

**Activity Title: Pilot Project for the Reduction of Mercury and Heavy Metals Contamination Resulting from Artisanal Gold Refining in Meycauayan, Bulacan River System**

Proposer: Blacksmith Institute

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Country (DMC): Philippines Region: Southeast Asia

Activity Proposed Start Date: 15 January 2008 Activity Proposed Duration: 10 Mos.

Cost Estimate: US\$ 49,813

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**Short Description:**

**I. Background and Rationale**

The Marilao, Meycauayan and Obando river systems in the province of Bulacan are the focus of a clean-up project being spearheaded by the Blacksmith Institute, in partnership with the Region 3 offices of the Environment and Management Bureau, the Bureau of Fisheries, the Department of Health, with the local governments of Marilao, Meycauayan and Obando province of Bulacan, Provincial government, NGOs and socio-civic organizations. The river systems from these municipalities are considered to be “hot spots” of water quality.

The problem in the said river system is quite unique where industries utilizing toxic heavy metals are located in the same geographical area upstream of a river system that eventually find their way to thousands of hectares of thriving fishponds downstream, before eventually draining to the Manila Bay. Threatened by the pollution downstream, aside from the fishponds are urban communities who have to contend living in flood-prone conditions; agriculture, livestock and poor families who largely depend on possibly contaminated groundwater. Sources of pollution are the artisanal gold and precious metal refiners of Meycauayan, Bulacan – the focus of this project - who supply the thriving jewelry making industry, also based in Meycauayan. These artisanal gold and precious metals refiners do not have waste treatment facilities and the emissions, solid and liquid wastes from the refining process find their way into the atmosphere, river system and eventually to thousands of hectares of fishponds downstream.

The municipality of Obando, which is downstream of Meycauayan are thousands of hectares of active fishponds where the produce are consumed by the local populace where the cultured fishes are shipped to adjoining areas primarily Metro Manila. The final recipient of the contaminated water is the Manila Bay, which is already heavily contaminated with mercury and other heavy metals. The water quality where fishes are grown and shellfishes harvested far exceed environmental standards thus affecting the health of people. Because of the proximity of Bulacan province to Metro Manila, it became a strategic hub of industries, agricultural and residential sectors. Bulacan is the major supplier of freshwater fishes and pork meat to Metro Manila. The province is also the center of leather tanning and lead

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recycling. These industries are known to be sources of heavy metal contaminated wastes. The long history of jewelry making and gold and precious metals refining in the municipality explains the presence of mercury and other heavy metals in the water bodies and sediment of the river system and Manila Bay.

Under the ADB country and program assessment for the Philippines 2004, though aquaculture has grown very quickly and now contributes more than 40% of the output value of the fisheries sector it is plagued by problems such as pollution of major rivers, lakes and coastal areas. Urbanization has been identified as a major source of pollution. The country's position as a major international player, being the fourth largest producer of aquaculture products in the world and the largest in Southeast Asia may not be sustained.

## **II. Objectives**

This PDA is designed to pilot test the use of locally-fabricated cost-effective technologies to reduce mercury and other heavy metals from emissions, liquid and solid wastes and disseminate the use of the identified technologies.

Specifically, the PDA will support:

1. Collection of baseline data to determine extent of mercury and other heavy metal pollution; assess gold and precious metals refining practices, community and occupational health risks and socio-economic factors related to gold refining in the municipality of Meycauayan, Bulacan, the chosen pilot area.
2. Awareness raising among those directly and indirectly affected by the heavy metal pollution from the artisanal gold and precious metals refining industry;
3. To test locally developed cost- effective technologies to reduce and possibly recover mercury and other heavy metals from emissions, liquid and solid wastes and related ways and disseminate the use of said technologies and measures
4. DENR and local governments, through the stakeholder group, in developing innovative policy instruments to encourage support and compliance to environmental laws, specifically targeting industries/sectors using mercury and other toxic heavy metals;
5. Strengthening of existing stakeholder group involved in addressing the pollution problem caused by the artisanal gold and precious metals refining industry.
6. Exploring the possibility of transforming the stakeholder group into Water Quality Management Board provided for in the Clean Water Act.

## **III. Scope and Location of Work/ Description of Activities**

### **Profile of Meycauayan, Bulacan**

The Municipality of Meycauayan has an area of 32.1 sq.km. and a population of 200,751 as of 2005. Meycauayan has 26 barangays. It is located 19km north of Metro Manila. Its surface water run-off comes from the northeastern and eastern portion towards the flat lying areas in the southwestern side. The main river system of Meycauayan has an approximate length of 17.2 km. and more than 10 km of tributaries.

Major existing land-use is classified as:

- Agricultural 371 has.

- Settlement 1,254
- Fishpond 517
- Commercial 217
- Industrial 766
- Total 3,125 has.

Bulacan has a very high population. Based on the National Statistics Office data, its population density is more than three times the national average. It has a population density of 851 as against the national average of 255 in 2002. The mix of large settlement areas, increasing number of industries, agriculture, and other land uses in a small geographical area and at the same time being a major aquaculture and piggery source for Metro Manila poses critical population health risks.

The uppermost north-eastern portion of the province of Bulacan is part of the foothill of the steep dense forest of the Sierra Madre mountain ranges and sloping downwards on a south-western direction towards the Manila Bay. The province is traversed by a series of tributaries and streams and river system where surface run-off from the steep mountain ranges and overland flow eventually drains to the low lying areas and finally exiting to the Bay.

*Jewelry Industry.* There are 567 registered business establishments considered large in the municipality. Noteworthy are the numerous jewelry makers in the area. Meycauayan has long been the seat of the jewelry industry in the country. A large percentage of the population derive their livelihood from this sector. As of 2004, there are 114 registered jewelers in Meycauayan mostly located in 5 barangays, namely Calvario, Malhacan, Saluysoy, Lawa, and Pandayan. But there are around 2,000 manufacturers, most of whom are small and unregistered, with very little investments in modern tools and equipment.

*Pollution Pathways.* Aside from pathways in the food chain through the consumption of marine and aquatic products derived from fishponds and fishing grounds, other pathways of pollutants are through the drinking water, eating of agricultural crops planted in contaminated lands, direct contact through wading in contaminated floodwaters, contact through contaminated dust particles, and the ambient air.

#### **IV. Institutional Management Arrangements and Proponent Qualifications**

The Blacksmith Institute will be the lead organization to implement the project. Assisting in the river clean-up project are government agencies and the private sector for the technical assistance. The pilot demonstration infrastructure projects such as the scrubbers and mercury retort technology and related ways of reducing mercury for the small-scale gold and precious metal refiners will be undertaken by the Department of Science and Technology, specifically the Industrial Technology Development Institute.

The Environment and Management Bureau (EMB) Region 3 and the EMB Central Office have been actively involved with the project even at the initial stage. EMB technical staff provide expertise during conduct of assessments, monitoring of the river system and ambient air, provides equipment, and laboratory support.

The project area is currently a recipient of a JICA funded technical assistance (TA) to delineate the boundaries of the water quality management area (WQMA) and prepare the necessary requirements to designate it as a WQMA under the Clean Water Act. The JICA TA started last June 2007 and will end by December 2007. By then the TA is expected have officially submitted all requirements to the EMB-DENR to have it declared as a WQMA. The existing stakeholder group will continue to follow-up on the work until the area is officially declared as such. Even prior to the area being declared as a WQMA, the existing stakeholder group will constitute itself as an interim Water Quality Management Board to develop and coordinate clean-up activities. This will ensure project sustainability and to make the major stakeholders of the project more accountable in addressing the pollution problem in the municipalities of Marilao, Meycauayan and Obando, province of Bulacan.

The other actively participating members of the stakeholder group are the Meycauayan Tannery Association, Philippine Recyclers Inc. (one of the largest lead smelting company in Southeast Asia), LGUs of Marilao, Meycauayan, Obando, the Provincial Government of Bulacan, Bureau of Fisheries Region 3, Department of Health Region 3, Bulacan State University, Marilao and Meycauayan Water Districts, and other NGOs and socio civic organizations.

#### V. Measurable Performance Indicators

Objectives	Performance Indicators
<p>1. To collect baseline data to determine extent of mercury and other heavy metal pollution along the Meycauayan river system in fishes and shellfishes and groundwater; assess gold and precious metals refining practices; community and occupational health risks and socio-economic factors related to gold refining in the municipality of Meycauayan, Bulacan, the chosen pilot area.</p>	<p>1.1 Two sampling surveys conducted during the year (dry and rainy season) of the following:</p> <ul style="list-style-type: none"> <li>1.1.1 Surface water along Meycauayan river system</li> <li>1.1.2 sludge/sediment along Meycauayan river system</li> <li>1.1.3 Groundwater</li> <li>1.1.4 Tilapia, bangus, prawns, shellfishes</li> </ul> <p>1.2 Report on the detailed characterization of the gold and precious metals refining process</p> <p>1.3 Health risk assessment report of artisanal workers and the affected communities</p> <p>1.2 Baseline report</p>
<p>2. To raise awareness of people directly and indirectly affected by the heavy metal pollution</p>	<p>1.1 <u>Two planning workshops</u> for regional government regulatory offices such as Bureau of Fisheries and Aquatic Resources, Environment and Management Bureau, Department of Health; and for the Bulacan Provincial Government and Meycauayan Local Government, barangay officials; and NGOs)</p> <p>1.2 <u>Two forum/seminar –workshops</u> for artisanal gold and precious metals refiners, jewelers, sellers/suppliers of chemicals and heavy metals as raw materials</p> <p>1.3 <u>Two planning -workshops</u> for private medical practitioners and municipal health officers and workers in Meycauayan</p> <p>1.4 Preparation of IEC materials using the inputs of the planning workshops using print and radio (may include</p>

	<p>pamphlets, health advisories, spiels, news clips)</p> <p>1.4.1 Pamphlets (4 sets at 3,000pcs/set)</p> <p>1.4.2 Health advisories (4 sets at 3,000pcs/set)</p>
<p>3. To test locally developed cost-effective technologies to reduce and possibly recover mercury and other heavy metals from emissions, liquid and solid wastes and related ways and disseminate the use of said technologies and measures</p>	<p>1.5 Two scrubbers as pilot demo technology, one for each barangay having the most number of artisanal gold refiners</p> <p>1.6 Six mercury retort technology for pilot demo for the artisanal gold refiners</p> <p>1.7 Assessment report on the effectiveness and efficiency of the pilot demonstration technologies</p> <p>1.8 Number of artisans who are willing to adopt the technology</p> <p>1.9 Two planning-workshops for the project stakeholder group and government regulatory agencies to design the IEC on technology dissemination</p> <p>1.10 Two training sessions on the operation and fabrication/construction of the mercury retort technology</p> <p>1.11 Two training sessions on the operation and maintenance of the scrubber for the artisanal gold and precious metals refiners</p>
<p>4. Through the stakeholder group, support the DENR and the local governments in developing innovative policy instruments to encourage support and compliance to environmental laws, specifically targeting industries/sectors using mercury and other toxic heavy metals</p>	<p>6.1 List/Inventory of the unregistered gold refineries in Meycauayan</p> <p>6.2 At least 2 workshops and 4 meetings with the unregistered gold refineries to identify and discuss possible policy measures to encourage effective compliance. Possible options are tax incentives for compliance to environmental laws, simplified registration procedures, provision of free technical assistance, provision of common service facilities, among other options.</p> <p>6.3 Through the stakeholder group, initiate drafting and eventually passage of Municipal Ordinance/s or Memorandum of Agreements or Administrative Orders from the EMB Region 3</p>
<p>5. Strengthen existing stakeholder group involved in addressing the heavy metal pollution problem, and spinning-off the group into an interim Water Quality Management Board under the Philippine Clean Water Act</p>	<p>1.12 Interim organization of the Water Quality Management Board within the project duration of 10 months</p> <p>1.13 Monthly stakeholder or Water Quality Management Board meetings for a total of at least 6 meetings over a one year period</p> <p>1.14 Two training-workshops on organizational development for the stakeholder group</p> <p>1.15 Two workshops on the setting-up of the Water Quality Management Board with detailed organizational plan and work &amp; financial plan for at least three years</p>

## VI. Expected Outputs and Outcomes

As a result of the Pilot Demonstration Activity, it is expected that the following will be achieved:

<b>Outputs</b>	<b>Outcomes</b>	<b>Effects</b>	<b>Impacts</b>
1. Baseline survey;  2. Assessment of gold and precious metals refinery;  3. Information, Education, Communication/Advocacy	1. Presence of data as basis for monitoring changes over time;  2. Sound basis for designing of intervention  3. Purposive and systematic IEC Plan	1. Effective and efficient technology design;  2. High adoption rate of technology  3. Better informed constituents of target municipality	1. Improved governance;  2. Improved compliance of industries 3. Improved health of affected communities and workers;  4. Improved biophysical environment
Mercury retort technology;  Scrubber	Reduced and controlled emissions, solid and liquid heavy metal and other toxic wastes	Community and occupational health risks mitigated	1. Improved health of affected communities and workers; 2. Improved biophysical environment
Capability Building and Organizing a Water Quality Management Board	1. More effective and efficient delivery of services; 2. Prevent arbitrary or subjective dispensation of regulatory functions; 3. Promote devolution of functions from the national government consistent with the Local Government Code; 4. Address funding constraints- (provision for funding as prescribed in the Clean Water Act);	Sustained effective and efficient operations and delivery of services because of availability of funding; Potential for modeling for replication in surrounding polluted municipalities	Improved governance

## VII. Stakeholder's Participation

The existing stakeholder group was initiated by the Blacksmith Institute in mid 2005. Appropriate and broad stakeholder consultations in the target areas have been conducted prior to the submission of this proposal to ensure buy-in and ownership. The stakeholders are composed of representatives from the local, provincial and national government agencies, industry, socio-civic organizations, academe, and research institutions. All of the stakeholders have committed support to the project either in-kind or cash. The constituents of Meycauayan are aware of the deteriorating environment. The people have attributed the high incidence of mortality and morbidity to the deteriorating environment but they generally are unaware of the magnitude and gravity of the implications of heavy metal contamination to their general well-being.

The stakeholder group had initiated activities to create awareness on the heavy metal problem and some industry partners, particularly the tannery association has put up a pilot bioremediation facility to address the organic effluents. Some of the medium to large scale gold refiners have similarly slowly adopted measures to mitigate the heavy metal pollution. These measures consist of putting-up scrubbers, shifting to nitric acid instead of mercury in the refining process, construction of a containment pond to discard liquid and solid wastes. This project will help strengthen the existing public-private sector partnerships of stakeholders who are responsible stewards of community water resources through the adoption of innovative approaches to address heavy metals pollution.

### VII. Timetable (Please see separate attachment)

### VIII. Summary of Cost Estimate for 10 Months

<b>Inputs/ Expenditure Category</b>	<b>Total Costs (In PhP)</b>	<b>Total Costs (In US\$)</b>
1. Pilot Demonstration Technology and River Assessment for Baseline <i>(River assessment, fabrication of scrubbers, gold retort gadget)</i>	950,400	19,800.00
2. Communications, Transport, Supplies <i>(Lump-sum of P15,000/month)</i>	180,000	3,750.00
3. Trainings, workshops, seminars, public campaigns <i>(includes information-education-communication materials for distribution)</i>	437,250	9,109.38
4. Specialists Services (communication expert, chemist/chemical engineer, toxicologist)	270,000	5,625.00
5. Project Management (two research assistants)	336,000	7,000.00
6. Contingencies (10% of items 1-5)	217,365	4,528.44
<b>Total PDA Grant Financed</b>	<b>(PhP) 2,391,015</b>	<b>(US\$) 49,812.81</b>

