>19,938</i> | <i>11,238</i> | <i>15,554</i> |

In addition to more coordination staff, more Field Investigators have been contracted for each country. Where previously 1-2 Field Investigators were contracted for a given country, currently 5-10 are hired and trained. The consultants contracted under the project are typically professionals in a relevant area with a Master's degree in Environmental Engineering, Public Health or related field.

2. Objective 2: Capacity Building

a) *Summary*

Several activities of the project directly contributed to building local capacity. Among them trainings, site assessments (implemented jointly with local governments) and pilot projects most clearly contributed to this objective.



As part of the TSIP, National Investigators and government personnel are trained in ISS protocol during a two-day workshop.

b) *Pilot Projects*

The section below provides a summary overview of selected pilot projects implemented during this project's duration, and the core problem they sought to address. The timing in implementing the pilot cases and the key activities carried out.

Overview Selected Pilot Projects as Reported in Project Reporting

| Country | Pilot Project | Key Project Activities and Results |
|-----------------------------------|--|---|
| Zambia (Kabwe) | Pilot Project for lead remediation techniques (Nov. 2014 – Jan. 2015) | <p><i>Pilot project purpose:</i> Demonstrating how they are cost-effective and low-technology.</p> <ul style="list-style-type: none"> • Approx. 30 yards to be cleaned in the Kasanda Block M neighbourhood, (vulnerable low income neighbourhood with a high soil lead concentrations in soil (as high as 12,000ppm of lead in soil). • Teach people how to properly clean out their homes and how to avoid recontamination from fugitive dust (with help of local health workers). |
| Senegal (Maristes Lake) | GAHP pilot project (funded with <i>Action et Developpement Senegal</i> (ACDEV) | <ul style="list-style-type: none"> • Focus area is the Maristes Lake, polluted with pesticides and other hazardous materials. • The local workshop organised created i) a working group and a ii) guidance document to help the locals to prevent contamination and to remediate the lake pollution. |
| Peru (Lima) | GAHP project - used lead-acid battery (ULAB) recycling | <p>This GAHP project analysed used lead-acid battery (ULAB) recycling in Lima, Peru. Two main project activities were carried out in the project:</p> <ul style="list-style-type: none"> • Firstly ULAB recycling sites have been identified with community surveys and focus groups. Soil sampling was then implemented to examine the concentration of lead. • Development of an ULAB guide to prevent health risk related to contamination, which was validated by local, regional, and national government agencies. |
| Uruguay (Pantanos River Basin) | In partnership with the <i>Intendencia de Montevideo</i> . | <ul style="list-style-type: none"> • Clean-up of toxic hotspots in the “Cuenca del Arroyo Pantanos” (Pantanos River Basin), in two neighbourhood areas (“Aguiles Lanza”) • Pilot project focus was on lead contamination, in partnership with the Intendencia de Montevideo. The main issue was the extraction of copper for sale burning electronic trash and electrical cables. • Project activities involved also blood sampling of local children, since they had previously shown signs of contamination. • A project committee including representatives from the Intendencia as well as other stakeholders was established in 2013. • The local population also received graphic material to inform them on |

| Country | Pilot Project | Key Project Activities and Results |
|-----------------------------|------------------------------------|--|
| | | the objectives and activities of the project, while two workshops have been held for the community. |
| Argentina (Buenos Aires) | Pilot project (April 2015) | <ul style="list-style-type: none"> Target areas was the “Ex - Astillero Osvaldo Tacconi” located in the “Matanza - Riachuelo Basin” Project aim was the scoping and remediation design for a contaminated location for ship dismantling: this was necessary to support land-use projections for the construction of affordable housing |
| Uruguay (Montevideo) | GAHP pilot project (April 2015) | <ul style="list-style-type: none"> Develop citywide monitoring and remediation for lead contaminated hotspots in residential areas. |
| Mexico (Morelos) | GAHP pilot project (April 2015) | The project concentrated on the use of Ceramic glazes with lead, spread among nearly 50,000 artisanal ceramicists across the country. See below for further details. |
| | | |

c) Trainings

All consultants and government staff engaged in the project were trained during two-day workshops held jointly with government representatives. The workshops were technical in nature and dedicated almost entirely to describing the ISS. A field visit is made by the group to demonstrate the methodology. As part of the project, 23 National Training Workshops have been carried out.

The dates, locations and attendance details are listed below organized by region and date

| Africa | |
|---|---|
| Accra, Ghana 22-23 March 2012 Investigators present: 18 Government personnel present | Dakar, Senegal 19-20 February 2013 Investigators present: 15 Government personnel present: |
| Dar es Salaam, Tanzania 26-27 April 2012 Investigators present: 17 Government personnel present: 2 | Antananarivo, Madagascar 25-27 March 2014 Investigators present: 7 Government personnel present: 5 |
| Nairobi, Kenya 2-3 May 2012 Investigators present: 15 Government personnel present: 1 | Lagos, Nigeria 28-29 March 2012 Investigators present: 10 Government personnel present: 14 |
| Former Soviet Union and Mongolia | |
| Baku, Azerbaijan 1-2 March Investigators present: 8 Government personnel present: 15 | Ulaanbaatar, Mongolia 3-4 July 2014 Investigators present: 8 Government personnel present: 9 |
| Yerevan, Armenia 6-7 March Investigators present: 6 Government personnel present: 13 | Yerevan, Armenia 23-24 April 2014 Investigators present: 6 Government personnel present: 8 |
| Dushanbe, Tajikistan March 30-31 Investigators present: 6 Government personnel present: 4 | Tblisi, Georgia 28-29 April 2014 Investigators present: 6 Government personnel present: 7 |
| Bishkek, Kyrgyzstan April 7-8 Investigators present: 5 Government personnel present: 6 | Minsk, Belarus 29-30 May 2014 Investigators present: 5 Government personnel present: 6 |
| Vladivostok, Russia 23 July 2012 | Bishkek, Kyrgyzstan 27-30 June 2014 |

| | |
|---|--|
| Investigators present: 4 | Investigators present: 7 Government personnel present: 8 |
| Astana, Kazakhstan 12-13 June 2013 Investigators present: 6 Government personnel present: 2 | |
| Latin America | |
| Mexico City, Mexico 21-22 February 2012 Investigators present: 12 Government personnel present: 2 | Lima, Peru 14-15 March 2012 Investigators present: 10 Government personnel present: 7 |
| Buenos Aires, Argentina 28-29 February 2012 Investigators present: 7 Government personnel present: 4 | Santiago, Chile 1-2 August 2012 Investigators present: 7 Government personnel present: 16 |
| Montevideo, Uruguay 7-9 March 2012 Investigators present: 5 Government personnel present: 4 | La Paz, Bolivia 18-20 June, 2013 Investigators present: 4 Government personnel present: 4 |

c) Regional Summaries

i. Africa

Number of Sites Screened: 264

Number of trainings: 6 trainings for 82 staff and 36 government personnel

Issues Identified

Three primary types of sites characterize the African TSIP effort. The first such type of site results from informal e-waste recycling. Issues here include occupational and public PAH exposure from open burning of mixed wastes. Metals exposure results from contaminated soil (primarily lead) migrating throughout the community. The issue is common throughout the continent in small-scale sites, however the highest risk site yet identified is located in Accra, Ghana (Agbogbloshie), where the GAHP pilot project took place. A second issue, Artisanal Small-scale Gold Mining (ASGM), is well known. Additional sites have been identified and characterized as part of this project. The governments of Senegal, Tanzania, and Kenya have all identified ASGM as a priority area. A third issue, informal Used Lead Acid Battery (ULAB) processing is common throughout the continent presenting a significant public health risk.

Pilot projects

The pilot project at the Agbogbloshie dump site in Accra, Ghana was completed with the opening of the e-waste recycling center in August 2014. The project introduced simple wire stripping technologies to replace the practice of open burning of cables. The project involved local workers' organizations, NGOs and government. The effort exploits a profit motive as clean (stripped) copper wires fetch a higher market price than burned cables. It is estimated that the facility is able to recycle nearly ten tons of copper per month, with a net profit of GHC 66,000. With the success of this GAHP project, Blacksmith leveraged a \$112,000 grant from the Addax & Oryx Foundation for continued expansion of the e-waste recycling facility to include additional equipment and a health clinic.

In November 2014, a new pilot project began in Kabwe, Zambia to demonstrate cost effective lead exposure mitigation methods. As part of the pilot, extensive sampling and analysis were conducted. This in turn leveraged additional resources that were used to carry out the remediation of 80 homes in the Chowa neighborhood of the city. The contamination results from decades of poorly controlled mining resulting in average residential soil concentrations above 4,000 ppm.

GAHP also funded a remediation workshop in Dakar, Senegal, with partners, “Action et Developpement Senegal” (ACDEV). The Maristes Lake, an important water source for the Hann Bel Air district in Dakar, is polluted with pesticides and other hazardous materials. The workshop brought together a variety of stakeholders from local government officials to NGOs to create a working group and guidance document for the local neighborhood in order to understand steps that can be taken to prevent further contamination and work toward remediation of the lake. GAHP pilot project summaries are attached as Appendix B.

ii. Former Soviet Union and Mongolia

Number of Sites Screened: 281

Number of trainings: 11 trainings for 67 staff and 78 government personnel.

Issues Identified

Legacy mining locations and pesticides contaminated land from former pesticides storages or burial sites are the two primary issues identified by the project. Specifically, former poly-metallic mines in the Caucasus and uranium mines in Central Asia pose a risk. In addition several former industrial facilities have been assessed under the project, including some high-risk former lead smelters. These sites are often complex and large in scale presenting high levels of exposure in multiple pathways. Intervention in many cases is likely to require significant investment. Pesticides sites are often similarly large in scale and complex in their exposure pathways. To help better understand this risk, Blacksmith partnered with FAO to refine their pesticides assessment methodology and conduct assessments at sites contaminated by banned or obsolete pesticides. This data is being entered into an FAO database of pesticides contaminated sites.

Pilot projects

Two pilot projects were initiated in the region. The first endeavored to fully characterize a village in Armenia contaminated with tailings from a poly-metallic mine. The project included a detailed environmental assessment of the village; blood-lead monitoring; education programs to reduce exposures to heavy metals for students, teachers, parents, health workers and municipal officials; and a public awareness campaign to raise the profile of the issue at the regional and national level. This project was completed in August of 2014. A second effort to deal with chemical wastes in Sumgayit Azerbaijan was completed in the first quarter of 2015.

iii. Latin America

Number of Sites Screened during project: 227

Number of trainings: 6 trainings for 45 staff and 35 government personnel.

Issues Identified

The primary pollutants found in the region were lead, chromium and mercury. Sources vary but including mining (formal and informal), chemical manufacture, tannery operations, and informal waste recycling. In Montevideo, the main source of toxic pollution is former waste dumps where irregular settlements (“asentamientos”) have been built. In many of these “asentamientos”, informal e-waste recycling is emerging as a significant new source of toxic pollution.

Pilot projects

GAHP pilot project funding was awarded to the municipalities of Buenos Aires and Montevideo (USD 75,000 and USD 80,000) In the former the resources were used for the scoping and remediation design for a heavily contaminated location used for ship dismantling. In Montevideo, the grant was used to develop a citywide monitoring and remediation effort for lead contaminated hotspots in residential areas. Both projects were completed in April 2015. In Mexico project funds were used to promote lead free ceramic glazes in the state of Morelos. Additionally, a GAHP pilot project assessing informal ULAB recycling in Peru was completed in April.

d) National Toxic Action Plans (NTAPs)

By the end of the project National Toxic Action Plans (NTAPs) were under development or completed in eleven of project countries. NTAPs were initially envisioned as documents and broad

in scope, reviewing a large array of pollution issues and intervention strategies. As a basis for the preparation of these documents, meetings were held with relevant agencies in many countries. The current knowledge of contamination issues (based on the TSIP database) was presented, as were possible intervention strategies and funding mechanisms. Based on these meetings, the initial NTAP outline was realigned to focus on specific thematic areas, rather than toxic pollution as a whole (e.g. electronic waste recycling in Ghana). Moreover it became clear that absent additional incentive, there was little motivation on the part of governments to draft or formally adopt additional planning documents. Thus NTAPs have in practice materialized more as informal thematic approaches to dealing with contaminated sites and integrating the TSIP program into local or national efforts. Draft NTAPs are attached in Appendix P.

e) Memorandums of Understanding (MoUs)

A key part of the project objectives under Outcome 2 of the project is to translate the knowledge gained from site assessments and local capacity development of stakeholders into a plan of action at national level.

For furthering collaboration, MoUs have been signed in eleven countries. MoUs have been signed in the following countries: Armenia, Argentina (Municipalities of Buenos Aires, Cordoba, Salta), Azerbaijan, Ghana, Indonesia, Kazakhstan, Kenya, Kyrgyzstan, Madagascar, and Uruguay (Municipality of Montevideo). The MoUs are broad in nature and outline areas of possible collaboration do deal with the issue of polluted sites and human health. No additional commitments are made on the part of Blacksmith or partner organizations, beyond what has already been committed under this project. Copies of the MoUs are attached in Appendix Q.

The focus of this work has changed somewhat compared to the thinking at the time of formulation of the project. Initially the National Toxic Action Plans (NTAPs) were intended to review a large array of pollution issues and intervention strategies, with their preparation including meetings with relevant national agencies in the respective target countries. Following the initial meetings with national authorities in some countries, which involved presenting current TSIP data and knowledge on contamination issues as well as possible intervention strategies and funding mechanisms, it was decided to reassess the approach.

Following this reassessment the original NTAP outline was adapted from its initial broad scope to instead focus on specific thematic areas rather than toxic pollution as a whole (e.g. Artisanal Small-Scale Gold Mining in Peru). A second modification was to bring more flexibility in reaching the goal of obtaining national commitment to take action against one or more pollution issues by not requiring that the NTAP process has to generate a stand-alone NTAP document, but could also dovetail with existing national initiatives and policies. It was also decided that the NTAP process does not have to produce a document, but rather can supplement current programs or plans enacted by government. In Ghana, Blacksmith is working closely with the Ghana EPA to screen and address contaminated sites. And in Uruguay, Blacksmith has provided technical assistance and equipment for a municipal program that strives to identify and reduce exposures from contaminated sites.

Overview Countries with which MoUs have been signed

| | Africa | Eastern Europe, Central Asia, Asia | Latin America |
|--------------|------------------------------|--|--|
| MoUs | Ghana Kenya Madagascar | Armenia Azerbaijan Indonesia Kazakhstan Kyrgyzstan | Argentina: <i>Buenos Aires, Córdoba, Salta</i> Uruguay: <i>Montevideo</i> |
| NTAPs | – | Armenia (draft) Azerbaijan (draft) | – |

5. Objective 3: International Awareness on the Scope of Pollution

a) Summary

The project engaged in a series of activities related to raising international awareness on the health burden of contaminated sites. The first component of this work involved research utilizing the data collected as part of assessment and pilot work. Accepted methodologies were applied to the dataset, including those for determining cost effectiveness and estimating the resulting disease burden. Completed manuscripts were published in the peer-reviewed literature. A second component was the engaging of key stakeholders on the issue. As part of this work, the Global Alliance on Health and Pollution (GAHP) was formed. Finally a third component dealt with reaching out to mainstream media to build public support for the issue.

Under this objective, three types of activities were undertaken: i) meeting with Multilateral Agencies, Bilateral Agencies, Country Government Agencies, International Organizations and other actors; ii) presenting the project and the toxic pollution at several conferences; and iii) producing a number of articles and reports. The aim of these activities was to ensure the support of the international community for GAHP and its activities.

b) Global Alliance on Health and Pollution

Regarding progress towards increasing international awareness of toxic pollution's global scope, the project has implemented a series of activities dedicated to awareness-raising, mostly focused on expanding the Global Alliance on Health and Pollution (GAHP) and on spreading awareness about the global scope of pollution, especially in low- and middle-income countries. The Global Alliance on Health and Pollution (GAHP), which was formed as part of the project, is a collaborative body that facilitates the provision of technical and financial resources to governments and communities to reduce the impacts of pollution on health in low- and middle-income countries. Members include donor and recipient country governments, multilateral banks and implementing agencies, research organizations and non-governmental organizations (NGOs). In particular, the GAHP sought to convince organizations and national governments to include the reduction of the health impact of toxic pollution among the post-2015 Sustainable Development Goals (SDGs). These meetings also aimed at expanding the GAHP membership: in this context, meetings were held with 25 country government agencies in 23 countries, 14 bilateral agencies in 10 countries, 4 multilateral agencies, 5 international organizations in 9 countries and 8 meetings with other entities, mostly in India. A list of GAHP members at the time of its formation is included as part of the Constitutive Document (attached as Appendix E). A full and regularly updated list of member organizations is available on the GAHP website (gahp.net). GAHP meetings were held by phone semi-annually throughout the project to discuss ongoing activities of members and to review the progress of GAHP pilot projects. For more information on GAHP, the strategy and business plan can be found in Appendix F; a pollution fact sheet can be found in Appendix H; Executive Committee meeting minutes can be found in Appendix I; the GAHP Five-Year Plan can be found in Appendix J; guidance documents can be found in Appendix K; and the GAHP 2013 Annual Report can be found in Appendix L.

c) Meetings with Key Stakeholders

The principal manner in which an international response was built was through the creation of the GAHP and implementing its activities. Several efforts were made towards building and broadening membership of the GAHP as well as implementing its activities, GAHP Executive Committee and Subcommittee meetings and the carrying out of activities such as organising national toxic action planning workshops, carrying out and expanding TSIP activities, developing and publishing scientific research papers using TSIP data.

A large number of in person meetings were held with key stakeholders throughout the length of the project to present the severity and scale of the issue and to discuss integration into existing programs or the formation of new ones to mitigate health risks. These meetings were used as opportunities to distribute relevant peer-reviewed research and summary reports as well as to solicit involvement into GAHP programs. In addition to small group meetings, presentations were made at a number of government and academic conferences (a partial list is attached as Appendix M)

d) Publications

The project produced a number of publications, including those intended for academic and technical audiences as well as those intended for wider consumption.

The project directly supported innovative research related to pollution and health in low- and middle-income countries. Most significantly the project supported a partnership with the Children's Environmental Health Center of Mt. Sinai School of Medicine in New York to quantify the disease burden of contaminated sites in Disability Adjusted Life Years (DALYs). The resulting paper (see Chatham-Stephens 2014) estimated DALYs resulting from TSIP assessed sites in three Asian countries. The paper built on previous work to develop a novel approach and significant contribution to epidemiology. Other research quantified the health burden through IQ point decrements resulting from pediatric exposure, while still other documented the projects approach to site assessment.

A list of some of the more notable publications produced as part of the project is below:

- Landrigan, Philip J., and Richard Fuller. "Environmental Pollution: An Enormous and Invisible Burden on Health Systems in Low- and Middle-income Countries." *World Hospitals and Health Services* 50.4 (2014): 35-40.
- Caravanos, Jack, Sandra Gualtero, Russell Dowling, Bret Ericson, John Keith, David Hanrahan, and Richard Fuller. "A Simplified Risk-Ranking System for Prioritizing Toxic Pollution Sites in Low- and Middle-Income Countries." *Annals of Global Health* 80.4 (2014).
- Caravanos, Jack, Russell Dowling, Martha María Téllez-Rojo, Alejandra Cantoral, Roni Kobrotsky, Daniel Estrada, Manuela Orjuela, Sandra Gualtero, Bret Ericson, Anthony Rivera, and Richard Fuller. "Blood Lead Levels in Mexico and Pediatric Burden of Disease Implications." *Annals of Global Health* 80.4 (2014).
- Caravanos, J., Ericson, B., Ponce-Canchihuamán, J., Hanrahan, D., Block, M., Susilorini, B., & Fuller, R. (2012). Rapid Assessment of Environmental Health Risks Posed by Mining Operations in Low- and Middle-Income Countries: Selected Case Studies. *Environmental Science and Pollution Research*, 20(11), 7711-7718.
- Caravanos, Jack, Richard Fuller, and Stephan Robinson. "Notes from the Field: Severe Environmental Contamination and Elevated Blood Lead Levels Among Children—Zambia, 2014." *MMWR. Morbidity and mortality weekly report* 63.44 (2014): 1013-1013.
- Chatham-Stephens, K., Caravanos, J., Ericson, B., Landrigan, P., & Fuller, R. The Pediatric Burden of Disease from Lead Exposure at Toxic Waste Sites in Low and Middle Income Countries. *Environmental Research*. July 2014.
- Caravanos, Jack, et al. "A Comparison of Burden of Disease from Toxic Waste Sites with other Recognized Public Health Threats in India, Indonesia and the Philippines." *Journal of Health Pollution* 4.7 (2014): 2-13.
- Philip J. Landrigan, Richard Fuller. Environmental Pollution and Occupational Health in a Changing World. *Annals of Global Health*. 2014 Vol. 80, Issue 4, p245–246.
- Ericson, B., Caravanos, J., Chatham-Stephens, K., Landrigan, P., & Fuller, R. Approaches to systematic assessment of environmental exposures posed at hazardous waste sites in the developing world: the Toxic Sites Identification Program. *Environmental monitoring and assessment*, 185(2), 1755-1766. (2013).

- Chatham-Stephens, K., Caravanos, J., Ericson, B., Sunga-Amparo J, Susilorini B, Sharma P, Landrigan, P., & Fuller, R. Burden of Disease from Toxic Waste Sites in India, Indonesia, and the Philippines in 2010. *Environmental Health Perspectives*. (2013).
- Caravanos, J., Chatham-Stephens, K., Ericson, B., Landrigan, P. J., & Fuller, R. The burden of disease from pediatric lead exposure at hazardous waste sites in 7 Asian countries. *Environmental Research*. (2012).

In addition to producing unique research in this area for publication in leading journals, the project endeavored to support researchers in low- and middle-income countries to conduct innovative research in this field. This work included a small grants program for researchers, mentoring and training assistance (primarily through a partnership with AuthorAID; authoraid.info), and the development of an independent peer-reviewed journal. The *Journal of Health and Pollution* (JHP; journalhealthpollution.org) is an open access peer reviewed journal focusing thematically in this area and actively soliciting journals from authors in low- and middle-income areas. Once articles are submitted, editors work with the authors to make any necessary improvements to reach the standards of the reviewers, providing an uncommon amount of support. As part of the project 30 articles, 9 editorials and 6 case studies were published in JHP.

A number of documents were produced for wider consumption. These include those related to the severity and scope of the problem (e.g. “The Poisoned Poor”; Appendix C) as well as those related to existing efforts or local capacity. One example of a report produced as part of the latter group is “Regulatory Best Practices for Remediation of Legacy Toxic Contamination.” This report, produced in partnership with the Vance Center (New York, USA), was a Spanish language document drafted with substantive inputs from several Latin American governments (An English translation has been attached as Appendix D).

e) Tangible Progress towards an International Response

The most significant contribution of the project with regard to a tangible international response was the formation of GAHP. GAHP represents unprecedented progress on this issue. One illuminating example was GAHPs coordination around the Sustainable Development Goals (SDGs) in 2015. To promote the inclusion of pollution in the SDGs, GAHP launched a successful Spotlight Pollution campaign to raise awareness round the possible inclusion of pollution in the Sustainable Consumption and Production. For this campaign, Blacksmith created a position paper on the scope of pollution and a specific target and indicator document for a consideration under the Health SDG. Within a very short period (two weeks), support was secured from more than 38 different organizations from 25 countries, including academic institutions, governments and NGOs. In total, 19 government agencies from 19 countries sent verbal communication, email or physical letters of support to GAHP and/ or the Open Working Group (OWG) of the SDG process. A complete set of these letters of support and the position and target/ indicators documents were provided to the Chair and co-Chairs of the OWG. As a result, the target related to air pollution under the Health SDG was broadened to include water and soil pollution.

An increasing international response can also be evidenced in the project (Blacksmith) successfully obtaining four grants related to GAHP projects: two for work on lead in Indonesia and Jakarta from the Asian Development Bank and the GEF, and two other grants to work on mercury-free ASGM practices in Peru from US Department of State and the Inter American Foundation.

f) Private Corporations and Industry Groups Engaged

Blacksmith is continuing to dialogue and meet with a variety of private sector entities about GAHP, the scope of toxic pollution worldwide and how the private sector can get involved. During the project meetings to this effect were held with the following groups: the International Lead Association (ILA), EcoGlobal (responsible Philippines battery processor), CLSA India, HSBC (Philippines and India), and Indian Institute of Technology, International Council of Chemical Associations (ICCA) and the India Lead Zinc Development Association (ILZDA).

III. LEASONS LEARNT

An evaluation of this was undertaken in September 2015, which final report is in Appendix O. The evaluation findings emphasise the importance of this global asset that has been built up with significant legacy funding support by the EC.

The Toxic Sites Identification Program (TSIP) has been extremely successful at identifying and assessing toxic sites in about 50 countries, although data is far from comprehensive. Currently, there are more than 3,200 sites in the TSIP database, with an estimated affected population of more than 90 million people. These numbers will grow as more sites are identified and assessed; a team of more than 200 trained investigators coordinated by Blacksmith are actively worked in 15 countries to collect health and pollution data in collaboration with local and national authorities. The new project proposals, recently approved, build on this extensive team to expand work to countries lacking comprehensive data; particularly LDCs. Investigator training protocols, curriculum and workshops are well-established by now. Likewise, the site risk assessment process has been refined, and collects information efficiently from all stakeholders, including local NGO's, businesses, technical agencies, and governments, all of which is then uploaded to the online database.

UNIDO activities need to generate the national capacity to prevent and avoid contamination, to create green business to cope with the recovery and recycling and generates profitable activities, which could guarantee sustainability.

One important issue, is the difficulties to separate the work on site identification, data uploading and any related remediation from wider development-focussed and using this data and information to address development challenges. Going forward, it is important that consideration is given to how appropriate multi-stakeholder governance advisory and oversight is put in place for this valuable public good, as well as considering how maximum utility can be derived from it.

An important lesson learnt, which required some improvements, during the design of the second project, is in paying more attention to sustainability of site-related interventions. More will be done to focus on the wide aspects to sustainability beyond pollution, environmental and health dimensions, even if the importance of non-environmental and non-health factors may vary considerable in significant depending on the nature of the site. Greater sustained impact has been reduced by the lack of a more strategic approach to at least some pilot sites. The approach to the wider socio-economic context and sustainability of some sites was not sufficiently present, in terms of how local ownership and/or funding or in-kind support can be maximised, or how to maximise prospects for financial viability.

Significantly increasing the focus on the development dimension and on improving livelihoods is not only important for the EC as this is development co-operation funding, but feedback also suggests it is an important issue for at least some of the GAHP members, in particular donor organisations. The change, at least partially of the focus to reflect this, has been one of the main aspects included in the second phase project, recently approved by the EC.

In this regard, progress to NTAPs and securing national government support has been included in the new project as one of the main role of UNIDO, be the responsible organization in implementing the project. Not only NTAPs should be signed but, and in agreement with the Government concern, provide for a timeline to implement the actions recommended, and formal commitment to resource or fund specific actions.

More analysis and information is likely to be required as to national government and relevant stakeholders' awareness of toxic pollution, their likely or existing interest in (and commitment to) tackling it. More comprehensive country analysis would likely allow for a more informed decision about what might be the impact of toxic pollution remediate in specific countries and the relevant source of such pollution. Involving the GAHP in this process in a more structured manner would also seem to offer a number of advantages, including benefitting from the views of other bilateral and multilateral agencies and donors active in these countries and regions, considering which funding programmes could eventually support.

Regarding extracting the maximum value from this project's implementation experience, it may be worthwhile how the project can increase effectiveness in getting national governments to commit to increased support and action in addressing toxic pollution.

IV. CHALLENGES

With regard to Objectives 1 and 3, few significant challenges were encountered during the project. In some cases, there was difficulty identifying sites of industries that tend to be clandestine (e.g. informal car battery processing in Peru). Another challenge related to data quality assurance and control (QA/ QC) due to the large number of sites now being entered into the online database. This challenge potentially had budgetary implications, ameliorated, at least in part, through the contracting of relatively low cost graduate students, asking more of existing staff, pre-empting regularly occurring problems in primary data collection, and triage. Importantly QA/ QC continues to remain a challenge that will only increase in scope as the database grows, the ISS protocol is modified and the actual conditions of sites change with time.

A second challenge was related to the development of National Toxics Action Plans (NTAPs). NTAPs were initially envisioned as a physical documents outlining domestic pollution issues, local capacity and interests, and existing technologies, among other considerations. The documents would then provide the basis for international funding agencies to better understand areas where their support could be most effective. Absent a concrete incentive, interest in the generation of additional documentation proved to be limited within country governments. Thus NTAPs became more informal in nature and used to describe the work of encouraging governments to target specific thematic or contaminant specific areas. This issue was also identified by external evaluators and is further described below.

V. EVALUATION

Two independent evaluations were conducted; one at midterm by Patterson Consulting (Ottawa, Canada) and a final evaluation carried out by New Frontier Services (Brussels, Belgium). The midterm evaluation is attached as Appendix N. The Final Evaluation is attached as Appendix O. Both Evaluations were favorable.

The Final Evaluation made a number of useful recommendations, which can be easily grouped into the four broad categories: Those related to project formulation; those more operational in nature; those related to improving frameworks and contributing to sustainability; and those related to better leveraging potential. Some of the observations of the evaluators, particularly those related to NTAPs or pilot projects, were apparent during implementation. Others, such as those related to the improved sustainability through better integration with market forces, for instance, provided a useful insight. In nearly all cases recommendations will be addressed in subsequent proposals.

VI. VISIBILITY

All publications and promotional materials intended for international distribution acknowledged the involvement and support from UNIDO and EC. The Final Evaluation found that within two pilot projects (Accra and Sumgayit) visibility could have been improved. In a third project (Morelos) visibility was determined to be satisfactory.

VII. CONCLUSION

The health burden of contaminated land, water and air is significant and under documented. A recent WHO analysis found that as many as 7 million early deaths are attributable to air pollution alone, with the majority occurring in low- and middle-income countries (LMICs). However, remarkably little is known about the extent of soil and water contamination in LMICs, complicating potential interventions. This project and its predecessor (UNIDO Project EE/GLO/08/041) have made significant progress in understanding and reducing the scope of that information gap. More than 2,400 contaminated sites in 49 countries have been visited by trained local staff and government personnel. Environmental samples have been collected, site histories taken, and stakeholders interviewed. This data collection has formed the basis of innovative research to quantify the related health burden and to measure the effectiveness of interventions.

The projects have built substantial and lasting capacity in local governments, universities and NGOs to assess and mitigate the risks posed by pollution. Representatives of key multilaterals, recipient and donor countries, and relevant organizations have worked jointly in the context of the projects to advance the issue. Pilot cleanups have physically reduced exposures to affected populations, while implementation modalities have been refined and local capacity to develop and execute projects improved.

A follow-up project will capitalize on the successes of previous efforts while allowing implementers to apply lessons learned from these projects. Among them, improved pilot project design and NTAP implementation will be the focus. A third project would be implemented with greater efficiency than previous efforts as the key infrastructure and human resources are well in place. Increased interest generated by the project - as exemplified in the SDGs' inclusion of pollution - will lead to more effective and sustainable implementation.

VIII. FINANCIAL REPORT

A Financial Report is attached as Appendix A.