



Toxic Sites Identification Program (TSIP) in the Philippines

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ORGANIZATIONAL BACKGROUND

Pure Earth/ Blacksmith Institute (PE) is an international non-profit organization dedicated to solving pollution problems in low- and middle-income countries. Pure Earth has been implementing the Toxic Sites Identification Program (TSIP), which is an effort to identify and screen contaminated sites in low- and middle-income countries where public health is at risk. TSIP has been supported by The United Nations Industrial Development Organization (UNIDO), European Commission (EC), Asian Development Bank (ADB), World Bank, USAID, and Green Cross Switzerland. The contaminated sites are identified by trained consultants/investigators drawn from universities in respective countries using the Initial Site Screening (ISS) protocol. The ISS helps to understand the risks posed by pollution, types of pollutants, size of the polluted site, population at risk, magnitude of health risk and possible remediation measures.

LIST OF ACRONYMS

ADB	Asian Development Bank
ASGM	Artisanal and Small-scale Gold Mining
BHW	Barangay Health Workers
BNS	Barangay Nutrition Scholars
BLL	Blood Lead Level
BPO	Business Process Outsourcing
CAC	Community Advisory Committee
CDC	Center for Disease Control
CDI	Cities Development initiative
CENRO	City Environment and Natural Resources Office
CHO	City Health Office
CLUP	Comprehensive Land Use Plan
CPDO	City Planning and Development Office
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
DILG	Department of Interior and Local Government
DOH	Department of Health
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology
DTI	Department of Trade and Industry
ECC	Environmental Compliance Certificate
EC	European Union
EMB	Environmental Management Bureau
ESM	Environmentally Sound Management
FASPO	Foreign Assisted and Special Projects Office
GCS	Green Cross Switzerland
GEF	Global Environment Facility
GPS	Global Positioning System
HLURB	Housing and Land Use Regulatory Board
HPAP	Health and Pollution Action Plan
HW	Hazardous Wastes
ISS	Initial Site Screening
IAA	Investigative Assessment Approach
IACEH	Inter-Agency Committee on Environmental Health
JFPR	Japan Fund for Poverty Reduction
LAG	Local Advisory Group
LMIC	Low-to-Middle-Income Countries
LGU	Local Government Unit
MMDA	Metro Manila Development Authority
MMORS	Marilao-Meycauayan-Obando River System
MSME	Micro, Small and Medium-Scale Enterprises
NCR	National Capital Region
NGA	National Government Agency
NGO	Non-Government Organization
NIOSH	US National Institute on Occupational Safety and Health

NLRC	North Luzon Railway Corporation
NOV	Notice of Violation
NPMCC	UP National Poison Management and Control Center
NSWMC	National Solid Waste Management Commission
OSHS	Occupational Safety and Health Standards
PPC	Parish Pastoral Council
PCO	Pollution Control Officer
PDP	Philippine Development Plan
PE	Pure Earth
PGH	Philippine General Hospital
PPE	Personal Protective Equipment
PPSO	Planning and Policy Studies Office
PRI	Perceptual Reasoning Index
RA	Republic Act
RHU	Rural Health Unit
SURGE	Strengthening Urban Resilience and Growth with Equity
THW	Toxic and Hazardous Wastes
TWG	Technical Working Group
TSD	Treater, Storage and Disposal
TSIP	Toxic Sites Identification Program
ULAB	Used Lead Acid Battery
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WB	World Bank
WHO	World Health Organization
XRF	X-ray

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INTRODUCTION

Pure Earth is a New York based not-for-profit organization that partners with governments, non-government organizations (NGOs) and community groups to solve life-threatening pollution problems in low- and middle-income countries (LMICs). Its mission is embodied in the flagship Toxic Sites Identification Program (TSIP).

The program is supported by the United Nations Industrial Development Organization (UNIDO), European Commission (EC), Asian Development Bank (ADB), World Bank (WB), USAID and Green Cross Switzerland (GCS), among others. It aims to assess sites affected by toxic pollution from a point source, in concentrations that can cause adverse human health impacts, where there is a migration route and exposure pathway to communities in LMICs. The program focuses specifically on legacy sites (i.e. abandoned or non-active) and artisanal sites (i.e. small-scale or informal industries).

As part of the TSIP program more than 3,400 sites have been screened in 47 countries. An additional 1,000 sites have been identified for future screening. The actual number of contaminated sites in low- and middle-income countries with a potential human health impact is clearly much greater. Pure Earth utilizes the toxic sites inventory to work with all levels of government to raise awareness on the reality of pollution impacts; build capacities in assessing priorities and developing action plans; and assist in attracting international support and conducting exposure mitigation projects to address the most severe human health risks.

BACKGROUND

In 2017, the Philippines was among the top three growth performers in the Southeast Asia region.¹ It is expected to stay on this expansionary track as the government implements the Philippine Development Plan (PDP) 2017-2022. The country has rich natural resources and developing human capital thus it embarks on more economic opportunities in the agriculture, fisheries and forestry sectors; sets out to expand the industry and services sector through infrastructure development, micro, small and medium-scale enterprises (MSMEs), and science, technology and innovation. This plan, however, also recognizes the environmental concerns besetting the country as it pursues further economic development. For instance, the rapidly growing number of privately-owned vehicles, remains to contribute largely to outdoor air pollution. In water quality, many of the water bodies have been declared unfit for their intended uses. The waste management problem has also persisted despite efforts to exact compliance. The sustainable development outlook is further threatened by climate change and natural disasters.

¹ <http://www.worldbank.org/en/country/philippines/publication/philippines-economic-update-investing-in-the-future>

Despite these challenges, PDP highlights that “individuals and communities will be made more resilient by reducing their exposure to risks, mitigating the impact of risks, and accelerating recovery when the risk materializes”.² Pure Earth’s work in the Philippines is very much aligned with this. Since 2008, it has been doing pollution identification and abatement work through assessments of contaminated sites, exposure mitigation; multi-stakeholder coordination, education, capacitation and mobilization; industrial process reviews, and technical advice on environmentally sound management (ESM) and pollution control best practices and technologies.

The first round of TSIP implementation in the country was in 2009-2011 wherein over 120 sites were identified, 114 of which underwent on-site assessments. Data from these site assessments indicated that artisanal gold mining, mining and ore processing, used lead-acid battery recycling, and other large-scale industries located along river basins are probably the most significant primary environmental hazards in the Philippines. Specifically, mercury and lead are the two pollutants that pose the greatest risk to human health.³ Most of the sites were located in Central Luzon or Region III. This was key in having the first National Summit on Health and Pollution in the Philippines in June 2011 held at the Department of Environment and Natural Resources (DENR). Actionable plans were outlined in relation to battery processing and artisanal gold mining, and a World Bank-funded program to deal with industrial river basins was refined.

In 2014, an ADB technical assistance project funded by the Japan Fund for Poverty Reduction (JFPR) entitled “Mitigation of Hazardous Waste Contamination in Urban Areas: Supporting Inclusive Growth” provided a platform to utilize TSIP data in the regional demonstration between Indonesia and the Philippines of utilizing urban redevelopment in remediating contaminated sites and spurring socio-economic opportunities. A total of 20 sites were assessed and ranked depending on a number of environmental and land use and redevelopment criteria. For the Philippines, this resulted to an urban redevelopment plan for a legacy lead contaminated site in Meycauayan, Bulacan which was identified as a critical area during the first national inventory of contaminated sites.

Lead contamination is recognized as one of the priority issues. The project “Reducing Environmental and Health Risks to Vulnerable Communities from Lead Contamination from Lead in Paint and Recycling of Used Lead Acid Batteries (ULABs)” funded by the Global Environment Facility through the United Nations Development Programme (UNDP) in Indonesia and the Philippines followed through. This entailed a nationwide survey of 282 establishments involved in the collection, storage, recycling, and/or selling of ULABs, 50 of which were prioritized and assessed for lead contamination. As a result, exposure mitigation for a community of 12 families (44 individuals, 15 of whom are children) was accomplished in a lead contaminated site in San Simon, Pampanga in November 2017.

² <http://pdp.neda.gov.ph/wp-content/uploads/2017/01/PDP-2017-2022-07-20-2017.pdf>

³ Global Inventory Project Philippines Report, 2012

In the same year, with the support from the United States Agency for International Development (USAID), Pure Earth piloted the investigative assessment approach (IAA) in assessing Iloilo City and Tagbilaran City in the Visayas Region. This meant soil sampling every 3 meters of randomly selected barangays in these cities. To date, 51 barangays in Iloilo City and 6 barangays in Tagbilaran City have been assessed; yielding over 16,000 data points with readings of over 20 elements in soil, including toxic heavy metals. Aside from this, targeted sampling was conducted in 18 sites in Luzon and Visayas. Initial sharing of TSIP data at the local government level has resulted to interests in the integration of pollution mitigation considerations in land use and development planning in Iloilo City and Tagbilaran City, ESM of a ULAB recycling facility in Bacolod City, and a request for technical assistance in community exposure mitigation at a legacy lead contaminated site in Cebu City.

TOXIC SITES IDENTIFICATION PROGRAM (TSIP) IN THE PHILIPPINES

TSIP METHODOLOGY

1. TSIP Stakeholder Coordination

Integral to Pure Earth's approach is coordination with local stakeholders. At the country level, Pure Earth holds inception meetings and workshops to level off with concerned national and local authorities. The inception workshops for ADB-JFPR, GEF-UNDP and USAID supported projects engaged 98, 26, and 100 (44 in Luzon and 56 in the Visayas) participants respectively.

Pure Earth mainly coordinates with the DENR, particularly the Office of the Secretary (OSEC), Environmental Management Bureau (EMB) and the Foreign Assisted and Special Projects Office (FASPO). The level and nature of coordination varies based on the project requirements.

During the urban redevelopment project implementation, a Country Advisory Committee (CAC) was established consisting of ADB and DENR-EMB and FASPO. There was also an inter-agency Technical Working Group (TWG) headed by DENR-EMB and FASPO, having EMB National Capital Region (NCR), EMB Region III, Department of Health (DOH), Department of Interior and Local Government (DILG), LGUs of Meycauayan and Valenzuela, Metro Manila Development Authority (MMDA), National Solid Waste Management Commission (NSWMC) as regular members and the following as on call members: Department of Agriculture (DA), Department of Science and Technology (DOST), Housing and Land use Regulatory Board (HLURB), civil society and industry representatives as well as experts. For the lead contamination mitigation project, DENR took on the role of project implementation along with a private environmental consultancy firm, Innogy Solutions, Inc. A TWG was created composed of the EMB, FASPO, NSWMC, DOH, Department of Labor and Employment – Occupational Safety and Health Center (DOLE-OSHC),

Department of Trade and industry (DTI), LGUs, Philippine Battery Manufacturers Association, representative from the formal sector, representative from the informal sector, NGO, academe, DENR-Planning and Policy Studies Office (PPSO).

In addition to this, Pure Earth coordinates all project activities, including the initial site screenings (ISS), with the concerned regional government offices and LGUs, industries and communities. For the exposure mitigation project in Barangay San Isidro, San Simon, Pampanga, a Local Advisory Group (LAG) was formed composed of Barangay Chairman, Chairman of the Parish Pastoral Council (PPC), representatives from Barangay Health Workers (BHWs), Barangay Nutrition Scholars (BNS) and Mother Leaders, and the Barangay Peacekeeping Officer. In the same project, the community health assessment entailed coordination with the Jose B. Lingad Memorial Regional Hospital and the Rural Health Unit (RHU).

2. TSIP Awareness Raising and Capacity Building

One of the reasons underlying the proliferation of contaminated sites is lack of awareness and capacity among stakeholders in general. As such, part of Pure Earth's holistic and sustainable approach is conducting awareness raising and capacity building activities (see Table 1) for identified key stakeholder groups such as government or regulators, industry, academe, health service providers, and community. The list of organizations represented during the said activities is found in Annex A.

Table 1 Topics and Reach of TSIP Awareness Raising and Capacity Building Activities

Topic	Target Stakeholders	Participants
Integrating Public Health and Law Enforcement in THW Management	Academe Health offices Law enforcers Private and public hospitals	51
Mitigation of Toxic and Hazardous Waste Contamination through Environmental Management Tools and Land Use Planning and Development	Environmental regulators (NGAs and LGUs)	79
Private Sector Engagement in THW Management	Environmental regulators (NGAs and LGUs) Industry sector Private sector	54
Community Needs, Preferences, and Opinions about Potential Redevelopment Options	Civil society Commercial business owners Community residents Homeowner's associations Hospital administrators Informal settlers Lot owners School principals	61
Alternative Livelihood Options	Informal tanners and waste collectors/pickers	72
Environmentally Sound	Informal sector	32

Management of Used Lead Acid Batteries (ESM of ULABs)	LGUs NGAs	
	ULAB TSD facilities registered with EMB	17
	National and regional environmental regulators	70
Toxic Sites Identification Program (TSIP)	Luzon - Academe Industry LGUs NGAs	34
	Visayas – Academe LGUs NGAs	47
	LGU personnel	31
	LGU personnel	44
	LGU personnel	21

These engagements with the key stakeholder groups significantly contributed to the recommendations under the themes awareness raising and capacity building, enforcement, mitigation and policy, which will be discussed at the end of this report. Generally, for most of the participants particularly at the local government level, these efforts served as an eyeopener on the reality of the issue on toxic pollution. For the environmental regulators, the need for equipment and manpower for monitoring and policy amendment and development were expressed. The formal industry sector could establish associations among themselves that promote environmental compliance as well as emergency response. The informal sector was recognized as one that needs help in terms of forming associations, facilitating registrations, zoning, technology transfer and alternative livelihood options. The academe on the other hand could assist in research and development as well as pilot community projects. The health sector recognized the need for toxicologists in areas where environmental contamination has been posing serious risks to the population. On the part of the communities, ways to protect themselves from exposure were deemed most important. More importantly, these activities are designed to have hands-on training and as such, especially at the local government level, those who have attended these events have been tapped as local investigators in the conduct of site assessments.

3. TSIP Assessments

TSIP implementation in the Philippines employed two (2) approaches: 1) Targeted Site Assessments and 2) Investigative Site Assessments. The summary and comparison of these two approaches are presented in the Table 2 below.

Table 2. Summary and Comparison of Targeted and Investigative Approaches to Site Assessment

TSIP Process	Targeted	Investigative
Site Selection	Pre-identified	Random
Data Gathering	By PE investigators	By PE and local investigators
On-site Assessment	Targeted sampling	Sampling at regular intervals
Database Entry	By PE investigators	By PE and local Investigators
Reporting	Mainly DENR EMB, LGU and Industry	Wider stakeholder group within the LGU
Next steps	Prioritization for potential remedial action	Integration of data generated in local development plans, programs and policies and prioritization for potential remedial action

With regards to the conduct of the actual assessments, the first step is site identification.

3.1 Site Identification. For targeted site assessments, the list of identified polluted sites was typically consulted at least with the concerned regional DENR-EMB offices and LGUs, both at the City or Municipality and Barangay levels, for confirmation, deletion and/or addition of sites depending on their priority sites for ISS. The limitation of the list was often the fact that it mainly covers formal or registered industries; hence, the risks posed by the informal or unregistered industries were underestimated.

For the investigative assessments, cities where USAID has been implementing its Cities Development Initiative (CDI) through the Strengthening Urban Resilience for Growth with Equity (SURGE) project were prioritized. In this framework, TSIP complements the existing technical assistance in these LGUs. Pure Earth generated a random list of barangays to assess by means of soil sampling every three (3) meters. The random list was generated irrespective of whether there is/are known contaminated sites or contamination sources in the area. The list was presented to the Mayor and/or City Environment and Natural Resources Officer (CENRO) and the City Planning and Development Officer (CPDO) and as the project could accommodate, barangays perceived as critical for assessments by the City were then added on the list if these were not part of the original randomized list.

Once the list of sites is cleared, collection of primary and secondary data about the sites follows.

3.2 Collection of primary and secondary data. Local investigators are trained on TSIP and the ISS protocol, grouped and assigned sites for assessment. The entails the following sub-steps.

- 3.2.1 Research about the site. For sites which were already in the TSIP database, site records were retrieved for review and references. For new sites, Google Earth maps were examined to familiarize with the area and its key features. Examples of key features include roads, residential areas, industrial areas, schools, playgrounds, public places like plaza, and water bodies. Also, the appropriate offices to deal with in the conduct of the ISS were identified.
- 3.2.2 Courtesy call with local stakeholders. For targeted assessments, letters informing of the project and requesting for meeting and/or joint on-site assessment were sent to concerned local stakeholders – regional offices of EMB and LGUs.

For investigative assessments, letters informing of the project and requesting for a memo or permit to conduct site assessments in barangays and local staff support as local investigators were sent to the LGUs. In actual meetings, local investigators delivered project presentations, confirmed and gathered information regarding the sites, arranged for schedule of site assessments with focal persons from the concerned offices.

3.2.3 On-site assessment. This involved two essential activities:

- 3.2.3.1 Interview of local stakeholders and request for relevant data. Interviews generally revolved around their awareness of the target site - if it's an industry, what type of industry, how long has it been operating, have there been environmental and health problems brought about by its operations; if there were pollution or contamination concerns, questions were asked on the description of such (i.e. emissions, wastewater discharge), the probable routes of pollution or contamination, the perceived effects on the community (i.e. in terms of environment, health and livelihoods), and the efforts expended to address them.

In instances where the local investigators together with the government representatives were accommodated by the industry inside their premises, interviews were also conducted on basic industry information: history, main line of business, industry processes, and compliance to DENR regulatory requirements including regular monitoring.

The main difference between the interviews done for targeted and investigate assessments is that the former mainly revolved around a point source while the latter took into account the barangay in general.

With regards to relevant documents, LGUs were requested for copies of their Comprehensive Land Use Plans (CLUPs). Barangays on the other hand were requested copies of their respective profiles containing socio-economic and health information among others.

- 3.2.3.2 Initial Site Screening. For targeted assessments, local investigators inspected the sites particularly identifying pollution or contamination source, probable migration route/s and pathway/s to the population. Assessment of presence and levels of heavy metals was done using an X-ray fluorescence (XRF) spectrometer Niton XL3T 600 and Innov X a-2000. In absence of XRF or in case of rainy season, soil samples were gathered, dried and later analyzed using XRF. The number of samples per site varies given the considerations of actual physical characteristics of the area (i.e. size, mostly cemented or not, isolated or far from communities). Water and biota, mostly plants, samples were also gathered wherever necessary - for instance, a community where residents get water from deep wells or where residents maintain small backyard vegetable gardens.

In the case of investigative assessments, the barangay zones were delineated and each group of local investigators simultaneously gathered soil samples every three (3) meters of main thoroughfares, open vacant lots, public places and if allowed by owners, private lands.

All Global Positioning System (GPS) coordinates of the sampling points were recorded and maps were generated.

4. TSIP Data Management

4.1. TSIP Database. Data gathered in the conduct of site assessments are entered into the TSIP database at <http://www.tsipdatabase.org>. This platform takes in a wealth of data from site profiles to the levels of contamination to maps, local contacts and meeting notes, as well as next steps. Put together, the data help significantly in analysing the pollution-pathway-population aspects of the site. Pure Earth headquarters reviews the data entered by the country team or local site investigators for quality control. The site may be marked as waiting for approval, approved, and needs more information. Once the sites are approved, they will be available publicly on <https://www.pollution.org>. Government can then use such data to discuss, decide, develop and implement appropriate action.

4.2 TSIP Reporting. TSIP results should be reported to concerned stakeholders for appropriate action. Government must be informed so scientific data can guide their policy and program decisions. At the end of every project, Pure Earth holds a conference with national government agencies, local government units and other key stakeholders to present the findings and recommendations. For the urban redevelopment project, the report was shared to 22 stakeholders from these offices: DENR FASPO, DENR EMB Hazardous Waste Management Section, EMB NCR, DILG Region III, HLURB Region III, Meycauayan City, Environmental Practitioners Association and Philippine Investment, Inc. For the lead exposure mitigation project, the report was shared to the Municipal Government of San Simon, Pampanga and Barangay San Isidro. The same was reported to 30 Philippine stakeholders from DENR EMB, DENR PPSO, DENR FASPO, EMB NCR, EMB Region III, EMB Region IV-A, DOH, and DTI along with Indonesia and Vietnam representatives in a regional conference. For the investigative assessment initiative, reporting was done for Iloilo City and Tagbilaran City as well as Cebu City given its concern over the former informal ULAB recycling site. Throughout the TSIP implementation, Pure Earth has shared the site-specific TSIP results to LGUs where the assessed sites are located. Aside from these, whenever presented with the opportunity, Pure Earth also shares TSIP information during Inter-Agency Committee on Environment and Health (IACEH) meetings and UNIDO Health and Pollution Action (HPAP) workshops.

A feedback to the industry of concern may be of help in correcting the current portions of operations that are resulting to contamination or in calling for the remediation of an industry's legacy site. In line with this, Pure Earth had expended efforts in collaboration with the DENR EMB and City Government of Meycauayan to communicate with RAMCAR who maintains control over the legacy lead contaminated site in Meycauayan City, Bulacan which was subjected to redevelopment planning. Unfortunately, in this case, the industry is not cooperative. In the same manner, Pure Earth also advised Celica Lead in San Simon, Pampanga but the owner never attended any meeting and the Pollution Control Officer (PCO) and representatives allowed to interact with the project team could not make decisions and/or consider that the recommendations are not affordable. In cases like this, reporting to national and local authorities were deemed best for pursuing intervention. Action plans were accomplished by the end of each project but remains to be finalized, approved and provided or sourced funding appropriations for implementation. The draft action plans are attached as Annex B.

At the grassroots level, the reporting of TSIP results to impacted communities were anchored on raising awareness on the sources, migration routes, pathways and health impacts of contamination and more importantly, how the residents can protect themselves from further exposure.

TSIP IMPLEMENTATION

1. TSIP and Site Redevelopment

A total of 20 sites were assessed, 11 in Bulacan and 9 in Metro Manila. Half or 50% of the sites were related to two industry sectors: treater, storage and disposal (TSD) facilities and lead smelting and ULAB recycling. Almost half (45%) of the sites had an active facility or process but where soil or groundwater pollution exist from years of past industrial activities. Almost all (90%) of the sites were registered industries. The limitation of the agreed list of sites assessed was that it mainly covered registered industries. For instance, sites where informal e-waste recycling, gold smelting, tannery operations, and ULAB recycling were not covered in the assessment. On the other hand, if a site was to be considered for redevelopment, being registered had its advantages. Expectedly, Lead was identified as the key pollutant present in 55% of the sites. All the 20 sites were subjected to a scoring process that took into account environment and public health risks. The top 5 sites were then subjected to a scoring composed of redevelopment criteria. This selection process pointed to the Ramcar Site as the pilot site for urban redevelopment planning that addresses the contamination and at the same time presents inclusive growth opportunities.

The Ramcar Site housed the former ULAB recycling facility owned by the Leelin Battery Corporation. It is located along MacArthur Highway in Barangay Bancal, Meycauayan City, Bulacan, approximately 19 kilometers north of Manila and 22 kilometers south of the provincial capital, Malolos. Meycauayan City is situated near the center of the Marilao-Meycauayan-Obando River System (MMORS) Water Quality Management Area (WQMA). The landlocked city of Meycauayan is comprised of 26 barangays with a total land area of 3,210 hectares. A huge percentage of the city's high-income revenue are from the industries that also serve as one of the major sources of employment for local residents and the population from neighboring towns and cities. There are at least 2,569 registered business establishments in Meycauayan City amounting to an estimated gross income of PhP 85.5 billion in 2015. The cumulative effect of the activities of business establishments has been observed through time in the alarming degradation of the MMORS water quality. The Ramcar Site has long been one of the priority TSIP sites for intervention.

The lead recycling facility operated from 1978 to 2000. It was the site for one of the longest industrial operations in Meycauayan City. The building that housed the recycling operation has been demolished, but no remediation and clean-up was conducted since policy or regulation pertaining to such was inexistent during that time.

Although closed, the facility is still being guarded and is privately owned. The Ramcar Site is composed of 11 different land parcels forming a contiguous irregularly shaped area of almost 4 hectares. It is mostly vacant with concrete fence defining the boundaries of the entire project site. It is situated beside the Philippine National Railways (PNR) former railroad and where a number of informal settlers resided due to the available open space and its proximity to sources of urban employment and services. The site is also prone to flooding with wetlands located at the back of the property. Of particular interest are the tanneries and gold smelting business establishments within the 500-meter radius of the Ramcar Site. Based on the 2015 list of registered businesses in the city, there are 12 registered tanneries and gold smelting establishments in the area. However, the satellite image of the Ramcar Site shows that there are at least 28 tanneries and gold smelting facilities in the site (Figure 1). Many of these facilities are concentrated within 500 meters of the tributaries of the mainstream Meycauayan River.



Site contamination was first recorded in 2008 when Pure Earth, conducted the baseline assessment of surface soil at selected public places in Meycauayan City. Soil lead levels at the back of the legacy site ranged from 1,500 – 200,000 pm which is above the permissible level of lead in soil at 400 ppm. The discovery of the former lead contaminated site led into the project entitled “Remediation of Surrounding Communities near a Former Lead Acid Battery Manufacturing and Used Lead Acid Battery (ULAB) Recycling Plant” of Pure Earth and Ramcar represented by Leelin

Corporation in 2010 with the Environmental Management Bureau Region III as government agency oversight.

Community survey, soil sampling, removal of battery casings from the informal settlers' houses and an IEC workshop with community health workers and stakeholders were accomplished. Remediation of the informal settlers' site was emphasized as an urgent course of action because there were children who were assessed to have blood lead levels (BLL) exceeding the World Health Organization (WHO) set limit of 10 ug/ml. Planned remediation of the informal settlers' site however was not implemented because the funds for this phase was not released. It was also recommended that the site within the facility be remediated and initial discussions regarding the remediation options was done.

Soil sampling in 2010 and 2011 yielded readings of 12.10 to 76, 033.20 ppm of lead. Levels in front of the facility ranged from 400.01 to 1,000 ppm. Exposure of the community members in Daang Bakal was established in 2010 when the Department of Health (DOH) and the University of the Philippines – National Poison and Management Control Center (UP-NPMCC) in partnership with Blacksmith conducted a health assessment study. Blood Lead Levels (BLL) of children living near the former ULAB site were collected and analyzed in April – May 2010. Results showed that out of the 76 children ages 6-7 years old, 12 had BBL of more than 10 ug/dL some as high as 65 ug/dL. The Center for Disease Control (CDC) uses 5 ug/dL as the level of concern for a child's BLL. At 45 ug/dL, the CDC recommends chelation therapy. In the same study, the median IQ scores of children with higher blood lead concentrations (>10 ug/dL) were lower for all 3 domains, especially for perceptual reasoning index (PRI). The PRI measures the child's ability "to examine a problem, draw upon visual-motor and visual-spatial skills, organize thoughts, create solutions and then test them." Similar findings were observed when the reference level was lowered to 5 ug/dL.

In 2014, within the context of the planned North Luzon Railway Project, Ramcar, in coordination with EMB Region III and based on reconfirmed findings of the 2010 project, implemented remediation just outside of the walled property and only for identified contaminated areas which fall within the North Luzon Railway Corporation (NLRC) property. The total area excavated covered 3,800 sq. m. at 0.6 m with an estimated volume of 2,280 m³. The contaminated soil was dumped, secured and covered inside the walled facility of RAMCAR. Clean soil from Newtown, Dulong Bayan, San Jose Del Monte City in Bulacan was used to backfill the site. Post remediation assessment with officers from DENR-EMB Region 3, Leelin Industrial Corporation and Pure Earth was conducted last August 2014. Results revealed that eight out of the 20 sampling points have lead levels above 400 ppm ranging from 412.9 to 2540.56 ppm. In the November 2014 reassessment, still 14 of the 44 sampling points yielded levels above 400 ppm. Figure 2 shows the lead levels on soil surface at the PNR property adjacent to the ULAB that underwent remediation.

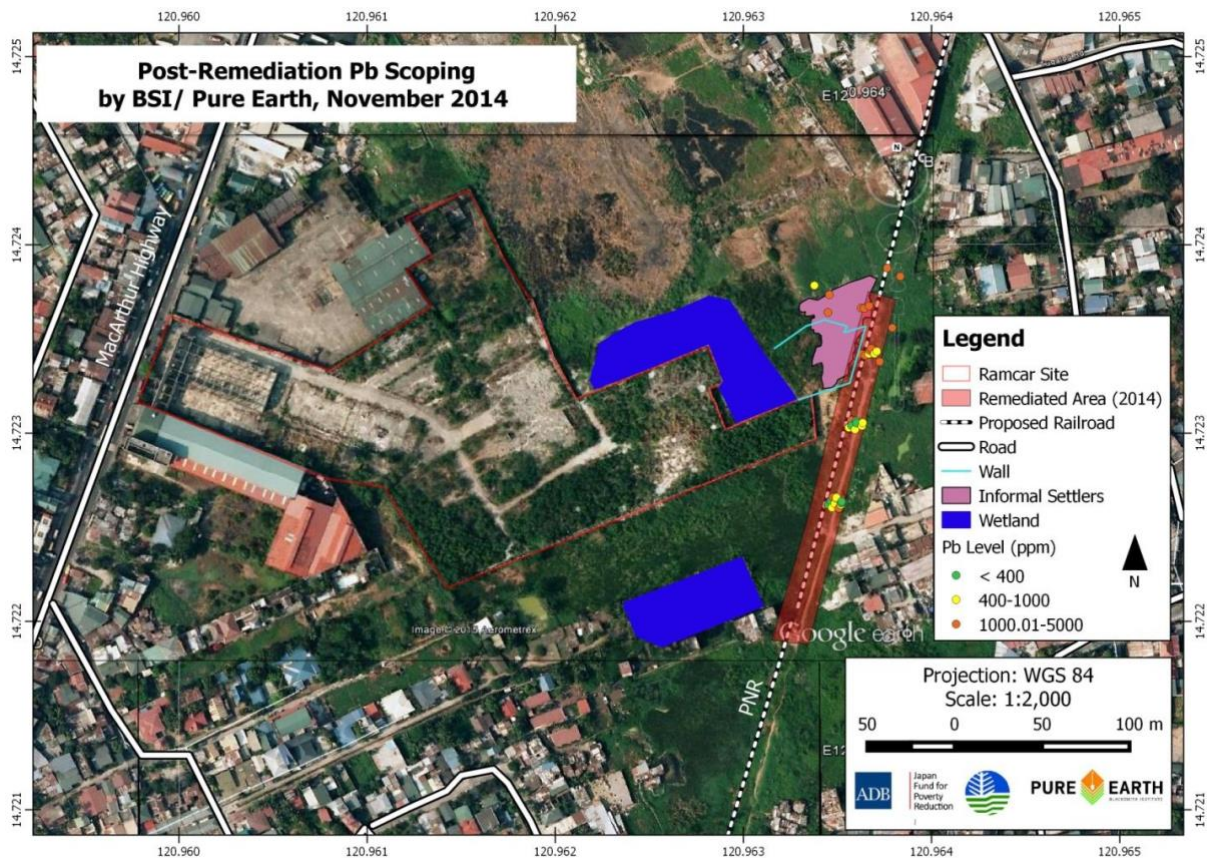


Figure 2. Lead levels on surface soil at the PNR Property in November 2014

Given the available data, Pure Earth identified six (6) remedial alternatives: 1) excavation and off-site disposal in a THW landfill, 2) excavation and off-site stabilization and disposal, 3) excavation and off-site disposal in an entombment structure, 4) On-site entombment, 5) Capping, and 6) combination of off-site entombment and capping.

Based on technical evaluation, the favorable remedial alternatives were ranked as follows: first, excavation and off-site disposal in a THW landfill; and secondly, excavation and off-site stabilization and disposal. These two are ideal however, there costs are too restrictive. The same can be said of the entombment options. Capping is affordable but may pose the greater human and environmental exposure risk. Hence, it is appropriate at this point to recommend the combination alternative. “Hotspots” or areas of high contamination and areas where utilities and foundations will be built will be excavated and contaminated soil will be disposed in an off-site entombment structure. On the other hand, areas with low level contamination can be capped and used as parking or open space and roads. A more comprehensive site assessment, particularly at the site of former operations, is required to put forth a final recommendation for remedial action. However, it is a must that remediation be accomplished before any redevelopment takes place in the site.

Three conceptual designs were created for the redevelopment of the Ramcar Site. These are the development of the 1) Ramcar Site only, 2) South side expansion, and 3) North and South side expansion. A combination of commercial, institutional, residential, and open spaces described the proposed land use development in each of these design concepts. However, the Ramcar Site alone provides very limited access and frontage area. Extending the development to include the open land in the south side will slightly improve accessibility by providing another access point from MacArthur Highway, albeit indirectly as its road is only a barangay road that leads to the highway. Hence, Option 3 was recommended based on expert advice, consultation meetings with key developers in Metro Manila, and impact assessments during community outreach meetings. From 3.36 hectares, the planned development will then be expanded to 13.40 hectares. This will provide more flexibility and a more community-like development that will set it apart from the other developments in the area. Massing diagram of the proposed redevelopment is shown in Figure 3. Businesses, lot owners, and professionals saw the redevelopment plan as an opportunity for Meycauayan City to repackage their identity towards the revival of local/artisanal/traditional manufacturing, such as the leather tannery and jewelry-making industries, as well as the upgrading of the lifestyle of the working class in Meycauayan City by condominium living and provision of Business Process Outsourcing (BPO) jobs.



Figure 3. Massing diagram of the proposed redevelopment for the Ramcar Site

The feasibility study indicated that, accounting for the total cost of clean-up and redevelopment, the project is financially viable for both the residential and commercial development. In an overview, the projected total sales from the residential projects (low rise apartments and single-attached houses) is equivalent to PhP 3.8B, while the total capital expenditure would be around PhP 2.2B with average operating expenses of 16%. In addition to this, the net income after tax is expected to be around PhP 687.3M that is equivalent to 18% of the combined total sales for the residential projects. Moreover, commercial and institutional development could accumulate to a

total revenue of PhP 16.7B over a 25-year period. The Ramcar Site Urban Redevelopment Plan guidance document is attached as Annex C.

This exercise shows how TSIP data could be utilized in identifying potential local multi-stakeholder action. It supports urban redevelopment as one of the strategies to address contaminated sites. It presents possibilities in which remediation of a toxic site can be seen not just as a cost but also as a source of beneficial socio-economic development opportunities, upholding environmental welfare and public health.

2. TSIP and Community Exposure Mitigation

The National Inventory served as a basis in determining the scope of lead pollution and human health exposure risks posed by ULAB activities from collection and storage to recycling/treatment and disposal. A total of 282 sites were surveyed. Of these, 50 sites comprising 20 storage facilities and 30 recyclers/smelters were identified for potential lead contamination based on the following considerations: nature of ULAB activities (battery storage, breaking, draining, reconditioning, and/or lead smelting); operational capacity (quantity of ULABs or lead plates stored and recycled/smelted); and incidents of lead contamination due to ULAB activities (history of lead contamination and incidents of improper handling/disposal of ULABs or its components based on secondary information). Of the 50 sites, Celica Lead was selected as the pilot site for community exposure mitigation.

The Celica Lead Smelting Facility is located in Barangay San Isidro, San Simon, Pampanga. San Simon is a third-class municipality, situated 45 kilometers from Metro Manila and 20 kilometers from Subic Bay Freeport Zone. It has a total land area of over 5700 hectares with over 48000 population spread over the 14 barangays. Steel manufacturing, farming, fishing and poultry and swine as the principal industries. It is being promoted as a dynamic and business-ready destination because of its strategic location within the growth corridor of Central Luzon, good infrastructure particularly accessibility through the North Luzon Expressway (NLEX) and national highways, availability of skilled workforce, about 2000 hectares of commercial and industrial land area and 2500 hectares of agricultural land. Given these, the municipality is rapidly growing, attracting more industries and changing the land use in the area.

The site property is approximately 14,000 square meters of flood-susceptible area, with elevation ranging from 9.9 to 10.15 meters. The property has the following features: lead smelting facility; warehouse containing mixed toxic and hazardous wastes, which used to be an area for smelting too; workers and their families' living quarters around the warehouse; pockets of vegetable gardens; tracts of grassy wetlands and then a dirt road from the entrance gate to the smelting facility. Numerous residences, a medical facility, as well as the barangay hall and health center are located just beyond the facility gate.

Formerly Solid Lead, Inc. (Solid Lead), the facility began operations in the 1990s by smelting lead plates from used lead-acid batteries (ULABs) collected from Tondo,

Manila. The facility operates three to four times a week for eight to twelve hours per day, during which an average of three tons of lead plates are smelted. On 18 August 2011, the Department of Environment and Natural Resources (DENR) conducted a lead smelting raid to inspect recycling facilities violating Republic Act (RA) 6969, otherwise known as the Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990. Citing insufficient pollution control measures, DENR issued a Cease and Desist Order (CDO) to Solid Lead together with three other smelters in Pampanga and Nueva Ecija. However, months after, it renamed as Celica Lead Manufacturing and was able to get a permit from the local government provided it meets the condition set by DENR TO cement its facility. The facility also registered with the Environmental Management Bureau (EMB) of DENR as a hazardous waste (HW) transporter for wastes with inorganic chemicals (D406). However, its registration expired on 04 October 2012 and no document on its registration as a HW generator or treatment, storage and disposal (TSD) facility was found. Likewise, Celica has no Environmental Compliance Certificate (ECC) from DENR.

When Pure Earth revisited the site in early 2017, Lead (Pb) levels within the site are far above the maximum allowable limit for industrial sites of 800 ppm (USPEA) and certainly above the residential limit of 400 ppm. Looking at the facility, lead scrap, battery plates, and slag are burned in kettles and in a furnace to make lead ingots and cylinders to be used for ammunition. The operation is inefficient, lacks proper pollution control, and deficient in worker safety. Used motor oil for fuel is not properly handled and has been spilled on the ground. Lead slag is piled around the building and near the caretaker's house and other residences. Leaded ash from the furnace has been used for patching the roadway that leads to the residential area. Used battery cases are discarded throughout the site and in the residential area – used as a driveway, piled up to construct walls, lining the walkway, as a step into the bathroom, etc. The area where batteries were formerly broken was converted to a warehouse.

During the operation of the facility as lead recycling plant, the warehouse served as sorting area. Leaving the soil contaminated with lead. In 2017, the warehouse was utilized as storage for battery casings, separators and mixed scrap materials. Twenty-seven soil samples were collected inside the warehouse. The XRF reading of Pb in soil range from 452.36 – 10,643.43 ppm. Ten samples were sent to the laboratory for confirmatory tests. Results showed that lead level range from 25-11,300 ppm.

Each housing normally has a bedroom, living room and an extension area (usually an open area that either serves as kitchen or wash area). Galvanized iron sheets from the facility were usually used as roofing and walls in extension areas. Combination of GI sheets and plywood were used as dividing wall materials. Battery casings and bricks were used as flooring in some of the houses. Highest Pb level reading using XRF in different media are listed as follows: base soil inside the house 3,672 ppm, concrete floor 4,030 ppm, bricks used as flooring 300,117 ppm, battery casings used as flooring 252,271 ppm, and linoleum floor covering 2,079 ppm.

Results of the environmental assessment within and outside the smelter compound showed lead levels above the allowable limit in residential soil which is 400 ppm. Figure 4 shows the lead levels within the property using XRF.

Figure 4. Lead levels on surface soil within Celica and Lead property and immediate vicinity



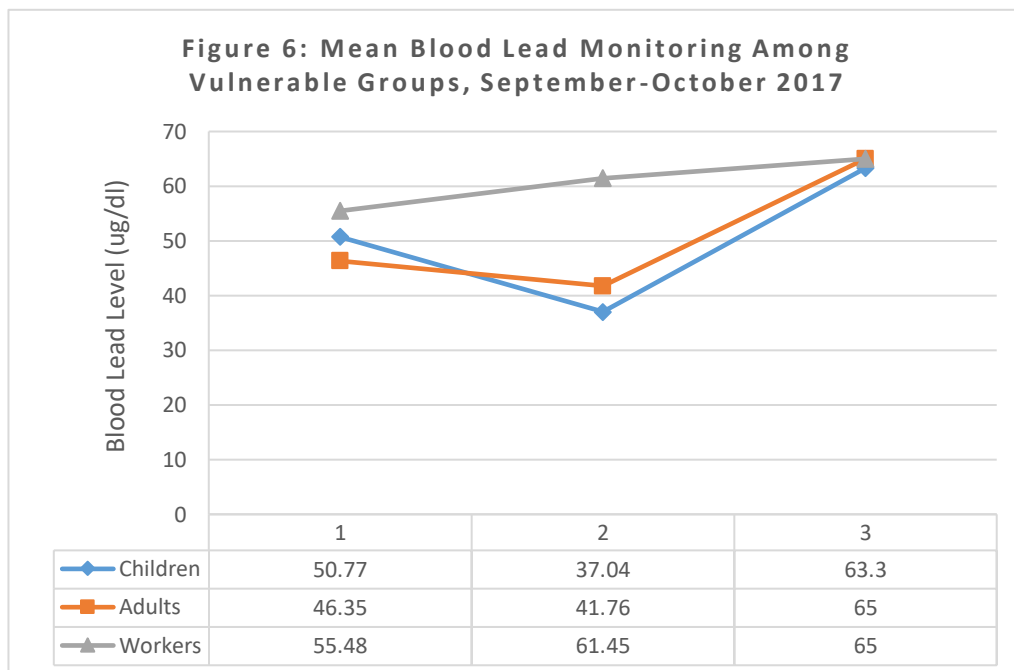
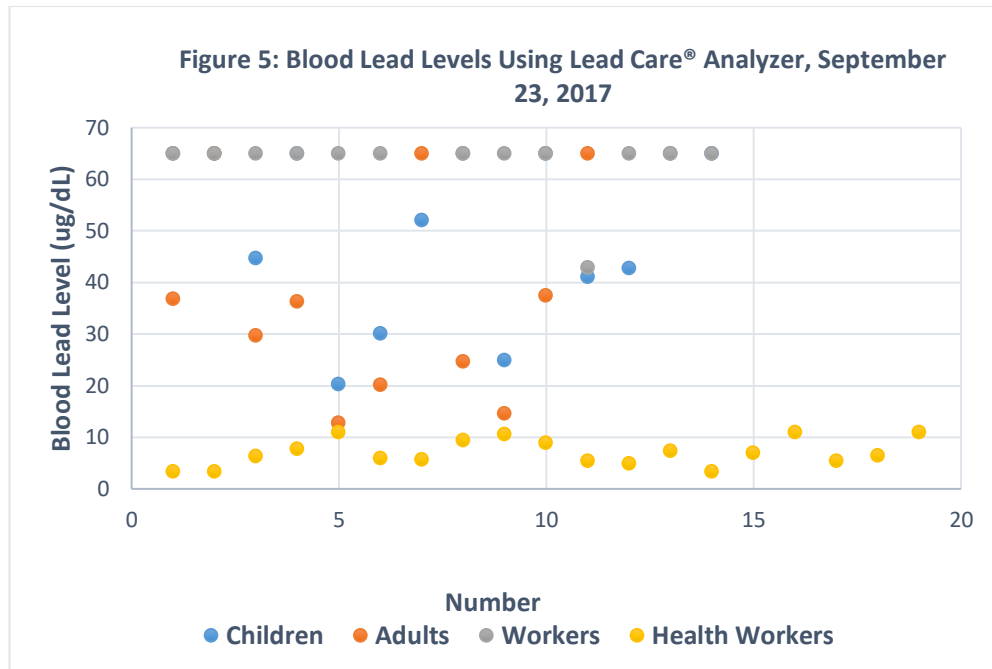
arangay has a total population of 3,551 with 592 households. The highly exposed members of the population are the workers, the twelve (12) families living within the smelter compound, and the approximately 36 households within 200-meter radius of the facility. Awareness raising sessions were conducted for this sector along with the Barangay health Workers (BHWs) of San Isidro. Appropriate protocols were observed in getting the consents of the concerned adults and children to go through Blood Lead Level (BLL) testing.

Screening examination for lead using the Blood LeadCare® Analyzer at the beginning of the exposure mitigation work showed elevated blood levels among workers, adult residents and children with 12 of 13 workers exhibiting lead levels > 65 micrograms/deciliter (ug/dL). The current reference blood lead level set by the U.S. Center for Disease Control and Prevention (CDC) and the U.S National Institute on Occupational Safety and Health (NIOSH) is 5 ug/dL. The health workers showed the lowest levels of lead with an average of 7.03 ug/dL (Figure 5).

The two succeeding blood lead determinations, conducted while the exposure mitigation work was ongoing, revealed consistent elevated levels among the workers.

On the other hand, the adult residents and children showed a drop in the blood lead levels on the second determination. However, a rise in the blood lead levels (BLLs) was observed on the 3rd determination (Figure 6).

Four children who showed persistently elevated BLLs for the 3 determinations underwent confirmatory tests. The results were consistent with the results of the screening tests. The levels were 37.6, 54.1, 66.4, 67.6 ug/dL.



Each test came with an advice on what could be done to mitigate exposure to lead. Mental status examinations showed abnormal results. At least 3 children were advised to undergo free treatment at the Philippine General Hospital (PGH) but parents did not avail of this primarily because it will take them away from work for a week. With due coordination with government and the industry, Pure Earth was given permission to implement a community lead exposure mitigation work for the residential area within the Celica Lead compound. This was implemented from September to November 2017 and consisted of the following:

- I. Clearing and grubbing or the removal of woody/ dense vegetation;
- II. Building a fence with a height of about 6 feet to delineate the residential area from the smelter area, including a gate for access. Although the emissions from the smelters air stacks can still travel over the wall and deposit radially away from the facility, the fence serves as a reminder that beyond the fence there is greater exposure to lead;
- III. Clearing of warehouse. Workers wore appropriate PPEs in hauling the hazardous materials from the warehouse. The hazardous materials were temporarily stored at the facility side. The owner committed to take full responsibility on the final disposal of the wastes as per agreement with DENR EMB Region III;
- IV. Laying of 250 gsm geotextile fabric on top of the contaminated soil to indicate a physical barrier separating the contaminated soil and the clean soil;
- V. Covering with clean soil from at least 15 cm to a maximum of 2 feet of clean soil was placed on top of the geotextile fabric due to the uneven elevation on site. According to references, 30 cm thickness of soil cover is sufficient to prevent direct human contact and exposure in residential areas. The soil was sourced from San Matias and Porac quarry sites in Pampanga. A total of 1620 cu.m. of soil were used to cover the site. Dust suppression has not been an issue due to the wet condition on site;
- VI. House cleaning which involved: removal of battery casings from the residential area, vacuum cleaning using a Shop-Vac hepa filter, transferring furniture, power washing, reading lead levels on plywood walls using XRF, cleaning furniture using three bucket system, replacing GI sheet walls which were reused from the smelting facility and thus have elevated lead levels, covering with clean soil and paving floors which were formerly composed of contaminated battery casings, reused furnace bricks and soil; and
- VII. Covering the driveway with at least 10 cm of gravel; extending at least 5m away from the new gate towards the smelter side.

The XRF reading after cleaning the site showed reduction of lead in soil (Figure 7).



Figure 7. Lead levels on surface soil within Celica Lead property as of July 2018

When UNIDO conducted its site visit in April 2018, the local stakeholders including the industry representative expressed appreciation of the mitigation work. The local government later issued a Notice of Violation (NOV) to Celica Lead citing non-compliance to environmental, engineering, worker and public safety requirements. In July 2018, a meeting with the local government revealed that the updated municipal land use plan would not allow industries such as lead smelting in the site and thus, Celica Lead would have to relocate. It was also relayed that the property was already purchased by the adjacent steel company and would be turned into an ecopark. Due advice was shared to the local government that the facility side of the property is still highly contaminated and must be remediated. They were also offered to undergo a training on benchmarking assessment tools so as to increase capacities in evaluating such types of industrial activities because simply imposing a total ban might just result to a spread of contamination to other areas. Additionally, Celica was advised to relocate to an industrial park and offered technical assistance on facility and process design through a meeting with the Celica Lead site supervisor. They were given until December 1 to vacate the place. Two families have moved back to their home provinces. On Oct 4, 2018, a follow up BLL testing was conducted for 19 individuals, 6 of whom are children. The results still ranged from 17.5 – 62.8 ug/dL. The operation still continues using the open melting pot. It remains to be verified where in Pampanga the facility has started to relocate.

This community exposure mitigation work is a major accomplishment for TSIP work in the Philippines. It successfully demonstrated that exposure mitigation can be done through practical solutions. It also modeled how local workforce can be capacitated to

implement such type of projects. Ultimately, it was able to help protect the community, especially the children from further exposure to lead contamination.

3. TSIP and Approaches to Locally-led Assessments and Action

3.1. Targeted Site Assessment Approach and Local Action. TSIP was launched anew in 2016 with the overall goal of assisting governments and communities heavily impacted by toxic pollution in identified Pure Earth partner countries to take locally-led action to mitigate health exposures by breaking pollution exposure pathways and preventing future toxic emissions. The inception meeting and TSIP training workshop for Luzon was conducted in March 2016 and for Visayas, August 2017. Following the targeted assessment approach, 18 sites were assessed in Albay and Camarines Norte of Region V (Bicol Region), Laguna of Region IV-A (CALABARZON), Pampanga of Region III (Central Luzon), and Quezon City of the National Capital Region (NCR). In the Visayas, 7 sites were assessed in Bacolod City and Sipalay City of Region VI (Western Visayas) and Cebu City of Region VII (Central Visayas). A number of these targeted site assessments were revisiting of sites tagged in the TSIP database. This emphasized the need to revisit contaminated sites, connect with local stakeholders who many have changed over time, and update results as to the status of the site, levels of contaminants, and whether there were changes or action executed to address the sites.

The issues remain to be artisanal and small-scale gold mining (ASGM) in the Bicol area and Sipalay City, lead-related industries and junkshops in the cities of Bacolod, Cebu, Quezon and the provinces of Laguna and Pampanga. This confirms that in the realm of soil pollution, Mercury and Lead remain to be the primary concerns in the country. Two major entities expressed need for technical assistance:

3.1.1. Recycling facility in Bacolod City needing guidance on ESM of ULABs. Oriental Lead is a ULAB recycler is situated in Bgy. Felisa, Bacolod City which is an agro-industrial zone. A retailer shop located in the Poblacion buys, collects and stores ULABs mostly from car battery buy-back and scrap dealers. ULABs are stacked properly according to size in a fenced and roofed property in the Poblacion. This served as the temporary storage and collection site before is it transported to the ULAB recycling plant in Barangay Felisa. At the time of the visit, the investigators were not able to see the vehicle responsible for the transport of collected ULABs from the temporary storage to recycling plant.

According to the owner, they only collect whole batteries. However, upon visiting the ULAB recycling plant, the caretaker shared that some of the batteries transported to the smelting plant were already drained of acid. Although there were no sign of battery breaking in the facility, since

batteries were already drained once brought at the facility, this poses a concern as to where the acids have been disposed and who are the scrap buyers potentially draining and breaking the batteries in the area.

At the time of revisit last February 8, 2018, there is no operation since the furnace is being repaired. Repair started in December 2017 and is expected to be set-up in April or May 2018. The site is free from acid residues unlike the visit in 2010 where pungent smell of acid in the workplace was noticeable. However, lead dusts are still present in the workplace. Workers who are currently on-site are not wearing proper personal protective equipment (PPE) and are exposed to lead dusts while breaking and sorting battery parts (Figure 8). There are only seven workers on site, one of the workers has been employed for 18 years now.



Figure 8. Workers manually breaking and sorting battery parts without PPE

Outside the smelting area, empty canisters of batteries and bricks from the furnace are stacked. Canisters are being sold to plastic recyclers while bricks are distributed to community members. Thus, the caretaker was advised not to donate or give the bricks to community members. Instead, stabilize it within the facility. Below is the map showing lead level XRF readings within the compound and its immediate surroundings. The range of

levels found to be of exceedance, based on the 800-ppm standard for industrial zones, during the recent rapid assessment was from 809 – 174,000 ppm. Figure 9 shows the profile of lead concentrations on site.

Profile of Lead (Pb) concentration at Oriental Recyclers, Brgy. Felisa, Bacolod City (February 8, 2018)



Figure 9. Profile of Lead Concentration at Oriental Recyclers, Bgy. Felisa, Bacolod City on February 8, 2018

The owner expressed willingness to be fully compliant to environmental standards and receive technical assistance. This could be a strategic intervention for the Visayas. The facility is located in an industrial zone and is duly registered as a TSD facility. If this facility will be fully equipped with the right structure, process flow and able personnel, ULABs in the Visayas can be directed to this facility for proper recycling, thus reducing lead contamination.

- 3.1.2. Cebu City Government needing guidance on community exposure mitigation in a former informal ULAB recycling site. In 2010, an informal ULAB recycling site was located in Sitio Tinggaan, Barangay San Nicolas, Cebu City. The name Sitio Tinggaan is actually translated “lead smelting village”. Recycling was done usually by the roadside and outside of homes (Figure 10). Acids were directly dumped into canals and roads. This informal industry has operated for about 30 years, with about 40-60 families doing informal recycling over a half-hectare area. The lead was melted into pellets for buyers and used for galvanized iron sheet fasteners and to seal nail heads when nailing concrete.



Figure 10. Manual battery breaking at Sitio Tinggaan, Bgy. Felisa, Cebu City in 2010

According to the Barangay Health Officer at that time, a health assessment was conducted by the University of the Philippines Manila around 2006 - 2007. Five children of those directly involved in the informal ULAB recycling and who were residing in the area for a long time were selected as respondents. Lead levels in their blood were examined and results showed that all of the respondents had blood lead levels exceeding health standards. The DENR EMB Region VII and the LGU prohibited the continuation of such activity at that time but the community persisted. In 2010, the highest lead level found in soil was over 500,000 ppm.

From the recent 2018 visits, the site was already cordoned off because it was sold off to a new owner. With the aid of the caretaker and the barangay and city guides, the investigators managed to get soil samples from the area particularly near the smelting furnace. Results showed high soil contamination in terms of Lead, Arsenic and Cadmium. For lead, the results were 3,266 and 6,504 ppm. Limited samples were taken due to the weather conditions during sampling but basing on site history, the site could still be possibly be contaminated with heavy metals at levels exceeding the standards. An informal settlers' community is situated adjacent to the back end of the site and an elementary school with hundreds of students is located in front, across the road.

According to the caretaker, the new owner has a plan of redeveloping the site and leasing it out to tenants. This certainly has to be guided by experts in order to prevent exposure of would be construction workers, would be tenants and surrounding community. Another possibly contaminated portion is the adjacent informal settlers' community. The informal settlers had brought in contaminated materials into the community like empty casings and other parts of batteries. The community used them as paving materials on pathways, make shift staircase, stool, and even as plant boxes (Figure 11).



Figure 11. Battery casings used as plant boxes in the community, July 2018

There was also unconfirmed information that the informal recyclers have moved to another town in Cebu and continued the operation. This has to be verified in order to prevent spread of lead contamination.

Cebu City officials have requested technical assistance for the planning of the community exposure mitigation work. They understood the urgency of the matter and were amenable to source funding and facilitate the necessary arrangements for the mitigation project. This will result to the protection of residents in the area. In addition, this will increase the capacity of the City in addressing contaminated sites. The City is also known to be the first LGU in the Philippines to have an ordinance on the management of local toxic and hazardous wastes. The opportunity for enabling other local governments in this otherwise unfamiliar field of addressing toxics through Cebu City's experience is great.

3.2. Investigative Assessment Approach and Local Action. USAID prioritized TSIP complementation in their Cities Development Initiative (CDI) sites. CDI through the Strengthening Urban Resiliency and Growth with Equity (SURGE) project seeks to advance the development of second-tier cities as engines of growth that is inclusive, environmentally sustainable and resilient. TSIP clearly complements this. The CDI sites Iloilo City and Tagbilaran City in the Visayas were the first to welcome TSIP. As such, the investigative assessment approach was piloted in these areas. As earlier mentioned, the investigative assessment approach covers randomly selected barangays within these cities, gathers soil samples every 3 meters whether or not there is a known source or manifestation of contamination, and conducts relevant data gathering through securing barangay profiles and maps and interviewing barangay officials and residents. In both cities, the Mayor, CENRO, CPDO, and USAID SURGE are at the forefront and supportive of the project. The barangays were also supportive and provided guides for the local investigator teams.

There were 23 local investigators trained and engaged in the Iloilo City assessment. The target number of barangays was 67 but this was increased to 70 as per request from the LGU, citing additional 13 barangays of concern. In Tagbilaran City, 16 local investigators were engaged. The original number of target barangays was 6 and this was increased to 15 as the City requested coverage of all their barangays. As of September 2018, 51 barangays of Iloilo City and 6 barangays of Tagbilaran City were assessed yielding 16,242 and 2,991 geo-tagged points respectively. The assessments are ongoing for the remaining barangays in both cities and are expected to be completed by end of November 2018. So far, the leading key pollutants identified are Arsenic and Chromium. While further assessment is required to pinpoint sources, the perceived establishments of concern in these cities are: battery charging, battery retailers, old dumpsites, junkshops, machine shops, repair shops for both cars and electronics, stockyards of old engines, and vulcanizing shops. The summaries and key results of this investigative assessment are discussed in the succeeding parts of this report.

The local government responses upon reporting of initial results are summarized in Table 3.

Table 3. Local Government Responses to Reporting of Initial Investigative TSIP Results

Response Category	Specific Responses of the LGUs
Awareness Raising	<ul style="list-style-type: none">• Identification of key stakeholder groups (i.e. barangays, business establishments, environmental law enforcers, hazardous waste generators, health practitioners, planners, schools) and development of appropriate IEC materials and activities
Capacity Building	<ul style="list-style-type: none">• Attendance to relevant trainings (i.e. National Hazardous

	Waste Management Training, Special Wastes Collection Training) Engagement of barangay personnel in site assessments <ul style="list-style-type: none"> • Capacitation of local laboratories • Conduct of water sampling • Engagement of more barangay personnel in the site assessments
Enforcement	<ul style="list-style-type: none"> • Assessment of critical industries i.e. coal-fired power plant, former landfill, funeral parlors, tin shops and metal works, old ship repair site • Clustering of industries of concerns such as junkshops in one zone • Implementation of City Toxic Waste Management Project i.e. conduct of waste characterization from various establishments by the Land Sector of the Hazardous Waste Management Section of the CENRO
Policy Development	<ul style="list-style-type: none"> • Review and/or development of spatial policies i.e. zoning, setting of buffer zones • Formulation of ordinance on hazardous waste management and • Revision of Environmental Code
Planning	<ul style="list-style-type: none"> • Updating of the City Land Use and Development Plan • Utilization of TSIP data in engineering, environmental protection, IEC, institutional and livelihood interventions or programs
Linkaging	<ul style="list-style-type: none"> • Convene Association of LGU CENROs to share project experiences and learnings • Engagement of the private sector or business associations in mitigating combatting pollution

These initial responses, which are clearly geared towards mitigation, are good indicators of local acceptance, appreciation and ownership of the project. These will pave the way for mainstreaming pollution issues in local development agenda. The City Governments of Iloilo and Tagbilaran now have baseline data of their contaminant levels in soil which could be the basis for enforcement of environmental laws, development of local ordinances, and local development planning. Having local champions is key in raising TSIP from just a conduct of site assessments to an actionable agenda. The engagement of local investigators and looping in of key departments resulted to heightened awareness, increased capacities, and locally-led identification of issues and solutions.

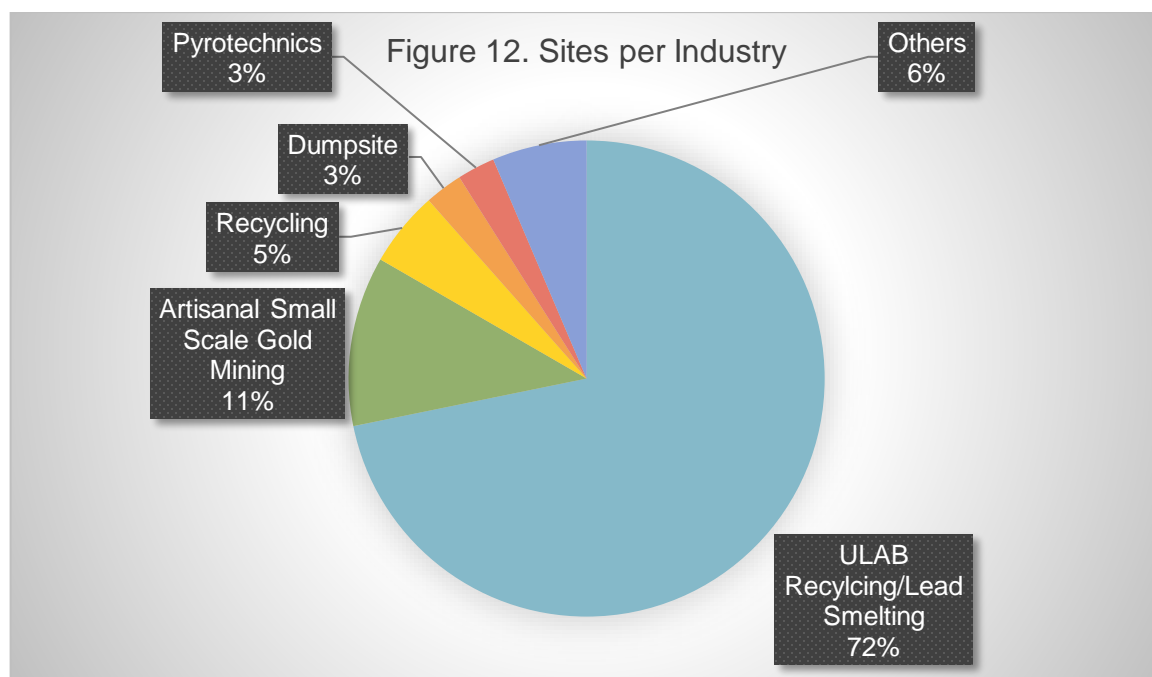
TSIP SUMMARY OF SITES ASSESSED

Since 2014, 143 sites were assessed; 84 sites through targeted assessment approach and 59 barangays through the investigative assessment approach. The list of sites assessed can be found in Annex D. The succeeding summaries are presented by category of assessment approach conducted.

1. Sites Assessed Using Targeted Assessment Approach. Of the 84 sites assessed, six registered no exceedances soil toxicants and will thus be deducted, leaving a total of 78 sites for the data presentation below. Out of the 78 sites, 39 were existing sites in the TSIP database and revisited while the other 39 were considered new sites.

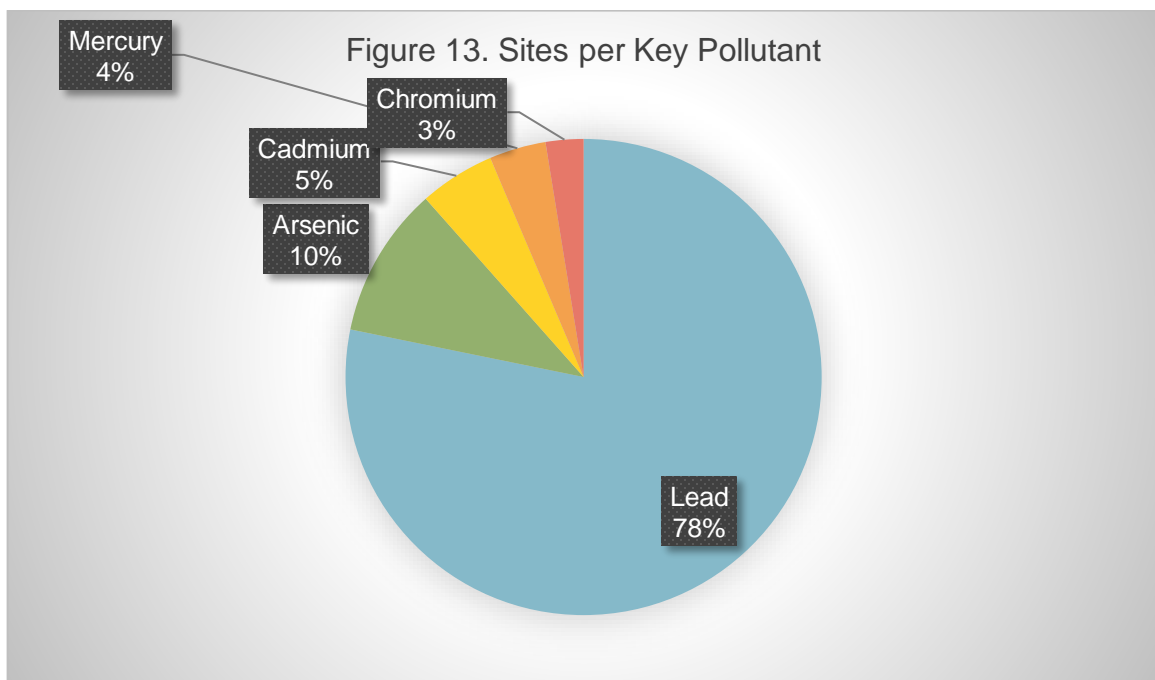
1.1. Sites per Industry

Majority or 72% of the assessed sites, 56 of 78, are traced to industries that have to deal with ULABs recharging, reconditioning, recycling, retailing, storage and transport or lead smelting as shown in Figure 12. This is primarily because this type of industry, formal and informal, is widespread in the country. During the 2009 – 2012 inventory of contaminated sites in the country, it was identified as one of the top industries of concern along with Artisanal Small-scale Gold Mining (ASGM). Significantly, the recent projects have sought to gather more data in understanding the scope of lead contamination in the country due to ULAB recycling in order to identify appropriate interventions towards reduction of environment and health risks posed by exposures to lead.



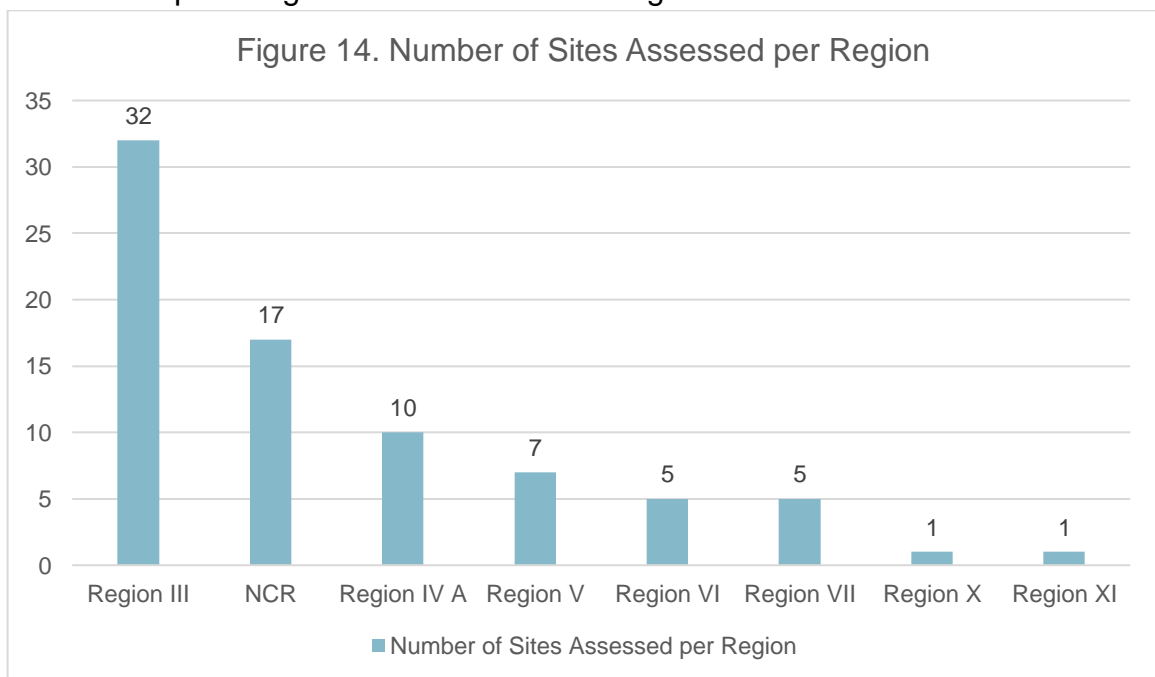
1.2. Sites per Key Pollutant

Lead is the key pollutant cited in 61 of 78 sites (78%). This is reflective of the above summary wherein majority of the sites are traced to ULAB-related industries. Figure 13 shows the number of sites assessed per key pollutant.



1.3. Sites per Region

Figure 14 shows the number of sites assessed per region. Almost half of the sites, 32 of 78 (41%), are situated in Region III. This was followed by 17 sites from the National Capital Region and 10 sites from Region IV-A.



2. Sites Assessed Using Investigative Assessment Approach

As of September 2018, 59 barangays were assessed using the investigative assessment approach. All of these barangays have registered at least one exceedance from key pollutants Arsenic, Cadmium, Chromium and Lead.

2.1. Barangays Assessed per City

The distribution of assessed barangays is shown in Table 4.

Table 4 Number of Barangays Assessed per City as of September 2018

City	Number of Barangays Assessed
Iloilo	51
Tagbilaran	6
Total	59

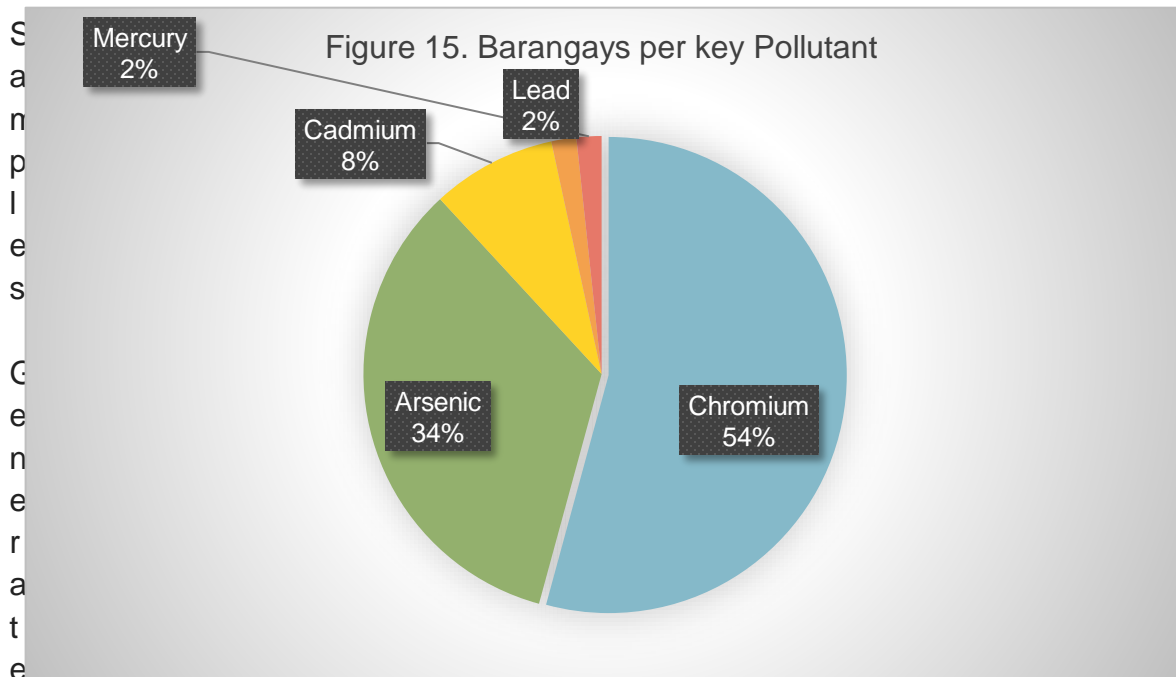
2.2. Barangays per Key Pollutant

The number of barangays per key pollutant is shown in Table 5 and the distribution in terms of percentage is presented in Figure 15. Based on these data, Chromium and Arsenic are the primary key pollutants in these areas.

Table 5. Number of Barangays per key Pollutant

Key Pollutant	Number of Barangays
Arsenic	20
Cadmium	5
Chromium	32
Lead	1
Mercury	1

2.3.



d and Samples Exceeding Standards

The number of geo-tagged samples per city is presented in Table 6. Over 19,000 geo-tagged sampling points in total yielded 8,899 samples, counting composite samples as one. Out of this 8,899 samples, 2,099 were found to be exceeding standards set for key pollutants. In terms of per City results, 25% of Iloilo City's samples and 16% of Tagbilaran City's samples exceeded the standards.

Table 6. Number of Geo-tagged Samples Generated and Samples Exceeding Standards

City	Number of Geo-tagged Sampling Points	Number of Geo-tagged Samples considering Composite Samples	Number of Geo-tagged Samples if Composite Samples are considered as one sample	Number of Samples Exceeding Standards
Iloilo	16,242	11,563	7,572	1,887 (25%)
Tagbilaran	2,991	2,718	1,327	212 (16%)
Total	19,233	14,281	8,899	2,099 (24%)

2.4. Samples in Exceeding Standards per Key Pollutant

The number of samples that exceed the standards set for each key pollutant is presented in Table 7.

Table 7. Number of Samples Exceeding Standards per Key Pollutant

Key Pollutant	Number of Samples Exceeding Standards
Arsenic	368
Cadmium	42
Chromium	1,038
Lead	6
Mercury	7

TSIP SUMMARY OF KEY RESULTS

Pollution Sources. There is an increasing risk of lead contamination if environmentally-sound management practices are not observed throughout the ULAB supply chain. ULAB recharging, reconditioning, recycling, retailing, storage and transport and lead smelting have been identified as key pollution sources accounting for 72% of the sites assessed.

According to the study conducted by Innogy Solutions, Inc., annual collection rate of ULABs by the formal sector is at 70 to 80% while the remaining 20 to 30 % of ULABs generated end up in the thriving informal recycling sector, which continues to be a major source of lead exposure.⁴ However, it must be noted that a considerable number of sites are also traced to formally registered business establishments and industries thus, as urgent as addressing the exposures due to the informal sector is enforcement of environmental compliance in the formal sector. In the 2017 national inventory of establishments and industries handling ULABs and lead, only 50 of the 282 underwent initial inspection. The remaining 232 already spell the potential gravity of lead contamination in the country, not yet taking into account the unknown number of informal sector players.

The accomplishment of a pilot community lead exposure mitigation project in San Simon, Pampanga amidst the country's lack of contaminated sites law is a good start. It shows how taking action against pollution can be done simultaneously with the efforts to identify contaminated sites in order to gather more data and use it to increase awareness and move

⁴ ULAB Supply Chain Report, Reducing Environment and Health Risks to Vulnerable Populations due to Lead Contamination due to ULAB Recycling and Lead in Paint

towards remediation. Another site in Cebu City is set to develop and implement a mitigation project.

For sites that underwent investigative assessment, among the industries perceived to be of concern are battery recharging and retailing, dumpsites, junkshops, machine shops, repair shop for cars and electronics, stockyards of old engines and vulcanizing shops. These are mostly small enterprises characterizing areas that are undergoing urbanization. However, they often lack the knowledge and capacity to adopt environmentally-sound business practices. They are located in mixed-use sites even residential areas, lack the appropriate facility and pollution controls, do not adhere to occupational safety and health standards, and operate in a sub-standard manner.

The local government responses are geared towards mitigation. Thus, on this note, the implementation of TSIP in these areas are proven to be of significance in convincing local stakeholders that toxic pollution is a critical issue that needs to be mainstreamed in their plans, programs and policies.

Key Pollutants. Expectedly, Lead is the key pollutant among targeted sites since majority of the sites are related to ULAB recycling and lead smelting. The highest lead reading in soil using an XRF was over 330,000 ppm, which is way above standard of 800 ppm for industrial areas and 400 ppm for residential areas. On the other hand, Chromium and Arsenic are the key pollutants identified among the investigative assessment sites. The highest reading for Cr and As were 17,655 and 10,855 respectively³ exceeding the 220 ppm and 12 ppm standards for these toxicants. Chromium is a naturally-occurring heavy metal. However, it can also be released to the environment through junkshop, leather tanning and plating industries as well those that use dyes, pigments, and wood preservatives. Arsenic occurs naturally in soil, water, and air plants; and can come from volcanic activities, metal mining and smelting activities. It is applied in the manufacture of insecticides, pesticides and various alloys. It is also used for bronzing and as a wood preservative.

The volume of data gathered on the levels of over 20 elements in soil, almost 9000 samples from the investigative site assessments alone, is a milestone and underscores the importance and practical application of evidence-based decision-making in all levels of governance. The data dictates what pollutants to prioritize in terms of intervention.

The determination of lead contamination in soil was further confirmed by the Blood Lead Level (BLL) testing conducted in the pilot lead exposure mitigation site in San Simon, Pampanga. The procedure and all the preparatory activities helped raise awareness of the 12 families living on site, the local officials and health workers on Lead, its sources, migration routes, pathways to humans; its health effects and how they can protect themselves from further exposure. The kind of awareness and action that TSIP promotes ultimately results to protection of vulnerable populations, especially children, from living in contaminated sites and suffering from its health impacts.

The identification of key pollutants also led the local government of Iloilo City to request for development of IEC materials per target stakeholder, assessment of critical industries, and specific recommendations to mitigate toxic contamination; and to conduct hazardous waste characterization of business establishments, updating of environmental code and land use plan, among others.

Priority Regions. Region III, National Capital Region and Region IV-A are the regions where most of the sites assessed are located. Understandably, these regions form the greater metropolis, are major growth corridors of the country and definitely preferred industry locations. It is thus imperative that these regions be prioritized for strengthening enforcement to increase environmental compliance of formal ULAB industries, identifying informal ULAB recycling activities and mitigating community lead exposures.

The results also show that for Regions V and VI, ASGM characterizes the list of assessed sites. Geographical characterizations such as this provide direction as to the varying issues confronting regions and therefore, varying solutions they may require.

Regarding developing cities like Iloilo and Tagbilaran, the level of contamination is not yet alarming. Nevertheless, it is present all 59 barangays assessed, with 24% of the total samples found to be exceeding the standards and must be taken into consideration in development planning. These cities must be prioritized too in order to apply mitigation efforts early on and prevent life-threatening levels of contamination.

TSIP HEALTH RISKS AND IMPACTS

Exposure Risks Mitigation. TSIP local investigators were required to undergo training prior to deployment not only to obtain site assessment know-how but also to be forewarned on potential exposure risks while on field. Annex C of the Pure Earth TSIP Handbook stipulates Health and Safety Guidelines for Investigators. The document provides an overview of the health and safety guidelines investigators should follow before, during and after the “initial site screening” (ISS) visits. In addition, Appendix D of the same handbook details pollutant information by providing descriptions, common sources, pathways to humans and health effects.

On site, TSIP is most concerned about industry workers and community exposures to toxic contaminants. At the core of the program is the protection of the otherwise exposed population. As Pure Earth endeavors to assess contaminated sites, advice is usually given to industry owners and workers on, at the very least, proper personal protective equipment (PPE). Pure Earth also conducts community awareness raising so they can be taught on ways to protect themselves. For the pilot community exposure mitigation work in San Simon, Pampanga, Pure Earth prepared a Health and Safety Plan (HASP) for the contractor to adhere to. Local residents who got to participate in cleaning their homes also went through a briefing and were provided with appropriate gears. Pure Earth Project Coordinator and staff along with Technical Consultants manned the site daily to ensure that the HASP was being followed.

Documented Health Impacts. Health assessment was conducted for the people living within the compound of Celica Lead. This health assessment showed significant lead exposure among smelter workers and their families as evidenced by elevated blood lead levels, especially among workers and children. The source of toxic exposure is the Celica Lead smelting plant considering that the company has poor, and to some extent, absent pollution control measures. The health status of workers and their families at the time of the health assessment did not show overt signs of lead poisoning. However, some findings of elevated blood pressure, pallor and abnormal mental status examination may be related to lead poisoning.

During the first BLL testing, 12 of 13 workers exhibited lead levels > 65 micrograms/deciliter (ug/dL). The two succeeding blood lead determinations, conducted while the exposure mitigation work was ongoing, revealed consistent elevated levels among the workers. Four children who showed persistently elevated BLLs for the 3 determinations underwent confirmatory tests. The results were consistent with the results of the screening tests. The levels were 37.6, 54.1, 66.4, 67.6 ug/dL. The current reference blood lead level set by the U.S. Center for Disease Control and Prevention (CDC) and the U.S National Institute on Occupational Safety and Health (NIOSH) is 5 ug/dL.

Health Effects of Key Pollutants - Lead. There are major health-related concerns with regards to lead exposure. The intrinsic property of lead is such that it is neither created nor destroyed, thus its tendency to persist in the environment. Inorganic Lead is readily absorbed in the body through inhalational and oral routes. When absorbed, lead is distributed primarily to three compartments: blood, soft tissue (kidney, liver, brain), and mineralizing tissue (bone and teeth). Lead stays in the body for long periods of time with a biologic half-life of approximately 25 days in blood, 40 days in soft tissue, and 10-20 years in cortical bone. Transplacental transfer of lead also occurs from the exposed pregnant woman to the developing fetus in her womb. The long-term health effects of Lead are summarized in Table 8.

Table 8. Summary of the Long-term Effects of Lead

Organ System	Adults	Children
Nervous System	Neuropathy, wrist drop, foot drop; Problems with thinking, organizing actions, coming up with decisions; Abnormal social behavior	
Endocrine System	Thyroid & adrenal gland dysfunction; effect on Vitamin D function	
Cardiovascular System	Hypertension	
Gastrointestinal System	Abdominal colic	Abdominal colic
Hematologic System	Anemia	Anemia
Urinary System	Nephropathy (gouty)	

Reproductive System	Spontaneous abortion, preterm labor, miscarriages; decreased sperm count and motility	
Cancer	Grp B2: Probable human carcinogen (US-EPA)	
Developmental		Developmental delays, decreased IQ impacting school performance, learning disabilities; Low birth weight

Chromium. Chromium is a known human carcinogen and the primary health impacts from it are damage to the gastrointestinal, respiratory, and immunological systems, as well as reproductive and developmental problems in exposed children.

Arsenic. Arsenic in drinking water causes bladder, lung and skin cancer, and may cause kidney and liver cancer. Studies have also found that arsenic harms the central and peripheral nervous systems, as well as heart and blood vessels, and causes serious skin problems. It also may cause birth defects and reproductive problems. Arsenic can be carcinogenic at very low levels and one-tenth of a gram accumulated over a two-month period can be fatal.

Mercury. In general, mercury affects the immune system, alters genetic and enzyme systems, and damages the nervous system, including coordination and the senses of touch, taste, and sight. Exposure to very small amounts of methyl mercury can result in devastating neurological damage or death. Mental retardation, blindness, and cerebral palsy have been observed in children born to women having high levels of methyl mercury exposure. Exposure could have a negative impact on their neurological development resulting in psychological abnormalities like deficits in short-term memory, irritability, and social withdrawal.

TSIP CHALLENGES

Among the key challenges encountered throughout the implementation of the project are categorized as follows:

1. Lack of awareness. There is low level of awareness among stakeholders. Regulators especially at the local level generally lack the technical knowledge on what businesses or industries might pose pollution risks, what pollution controls must be in place, and what to monitor. Their attention is usually on solid waste management and toxic and hazardous wastes and soil pollution are not prioritized. Industries particularly the formal small-to-medium scale and the informal sector are often not aware of pollution control practices and technologies. In most if not all of the sites assessed, lack of PPE

is a common issue. The usual excuses consist of hot weather, lack of resources, local belief that taking a bath after a day's hard labor would result to sickness, wrong ideas of what PPEs should be and generally not being used to wearing such. They are primarily focused on earning profits to keep the business going. At the receiving end of risky exposures, the community members lack knowledge about toxic pollutants, their sources and health impacts.

2. Lack of documented health effects. Lack of awareness is further aggravated by the fact that symptoms of toxic exposures in the environment are not easily identified as such because of semblance with symptoms of other diseases. In addition, health assessments require a number of factors to evaluate like genetic predisposition and lifestyle hence directly linking illnesses to toxic exposure is often difficult. Most local health workers, particularly those in the barangay, are not capable of determining toxicities. Also, illnesses and disabilities due to contamination exposures take a long time to manifest. Most of the time, once they manifest, it is already too late.
3. Limited resources – data, equipment, funds, personnel. Data limitations are encountered in areas where local maps are not yet digitized and establishments, not yet geo-tagged. There are also limitations in accessing environmental monitoring results and industry information because of laws that protect business privacy and trade secrets. Lack of equipment is another challenge. There is no XRF available in the regional offices of DENR EMB and in the local governments. When the XRF of Pure Earth Philippines broke down, it caused significant delay. XRF repair is expensive and also entails sending the equipment overseas. GPS units and cameras were also needed in the conduct of extensive, investigative assessments. Funds may be of concern since approaches vary for each site and on how the local governments would like the program to evolve to be truly beneficial to them. This goes along with personnel challenges in the case of investigative assessments which cover many sites and yield huge volume of samples. Concerning industries, lack of funds is often cited as a hindrance to adoption of technical advice on environmentally-sound management practices and pollution control technologies. Lack of funds also means having one supervisor fulfilling multiple roles of overseeing administration, operation and even sanitation and pollution control.
4. Low level stakeholder cooperation. This may result from the above challenges. Some other factors contributing to low level of cooperation from stakeholders are business interests, competing priorities, corruption, politics and lack of genuine concern for the people impacted by contamination.
5. Time and weather constraints. Because successful TSIP implementation require working closely with local stakeholders, low level of cooperation may result to delays. In the Philippines, rainy season is also a challenge since samples are supposed to be

dry for XRF reading. If not managed properly, project outputs will not be delivered within the approved timeframe.

TSIP GOOD PRACTICES AND KEY LESSONS LEARNED

Despite the challenges, TSIP implementation in the country has resulted to the identification of the following good practices and lessons learned.

1. Evidence-based decision-making. TSIP has contributed significantly to data generation in the field of toxics and soil pollution. The database is a helpful tool that decision-makers can use to identify priority issues and sites. Also, the baseline levels are useful in measuring impact of implemented interventions as well as in developing appropriate and necessary local policies to mitigate impacts of contamination.
2. Local capacitation, champions and coordination. Coordination at various levels of government is difficult but essential to project success. Coordination with national government can help in easing the process of data gathering. For instance, release of official memos can be a push for compliance at the regional and local levels and even the private sector. On the other hand, local government coordination is particularly important because the work happens on the ground where they have immediate jurisdiction. To have at least one local champion is key in the achievement of project goals and objectives. When there is appreciation and ownership of the project, openness to capacitation and co-sharing of resources through joint implementation takes place. This sets the platform for utilization of results in local intervention planning and policy making. This also help ensure project sustainability. This way, project investments are optimized to deliver target outcomes. It is futile to invest in a site that has no local champion committed to identifying and implementing solutions.
3. Messaging per target audience. This is key and has been echoed in the local stakeholder meetings conducted for TSIP. At the community level, miscommunicating data will just cause panic. At the industry level, it may result to non-cooperation. At the government level, it may cause non-cooperation or on the other extreme, hasty, unfounded decisions and actions that will further spread contamination. Appropriate messaging and delivery per audience or stakeholder is instrumental in achieving the desired project outcomes.
4. Pilot projects. Implementing pilot projects is an effective means to raise awareness, build capacities, and ultimately mitigate community exposures to toxic pollution. It demonstrates that solutions to contamination are doable. Success stories of cleaned up contaminated sites may call attention of and spur action in sites plagued by similar issues.

5. Prevention. One major good practice is the conduct of the investigative assessments. As a lesson learned, helping developing cities have baseline data on soil pollution levels is another approach in solving toxic contamination and saving lives by prevention. While soil pollution levels in these areas are not yet alarming, awareness raising and capacitation at this stage is beneficial. Local governments have showed great interest and started implementing mitigation measures in both programs (i.e. hazardous waste characterization in business establishments) and policy (i.e. updating of environmental code and land use plan).

RECOMMENDATIONS

The detailed recommendations are presented in Table 9. The categories outlined in the local government responses to the TSIP investigative assessments are adopted but the recommendations stand for TSIP as a whole considering both targeted and investigative assessment experiences in the Philippines.

Table 9. TSIP Recommendations

Category	Recommendations
Awareness Raising	<ul style="list-style-type: none"> • Identification of key stakeholder groups (i.e. barangays, business establishments, environmental law enforcers, hazardous waste generators, health practitioners, planners, schools) and development of appropriate IEC materials and activities • Conduct of more scientific studies relating toxic exposures to health effects
Capacity Building	<ul style="list-style-type: none"> • Identification of training needs and resource gaps of government particularly environmental regulators and health workers and industry both formal and informal • Development and implementation of appropriate trainings to address the identified needs (i.e. PCO accreditation for CENROs, benchmarking assessment, cost-effective pollution control technologies, MRF equipping for special wastes) and interventions to address the resource gaps • Capacitation of local laboratories to analyze toxicants • Establishment of medical surveillance system for environmental toxicant exposures • Implementation of pilot exposure mitigation projects • Ensuring that the city or region has sufficient waste management capacity like presence of compliant TSDs if the city or region has industries of concern
Enforcement	<ul style="list-style-type: none"> • Institutionalization of the TSIP as a regular program of the government including the use of the database for identifying priority industries, pollutants and regions • Follow-up assessment of critical industries identified in the

	<p>TSIP sites</p> <ul style="list-style-type: none"> • Clustering of SMEs of concern such as junkshops in one zone for ease in monitoring compliance • Strict implementation of Chemical Control Orders released by DENR • Strict implementation of the National Building Code, Environmental Impact Assessment, and other relevant environmental laws to exact remediation from polluters even in the absence of a contaminated sites law • Strengthen the implementation of Occupational Safety and Health Standards by having more reliable joint monitoring teams
Policy Development	<ul style="list-style-type: none"> • Conduct of supply chain studies pertaining to key pollution source industries to identify segments that need immediate action • Review and update of spatial laws as necessary i.e. zoning, setting of buffer zones to integrate pollution mitigation • Review and update of environmental codes to integrate pollution mitigation • Formulation of local ordinances on toxic and hazardous waste management and soil quality standards
Planning	<ul style="list-style-type: none"> • Institutionalization of TSIP as a regular program of the government at the local level, the results of which should feed into the National Health and Pollution Action Plan • Updating of the City Land Use and Development Plan, and Investment Plans to take into account mitigation of pollution risks • Identification of specific applications of TSIP data in engineering, environmental protection, IEC, institutional and livelihood interventions or programs
Linkaging	<ul style="list-style-type: none"> • Convene Association of LGU CENROs and League of Cities and Municipalities to share TSIP project experiences and learnings • Engagement of the academe, civil society, private sector or business associations, and international development organizations in combatting pollution

Recommendations from TSIP implementation in the Philippines are in parallel with the identified strategies of the PDP to attain improved environmental quality. In air quality management, strengthening the enforcement of air quality standards among industry players. In water quality management, strengthening water quality monitoring by maintaining the number of water monitoring stations, establishing, and operationalizing the required number of water quality management areas, and enhancing capacity for laboratory analysis; improving wastewater management by increasing the number of domestic, commercial and industrial wastewater treatment facilities in water districts, local government units (LGUs), and sites maintained by the private sector; identifying pollutants, including persistent organic pollutants and heavy metals in priority water bodies and determine the appropriate management interventions; and formulating guidelines to access the National Water Quality Management Fund and Area Water Quality Management Fund; and developing and

enhancing modeling tools for water quality scenario-building. In land quality management, integrating sustainable land management (SLM) practices into sectoral, national, and local development plans and natural resources management plans; and improving management of solid, toxic and hazardous wastes including electronic wastes.

In the same way, these also support the legislative agenda on the proper disposal of e-wastes, amendment to RA 6969 (Toxic Substances and Hazardous and Nuclear Wastes Control Act) to include emerging toxic and hazardous wastes, and the cross-cutting National Land Use Act and Philippine Environmental Assessment System.

ANNEX A

List of Participants/Participating Organizations during the TSIP Awareness Raising and Capacity Building Activities

Topic	Target Stakeholders
Integrating Public Health and Law Enforcement in THW Management	<ul style="list-style-type: none"> • EMB NCR • DENR-EMB Region 3 • DOH Region 3 • Bulacan Public Health Office • Health Offices of Marilao, Meycauayan, Obando, San Jose Del Monte, Valenzuela City • Bulacan Provincial Disaster Risk Reduction and Management Office • BHW-Marilao, Meycauayan, Obando • PNP Marilao, Meycauayan, Sta. Maria, Valenzuela, Obando, Bulacan Province • Marymount Hospital • Meycauayan Doctors Hospital • Nazarene College Foundation Hospital • Saint Mary's Medical Services Inc. • Sacred Heart Hospital • BMMG Hospital • Brigino General Hospital • San Miguel District Hospital • Baliwag District Hospital • Calumpit District Hospital • Emilio G. Perez District Hospital • Gregorio Del Pilar District Hospital • Sta. Maria District Hospital • Bulacan Medical Center • Bulacan State University Malolos • Mariano Quinto Alarilla Polytechnic College • Pambayang Dalubhasaan ng Marilao • Clark Development Corporation-Estate Preservation and Recovery Department

<p>Mitigation of Toxic and Hazardous Waste Contamination through Environmental Management Tools and Land Use Planning and Development</p>	<ul style="list-style-type: none"> • Environment Office of the Presidential Adviser for Environmental Protection • DILG Region 3 • MMORS-WQMA • DENR EMB Region 3 • HLURB • Bulacan - Provincial Engineering Office, Planning Office, Environment Office, Environment Office, Assessor's Office, Solid Waste Management Office, Health Office • Bulacan Environment and Natural Resources Officers Association, • Barangay Officials of Barangays Tugatog, Caingin, Lingunan • LGU San Jose, Nueva Ecija
<p>Private Sector Engagement in THW Management</p>	<p>DENR-EMB Region 3</p> <ul style="list-style-type: none"> • Valenzuela Health Office • C/MENRO - Marilao, Obando, Sta. Maria, San Jose Del Monte, Caloocan • C/MPDO - Marilao, Obando, Sta. Maria, San Jose Del Monte • Assessor's Office Marilao • BFARMC Ubihan • Cleanway Environmental Management Solutions • CRL Environmental Corporation • DoloMatrix Philippines Inc. • C.B. Manzano Trading • Yoda Metal Craft Trading • Asia United Oil Industry Corp. • Ecology Specialist Inc. • Soliman E.C. • Joechem Environmental Corporation • KRC Environmental Services • Metroclark Waste Management Corporation • Oriental & Motolite Marketing Corporation • Raymund's Gold Smelting • Gulf Oil Petroleum Products • ABS-CBN Bantay Baterya • Gasetron International Marketing
<p>Community Needs, Preferences, and Opinions about Potential Redevelopment Options</p>	<ul style="list-style-type: none"> • Lot owners (Origen and Philippine Investment) south of the planned redevelopment site • School principals • Hospital administrators • Commercial business owners along the MacArthur Highway • Homeowners' associations • Rotary Club • Residents within the vicinity of Ramcar • Informal settlers in Daang Bakal near NRLC property

Alternative Livelihood Options	<ul style="list-style-type: none"> • Informal tanners • Informal waste collectors/pickers
Environmentally Sound Management of Used Lead Acid Batteries (ESM of ULABs)	<ul style="list-style-type: none"> • 5th RA Trading • Celica Lead Manufacturing • Sementro Corporation • Allstar Battery • Power Point Battery Manufacturing Corporation • Vallacar Transit, Inc. • Paranaque City Environment and Natural Resources Officer (CENRO) • Caloocan City Local Government Unit (LGU) • Las Piñas City (CENRO) • Makati LGU • Quezon City LGU • San Fernando, Pampanga (CENRO) • San Juan City (CENRO) • Valenzuela City (Waste Management Division) • Quezon City Environment Multi-Purpose • Cooperative-Linis Ganda • Imarflex Batteries • Oriental & Motolite Marketing Corporation • Occupational Safety and Health Center • Bureau of Customs – Environmental Protection Unit • DENR-Foreign Assisted and Special Projects Service
	<ul style="list-style-type: none"> • Asia Metal Trading Corporation • Cleanaway Philippines, Inc. • DoloMatrix Philippines, Inc. • Evergreen Environmental Resources, Inc. • Far East Fuel Corporation • Green Theme Environment Experts, Inc. • HMR Envirocycle Philippines, Inc. • Maritrans Recycler, Inc. • Mega Manila GNB Motors • New Parbuilt Construction & Services Corporation • Oriental & Motolite Marketing Corporation • RRDS Petrochemical Industries • Servotreat Philippines, Inc. • Southcoast Metal Enterprise, Inc. • Far East Fuel Corporation
	<ul style="list-style-type: none"> • EMB Region 8 • EMB Region 9 • EMB Region 10 • EMB Region 11 • EMB Region 12 • EMB Region 13 • EMB Cordillera Administrative Region • EMB National Capital Region • EMB Negros Island Region

Toxic Sites Identification Program (TSIP)	<ul style="list-style-type: none"> • DENR-EMB Central Office • DENR-EMB NCR • DENR-EMB Region 3 • DENR-EMB CAR • DENR-EMB Region V • USAID • Quezon City • Navotas City in Metro Manila • San Jose Del Monte City in Bulacan • Sta. Maria, Bulacan • Industry • Batangas City • Sta. Rosa, Laguna • Puerto Princesa City in Palawan • Benguet State University • Bulacan State University • Pampanga State Agricultural University
	<ul style="list-style-type: none"> • DENR-EMB Region 6 • DENR-EMB Region 7 • DENR-EMB Region 18 • PEMU Bohol • PEMU Iloilo • West Visayas State University • Central Philippine University • Bohol - Tagbilaran City • Iloilo City (CENRO and CPDO) • Barangays in Iloilo City • USAID SURGE Iloilo City • Cebu City • Sipalay, Negros Occidental
	<ul style="list-style-type: none"> • CENRO Staff Iloilo City
	<ul style="list-style-type: none"> • CENRO Staff Cebu City • Barangay Environment Officers
	<ul style="list-style-type: none"> • Manga • Cabawan • Taloto • Cogon • BACU Tagbilaran City • CENRO Tagbilaran City • CHO Tagbilaran City • CPDO Tagbilaran City • USAID SURGE Tagbilaran cITY

ANNEX B.1

Action Plans Developed on Mitigation of Hazardous Waste Contamination in Urban Areas: Supporting Inclusive Growth

Pilot Site Remediation

Action	Responsible Party	How To	Timeline
1. Identify site as a legacy site for remediation or clean up	EMB Region 3, Meycauayan LGU	Notify owners Sale or redevelopment of site should not be permitted unless assessment and needed remediation are completed; could be sold if developer will take on remediation	September 2016
2. Organize multi-stakeholder group	EMB Region 3	Identify, notify and meet stakeholder group members	October 2016
3. Facilitate site access and conduct assessment *sampling has not been conducted inside the former Leelin/Ramcar operational areas	EMB Region 3, Meycauayan LGU, land owners, assessment team, multi-stakeholder group members can serve as witnesses	Review available site assessment guidelines Conduct training on assessment and community outreach (risk reduction) Prepare assessment/sampling plan and necessary gears and equipment	November 2016 – February 2017
4. Delineate and prioritize areas for remediation	Assessment team in coordination with EMB Region 3, Meycauayan LGU, land owners, multi-stakeholder group	Identify source, pathways and population at risk Rank posed risks and prioritize from high to low risk	March 2017
5. Prepare the remedial action plan	Assessment team to prepare plan to be submitted to EMB Region 3 and presented to Meycauayan LGU, land owners, multi-stakeholder group	Identify remedial alternatives Select best alternative, conduct community outreach Prepare cost estimates Immediately remediate or control high risk area/s	April - May 2017
6. Identify funding for the implementation of the RAP	EMB Region 3, Meycauayan LGU, land owners	Identify funding options – this can include a developer willing to remediate	April - May 2017

		Select best option Prepare implementation timelines Discuss/provide incentives	
7. Approval and implementation of the RAP	EMB Region 3 to approve RAP; responsible party to contract service provider; Meycauayan LGU, assessment team, multi-stakeholder group members to monitor implementation	Prepare and submit work plan Accomplish regulatory requirements Award contracts	June – September 2017
8. Conduct post-assessment monitoring and evaluation	EMB Region 3, Meycauayan LGU, multi-stakeholder group members, third party	Prepare post-assessment plan Conduct post-assessment Submission of post-assessment report	October 2017

Pilot Site Redevelopment

Action	Responsible Party	How To	Timeline
1. Identify the site as a site for redevelopment	Meycauayan LGU	Update CLUP to include or indicate redevelopment sites Update Local Development Plans Referendum Community demand Chief Executive and City Council Approval	September – December 2016
2. Organize multi-stakeholder group	Meycauayan LGU	Identify, notify and meet stakeholder group members	October 2016
3. Identify redevelopment possibilities for the site	Meycauayan LGU, land owners, redevelopment consultants, multi-stakeholder group	Review and improve as needed the redevelopment options and plan of this TA	November 2016 – January 2017
4. Conduct community outreach or consultations to identify preferred option	Meycauayan LGU, land owners, redevelopment consultants, multi-stakeholder group	Present redevelopment options and their pros and cons Target sectors – local community residents, surrounding business establishments, associations (home owners, industry, etc.), civil society	February 2017

5. Identify best redevelopment option and conduct feasibility study	Redevelopment consultants, Meycauayan LGU, land owners, multi-stakeholder group	Identify SWOT Conduct FS	March 2017
6. Submit redevelopment plan		Analyze feasibility study results Finalize redevelopment plan	April 2017
7. Identify funding for the implementation of the redevelopment plan	Meycauayan LGU, land owners, redevelopment consultants, multi-stakeholder group	Identify funding options Select best option Prepare implementation timelines Discuss/provide incentives	April – May 2017
8. Approval, bidding and implementation of the redevelopment plan	Meycauayan LGU, land owners, developer; multi-stakeholder group as monitors	May need to conduct redevelopment roadshow or meet with private developers or call for bids Award contracts Prepare and submit work plan, accomplish regulatory requirements, implement	June 2017 – January 2018

National Level Plan

Action	Responsible Party	How To	Timeline
1. Creation of Environmental Protection Authority	DENR House of Representatives Office of the President Technocrats	Pass enabling law Lobby for SB 1246 – Philippine Environmental Protection Authority Act	3-5 years
1. Increase HazWaste Section personnel	DENR	Review effects of rationalization Define problem scope per region Identify appropriate and necessary number of personnel Maximize MMTs/stakeholder engagement	October 2016 – March 2017
2. Build technical capacity	DENR and potential partners (other government agencies, academe, industry, private sector, development organizations,	Identify strategic regions for further investments in laboratory and equipment Continue technical hands-on and targeted training programs Continuous progression and utilization of the database	October 2016 – March 2017

	etc.)		
<p>3. Develop specific programs, policies and guidelines for mitigation of THW contamination</p> <p>*National Strategy for POPs Contaminated Sites is a major positive policy development</p>	<p>DENR FASPO DENR EMB HazWaste Section, other NGAs, potential partners and/or consultants and multi-stakeholder group</p>	<p>Seek grants for policy development Build on the national strategy for POPs contaminated sites Inter-agency collaboration on requiring clean-up/remediation prior to sale or development of property Establish clean-up standards Develop attractive incentives</p>	<p>April 2017 – March 2019</p>
<p>5. Establish THW mitigation support mechanisms</p>	<p>EMB Regional Offices, HazWaste Section as lead, DOST ITDI, DOH, potential partners and multi-stakeholder group</p>	<p>Encourage industry associations Coordinate/establish THW technology pool Push for incentive program Identify funding/financing options Provide platform for remediation success stories Maximize capacity building to include other stakeholders Establish Toxicology Center in hotspot regions</p>	<p>April 2017 – March 2019</p>
<p>6. Conduct regional THW contaminated sites inventory</p>	<p>EMB Regional Offices, HazWaste Section as lead, LGUs and potential partners</p>	<p>Directive to conduct inventory Review assessment guidelines Prepare equipment, materials, assessment plan and schedule Form and train assessment team Establish database</p>	<p>January – December 2017</p>
<p>7. Identify priority areas for action and plan out control or remediation</p>	<p>EMB Regional Offices, HazWaste Section as lead, LGUs and potential partners</p>	<p>Prioritize sites in terms of risks posed to environment and public health Prepare action plan including funding mechanisms</p>	<p>January – April 2018</p>
<p>8. Conduct pilot site controls or remediation</p>	<p>EMB Regional Offices, HazWaste Section as lead, LGUs, potential partners and multi-stakeholder group</p>	<p>Conduct site control or remediation in priority sites Document and review process Use learnings to improve programs, policies and guidelines</p>	<p>May 2018 – April 2019</p>

9. Institutionalize incentive program for remediation and redevelopment of contaminated sites	House of Representatives, EMB, DILG	Study industry operations and incentive schemes Provide for a more improved incentives' program <ul style="list-style-type: none"> • Tax breaks • Subsidized rent • Access to clean technology at a co-location, industry-friendly area for shared use • Secure loans 	April 2017 – March 2019
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Local Level Plan

Action	Responsible Party	How To	Timeline
1. Increase THW awareness	DILG, EMB, LGUs, possibly partner academe/s	In partnership with academe, development of THW modular course for LGUs Develop THW IEC programs, materials and activities Conduct hands-on trainings	September 2016 – April 2017
2. Require integration of THW mitigation in local plans	DENR, HLURB, DILG, NEDA	Issue directives Conduct capacity building specific to this Integrate in SWMP, CLUP, LDP, LIP	May – October 2017
3. Pass local THW policies	LGU Executives and Legislative Councils; multi-stakeholder groups may be consulted, may lobby for these policies	Review, improve and adopt draft ordinances from this TA Develop and pass local policies to address the specific policy gaps mentioned	May 2017 – April 2018
<ul style="list-style-type: none"> • Local EIA system • Polluters' fees based on envt, health, socio-economic impacts; require clean-up/remediation funds • Land valuation with consideration of posed risks • Management of special wastes (which should be part of the SWMPs) • CLUP/Zoning and actual use consistency; require historical land use data • Course of action for uncooperative industry and/or private land owners of contaminated sites; clear authority of the Mayor to suspend operations or close for violations – this depends on gravity and public clamor • Clean-up responsibility lies primarily on the polluter, protection and incentives for developer to invest in potentially contaminated sites or remediate as needed • Environmental police 			

<ul style="list-style-type: none"> • Local toxics release and toxic sites inventory • Environmentally-related illnesses surveillance • CENRO creation, permanent position 			
4. Build THW management capacity	EMB Regional Offices, LGU Executives and Legislative Councils, potential partners and multi-stakeholder group	Local directive to increase technical personnel Technical trainings – risk assessment, GIS mapping, RQM, health monitoring, remediation, emergency response, land use and redevelopment planning Establish technical support mechanisms	September 2016 – April 2018
5. Update local plans and employ effective data management and utilization	LGUs	Update SWMP, CLUP, LDP, LIP Employ useful planning tools i.e. GIS Establish database and protocols for informed decision-making and program/policy interventions using database	May 2017 – April 2018
6. Work towards convergence	NGAs, LGUs, potential partners and WQMA, multi-stakeholder group	Pass ordinance on Inter-Governmental Council of LGUs for THW management Forge partnerships with academe, business sector, etc. Local directive for inter-office convergence within LGU	May 2017 – April 2018
7. Conduct local THW contaminated sites inventory	EMB Regional Offices, HazWaste Section as lead, LGUs and potential partners	Directive to conduct inventory Review assessment guidelines Prepare equipment, materials, assessment plan and schedule Form and train assessment team Establish database	January – December 2017

8. Identify priority areas for action and plan out control or remediation	EMB Regional Offices, HazWaste Section as lead, LGUs and potential partners	Prioritize sites in terms of risks posed to environment and public health Prepare action plan including funding mechanisms	January – April 2018
9. Conduct pilot site controls or remediation	EMB Regional Offices, HazWaste Section as lead, LGUs, potential partners and multi-stakeholder group	Conduct site control or remediation in priority sites Document and review process Use learnings to improve programs, policies and guidelines	May 2018 – April 2019
10. Implement a program for remediation and redevelopment of contaminated sites	LGU Executives and Legislative Councils	Local directive or legislation Accomplish the toxic sites inventory and the sites for redevelopment Conduct remediation and redevelopment forum Formulate local incentives for those who will engage in remediation and redevelopment	April 2017 – March 2019

Other Stakeholders

Stakeholder	Areas of Engagement	Potential Partners
Academe	RQM participation, IEC development and implementation, Laboratory services, R&D	Meycauayan College, St. Mary's College of Meycauayan, Mariano Quinto Alarilla Polytechnic College, Nazareno College; DepEd
Business sector	Redevelopment planning – inventory, options, financing, incentives	Business establishment owners in Meycauayan
Civil Society	IEC, capacity building, alternative livelihoods, policy advocacy, remediation and redevelopment planning	Religious organizations, Guardians Stop Global Warming Foundation, Inc., Kabalik sa Maunlad na Buhay, Inc.
Community	Participation in IEC, health assessment, remediation and redevelopment MMT	Bancal, Tugatog, Caingin, Viente Reales residents
Industry	Remediation and redevelopment planning , best practices, CSR	Tannery Association of the Philippines, Jewelry Industry Association, Environmental Practitioners Association, Industrial Park organizations

Health Sector	Health surveillance, risk assessment and communication	Meycauayan Doctors, Marymount Hospital, The Lord's Hospital, private hospitals and clinics
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ANNEX B.2

Draft National Action Plan on the ESM of ULABs

Goal: Protect human health and the environment from releases of lead through the ESM of ULABs

Task	Responsible Agency	Measures	Targets		
			3-year	6-year	10-year
Objective 1 - Strengthen Legal/Regulatory Controls to Improve Compliance and Enforcement on ULABs Management					
Facilitate the amendment of RA 6969 or the approval/signing of the proposed Bill on Hazardous and Nuclear Wastes Management	DENR-EMB	Approved and enforced amended law on Hazardous Wastes Management	100%	100%	100%
Amend and implement the CCO on Lead and Lead Compounds to include: <ul style="list-style-type: none">Pre-importation clearance of lead-acid batteries and ULABsExport clearance for lead ingots and lead-acid batteries	DENR-EMB	Percentage of lead-acid battery manufacturers/ importers and ULABs importers reporting volume of imports	50%	75%	100%
		Percentage of exporters of lead-acid batteries and lead ingots reporting volume of exports	50%	75%	100%
Amend DAO 2013-22: Revised Procedures and Standards for the Management of Hazardous Wastes to include: <ul style="list-style-type: none">Separate classification for ULABsInclude a requirement for ULABs TSDs to submit and implement Health and Safety Programs including medical surveillance of employees	DENR-EMB	Access to ULABs Inventory	100%	100%	100%
		Percentage of TSDs for ULABs implementing Health & Safety Programs	100%	100%	100%
Review and amend the implementing guidelines of PD 1586 to ensure ECCs are secured for all HW storage facilities, which include junk shops, MRFs, retailers, and repair shops that store or collect ULABs	DENR-EMB	Percentage of ULABs storage facilities with ECC	33%	67%	100%
Develop and enforce Technical Manual on the ESM for ULABs for EMB ROs to include compliance monitoring	DENR-EMB	Percentage of ULABs Generators validated for compliance	50%	75%	100%
		Percentage of ULABs TSDs validated for compliance	100%	100%	100%

Goal: Protect human health and the environment from releases of lead through the ESM of ULABs

Task	Responsible Agency	Measures	Targets		
			3-year	6-year	10-year
Issue a memorandum circular requiring Hazardous Wastes Generators ID for all public utility vehicles (PUVs) operators when they secure and renew Certificate of Public Convenience (CPC)	LTFRB	Percentage of PUV operators compliant with DAO 2013-22: Revised Procedures and Standards for the Management of Hazardous Wastes	50%	75%	100%
Develop and implement local ordinances requiring retailers, bus companies, junk shops, and MRFs handling ULABs to secure Hazardous Wastes Generators ID and/or TSD Registration before issuance of Business Permit	NSWMC, DILG, DENR-EMB	Percentage of facilities from these sectors compliant with DAO 2013-22: Revised Procedures and Standards for the Management of Hazardous Wastes	30%	75%	100%
Objective 2 - Minimize ULABs Generation by Extending Product Life					
Establish / reorganize Technical Committee to review and amend the product standards for lead-acid batteries to ensure ESM requirements are included such as minimum environmental labelling	DTI- BPS	Percentage of manufacturers/ importers complying with the amended/ revised product standards for ULABs	50%	100%	100%
Develop and implement standards for reconditioned batteries and develop and implement scheme for accreditation of establishments performing lead-acid battery reconditioning	DTI- BPS	Percentage of lead-acid battery reconditioning companies with valid accreditation	50%	100%	100%
Conduct research on alternatives to lead-acid batteries, whose inputs, processes, or products do not pose greater risk than lead considering the overall life cycle of the materials, products, or processes	DOST-ITDI	Environmental Technology Evaluation / Environmental Technology Verification (ETE/ETV) Report on alternatives to lead-acid batteries	-	100%	-

Goal: Protect human health and the environment from releases of lead through the ESM of ULABs

Task	Responsible Agency	Measures	Targets		
			3-year	6-year	10-year
Objective 3 - Establish National Inventory and Database of Lead-Acid Batteries and ULABs					
Conduct inventory of types and average lifespan of lead-acid batteries used in the following: <ul style="list-style-type: none">AutomotivesIT and security batteriesBoatsGolf cartsHeavy equipmentTelecommunications	DOTr (vehicles) DENR-EMB (establishments)	Completion of the inventory	100%	Updating	Updating
Strengthen monitoring of import and export of lead-acid batteries and export of ingots	DOF-BOC DTI - BIS	Percentage of imports and exports documented	100%	100%	100%
Upgrade the existing Hazardous Wastes Database and specify separate entry for ULABs	DENR-EMB	Upgraded database with timely information on ULABs generation	100%	100%	100%
Objective 4 -Transition to Mandatory EPR for ULABs					
Conduct technical and financial study on enforcing mandatory EPR for lead-acid batteries including analysis on individual or collective responsibility	DENR-EMB	Completion of EPR Study	100%	-	-
Develop and enforce the needed regulatory instruments to implement the results of the Feasibility Study	DENR-EMB	Approval and enforcement of the regulatory instrument	-	100%	100%
Operationalize the mandatory EPR underscoring the need to convert the informal sectors as service providers of the EPR system as part of the ULABs Management Plan	Lead-Acid Battery Producers (manufacturers and importers DENR-EMB	Percentage of ULABs collected and recycled in an environmentally sound manner	-	40%	75%

Goal: Protect human health and the environment from releases of lead through the ESM of ULABs

Task	Responsible Agency	Measures	Targets		
			3-year	6-year	10-year
Objective 5 –Establish Health& Safety and Medical Surveillance Programs					
Develop and enforce Occupational Health and Safety Guidelines for those handling ULABs underscoring the need for controls to prevent employees' exposure to lead	DOLE-OSHC	Percentage reduction of workers exposed to lead due to handling ULABs	(baseline setting)	30%	50%
Develop and implement Medical Surveillance Program for workers as well as communities surrounding ULABs recycling facilities	DOH LGU	Percentage of establishments and surrounding communities monitored for lead exposure	30%	100%	100%
Strictly implement requirements of OSHS Rule 1093 on semi-annual lead monitoring for personnel exposed to lead	DOLE	Percentage of lead-acid battery manufacturers and importers and ULABs TSD facilities with semi-annual lead monitoring	50%	75%	100%
Objective 6 –Enhance IEC to Redefine Public Attitudes Towards the ESM of ULABs					
Develop and implement Strategic IEC Plan on ULABs	DENR-EMB	Percentage implementation of the Plan	50%	100%	100%
		Increase in the level of awareness on ULABs and its environmental and health and safety impacts from the sectors not currently regulated by EMB	100%	200%	300%
Build and sustain network of information exchange and communication	DENR-EMB IATAC of RA 6969	Percentage participation* of the IATAC member agencies <i>*Member agencies are implementing their respective IEC campaign on ULABs (e.g. DTI on battery care, DOLE on Workers' Safety, and DOH on Health Impacts)</i>	100%	100%	100%

Goal: Protect human health and the environment from releases of lead through the ESM of ULABs

Task	Responsible Agency	Measures	Targets		
			3-year	6-year	10-year
Objective 7 –Manage Sites Contaminated by ULABs					
Develop and enforce standards and guidelines for lead contaminated sites underscoring clean-up standards, procedure for determining liabilities, among others	DENR-EMB	Approval and implementation of the standards and guidelines	100%	100%	100%
Conduct complete national inventory of sites contaminated by ULABs using the approved standards and guidelines	DENR-EMB	Percentage completion of the national inventory of sites contaminated by lead due to ULABs	100%	Updating	Updating
Implement site control and/or site remediation	Liabe Entity	Number of sites remediated, controlled, or cleaned-up	3	5	10
Objective 8 –Strengthen Environmental Monitoring of Lead from ULABs					
<ul style="list-style-type: none">Enhance capability of laboratories of EMB ROs in analyzing lead in all media (air, soil, sediments, and water)Strengthen network with other agencies, institutions, private sector, etc. for environmental monitoring of lead from ULABs handlers	DENR-EMB	Percentage of EMB ROs with laboratories capable to analyze lead in all media	50%	100%	100%
		Percentage of water bodies and ambient air from ULABs recyclers regularly monitored for Lead	50%	100%	100%
Equip EMB ROs with the tools to conduct in-situ testing of lead (e.g. XRF)	DENR-EMB	Percentage of EMB ROs with XRF	50%	100%	100%

ANNEX C

Ramcar Site Urban Redevelopment Plan



VI. The Ramcar Redevelopment Plan

The Planning Process

The development of Meycauayan, in the context of macro urban planning, has many environmental benefits such as reduced commute time to workplace or commercial areas, low gas emissions, prevention of urban sprawl, improved solid waste management, and flood

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mitigation. In addition to the many environmental benefits, remediating and redeveloping the Ramcar Site could provide significant economic opportunities to local residents and the government in terms of employment, enhanced business potential, and tax revenues. In basic urban redevelopment planning, the primary objective is to establish the most efficient form of land use that offers the best economic returns. This means that the land use and products to be offered must be able to draw business to the area.

In the case of Ramcar, as a contaminated site, the other aspect that must be taken into consideration is remediating the land to the acceptable environmental standard, while also balancing this with the costs to ensure feasibility of the project. The planning activity conducted for the Ramcar redevelopment include a process of data gathering and preliminary planning, community consultations, assessment of specific planning considerations, financial viability validation, and conceptualization of implementation strategies. Figure 29 illustrates the process flow along with the desired outputs in each of the stages.

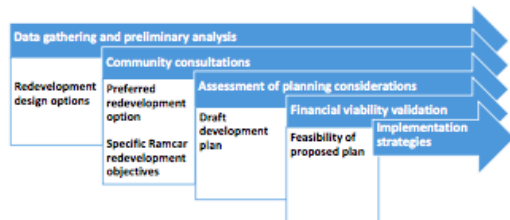


Figure 29. The Ramcar redevelopment planning process

After data gathering and research work, a draft plan detailing a number of proposed design options was made and presented to the community for feedback and comments. The draft plan and gathered market study data were also used as the bases for the feasibility study to validate the assumptions including the remediation methods to be used. This feasibility study is then used to finalize the redevelopment plan and come up with the recommended implementation strategies.

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Redevelopment Design Options

In the beginning of the planning process, three conceptual designs were created for the redevelopment of the Ramcar Site. These are the development of the 1) Ramcar Site only, 2) south side expansion, and 3) north and south side expansion.

A combination of commercial, institutional, residential, and open spaces described the proposed land use development in each of these design concepts. However, the Ramcar Site alone would provide very limited access and frontage area. Extending the development to include the open land in the south side will slightly improve accessibility by providing another access point from MacArthur Highway, albeit indirectly as its road is only a barangay road that leads to the highway. This additional area is not contaminated and can then provide an option to introduce more flexible residential development options.

Alternatively, at the north of Ramcar Site is a 81,757sqm of land that includes open fields, swamp and the Grand Pacific lumberyard. Expanding to the north and south side would give the development a total area of 140,053 sqm or 14 ha. The expansion would not consider acquiring the developed properties along the highway due to their higher value. In addition to the advantages of this option, accessibility would be greatly improved because of the two barangay roads that can be connected to the site. One of the roads can be linked to the communities in the north and east, without having to go through MacArthur Highway. From 3.36 hectares, the planned development will then be expanded to 13.40 hectares. This will provide more flexibility and opportunities, and provide a more community-like development that will set it apart from the other developments in the area.

Table 10. Area of land for each redevelopment option

Distribution of Area	Area (sqm)	%
North	81,757.00	58.38
Ramcar	34,851.00	24.88
South	23,445.00	16.74
TOTAL	140,053.00	100

Figure 30 summarizes the characteristics of each of the proposed redevelopment options providing an overview of the comparative assessment of the design's advantages and disadvantages.

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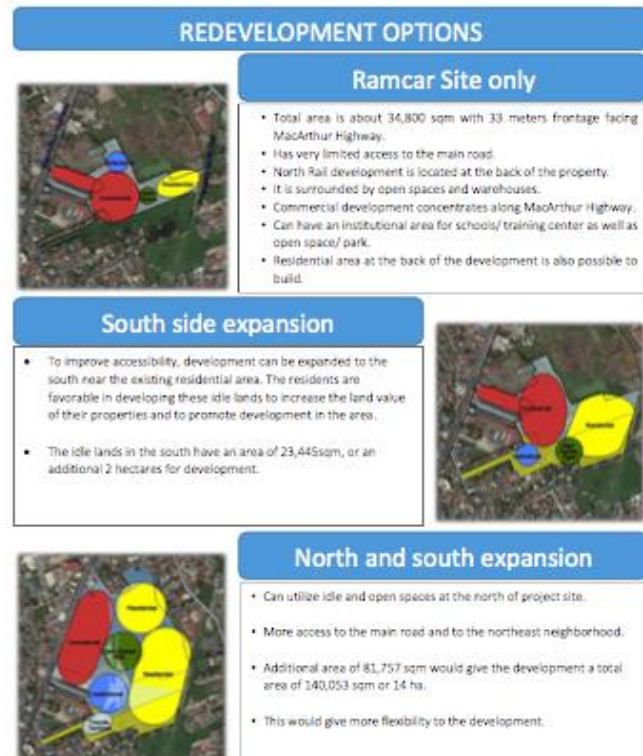


Figure 30. Redevelopment options for the Ramcar Site

Community Consultations and the Preferred Redevelopment Option

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Presentation of the three redevelopment options to the residents and members of the surrounding community is a fundamental next step in the planning process. The objective of the community outreach meetings is to determine and understand the community's needs, preferences, and opinions about the potential redevelopment options in the pilot site.

Two sessions were conducted, one each on March 12 and 13, 2016. These were held in Café Nenzo, Esperanza Mall and Tugatog Elementary School in Meycauayan City, respectively. The target participants for the March 12 session were lot owners of the planned redevelopment site, school principals, hospital administrators, commercial business owners along the MacArthur Highway, while residents in the vicinity of Ramcar and the informal settlers in Daang Bakal (PNR) were invited for the public consultation on March 13. There were about 15 participants on March 12 represented by teachers, doctors, large scale and small scale business owners, lot owners of the land south of Ramcar (Origen property), and investors (Philippine Investment), while there were 46 participants who are residents and informal settlers in Barangays Bancal and Tugatog on March 13.

Major issues that the participants would want the project to consider include right-of-way, limited access road and frontage, flooding, relocation of informal settlers, employment during the construction phase, and the provision of affordable housing. Between the two sessions, it is clear that the preferences and issues raised by the attendees substantially differ (Table 10).

Table 11. Summary of highlights of the consultation meetings

	Session 1 (March 12)	Session 2 (March 13)
Participants	Business owners, lot owners (Phil. Investment and "Origen Property"), health professionals, school teachers	Informal settlers in Daang Bakal (PNR), residents in Tugatog, Barangay Councilor, Barangay Secretary
Suggested redevelopment	BPO with condominium and showroom	Low cost housing with health center and park/playground
Priority issues	Right-of-way, limited access road, frontage, flooding	Employment during the project's construction phase, affordable housing, relocation
Most relevant advantages as perceived by the attendees	<ul style="list-style-type: none"> • There is demand for housing (condominium) from employees in SM Marilao and other businesses in Meycauayan City. • Will facilitate the revival/recreation of the identity of Meycauayan City by showcasing locally made products • Will upgrade the "taste" of Meycauayan City 	<ul style="list-style-type: none"> • Can provide low cost housing for informal settlers • Can provide employment but only during the construction phase

Businesses, lot owners, and professionals saw the redevelopment plan as a potential for Meycauayan City to repackage their identity towards the revival of local/artisanal/traditional manufacturing, such as the leather tannery and jewelry-making industries, as well as the

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opportunities, social and health services, and the inclusion of affordable housing.

The selection assessment is further informed by the SWOT analysis of the North and South Side Expansion determining the specific strengths, weaknesses, opportunities, and threats of the planned redevelopment (Figure 32).



Figure 32. SWOT Analysis of the planned redevelopment concept

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Specific Redevelopment Objectives

Additional information gathered during the community outreach meetings were used to specify the targeted planning objects for the Ramcar redevelopment. The goal of the Ramcar brownfield mixed use redevelopment is to **create a premiere destination in Meycauayan City by showcasing world class standard in planning and development**. In order to achieve this long-term vision for Meycauayan City, the redevelopment design shall address relevant land use and social welfare concerns. These include flooding, road traffic, community and personal well-being, neighborhood development, and economic progress. Thus, the redevelopment design also targets the following objectives:



Figure 33. Ramcar redevelopment planning objectives

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Planning Considerations

Location of Contaminated Areas and Level of Contamination

In planning for the redevelopment of a brownfield site, one of the major considerations is cost implications of the remediation work. The earlier chapter has discussed the different remediation options, and for Ramcar, the selected option is a combination of capping, and excavation and off-site encapsulation. The cost implication of this option is crucial in determining the financial viability of the project. The objective then is finding the right mix and balance of land use development. Cost-efficiency can be achieved by maximizing the use of capping because it is less expensive, and minimizing the use of the more expensive excavation and off-site encapsulation.

The development planning has taken this into consideration. Based on the key informant interview, the team was able to identify the location of the different operation activities of the ULAB facility. This information was translated into a map (Figure 34). From this, the recommended excavation work was estimated (Figure 35 and Table 11).



Figure 34. Activities during the operation of the ULAB facility

As shown in Figure 35, the smelting and baghouse areas need to be excavated by 2.00 meters; the parking area 1.50 meters, and the rest which are mostly parking, offices and utility areas, by 0.50

meter. The volume of contaminated soil to be excavated in these areas were easily derived as listed in Table 11.



Figure 35. Areas to be excavated and depth of excavation

Table 12. Excavation work for the proposed Ramcar redevelopment

Excavation Depth (m)	Area (sqm)	Volume (cu m)
0.50	6,387.00	3,193.00
2.00	623.00	1,246.00

By having this information, the planning and identification of the location of the structures can be planned that will result in the most practical and efficient remediation costs and financial viability without sacrificing the environmental integrity of the project. The strategy that was taken was to use the heavily contaminated soil in the Ramcar Site for road circulation, parking, utilities, and commercial development. Consequently, residential development was not considered in the contaminated site because the cost of remediation would be much higher for such than for commercial use or roads.

The area with required excavation of 1.5 meters would be used as roads and open space. It is expected that there will be excavation work for the foundation of the commercial building; hence, the commercial buildings are located in areas with required excavation depth of 0.50 m, and in some areas 2.0 meters. It is to be noted that the remediation requires the excavated contaminated soil to be hauled offsite and encapsulated. The excavation can be done during the land

development phase of the project as it is part of the construction work and cost. However, the hauling and encapsulation will fall under the remediation cost that can be excluded from the project cost. The capping or installation of a membrane can be done during the road construction. The asphalt or concrete to be used will be the cap of the contaminated areas aside from the membrane.

Linkages and Accessibility

The expansion of the Ramcar Site to the north and south side increased the total land area of development to 13 ha and improved the accessibility to the site from one access point to at least 4 access points (Figure 36). With the increased frontage from 33 meters to 123.2 meters, the main access to the site from MacArthur provides the opportunity to make 2 roads leading into the development. There is another direct access to MacArthur Highway on the north side, and two access points to the residential communities in the north and on the south. It is not possible to create an access to the east because of the planned North Rail project. However, the road on the northeast will link the project to the east. With this number of access points, the traffic to the site would be distributed, and would increase the accessibility of the site from different communities.



Figure 36. The planned redevelopment showing the four access points

Land Use Development

The kind and type of development that is aimed for is the one that has the highest and best use of the entire site. As this project aims for a mixed use development, it is important to locate the different land uses or product types in areas that are best suited not only in terms of health and safety, i.e., risk to exposure to contamination, but also access to surrounding communities as well as value of the land. The previous section has already discussed that the contaminated site is not ideal for residential development and the option available is commercial. Although the current actual land use of the site according to the Meycauayan Assessor's Office is industrial, it is more practical to use it as commercial because the current trend of development in the area is commercial use especially along the MacArthur Highway. Commercial use has higher value than industrial, and it promotes more economic development. Based on the existing Comprehensive Land Use Plan (CLUP) of Meycauayan, the site is also categorized under commercial-residential uses.

The access points also influence the type of land use to be located on site. The main access from the MacArthur Highway can provide the highest visibility from the road and greatest accessibility for many users (Figure 37). This means that it is indeed ideal to have commercial development in that area. Moreover, the exposure to the noise and traffic of being near to the highway has lower impact to consumers than it is to residents.



Figure 37. Land use development in the site and access points



Figure 38. Missing diagram of the planned Ramcar redevelopment (top view)



Figure 39. Missing diagram of the planned Ramcar redevelopment (aerial view from the east)

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Figure 40. Missing diagram of the planned Ramcar redevelopment (view from MacArthur Highway)

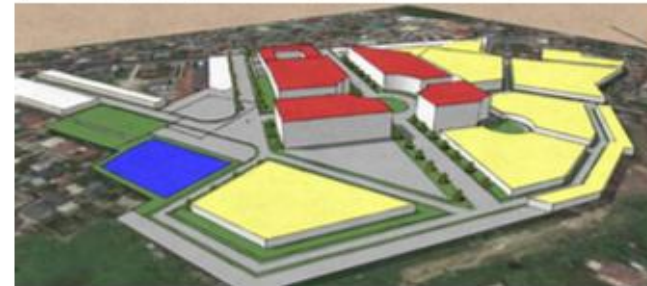


Figure 41. Missing diagram of the planned Ramcar redevelopment (south side view)

Market Requirement

The land uses are indicative of the possible specific development options. Commercial and residential developments can be of different product types. The identification of these product types is based on market scanning, which means finding the suitable product to offer to the communities of Meycauayan. In doing so, the development could have the highest financial gains if the products to be offered suited best the local market. The highest financial return is just one of the objectives of the market scan. The other objective is social inclusiveness that does not always result in highest returns in financial studies. Social inclusiveness in brownfield

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redevelopment is not only providing job opportunities but more importantly prioritizes offering housing options for the poor – specifically the informal settlers who live just outside the fence of the Ramcar Site, and who were exposed to lead from the former ULAS facility. During the community consultations, they expressed their desire of finding permanent and safe housing. For this section, the number of socialized housing units that can be absorbed by the project without significantly compromising the viability of the entire project will be discussed. The process of identifying this started with an inventory of commercial and residential projects in the area. The kind of projects, in terms of value and size, is an indication of the purchasing capacity or willingness to pay for such service or product.

Residential Development

A wide range of residential products was proposed during the initial stage of project planning, including A to BB market, and even condominiums. However, based on the data gathered, residential projects currently available in the market are low-cost housing and condominium projects (Table 13). The unit sizes of which ranges from 40 – 60 sqm and 80 – 100 sqm, while the unit price ranges from P1.0M – P2.5M and P4.0M – P5.0M catering to both the BB and BBB market.

Table 14. Existing residential projects in Meycauayan City

PROJECT NAME / LOCATION	PRODUCT TYPE	UNIT TYPE	LOT AREA (SQM)	FLOOR AREA (SQM)	PRICE PER SQM	UNIT PRICE
Estancia St., Bencal	Apartment	1 bedroom, 1 bathroom	30	30	12,333	370,000
Meycauayan City	Condominium	2 bedrooms, 1 bathroom	50	50	24,000	1,200,000
North Bencal Communities	Condominium	studio unit, 1 bathroom	17	17	34,424	585,000
Americana Residences, Camalig	Condominium	1 bedroom, 1 bathroom	28	28	91,962	2,575,484
Valencia-Meycauayan City	House and Lot	1 bedroom house and lot	48	52	32,302	968,400
Heritage Metrogate	House and Lot	2 bedrooms, 1 bathroom	96	55	34,545	1,900,000
Heritage Metrogate	House and Lot	3 bedrooms, 1 bathroom	96	60	38,333	2,300,000
Heritage Metrogate	House and Lot	3 bedrooms, 1 bathroom	96	55	40,000	2,400,000
Heritage Metrogate	House and Lot	3 bedrooms, 2 bathrooms	96	55	40,562	2,232,000
Villa Dulalia, Bange	House and Lot	2 bedrooms, 2 bathrooms	54	59	41,525	2,450,000
Sta. Nita	House and Lot	4 bedrooms, 3 bathrooms	152	160	42,500	6,800,000
Meycauayan City	House and Lot	2 bedrooms, 2 bathrooms	96	44	45,182	1,988,000
Heritage Homes	House and Lot	2 bedrooms, 1 bathroom	97	37	46,486	1,730,000
Heritage Metrogate	House and Lot	3 bedrooms, 2 bathrooms	120	100	48,000	4,800,000
Heritage Metrogate	House and Lot	3 bedrooms, 2 bathrooms	120	82	48,678	4,008,000
Villa Dulalia, Bange	House and Lot	2 bedrooms, 2 bathrooms	115	87	51,149	4,450,000
Bagbagin	Lifted Row House	1 bedroom, 1 bathroom	40	30	26,767	800,000
Heritage Metrogate	Lifted Row House	1 bedroom, 1 bathroom	40	30	27,000	810,000
Heritage Homes	Row House	1 bedroom, 1 bathroom	48	32	29,750	952,000

Based on the market analysis, it shows that there is an existing market for BB and BBB. However, there is almost none that offers small apartments and most of the housing units are relatively small. Low-rise apartments can be an alternate product for low-cost and low-maintenance

housing units while the single-attached houses can provide an alternate product for growing families who would want a bigger house to improve their quality of living (Table 14).

Table 15. Residential development product offering for the Ramcar Site

Product Type	Details
Low Rise Apartments	These are 4-storey building apartments with an average unit size of 30 sqm. This will cater primarily to young professionals and newly married couples who are looking for a place of their own. The target market is BB. The size of the property is approximately 2.2 hectares. This can accommodate a total of fourteen (14) buildings with a footprint of 800 sqm. Total no. of units is approximately 1,195. Initial average selling price is projected at P65,000/sqm with a unit price of P2,184,000 inclusive of VAT.
Single Attached Houses	These are duplex units with an average size of 100 sqm. This will cater primarily to start-up/growing families and those who would want to upgrade their homes. The target market is BBB. The size of the property is approximately 3.4 hectares. The total no. of units is approximately 294 with an average lot size of 100 sqm. Initial average selling price is projected at P52,200/sqm with a unit price of P5,846,400 inclusive of VAT.
Socialized Housing	50 socialized housing could be developed on site as a housing option for the informal settlers living within the area. The rest of the required socialized housing units would be developed offsite.

In addition to these suitable product types, the project also looks at the possibility for socialized housing. The BP 220 and PD 957 require that an amount equal to a percentage of land development cost of residential projects (5% and 15%) should be allocated for socialized housing. Based on the initial computation, the two (2) residential product types would need to comply and develop approximately 391 – 488 socialized housing units (using the cost method) in applying for a License to Sell. There are several scenarios wherein one can comply with the requirements: 1) Memorandum of Agreement (MOA) with LGU; 2) Memorandum of Agreement (MOA) with 3rd party developer; 3) Thru Donation; or 4) own development.

The usual practice is to have the socialized housing developed offsite because the cost of land is much lower if it is in a more remote or undeveloped location. For this project, 50 socialized housing could be developed on site as a housing option for the informal settlers living within the area. The rest of the required socialized housing units would be developed offsite.

The initial financial computations show that the informal settlers would not be able to afford the housing if the cost of land and its development were included. The cost of acquisition and

Gross Profit	988,443,623	615,142,282	1,611,068,296
Less: Operating Expenses	396,181,926	230,289,148	629,189,824
Selling	69,914,458	30,705,220	100,982,177
Commission	163,133,734	107,468,269	271,870,753
Marketing	46,609,638	15,352,610	62,143,498
Gen. & Admin.	116,524,096	76,763,049	194,193,595
Income from Operation	592,261,696	384,853,134	981,878,471
Less: Income Tax (30%)	177,678,509	115,455,940	294,563,541
Net Income After Tax	414,583,187	269,397,194	687,314,930
GP Rate	42%	40%	41%
OPEX Rate	17%	15%	16%
NIAT %	18%	18%	18%

Table 82. Profit and loss of the proposed commercial and institutional development

PARTICULARS	LIFESTYLE MALL	BPO, IT & GOV'T. OFFICES	TOTAL
Revenues	7,402,245,013	9,252,830,525	16,655,075,538
Basic Rent	5,858,745,013	9,252,830,525	15,111,575,538
% Share in Gross Income	1,543,500,000	-	1,543,500,000
Less: Expenses	2,090,499,770	2,746,934,615	4,837,434,385
Depreciation	1,350,275,268	1,821,651,563	3,171,926,831
Security	-	-	-
Housekeeping	-	-	-
Repairs & Maintenance	-	-	-
Electricity	-	-	-
Water	-	-	-
Aircon	-	-	-
Telecommunication	-	-	-
Dues & Fees	-	-	-
RPT	-	-	-
Insurance	-	-	-
Permits & Licenses	-	-	-
Miscellaneous	-	-	-
Selling & Mktg.	370,112,251	462,641,526	832,753,777
Gen. & Admin.	370,112,251	462,641,526	832,753,777
Net Operating Income	5,311,745,243	6,505,895,910	11,817,641,153

Less: Income Tax (30%)	1,593,523,573	1,951,768,773	3,545,292,346
Net Income After Tax	3,718,221,670	4,554,127,137	8,272,348,807
NOI Rate	72%	70%	71%
NIAT %	50%	49%	50%
Payback Period - Bldg. only	9 yrs.	10 yrs.	10 yrs.
Payback Period - Land + Bldg.	10 yrs.	10 yrs.	10 yrs.

Implementation Strategies

The long-term strategy is to develop a brownfield redevelopment strategy for and by the City of Meycauayan. The strategy should be well-integrated into the local land use, development, and investment plans. One of the primers, Primer 2 – Establishing Success Stories of Community Redevelopment: Redevelopment Approaches for Contaminated Sites, produced under this TA can be used as a guide of the LGU. In addition, the Guidebook on Devising and Implementing an Effective Brownfield Strategy produced by the Federation of Canadian Municipalities provides a more detailed step-by-step guide. The below discussion highlights the key strategies for the identified pilot site:

1. Prepare a site redevelopment strategy with the following parts:

- Introduction** – Defining a brownfield and brownfield redevelopment; providing the description on why the pilot site is identified as a brownfield and a brief on its redevelopment potential
- Goals and Objectives** – State specific, measurable and time-bound goals and objectives for redeveloping the pilot site; this may include the following: reduce environmental and public health risks posed by the brownfield, increase awareness and capacity on how a brownfield can be redeveloped, increase tax assessment and property tax revenues in the area, improve the physical and visual quality of the area, increase business, employment and housing opportunities in the area
- Local Policy Context** – Describe the policy context at the national, regional, provincial and municipal level relevant to redevelopment. At present, this concept of redeveloping brownfields is still new in the Philippines. This means that the strategy that will be developed by the City of Meycauayan and its resulting policies will serve as pioneering efforts in this area.
- Analysis of Relevant, Local Brownfield Data and Information** - This may include the site assessment results and the proposed redevelopment plan accomplished under the TA. Site assessment within the pilot site is necessary to complete the analysis and finalize the redevelopment plan.

E. **Enabling Local Programs** – Give an overview of the programs that will allow the City to pursue redevelopment and attract investors (if such is the approach the City will decide on) to fund and implement the redevelopment. Primarily, this has to do with the incentives program which will be tackled separately as it plays a very significant role in ensuring effectiveness of any brownfield redevelopment strategy.

F. **Program Structure and Monitoring and Evaluation** – This has to clearly identify the concerned offices and their specific roles and responsibilities throughout the redevelopment process. In addition, a M & E framework should be set for this specific brownfield redevelopment.

Most of the abovementioned items were already accomplished under the TA. The next step is for the City of Meycauayan to officially improve, finalize and adopt the redevelopment strategy for the pilot site.

2. **Institute an incentives program.** The success of redevelopment programs has been greatly fueled by an effective incentives program. Incentives can come in financial and non-financial forms distributed across the process of brownfield assessment, remediation, redevelopment and post-redevelopment.

Financial incentives may include a grant for the site assessment, exemptions or reductions in permitting and tipping fees, tax breaks, and tax increment financing. Non-financial incentives on the other hand are streamlined regulatory process in terms of requirements, offices to transact with and timely turn-around of paper works; provision of a one-stop-shop for transactions; and increased development allowances (i.e. density, height of development) with due community consultation to minimize encumbrances. A table below adapted from a graph prepared by Dave Harper of the Kilmer Brownfield Equity Fund L.P. is shown below as guide on timing the said incentives.

Table 23. Types of Incentives throughout the Remediation-Redevelopment Process

Preliminary Studies	Remediation	Redevelopment	Post-Redevelopment
Environmental Study Grant or Baseline Assessment Grant			
Streamlined approval process			
Exemption or Reduction of permitting fees			
	Exemption or Reduction in soil management/tipping fees		

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	Remediation/redevelopment grants/loans or counterpart financing	
	Tax breaks	
		Increased development allowances
		Tax Increment Financing

A significant part of optimizing the incentives program is to pursue government programs that provide incentives for investments such as PPP, PEZA and TEZ provisions. Below is a table on major relevant existing laws and incentive possibilities under these laws.

Table 24. Existing Philippine Laws with Provisions for Incentives

Law	Priorities/Eligible Projects	Incentives
Omnibus Investment Code of 1987 or EO 226	<ul style="list-style-type: none"> Creative Industries/Knowledge-based Industries Infrastructure Green Projects Strategic Projects 	<ul style="list-style-type: none"> Tax holidays Additional deductions from taxable income (labor expense and infrastructure)
Special Economic Zone Act of 1995 or RA 7916	<ul style="list-style-type: none"> Ecozone development/operation Facilities providers 	<ul style="list-style-type: none"> All incentives under EO 226 for Income Tax Holidays Preferential final tax of 5% of gross income Tax and duty-free importation Tax credits 50% of the cost of training for managerial posts can be deducted from the 3% national

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		government's share of the final tax
Tourism Act of 2009 or RA 9593	<ul style="list-style-type: none"> Tourism Enterprise Zones which could either be Greenfield Tourism Zones or Brownfield Tourism Zones 	<ul style="list-style-type: none"> Income tax holidays Preferential final tax of 5% of gross income Tax and duty-free importation Social responsibility incentive

3. **Acquire the brownfield or take the lead in brownfield redevelopment.** In other countries, acquisition of the brownfield by the local government help fast-track the redevelopment. In this case, it will allow the City of Meycauayan to have a direct authority over the property and to spend resources for its redevelopment. Typically, the local government does this by foreclosure, eminent domain, expropriation or voluntary purchase. The City Government of Meycauayan can then decide how to proceed – whether the City will make it a City-led redevelopment or sell it right away for the private developer to take charge of the entire process from remediation to redevelopment. This may also be a requirement of some private investors who would like to enter into public-private partnerships. The public entity usually sponsors the project and provides some initial funding (often for environmental assessments and infrastructure), and the private sector funds and manages the pre-development and construction phases.
4. **Implement redevelopment in phases.** To optimize resources, phased redevelopment is often the preferred approach. The commercial/institutional mix, which will be on approximately 2.8 has, can be implemented first. The residential development, which comprises 5.6 has approximately, can follow in phases wherein as units get sold, more units will be built. This lowers the initial capital outlay and allows initial income to fund the succeeding redevelopment phases.
5. **Keep the community residents and other key stakeholders engaged.** Community outreaches should be done to further raise awareness on this brownfield, the risks associated with it, the appropriate remediation, and the proposed redevelopment. Community buy-in is very important. They are the beneficiaries and would-be immediate clients of the project. They can also help strengthen the demand for remediation and redevelopment of the site. Other stakeholders (e.g. developers, landowners, real estate professionals) should also be consulted for better understanding of this specific brownfield redevelopment's opportunities and barriers, and to obtain early buy-in from these groups. It may also help to convene neighboring cities and municipalities to work toward a harmonized brownfield redevelopment or regional

revitalization or renewal program. This will help pool champions and resources into the program and help ensure sustainability.

VII. Financing Options

This section presents two sets of financing options, one pertaining to remediation and two, pertaining to the redevelopment. It is understood that the financing options for redevelopment covers the remediation cost as well, presenting the two as one package for a potential project. For remediation, probable funding sources for the remediation of the pilot site are as follows:

1. **Waste generator funding.** In this case, Leelin/Ramcar will shoulder the remediation. Leelin/Ramcar may cite that guidelines and laws pertaining to THW waste generation, storage, treatment and disposal came after they have ended the Meycauayan operations and hence, do not hold them accountable. However, despite non-operation, the legacy contaminated site they have left unremediated poses environmental and human health risks. The DENR EMB R3 and the LGU of Meycauayan, in accordance with their mandate to uphold environmental laws and constituency well-being, can thus require Leelin/Ramcar to remediate. This was initially done in 2014 when DENR EMB R3 required Leelin/Ramcar to clean up the contaminated areas which form part of the North Luzon Railway Corporation (NLRC) property.
2. **Private land owners' funding.** As per current records, the pilot site is divided into 11 parcels named under 7 different land owners. If these private land owners have intentions to either develop or sell the land, remediation should be addressed first. The National Building Code requires remediation to be incorporated in the building or development design when the lot has contamination issues. On the other hand, the development project may be classified as environmentally critical given that the site is a legacy Pb-contaminated site and remediation itself is a project categorized environmental enhancement or direct mitigation hence required to go through the Philippine Environmental Impact Statement (EIS) System. There are no current guidelines or laws espousing nor organized official records containing historical land use description of titled properties to inform the due diligence transactions of would-be buyers. However, since the status of the site is disclosed to DENR EMB R3 and the LGU, the same should coordinate with the Land Registration Authority (LRA) to impose such guidelines for the protection of would-be buyers. Depending on agreed arrangements, either the private land owners, the buyer or both may shoulder the remediation cost.
3. **Developer or private sector funding.** An interested developer may enter into negotiations with the private land owners for the acquisition of the site. Any planned development on the site will then go through the EIS and hence require

remediation. For this option to prosper, a feasibility study should establish that profitability is assured despite the remediation cost.

4. **Public-private partnership funding.** This option is viable if the government (whether national or local) develops a program similar to the BOA where the government subsidizes preliminary studies and remediation-redevelopment planning and private sector makes an investment for the actual implementation.
5. **Grant funding the remediation.** Grants for remediation are very limited. However, there is a current GEF UNDP project on "Reducing Environmental and Health Risks to Vulnerable Communities from Lead Contamination from Lead Paint and Recycling of Used Lead Acid Batteries" which is being implemented in Indonesia and the Philippines. In the case of the Philippines, the Executing Agency/Implementing Party, Blacksmith Institute, entered into a Memorandum of Agreement (MOA) with the DENR as the Responsible Party for the implementation of all project activities. This project has allotted \$77,127 for pilot remediation of a Pb-contaminated site. The amount may not be sufficient to cover all costs but is significant enough to explore initial remediation or counterpart funding for complete remediation.

Financing remediation only proves to be "unprofitable" hence the lack of windows for this particular activity or project. The financing scenario changes positively when remediation is packaged within a greater redevelopment project. For such, below are the potential financing options:

1. **Commercial Banks.** There are 36 major universal and commercial banks in the Philippines. Notable in lending windows and environmental project windows for the LGUs are state-owned Development Bank of the Philippines (DBP) and Land Bank of the Philippines (Landbank). DBP has a Green Financing Program which covers among others solid and hazardous waste management projects. It offers 80% of the total project cost for private corporations and 90% of for LGUs payable up to 15 years at prevailing market interest rate. Land Bank has an LGU Lending Program which seeks to finance local infrastructure and other socio-economic development projects in accordance with the approved local development plan and public investment program, payable up to 10 years.
2. **Private Investors/Venture Capitalists.** Venture capital is a type of funding for a new or growing business coming from firms that specialize in building high risk financial portfolios. The firm gives funding to the new or growing business in exchange for equity. As opposed to commercial banks, venture capitalists are fewer. However, there seems to be a growing interest in community-type development as presented in the proposed redevelopment of the pilot site in Meycauayan. The key here is to develop a concise executive summary and presentation of the brownfield redevelopment project. Both the technical and

financial considerations and projections must be sound for it to appeal to venture capitalists. Since the project also tackles THW mitigation, it may help to appeal to venture capitalists in the country with very strong corporate social responsibility.

3. **Government Incentives/Support.** The list of existing incentives program offered in Philippine laws can be maximized for purposes of supporting this specific brownfield redevelopment project. In addition, instituting local incentives program as earlier mentioned will help push the redevelopment and send a message to private investors that the local government is serious in trying to succeed in this endeavor.

It is noteworthy that Presidential Decree (PD) No. 1914 created the Municipal Development Fund (MDF), a special revolving fund for re-lending to Local Government Units (LGUs). According to the MDFO website, it became an effective mechanism that enabled LGUs to avail of financial assistance from local and international sources for the implementation of various social and economic development projects. It is administered by the Department of Finance (DOF) - Bureau of Local Government Finance (BLGF) and the Department of Public Works and Highways (DPWH) - Central Project Office (CPO).

The open and relevant financing windows are shown in the table below:

Table 25. Financing Windows under the Municipal Development Fund

Financing Window	Objectives	Eligible Borrowers	Eligible Projects
Program Lending (ProLend)	Assists provincial LGUs in financing development projects with the provision that they will pursue a policy reform agenda	All Provinces	Revenue-generation; Expenditures planning and management; Service delivery; Congruence with national policy objectives and programs
Public-Private Partnership Fund (PPP)	Aims to support the thrust of moving the PPP to the LGU level.	All LGUs are eligible to apply in the PPP financing window, provided, there is a	Public Economic Enterprise/Revenue Generating Subprojects, Social and Environmental Subprojects, Solid

		certainty that the LGU will partner with a private entity	Waste Management Facilities
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In addition, the City of Meycauayan is one of the LGUs that perform well in fiscal sustainability score card. It has been registering a very good rating in the area of revenue generation and low dependence on Internal Revenue Allotment (IRA) and other National taxation shares. Its local collection has been registering growth as well. The regular income of the City is around Pnp 600 million. This gives it capacity to financially contribute towards the implementation of the redevelopment plan.

4. **International Finance Institutions.** This includes multilateral, bilateral, and regional development banks mainly mandated to support economic and social development. Among the primary ones are the Asian Development Bank and the World Bank. They provide grants, loans, lines of credit, technical assistance and equity.

"The ADB country partnership strategy, 2011-2016 for the Philippines focuses on improving the investment climate, more effectively delivering social services, and minimizing disaster risks. Emphasis is also given to strengthening governance, developing infrastructure through public channels, and building on the successes of public-private partnerships. Developing the finance sector is an emerging priority." (www.adb.org) The bank has been lending an average of \$745 million in the last 10 years.

"The World Bank, the Country Partnership Strategy for the Philippines from 2015 to 2018 revolves around the theme "Making Growth Work for the Poor" which supports the country's goals of promoting and sustaining inclusive growth that reduces poverty and creates more and better jobs—jobs that raise real wages and bring people out of poverty." (www.worldbank.org) Among the 5 key engagement areas are

- Rapid, inclusive and sustained economic growth: promoting economic policy reform for inclusive growth, boosting private sector development by improving the investment climate for firms of all sizes, including greater access to finance, and increasing productivity and job creation, especially in rural areas.
- Climate change, environment, and disaster risk management: increasing physical, financial and institutional resilience to natural disaster and climate change impacts, and improving natural resource management and sustainable development.

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As of March 2016, the Philippine portfolio comprises 15 active projects with a total net commitment of close to \$3 billion. Sectors benefiting from Bank-supported projects include infrastructure, social protection, health, basic education, rural development and environment.

In this arena, the national or local government should initiate project development for funding. It has to be coordinated with the concerned national government agencies, in this case, the potential conduits are DENR and DILG. The project has to align with the country strategy and be included in the priorities list endorsed by NEDA.

ANNEX D.1

List of Sites Assessed using Targeted Site Assessment Approach

No.	Site Name	Latitude	Longitude	Industry	Key Pollutant	Test result	Region
1	Aluminum Recycling Plant in Meycauayan, Bulacan	14.760850°	120.999933°	Recycling facility	Lead in soil	436.04	Region III
2	Former dumping site of energizer battery in Graceville, San Jose Del Monte City	14.790849°	121.067225°	Dumpsite	Lead in soil	1,932.76	Region III
3	Treatment, Storage, Disposal (TSD) Facility in San Jose Del Monte, Bulacan	14.75009	120.9669	TSD including ULABs	Arsenic in soil	2,102.00	Region III
4	Boom Town Industries in Brgy. Lalakhan, Sta. Maria, Bulacan	14.815884°	120.945302°	pyrotechnics	Lead in soil	199.00	Region III
5	Pyrotechnics Industry in Bocaue,	14.78993	120.934	pyrotechnics	Mercury - Elemental in soil	13.70	Region III

	Bulacan						
6	Manufacturing and ULAB recycling in Meycauayan City, Bulacan	14.73	120.95	LAB manufacturing & ULAB recycling	Lead in soil	68.22	Region III
7	Open Dumpsite in Meycauayan, Bulacan	14.7258	120.96916	Dumpsite	Cadmium in soil	30.10	Region III
8	Former Used Lead Acid Battery Recycling Facility in 16th St., Tambo, Para	14.52217	120.9971	Former ULAB recycler; TSD	Lead in soil	16,053.82	NCR
9	Ship repair and building site along Navotas River	14.665362°	120.945108°	ship repair	Arsenic in soil	517.51	NCR
10	Multiple industries along Punturin-Lawang Bato and Bignay Creeks in Valenzuela City, Metro Manila	14.733411°	120.987706°	Dye	Cadmium in soil	244.91	NCR
11	Pandacan Creek, Pandacan, Manila	14.59278	121.0032	Oil depot	Mercury - Elemental in soil	4.80	NCR
12	G-six – No. 654 Quirino	14.697736	121.0338	ULAB recycling and TSD facility	Lead in soil	1,846.42	NCR

	Highway Novaliches, Brgy. Bagbag						
13	Mega Manila G.N.B Motors Corporation (Macabling, Sta. Rosa, Laguna)	14.300235°	121.102231°	Former ULAB Recycler / Smelter	Lead in soil	37,032.58	Region IV A
14	JMS Battery Supply (Valenzuela City)	14.696135	120.96367	TSD facility	Lead	Survey only	NCR
15	Myracle Trading (Pasig City)	14.569966	121.06635	TSD facility	Lead	Survey only	NCR
16	Mega Manila G.N.B Motors Corporation (Cavite)	14.311539	120.79984	ULAB Recycler / Smelter	Lead in groundwater	0.005mg/l	Region IV A
17	Celica Lead Plant in San Simon, Pampanga	15.006096	120.7528	ULAB Smelter	Lead in soil	101,854.00	Region III
18	Garcia Recycling Facility (San Leonardo Nueva Ecija)	15.397827	120.942642	Former ULAB recycling site	Lead in soil	16,550.96	Region III
19	Asia Pacific Recyclers Corporation (San Simon)	15.022867	120.744898	Former ULAB Recycler / Smelter	Lead in soil	178, 684	Region III
20	Chen Tian Xi Smelting Plant	15.317781	120.89833	Former ULAB Recycler /	Lead	Survey only	Region III

	(Jaen, Nueva Ecija)			Smelter			
21	Jiajia Chen Smelting Plant (Jaen, Nueva Ecija)	15.317998	120.8986	Former ULAB Recycler / Smelter	Lead	Survey only	Region III
22	Philippine Recyclers Inc., (Bancal, Meycauayan)	14.723587°	120.960416°	Former ULAB Recycler / Smelter	Lead in soil	193,880.00	Region III
23	5th RA Trading (Paso de Blas, Valenzuela City)	14.70277	120.98693	ULAB recycling and TSD facility	Lead	Survey only	NCR
24	Camel Group Metallic Manufacturing Corporation (Mabalacat, Pampanga)	15.231817	120.61619	ULAB Recycler / Smelter	Lead	Survey only	Region III
25	Honest Parts and Metal Enterprises (Tambo, Paranaque)	14.52217	120.9971	Former ULAB recycler; TSD	Lead in soil	16,053.82	NCR
26	Don Pangan Collection Facility (San Fernando, Pampanga)	15.042683	120.69416	TSD facility	Lead	Survey only	Region III
27	Far East Fuel Corporation	14.761478	121.00887	ULAB Recycler / Smelter	Lead	Survey only	Region III
28	Meycauayan Industrial Subdivision I	14.723057°	120.963525°	near Former ULAB Recycler / Smelter	Lead in soil	60.00	Region III

29	Philippine Recyclers Inc., (Marilao)	14.769996	120.95717	Former ULAB Recycler / Smelter	Lead in soil	3,500.00	Region III
30	Sentro Corporation (Iba, Pantok, Meycauayan)	14.761787	120.97815	ULAB Smelter	Lead	Survey only	Region III
31	KDJ Recycling (Bunawan, Davao City)	7.258158	125.63957	ULAB Recycler / Smelter	Lead	2,782.37	Region XI
32	Allianz Dominion Ventures Inc (Marilao, Bulacan)	14.770253	120.95529	near Former ULAB Recycler / Smelter	Lead in soil	Survey only	Region III
33	Figueroa Collection Facility (San Leonardo, Nueva Ecija)	15.31896	120.93856	former TSD facility	Lead	Survey only	Region III
34	Mass V Group, Inc., (San Pablo Proper, San Simon Pampanga)	15.024606	120.74612	former LAB manufacturing and Storage of Lead Acid Batteries	Lead	Survey only	Region III
35	Powerpoint Battery Manufacturing Corporation	15.023155	120.74579	former LAB manufacturing and Storage of Lead Acid Batteries	Lead in soil	353,498.00	Region III
36	Garcia Collection Facility (Tabuateng, Nueva Ecija)	15.410136	120.94835	Former ULAB recycling site	Lead in soil	3,393.57	Region III

37	Green Theme Environment Experts, Inc., (Sta. Rosa II, Marilao)	14.779067	120.97144	HW transporter and TSD facility	Lead	Survey only	Region III
38	Green Eco TechWin, Inc., (Barangay Buenavista II, General Trias, Cavite)	14.311591	120.88997	HW transporter and TSD facility	Lead level range in ambient water and air	0.05to 1.77 ug/Ncm (SMR, 2015)	Region IV A
39	Maritrans Recycler Inc., (Barangay Parian, Calamba City)	14.218807	121.14332	HW transporter and TSD facility	Lead	Survey only	Region IV A
40	Ecoglobal Inc., (Meycauayan)	14.725643	120.96841	Used Lead Acid Battery Recycling Facility	Lead in soil	2,493.98	Region III
41	Battery Depot of Central Luzon (Barangay Dolores, San Fernando, Pampanga)	15.043696	120.67374	Battery depot and service center for vehicles	Lead	Survey only	Region III
42	Vollacar Transit, Inc., Mansilingan, Bacolod City, Negros Occidental	10.636294	122.9748	Manufacturer of new lead-acid batteries	Lead	Survey only	Region VI
43	AM Tubera Trading	14.6694	120.94875	Shop selling automotive	Lead	Survey only	NCR

	Concepcion, Malabon City, Manila			batteries, recharging laed-acid automotive batteries and reconditioning ULABs			
44	HMR Envirocycle Philippines, Inc.	14.222423	121.10225	HW transporter and TSD facility	Lead	Survey only	Region IV A
45	RRDS Petrochemical Industries, Inc., Barangay Umapad, Mandaue City	10.340033	123.9644	TSD including ULABs	Lead	Survey only	Region VII
46	Oriental Lead Products Barangay Natumolan, Tagaloan, Misamis Oriental	8.534425	124.80442	TSD including ULABs	Lead	Survey only	Region X
47	Evergreen Environmental Resources Inc., (Sta. Maria, Bulacan)	14.850775	121.01419	HW transporter and TSD facility	Lead in soil	78.00	Region III
48	Maritrans Recycler Inc., (Mandaue City)	10.362343	123.93977	HW transporter and TSD facility	Lead	Survey only	Region VII
49	RIS Metal Craft and General Merchandise	15.659814	120.75917	Automotive parts seller	Lead	482.05	Region III
50	Leonida's	14.279933	121.41382	Former ULAB	Lead		Region IV A

	Junkshop at Barangay Sto. Angel, Sta. Cruz, Laguna			recycling site		4,111.40	
51	Clean Leaf International Corporation (Maysilo, Malabon)	14.680892	120.95883	TSD facility for hazardous and non-hazardous wastes	Lead	Survey only	NCR
52	TPL Industrial Sales Corporation, Barangay San Pablo Libutad, San Simon	15.024636	120.74549	Storage of Lead Acid Batteries	Lead	Survey only	Region III
53	Odet Electrical Santo Nino, Marikina City	14.637913	121.09759	Shop recharging laed-acid automotive batteries and reconditioning ULABs	Lead	Survey only	NCR
54	Glen's Junkshop Labuin, Sta. Cruz, Laguna	14.25422	121.39112	Junkshop	Lead in soil	1,490.50	Region IV A
55	MC JO Trading Barangay San Isidro, Makati	14.550959	121.0068	TSD facility	Lead	Survey only	NCR
56	Dela Cruz Junk shop Brgy 82. Tondo, Manial	14.616394	120.9661	Junkshop	Lead in soil	209,336.45	NCR
57	Ecology Specialist Inc., San Roque,	15.012813	120.93284	TSD facility	Lead	Survey only	Region III

	San Rafael, Bulacan						
58	Ruth Perez General Merchandise Brgy 81, Tondo, Manila	14.615781	120.96692	Retailer of local automotive batteries	Lead in soil	209, 336.45	NCR
59	Pollux Distributors, Inc., Grace Park, Caloocan	14.646936	120.99162	Former ULAB recycler	Lead in soil	28,339.00	NCR
60	Nel Battery, Balibago, Sta. Rosa, Laguna	14.290378	121.09633	Battery dealer conducting manual draining, recycling and reconditioning of ULABs	Lead	Survey only	Region IV A
61	Intergreen Resources, Inc. Barangay Aguado, Trece Martires City	14.254204	120.86489	Former recycling plant	Lead	Survey only	Region IV A
62	Octapower Marketing, San Isidro, San Simon, Pampanga	15.015506	120.75054	Warehouse for Lead-Acid Batteries	Lead	Survey only	Region III
63	Material Recovery Facility in Brgy. Malitlit, Sta. Rosa Laguna	14.260902	121.10429	Others: Material Recovery Facility	Lead	2,451.80	Region IV A
64	Former Motolite Distribution	14.720826°	121.032262°	Warehouse for Lead-Acid	Lead	1,779.00	NCR

	Center in Gen. Luis, QC			Batteries			
65	Philceramics, Putsan, Tiwi, Albay	13.475832	123.67152	Pottery/Ceramics	Lead	76,621.03	Region V
66	Mambulao Bay, Jose Panganiban, Camarines Norte	*in the database	*in the database		Arsenic in soil		Region V
67	ASGM in Barangay Luklukan Sur, Jose panganiban, Camarines Norte	14.3035	122.70884	ASGM	Chromium	833.42	Region V
68	Artisanal Small Scale Gold Mining in Brgy. Malaguit, Paracale, Camarines Norte	14.274301	122.79899	ASGM	Mercury - Elemental in soil	90.53	Region V
69	Informal Used Lead Acid Battery Recycling Plant in Sitio Tinggan, Barangay San Nicolas, Cebu City	10.293504	123.89018	Informal ULAB Recycling	Lead in soil	6,504.94	Region VII
70	Artisanal Gold Mining in Skid 8, Brgy.	*in the database	*in the database	ASGM	Cadmium in soil	57.08	Region VI

	Nabulao, Sipalay City, Negros Occidental						
71	Artisanal Small Scale Mining in Libertad, Brgy. Nabulao, Sipalay City, Negros Occidental	9.667991	122.51679	ASGM	Cadmium in soil		Region VI
72	Used Lead Acid Battery Recycler in Barangay Felisa, Poblacion, Bacolod City	10.59839	122.97285	ULAB Recycling	Lead in soil	174,953.00	Region VI
73	MMC in San Jose Sipalay	9.775775	122.44315	Mining	Arsenic in soil	18.90	Region VI
74	Junkshops and poudry, kitchen utensil mnftg in Hipodromo Cebu	10.311839	123.90806	Others: Junkshop and Metal Poudry	arsenic in soil	30.52	Region VII
75	Junkshops in Mabolo, Cebu City	10.318154	123.91755	Others: Junkshop	arsenic in soil	18.47	Region VII
76	ASGM in Casalugan, Paracale, Camarines Norte	14.28128	122.76092	ASGM	arsenic in soil	23.51	Region V
77	ASGM	14.300869	122.73384	ASGM	Chromium in		Region V

	Gumaus, Paracale, Camarines Norte				soil	2,494.89	
78	ASGM in Sta. Milagrosa, Jose Panganiban, Camarines Norte	14.290104	122.66389	ASGM	Arsenic in soil	70.29	Region V
79	ASGM in Sta. Rosa Sur, Jose Panganiban, Camarines Norte	14.274913	122.79812	ASGM	Arsenic in Soil	122.04	Region V
80	Former Informal Used Lead Acid Battery Recycling Site in Labuin, Sta. Cruz, Laguna	14.25845	121.398	Informal ULAB Recycling	Lead in soil	1,490.50	Region IV A
81	Former Informal Used Lead Acid Battery Recycling in Santo Angel Sur, Sta. Cruz, Laguna	14.279933	121.41382	Informal ULAB Recycling	Cadmium in soil	17.35	Region IV A
82	Former Used Lead Acid Battery Recycling in Brgy. Macablang, Sta.	14.3006	121.10195	Used Lead Battery Recycling	Lead in soil	104,210.90	Region IV A

	Rosa City, Laguna						
83	Former Used tire recycling facility in Brgy. Lewin, Lumban, Laguna	14.3074	121.48288	Used Tire recycling Facility	Lead in soil	-	Region IV A

ANNEX D.2

List of Sites Assessed using Investigative Assessment Approach

LGU	No.	Barangay	Number of Geo-tagged Samples	Key Pollutant	Other metals in exceedance (number)	Number of Geo-tagged Samples with Exceedance	Number of Samples per Key Pollutant
Tagbilaran City	1	Dampas	134	Arsenic	Pb(1); Cr(1); Cd(9)	17	7
	2	Poblacion II	100	Mercury	Pb(10); As(4); Cr(6); Cd(5)	18	7
	3	Booy	71	Arsenic	Cd(2)	6	3
	4	Cabawan	213	Arsenic	Cr(9); Cd(2)	50	42
	5	Manga	271	Arsenic	Cd(4); Cr(4)	69	60
	6	Taloto	236	Arsenic	Cd(4)	18	12
	7	Cogon	276	Arsenic	Pb(14); Hg(1); Cr(7); Cd(6)	32	14
	8	Bool	26	Cadmium	As(1)	2	1
Iloilo City	1	Baldoza	45	Arsenic	0	2	2
	2	Ticud	103	Cadmium	As(1); Cr(1)	10	8
	3	Balabago	158	Cadmium	Cr(2)	14	12
	4	Tacas	147	Cadmium	Pb(1); AS(1); Cr(3)	15	11
	5	Calahunan	109	Cadmium	Pb(1); As(1); Cr(4)	15	10

	6	Sto. Nino Sur	208	Chromium	As(3); Cd(21)	60	39
	7	Katilingban, Molo	123	Chromium	As(4); Cd(4)	18	11
	8	Poblacion, Molo	121	Chromium	As(3); Cd(1); Hg(1)	24	17
	9	North San Jose, Molo	132	Chromium	Pb(6); As(7); Cd(3)	21	9
	10	South San Jose, Molo	198	Chromium	As(2); Pb(1);Cd (4); Hg(1)	30	26
	11	South Baluarte, Molo	91	Lead	As(3); Cr(4); Cd(3); Hg(14	6
	12	East Baluarte, Molo	191	Chromium	As(9); Cd(2)	22	11
	13	North Fundidor, Molo	372	Chromium	Pb (1)	126	109
	14	North Baluarte, Molo	125	Chromium	As(3); Cd(1)	13	9
	15	West Habog-Habog, Molo	124	Chromium	Arsenic(13)	42	33
	16	General Hughes	122	Chromium	As(23)	67	56

	17	San Agustin, City Proper	60	Chromium	As(3)	18	18
	18	Rima Rizal, City Proper	29	Chromium	As(5)	12	8
	19	Rizal Pala-Pala II, City Proper	90	Arsenic	Cr(8); Pb (1)	18	10
	20	Baybay, Tanza	117	Chromium	As (18)	35	22
	21	Mabolo Delgado, City Proper	69	Chromium	As(10)	28	21
	22	Bonifacio Tanza, City Proper	125	Arsenic	Chromium (16)	39	24
	23	Tanza Timawa, City Proper	140	Arsenic	Cr (30); Cd (1)	50	27
	24	San Jose, City Proper	41	Arsenic	Pb(18); Cr(23)	35	18
	25	Hipodromo	69	Chromium	As(19)	45	36
	26	Liberation Road, City Proper	73	Chromium	Pb(11); As(8); Hg(1)	57	51
	27	Yulo Arroyo, City Proper	18	Arsenic	Pb (2); Cr (6)	10	5
	28	San Felix, City Proper	117	Chromium	Pb(1); As(20)	21	35

	29	Monica Blumentritt, City Proper	71	Arsenic	Cr(19)	31	19
	30	Tabucan, Mandurriao	209	Chromium	As(20); Hg(44); Pb(1)	91	82
	31	Airport, Mandurriao		Chromium	Arsenic, Mercury	89	71
	32	EL 98, Jaro	70	Arsenic	Cr(23)	27	23
	33	Luna, Jaro	98	Chromium	As(6)	31	25
	34	San Roque, Jaro	193	Chromium	As(11)	24	13
	35	Camalig, Jaro	514	Chromium	Pb(2);As(36)	101	66
	36	Railway, Lapaz	201	Chromium	As(23); Pb(2)	68	48
	37	Magdalo, Lapaz	117	Chromium	As(17)	35	18
	38	San Nicolas, Lapaz	136	Chromium	Pb(2); As(11); Cd(1)	37	30
	39	Magsaysay, Lapaz	217	Chromium	As(20); Hg(1)	59	45
	40	Sinikway, Lapaz	235	Chromium	As(13)	33	20
	41	Rizal, Lapaz	25	Arsenic	Cr(6)	10	6

	42	Bantud, Lapaz	122	Chromium	As (11 samples)	28	21
	43	Jereos, Lapaz	364	Arsenic	Cr(24)	46	24
	44	Lopez Jaena Norte, Lapaz	170	Arsenic	Cr(14); Pb(1)	29	19
	45	Lapuz Sur	141	Arsenic	Pb(1); Cr(12)	24	14
	46	Progreso, Lapaz	83	Chromium	As(5)	13	9
	47	Burgos Mabini Lapaz	232	Arsenic	Chromium (30); Lead(1); Cadmium (1)	48	22
	48	San Pedro, Jaro	212	Arsenic	Cr(21), Pb(2)	37	17
	49	Cuartero, Jaro	279	Chromium	Lead (2); Arsenic (17)	50	33
	50	Caingin Lapaz	316	Chromium	Arsenic (18)	98	33
	51	PHHC Block 22, Mandurriao	250	Chromium	As(6)	17	13

