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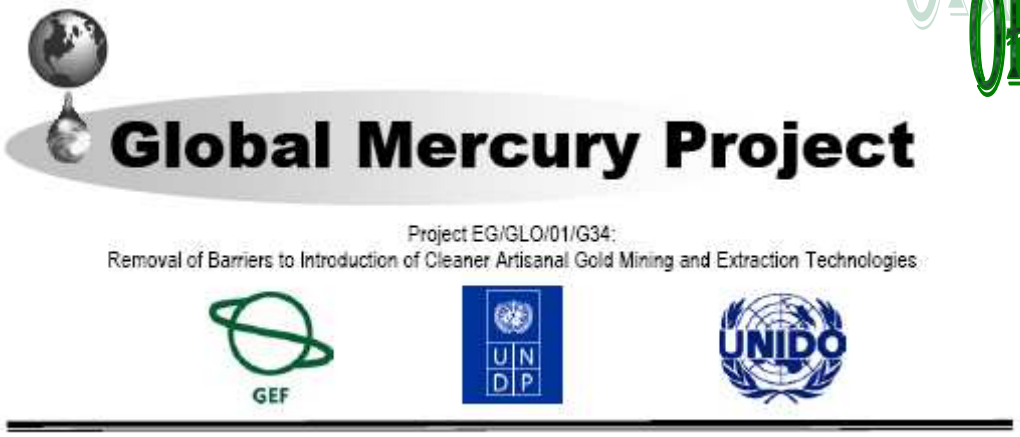

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Removal of Barriers to Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies

GMP

FINAL EVALUATION

January 2009

Submitted by Salvador Mondlane Junior

Project Title: "Removal of Barriers to the Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies" or the Global Mercury Project (GMP)

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Acknowledgement

The final evaluation mission wishes to express its gratitude to all those who directly or indirectly contributed for the proper implementation of the present evaluation, in particular those listed in the appendix C for their cooperation, technical and logistical support that was crucial for the mission.

About the author

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Acronyms

ACFP – Assistant Country Focal Point
AfDB – African Development Bank
APR – Annual Project Review
ASM – Artisanal and Small scale Miners
AU – African Union
BPTF - Basin Project Task Force
BTO – Back to office
CFP – Country Focal Point
CPTF - Country Project Task Force
CTA – Chief Technical Advisor
EPA – Environmental Protection Agency
GEF – Global Environment Facility
GMP – Global Mercury Project
Hg – Mercury
NGO – Non Governmental Organization
PDR – People Democratic Republic
PIR – Project Implementation Report
TDU - Transportable Demonstration Unit
TOR – Terms of Reference
TPR – Tri partite Project review
UBC – University of British Columbia
UNDP – United Nations Development Programme
UNIDO – United Nations Industrial Organization

Executive Summary

The Global Mercury Project (GMP) was initiated to begin a global response to address environmental impacts resulting from mercury released by the artisanal mining sector. This objective was achieved in all countries where the project was implemented. The awareness of the environmental impacts of mercury (Hg) has risen significantly worldwide as a result of the implementation of the GMP.

The project did face challenges related to the rise in the gold price which mobilized more miners to the sector and these new miners were not aware of the best practices demonstrated by the project. The project did also face the challenge related to the poor involvement of the central governments which impacted negatively in the attempts to regulate the use of Hg in the sector. The low involvement of government resulted in the poor sustainability of the results of the project. In all countries it is not clear how the initiated activities and the achievements will be sustained.
The fact that this pilot phase was a learning experience of this type and magnitude of projects it did achieve at different level of accomplishment the results that are detailed in the country evaluation reports presented in the appendices D to I.

The field implementation of the project was anchored on the Transportable Demonstration Unit (TDU) which was to amalgamate the messages on new and clean technologies, health and environmental. Although there is consensus on the usefulness of the concept there are divergences in the way it was implemented and the results achieved. The TDU was conceived after field evaluation of the need of each mining site. However the list of equipment included in the TDU was not easily transportable (e.g. Zimbabwe, Brazil and Sudan). As a result the countries had to make their own adjustments which contributed to the delays in the implementation of the TDU. The TDU implementation requires some access infrastructures that can allow mobility of the teams. The GMP did apply adaptive management in order to accommodate the local conditions, for example in Brazil mobile teams carrying small equipments (e.g. retorts, DVD) were used. The combination of technology, health and environmental message in the TDU required an extra effort in harmonization, synchronization and logistics.

The timing of the activities was not adequate in the project, to an extent that the field implementation phase (awareness campaign and TDU) was less than two month in some countries. Countries like Zimbabwe did not even produce the awareness campaign material and the project team in Sudan missed the majority of the miners who has migrated back to their locations as a result of the peace agreement in 2005.

The management of the GMP was based in Vancouver from 2005 to 2007 and it comprised country coordinators and Chief Technical Advisor (CTA). This

structure is considered weak for proper supervision of field activities of the project especially in the regard to travel time and cost. The evaluation recommends the relocation of the country coordinators to the project countries and a redefinition of their roles to become more technical assistants to the project implementers in the country.

The GMP did not place any monitoring and evaluation process at country level, being the only evaluation process the one from the United Nations Development Programme (UNDP) and Global Environment Facility (GEF).

United Nations Industrial Organization (UNIDO) carried the financial management of the project and the procedures were not very clear to the ACFP. Some of the ACFP did not have provision for operation cost or running cost. It seems that the UNIDO and UNDP financial procedures did delay the implementation of the activities in the countries.

The outputs of the project, especially those that depended on the field implementation which were directly managed at country level (e.g. TDU and awareness campaign) can be considered reasonable.

The challenges faced by the GMP management team are proper for a pilot global project. The project was a learning experience and it is also clear that the implementers have accumulated enough experience that would allow them to avoid wastage and delays in the future project (e.g. GMP II). For example the GMP II proposal considers the emplacement of technical experts in each country; it also sets the need for government commitment as a pre-condition for the country to be beneficiary of the project.

All Governments approached during the present evaluation did show high interest and were prepared to guarantee their commitment and were also willing to contribute for the project implementation mainly in kind, up to 30% of the project cost.

The present report is divided in two parts; one which is the general evaluation of the GMP including the management structures, the second part is made of the appendixes of the country evaluation of the GMP activities in each country. The country specific level of implementation, achievements, challenges, recommendations and opportunities are presented in detail in the country evaluation reports.

1. Introduction

The GMP was funded by GEF and was implemented by UNDP. UNIDO was the executive agency.

The Global Environment Facility (GEF) approved the GMP in March 2002. A suite of activities, financed through the participating countries' own resources and/or bilateral programs, complemented the project. Study areas, all located in key trans-boundary river/lake basins were selected in six developing countries: Brazil, Indonesia, the Lao People Democratic Republic (PDR), Sudan, Tanzania, and Zimbabwe. In these areas artisanal gold mining directly involved nearly 2 million people in total, supporting more than 10 million dependents.

The countries were expected to co-fund the project in approximately 6.3 M USD. None of the countries has co-funded financially the project at levels established on the original project document

The main project objectives of the GMP were to assist the six pilot countries in the

(i) assessment of Artisanal and Small scale Miners(ASM) the extent of pollution from current Artisanal and Small scale Miners activities,
(ii) establishment of cleaner gold mining and extraction technologies to minimize or eliminate mercury releases,
(iii) development of capacity and regulatory mechanisms that will enable the sector to minimize negative environmental impacts,
(iv) introduction of environmental and health monitoring programmes, and
(v) building capacity of local laboratories to assess the extent and impact of mercury pollution. This specific objective was deployed in order to ensure sustainability of the monitoring programs, the project worked to build capacity of local institutions (e.g., local laboratories) through training and material support, enabling them to carry out continuous monitoring beyond the initial project's term.
(vi) Development of Country-specific policies and legislation for governing the ASM sector
(vii) Dissemination of project results and searching for opportunities for increased self-financing of the Project

The project aimed to increase knowledge and awareness of the environmental impacts associated with use of mercury among miners, government institutions, and the public at large. This was bolstered by the introduction and demonstration of cleaner and more efficient technologies that minimizes negative environmental impacts while improving earnings, health, and safety.

This evaluation was requested by UNIDO on behalf of GEF/UNDP on the basis of the TOR on the appendix A.

1.1. Evaluation methodology

The evaluation started with literature review of the reports and studies carried under the auspices of the project. The following stage included the inspection of all project sites and countries in which individual interviews, stakeholders' meetings and anonymous questionnaires were administered. Direct interviews and stakeholders' meetings had a written guide of open-ended questions while the anonymous questionnaires (appendix B) were administered to key players in the GMP such as the assistant country focal point and others.

The evaluation included interaction with most players (miners, service providers, governments, consultants, NGOs and communities), stakeholders meetings (community meetings) and email and phone interaction.

The evaluator held debriefings to the UNIDO representative in each country of the project in order to present the preliminary findings.

The evaluator also conducted a debriefing to the management team at the UNIDO head quarters in Vienna.

The main limitations faced by the evaluator are related to impossibility to inspect the field sites in Sudan and Laos.
The project did generate baseline information on the health and environmental status of the project sites and this constituted important information for the evaluation.

1.2. Sites Background and Project Relevance

The country sites were selected after extensive evaluation of about 20 countries and those that presented indications of environmental problems in trans-boundary river/lake basins mainly due to use of mercury by ASM. The global nature of the GMP led to geographical distribution of countries in the three main continents where there is significant ASM activity.

The selection of the sites within the pre-selected country was done in consultation with national governments and each country has defined its priorities (e.g. in Tanzania it was the number of ASM in Geita District and the fact that they are mining in the catchment of the Lake Victoria).

1.2.1 Brazil

The Tapajos region in Brazil is the largest artisanal gold mining region in the world. There are more than 2,000 mine sites in the 98,000 km^2 of the Tapajos basin and its sub-basins and between 60,000 and 90,000 small-scale gold miners. For the GMP, São Chico and Creporizinho ASM sites, located in the Tapajos region of Brazil, were selected and evaluated. These sites are an

integral part of the municipality of Itaituba in the State of Pará, and are located about 350 km from Itaituba city.

1.2.2 Indonesia

Three distinct sites in Indonesia were selected and evaluated: two in the Central Kalimantan and one in the North of Sulawesi,.

i. Galangan, Central Kalimantan; covers over 200 km^2 of land that is extremely degraded from deforestation, desertification and mercury contamination from ASM.
ii. Rasau and Aspai along the Sekonyer River, Central Kalimantan
iii. North Sulawesi, within the headwaters of the Tanoyan River and its tributaries.

Each mining community exists under different organizational and government structures with diverse levels of understanding and attitudes towards mining, mercury use, legal status and environmental and human health.

Galangan, Kalimantan

Gold mining in the Galangan area of Central Kalimantan has been going on for more than 20 years. Mercury contamination in the study area stems from processing ore in the mining field of Galangan and from amalgam burning in the township of Kereng Pangi. Mining methods involve the use of hydraulic monitors to strip the subsurface soil, and carpeted sluices to trap the gold.

Rasau and Aspai are two remote mining camps along the west side of the Sekonyer River in Kota Waringin Barat District, Central Kalimantan province in a protected forest district. Options for livelihood for most people are limited to illegal mining (gold and zircon). Aspai is the largest camp along the river, with about 1,000 miners and temporary occupants. Rasau has only about 500 miners. Miners exploit alluvial deposits on land using hydraulic pumps in both camps.

North Sulawesi

Mining activity started in 1986 in the Tanoyan area of the North Sulawesi region. The mining area is spread out within the headwaters of the Tanoyan River and its tributaries and is surrounded by rice paddies, coconut plantations and cornfields. The miners use both amalgamation and cyanidation for gold extraction.

1.2.3 Lao PDR

In Lao the Champat and Pak Ou districts on the Mekong and Nam Ou rivers were selected. The results of the diagnostic analysis carried on the initial stages of the GMP proved that mercury contamination in the area was negligible. Thus, new sites were selected, the Lak Sao, in the Bolikhamxay Province, and Sanamxay, in the Attapeu Province.

Lak Sao, Bolikhamxay Province

Lak Sao is situated in central Lao PDR, approximately 50 kilometres from the Vietnam border. In 2005 there were at least three different hard rock ('primary') mining operations in the area, as well as artisanal alluvial mining by villagers. In the area surrounding Lak Sao there are five ASM areas that involve exploitation of both alluvial and primary deposits. These activities are concentrated around the village of Ban Nakadok. Currently, 1,500-2,000 people are believed to be involved in ASM activities. Local and foreign companies, and a military mining concession also operate in the area.

Sanamxay, Attapeu Province

The region of Sanamxay, Attapeu Province in southern Laos was chosen as the second implementation site because both large-scale mining as well as ASM activities on or near the Sekong River take place. The scope of ASM activities and extent of mercury use in this region is not known at this time, as this was not a specific goal for this stage of the project.

1.2.4 Sudan

Gold was discovered in the central part of Ingessana Hills in 1997. Migrants have flocked to the region, especially those displaced by civil war in the southern parts of the region. The population is now multi-ethnic, including the Dawalla people from the Kurmuk region and the indigenous Ingessana people. The GMP sites are in Gugub and Khor Gidad villages, located 80km southwest of El Damazin, the capital of the Blue Nile state.

The Ingessana Hills District, with a population of 100,000, is characterized by an extreme shortage of water during the dry season, poor accessibility and lack of infrastructure. The communities are semi-nomadic and impoverished, relying on limited farming, animal husbandry and artisanal mining for their livelihoods. There are approximately 1,100 small-scale gold miners near Gugub and adjacent villages, processing alluvial and primary quartz vein type ores at about 20 ASM sites.

Mercury-gold amalgams are roasted openly on pans over wood fires, both inside and outside village huts.

1.2.5 Tanzania

The Geita District has more than 150,000 artisanal and small-scale miners, mostly impoverished illegal panners. This area accounts for about 15% of all active small-scale miners in Tanzania. Intensive small-scale gold mining began in this region in the 1980s, and currently involves most of the population (either as miners, part-time miners, or buyers). The specific sites for the GMP are Nyarugusu and Rwamagasa village.

In Rwamagasa, the licensed small-scale Blue Reef Mine and the independent miners mill and sluice for gold by the River Isingile. At Blue Reef Mines, 150 people work primary ore from underground shafts. The independent millers employ approximately 300 people in 10 sites where they process tailing material or weathered ore from pits or shafts. The ore is dry milled in small ball mills, without mercury, then slurried and passed over sluices. The sluice concentrates are amalgamated in metal trays, with bare hands, and the amalgamation tailing is stored in concrete or wood-lined tanks and is frequently reprocessed. Amalgam is burned in a small charcoal fire with no retort. Housing, food stalls and schools are all located close to amalgamation sites and contaminated tailing material is stored near wells and agricultural land.

The scenario in Nyarugusu is similar to the one in Rwamagasa.

1.2.6 Zimbabwe

Small mining and milling operations in Zimbabwe have used both mercury and cyanide for about 100 years. The GMP decided to work in the Kadoma-Chakari area. Recent estimates suggest that Kadoma-Chakari area produces about 10% of the country's ASM gold. About half of the mercury loss associated with burning the amalgam occurs when amalgam is dissolved during pre-treatment of the amalgam with nitric acid. This practice is standard throughout Zimbabwe, and miners and millers simply discard the waste solution containing the dissolved Hg on the ground.

1.2.7 Project Relevance

The project constituted the first global initiative geared towards assistance of the ASM sector. The ASM sector faces challenges related to illegality, remoteness of the sites, lack of environmental and health awareness, lack of knowledge of the dangers related to the gold extraction methods, lack of basic sanitation, health and education infrastructures, lack of social and governmental recognition, lack of funds and lack of geological and mining knowledge. The GMP could not address all the ASM challenges, but it is worth recognition that it did manage to test, demonstrate "clean" technologies and did raise awareness about the health and environmental issues related to the ASM activity.

2. GMP Structure

The GMP implementation structure was a multi-layer and multi-institutional which included the UNDP as the implementing agency, the UNIDO coordinator, the UNIDO Chief Technical Advisor, six Country Focal Points, six country assistant to country focal point, the UNIDO Administrative Assistant, consultants for (technology, database, media relations/ GMP II, and webmaster), six country coordinators (from 2005) based in Vancouver, *International Experts*

The hierarchy and the subordination channels were only clear at level of UNIDO coordinator and the UNIDO CTA, for example the Assistant Country Focal Point was at the same hierarchical level as the Consultants on Technology, Database, Media Relations/GMP II and Webmaster. In this structure the coordinators were at the same level as the team of consultant that carried the policy development and the reclamation strategies who were directly subordinated to the CTA.

According to the latest structure the CTA was the one to read the preliminary report drafts from all 24 technical staff involved at different specialties of the project.

In the latest structure ACFP and CFP did not have clear responsibility over the consultants or over the service providers.

2.1 Effectiveness, efficiency and relevance of the management structure

The present GMP structure is confusing in terms of responsibility distribution and reporting channel, apparently everybody is directly subordinate to the CTA, and there is no middle management of the project. In the latest structure the assistant to the Country Focal Point and the Country Focal Point did not have clear responsibility over the consultants or over the service providers.

Although the latest structure did deliver positive results, it is rather inefficient for managing processes like the GMP where sustainability is the key factor in order to really produce an impact in the social and environmental processes.

The structure proved to be inefficient as demonstrated by the generalised frustration shown by the different players in relation to the UNIDO bureaucracy and the fact that every action had to be channelled through the CTA. It also proved to be inefficient to accommodate smooth communication between the UNIDO, UBC coordination Unit and the Assistant Country Focal point and the service providers.

The figure of Country Coordinator based in Vancouver is not appropriate for field project like GMP. The Country coordinators should have been sort of technical assistance to work "*under"* or in collaboration with assistant country focal point in the implementation of field activities, such that in the absence of the country coordinator the ACFP would take over all activities. The country coordinator should not have more administrative or responsibility power than the assistant country focal point. An option would have been to have the country coordinator at the same level as assistant country focal point directly subordinated to the CTA and to the Country Focal Point.

In regard to the contractors and consultants, it would have been more positive to consider them answerable to the assistant country focal point, because the ACFPs are the one on the ground. They have better understanding of the local

environment, the applicability of specific technology to be introduced and, they should have been the one to drive the tests of the technologies on the sites. The ACFPs should have been in position to pre-select the technologies that are considered more suitable to their countries.

3. Management process

The management of the project followed a vertical hierarchical and centralised process. The financial management was completely independent from the technical management. Apparently the ACFP were not fully aware of the funds available for executing the project.

Financial cost of the management structure was considerably high, especially in costs related to travelling to the beneficiary countries.

The management process at UNIDO included one Project Coordinator and one Administrative Assistant, in Vancouver the project management Unit consist of one CTA (Chief Technical Advisor), six country coordinators and technical consultants.

In each country it was supposed to have been installed the country steering committees or a country project task force and a basin project task force. These committees and task forces were not established.

In every country there was a country focal point, a political figure highly placed in the relevant ministry and with capacity to influence regulations and/or legislation processes in favour of the ASM. The project did not fully capitalise on these figures in most of the countries. The CTA argues that the CFP were not active because they were too busy to incorporate the GMP project in their schedule. Other views of some of the country coordinators believe that the lack of payment could have been behind the complete absence of the CFP.

Whichever reason, the fact that the CFP did not function diminished the government involvement and its commitment to the project and it is encouraged that future project (e.g. GMP II) finds mechanisms to capitalise on the local capacity.

The Assistant country focal point (ACFP) was recruited on the full time basis; however his work was not properly supervised, either by regular reporting or by occasional debriefings to the CTA. In personal interviews some of the ACFP alleged that the bureaucracy and the poor supervision led to the relaxation on their duties. Other reasons included the weak knowledge of the local reality by the country coordinators who could not attend to the politics in the different countries, and who did try to drive the process at all cost with little synchronisation with ACFP and CFP.

It is evaluator's perception that the ACFP should have been trusted with full responsibility to run the project and the CTA should have established a monitoring and evaluation process that would allow control of the activities in the field (e.g. daily activity log-sheets). The processes should have been driven from the country perspective, and should have been given enough authority to call for specific technical assistance through the CTA. This fact would have given more time to the CTA to oversee the processes, monitor and correct the mistakes, transfer experiences from one country to another.

Probably all this happened because the present CTA did not select the ACFP, thus he could not trust them. But if this was the case, then the CTA should have had the authority to dismiss and recruit people of his trust. Probably this is what the CTA ended doing when he recruited six country coordinators to be based in Vancouver. Allegedly because he could not be in all countries enough time to drive the processes.

On other hand it is important to recognise that the CTA and the management team did their best to achieve the positive results that today the GMP can be proud of, and the fact that this was a learning experience for everyone involved in the project implementation. Thus, the adaptive management of the project based on reactive response and not on proactive planed actions.

A point must be taken and recognised that the differences among the six countries required extra effort from the implementation team.

4. Project Implementation

The GMP was initially approved for three years, 2002 to 2005. The assessment of the project results in 2005 lead to the extension of the project until the end of 2007.

Thus, the implementation analysis will be divided in two phases, namely the period between 2002 and 2005 (diagnostic analysis phase) and the final period between 2005 and 2007 (Training, awareness campaign and promotions of the program).

The diagnostic analysis phase of the GMP comprised the carrying out of a series of studies in order to evaluate the extent of mercury contamination and to establish the magnitude of the peripheral problems at each of the pre selected sites. These studies included the social-economic studies to analyse the history, characteristics and dynamics of the chosen mining communities; legal studies to identify the existent legal framework and regulations for the ASM; and environmental and health assessments to bring evidences and levels of mercury

in soil, sediments, fish, human blood, urine and hair and to characterize the main symptoms of contamination in humans.

The second phase consisted of training, awareness campaigns and promotions of the GMP and was highly focussed on the implementation of concrete solutions to reduce or eliminate the use and release of mercury from ASM. The training program constituted the main activity and focused on how to increase the recovery of gold, how to recycle mercury, how to use retorts, impacts of mercury on health and the environment, mercury in the gold shops, how to protect water bodies, how to diversify the miners' rural economy, how to legalize a mining site, tailings and waste management, refilling old pits, pools for mercury amalgamation, use of latrines and mosquito nets, how to filter water, garbage disposal, and reforestation of degraded areas. The awareness campaign provided education about the hazards of ASM activities, with focus on mercury, to local and national citizens in pilot project countries. Awareness on preventative and corrective actions for healthy living were included.

Promotion of the program occurred simultaneously with other phases of the project and aimed to reach other stakeholder groups such as international, federal, state, and local governments, NGOs and government organizations to assist in the implementation of common goals and establish synergies and partnerships.

The project objectives did not change along time. However, with retirement of the CTA and the recruitment of the new CTA in 2005 a new approach was adopted in the project management.

4.1 Work plans

The evaluation mission did not identify clear planning structure in the countries or in the management unit. There was planning exercise during the country meetings, which was not enough to guaranty efficient follow up and held responsibilities for non realized activities, especially during the field implementation of the TDU, and awareness campaign.

4.2 Budgets

The GMP project initial budget was 6,806,800 USD from GEF, 670,000 USD from UNIDO and 13,052,000 USD expected parallel Co-financing by the beneficiary countries (Table 1).

Table 1. Summary of UNDP and Cost-Sharing for GMP

UNDP:	Current
Other (GEF)	$6,488,000
AOS	$318,800
Sub-total	$6,806,800
TOTAL GEF	**6,806,800**
Government inputs	Parallel Co-financing
Brazil	2,953,000
Sudan	2 00,000
Tanzania	1,630,000
Zimbabwe	5,450,000
Indonesia	2,089,000
Lao	60,000
Total Gov'ts	12,382,000
UNIDO	670,000
Total co-financing	**13,052,000**

From the above budget only the GEF and UNIDO funds were materialized financially. While hard to track, the governments have partially made their contribution in-kind (e.g. office space, staff time, logistical support).

4.3 Generalized Project Expenditures

The Fig.1 summarises the major project expenditures. From the Fig.1 it is clear that the subcontractors (including the TDU implementation) and the travel costs were the major expenditures to the project. The non TDU equipment budget line constitutes one of the least in the order of expenditures (5.4% equivalent to $367,950.3).

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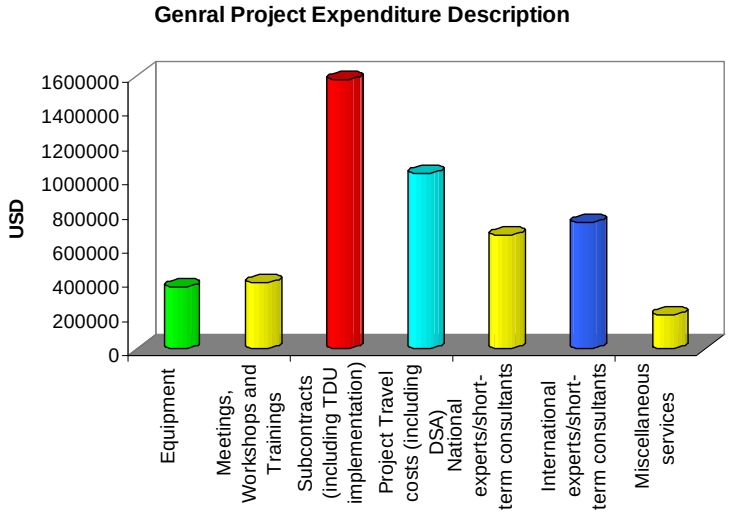

Figure 1: Illustration of the budget distribution for the GMP (table data compiled by UNIDO, 2008)

The budget line “subcontractors” comprises all activities carried by private entities in the beneficiary countries. The TDU (Raising General Community Awareness on Health Risk of Mercury and Cyanide and Improved techniques for Gold Recovery) consumed 46.6% ($736,727.00) of the budget line and 10.9% of the total budget. On other hand the project spent 15% ($1,026,020.4) of the total budget on travel costs.

4.3 Project monitoring and reporting process

The project document indicates that the monitoring and evaluation will be on regular quarterly meetings and regular project implementation site visits of the Country Project Task Force (CPTF) to review the implementation of the project objectives and advise accordingly. It is also indicated that the Basin Project Task Force (BPTF) would meet once a year to review the regional objectives of the project. And additionally the project would be subject to UNDP review mechanisms (e.g. APR, TPR), GEF review process (PIR).

The evaluation mission did not identify any clear monitoring and self evaluation procedures especially at country level. The annual project meetings are considered to be the point where the ACFP presented their annual reports.

The evaluation did not trace any reporting procedure that would lead to regular reporting by any of the management structure layers. It is claimed that the meetings presentations and the BTO reports are part of a procedure.

The fact that the CPTF and the BPTF were not established might have been the reason for reduced attention on monitoring and evaluation processes.

4.3.1 Project Indicators

The project did not have pre-set **indicators**, probably because when the project was developed the log frames and project indicators were not yet part of the GEF project procedures. To demonstrate this are the APR and PIR for 2003 which have different indicators from the rest of the years 2004 to 2007.

Table 2: Summary of the objectives and the proposed indicators and the rating according to APR and PIR for 2004 to 2007.

		Rating according to APR and PIR				
Objective	Indicator	2004	2005	2006	2007	Present Evaluation
1. Capacity building to reduce Hg pollution and exposure from ASM	1. Recruitment of coordination team and experts	S	S	S	S	S
	2. Recruitment of ACFP, working facilities (vehicle, office, etc.)	S	S	S	S	S
	3. Review of the past, existing and preparation of new case studies	S	S	S	S	MS
	4. Establish website	S	S	S	S	S
2. Project Demonstration sites identification, raise awareness to public, miners and government	1. Agreement on site selection	S	S	S	S	
	2. Awareness campaigns organized and conducted	S	S	S	S	S
	3. Development of replicable material	S	S	S	S	S
3. Determination of the extent of environmental pollution on surrounding water bodies and public health	1. Recruitment of consultants	S	S	S	S	S
	2. Upgrading local laboratories for monitoring Hg pollution	S	S	S	S	S
	3. Return the results to the stakeholders	S	S	S	S	MS
4. Establish a databank comprising technological requirements relevant to ASM activities	1. Establish website containing main documents and finalized reports	S	S	S	S	S
	2. Collection of data on ASM in hotspots	S	S	S	S	S
	3. Databank of local equipment fabricators	S	S	S	S	S
	4. Develop micro-financing **programs**		S	S	S	MU
5. Application of affordable high-efficiency clean technology with improved gold processing methods while avoiding environmental degradation	1. TOR for building transportable demonstration unit (TDU)		S	S	S	S
	2. Training of trainers		S	S	S	S
	3. Recruitment of local organizations to lead the TDU training		S	S	S	S
	1. Synthesis of legislation relating to ASM		S	S	S	S
	2. Dissemination of policy recommendations		S	S	S	MS

6. Country-specific policies and legislation for governing the ASM sector	3. Develop guidelines on regulatory standards for incorporation into government policies		S	S	S	MS
	4. Promotion of government capacity mechanisms		S	S	S	MS
	5. Promotion of Green Gold Initiative		S	S	S	MS
	6. Promotion of amendments to existing International Protocols/treaties		S	S	S	S
7. Dissemination of project results and searching for opportunities for increased self-financing of the Project	1. Country Task Force Meetings	S	S	S	S	S
	2. Global Task Force Meeting	U	S	S	S	S
	3. Replicating implementation activity in neighbouring countries through partnership funding agency		S	S	S	S
	4. Partnership of mining companies with GMP		S	S	S	S
	5. Partnership with US EPA		S	S	S	S

HS - Highly Satisfactory; S – Satisfactory; MS - Moderately Satisfactory; MU - Moderately Unsatisfactory; U – Unsatisfactory; HU - Highly Unsatisfactory

The indicators listed above are in reality the specific activities for each objective, such that they can only measure the quantitative implementation rate of the project, however, they are rather inefficient as indicators for measuring the quality and the sustainability of the outputs.

The project indicators listed in the table above can be measured simple by asking or observing the event suggested in the activity, for example did the Global Task Force meeting happen? Some of the indicators were developed along the implementation of the project such (e.g. promotion of green gold initiative).

5. Major outputs and Cost effectiveness

5.1 Major outputs of the project

The following major outputs of the project can be listed:

- The project did manage to rise world wide awareness about the impacts of HG
- The project conducted environmental and health assessments in all 6 countries
- On the basis of the Environmental and Health Assessment, the project published a protocol which is now the benchmark for all assessment worldwide (e.g. UNEP, WHO projects).

- GMP did equip national laboratories with capacity to measure Hg in the human being and on the environment.
- The project did demonstrate at different levels of accomplishments the cleaner gold extraction techniques
- The project did help in regulating the ASM in some countries (e.g. Tanzania).
- The project did train miners, government officials and other interested parties in all 6 countries
- The project conducted socio-economic assessments and have established the root causes for the ASM sector and proposed ways to address the sector socially.
- The GMP completed assessments on policy and governance issues and discussed results with community stakeholders and government policymakers. This did help in rising awareness on the need to properly regulate the sector
- The GMP did publish 60 papers (refereed journals, conference proceedings and book chapters) on GMP related activities
- The GMP did examine alternatives to turn the ASM sector into a viable activity for poverty alleviation in developing countries. GMP identified that the feasibility of the micro-credit initiatives is key to success of ASM as alternative livelihood. The main conclusion from this study comes from Sudan where they believe that microcredit is viable when delivered in an integrated rural development package.
- The GMP delivered "Training of Trainers" (mainly on retort use, tailings disposal, Hg recycling, and processing techniques) in all six countries. Although the number of trained miners can be considered very small when compared to the universe of ASM, it must be seen as the beginning.
- The GMP did successfully implement the Transportable Demonstration Unit campaign in **some** countries (Tanzania, Indonesia)
- The GMP did identify and train local manufactures who are now producing ASM equipments (**Tanzania, Indonesia and Sudan**)
- The GMP has assembled a static database running on www.globalmercuryproject.org. It is very unclear how sustainable this will be especially if the GMP II does not happen.

The table bellow rates the objectives against the achievements in the six countries. The raking is based on field observations, anonymous questionnaires on comparative criteria, i.e. the best result has the highest rank.

Table 3: General rating of the specific objectives of the project at country level

Objective	Brazil	Indonesia	LAO	Sudan	Tz	Zw
To ensure effective project coordination and support through establishment of a UNIDO based Programme Coordination Unit (PCU) and a Global Project Task Force	na	na	na	na	na	na
Assessment of Artisanal and Small scale Miners(ASM) the extent of pollution from current Artisanal and Small scale Miners activities	HS	HS	HS	HS	HS	HS
Establishment of cleaner gold mining and extraction technologies to minimize or eliminate mercury releases	S	S	S	S	HS	HS
development of capacity and regulatory mechanisms that will enable the sector to minimize negative environmental impacts	S	S	S	S	S	S
Introduction of environmental and health monitoring programmes	U	U	U	U	U	U
Building capacity of local laboratories to assess the extent and impact of mercury pollution.	S	MS	S	S	HS	MS
Development of Country-specific policies and legislation for governing the ASM sector	MS	S	MS	S	S	U
Dissemination of project results and searching for opportunities for increased self-financing of the Project	MS	MS	MS	MS	S	MS

HS - Highly Satisfactory; S – Satisfactory; MS - Moderately Satisfactory; MU - Moderately Unsatisfactory; U – Unsatisfactory; HU - Highly Unsatisfactory

5.2 Cost effectiveness of the major outputs

It was difficult to measure the cost effectiveness of the outputs especially because the financial statements did not discriminate the costs on the basis of the outputs or activities. Exceptions are the TDU and the awareness campaign. The budget lines as shown on the table 4 suggest that most of the budget was spent in personnel and subcontractors (23.3% of the total budget). A significant amount of funds (15% of the total budget) were spent in travelling and subsistence allowances. This cost could have been minimized if consultants were procured regionally and on medium term of engagement in order to allow longer presence in the field and fewer missions.

The results achieved are significant; however considering the size of the budget one would have expected a considerable impact on the ground at beneficiary countries. The direct implementation geared towards finding solutions for the Hg impacts was quite limited in terms of size of the funds per country (average of 135000 USD per country (table 4), excluding the environmental assessments) and time spent in the field with communities. An immediate consequence of such limitations is the reduced adoption of the practices and technologies by the miners and communities.

The project did manage to spark awareness on the problem of mercury (through the environmental assessments) in all countries and at all levels in the

beneficiary countries. Most of the beneficiary countries are prepared to incorporate issues related to Hg contamination in their annual budgets.

In summary, considering the above achievements one may consider that some activities (e.g. TDU, awareness campaign) were cost effective.

Table 4. Budget expenditure on heading subcontracts (data source: UNIDO 2008)

Subcontracts

Expenditures under this heading relate to all costs relating to subcontracts negotiated by or with the clearance of Procurements Services

Description/Activity	Subcontractor	country	2002	2003	2004	2005	2006	Grand Total
Printing of books	Corba Editira Artes	Brazil	$3,239					$3,239.44
Environmental and health survey in Zimbabwe	BRGM (Bureau de Recherches Géologiques et Minières)	France		$137,222.01				$137,222.01
Environmental and health survey in Lao PDR	BRGM (Bureau de Recherches Géologiques et Minières)	France		$71,062.00				$71,062.00
Environmental and Health studies- Tanzania	British Geological Survey	UK		$135,760.00				$135,760.00
Environmental and health survey in Brazil	CETEM	Brazil		$126,150.00				$126,150.00
Environmental and health survey in Sudan	BRGM (Bureau de Recherches Géologiques et Minières)	France		$71,242.00				$71,242.00
Environmental and health survey in Indonesia	CETEM	Brazil		$136,249.00				$136,249.00
Sociological survey of the selected sites in Luang Prabang.	Earth Systems Lao	Lao		$6,500.00				$6,500.00
Institutional Video for the Global Mercury Project	ACRP CONSULTORIA LTDA ME	Brazil			$19,923			$19,923.00
On-site Assistance of Wall Street Journalist and Small-Scale Miners in Tapajos, as per faxed offer, dated 16 Sept. 2005		Brazil				$17,192.59		$17,192.59
Misc. expenses to ACFP		Lao				$538.74		$538.74
Hg Awareness campaign in Brazil	CETEM	Brazil			$8,000	$26,492.09		$34,492.09
Raising Community Awareness on Hazards of Mercury Exposure, Introduction of Small-scale Gold Mining Equipment and Assessment of Small-scale Gold Mining Activities in Lao PDR	Earth Systems Lao	Lao					$74,500	$74,500.00
Editing Brochures to Artisanal Gold Miners	Imago Creative Shop	Canada					$6,900	$6,900.00

Raising Community Awareness on Hazards and Solutions to Exposure to Mercury through Community Theater in the Kadoma-Chakari District of Zimbabwe	Amakhosi Performing, Arts Workshop	Zimbabwe					$12,670	$12,670.00
Raising Community Awareness on Hazards of Exposure to Mercury and Supply Equipment for Mercury-cleaner Gold Processing Technologies in Blue Nile State, Sudan	Geological Research Authority of the Sudan	Sudan					$120,000	$120,000.00
Raising Community Awareness on Hazards of Exposure to Mercury and Supply Equipment for Mercury-cleaner Gold Processing Technologies in the Kadoma-Chakari District of Zimbabwe	Institute of Mining Research University of Zimbabwe	Zimbabwe					$115,000	$115,000.00
Raising General Community Awareness on Health Risk of Mercury and Cyanide and Improved techniques for Gold Recovery in North Sulawesi, Indonesia.	Yayasan Lestari	Indonesia					$40,125	$40,125.00
Raising Community Awareness on Hazards of Exposure to Mercury and Supply Equipment for Mercury-cleaner Gold Processing Technologies in Galangan, Central Kalimantan, Indonesia	Yayasan Tambuhak Sinta	Indonesia					$94,970	$94,970.00
Raising General Community Awareness on Health Risk of Mercury and Introducing cleaner technology for Gold Recovery along Sekonyer River, Kotawaringin Barat District, Central Kalimantan.	Yayasan Pecinta Taman Nasional FNPF	Indonesia					$10,000	$10,000.00
Term of Reference for the Use of a Geographic Information System Lab to Develop Images on Artisanal Gold Mining in the Tapajós Region, Brazil	IDEAL Faculty of Forestry	Canada					$10,000	$10,000.00
Cilantro- Reducing the Negative Health Impacts of Mercury Exposure Using Native Food Plants as Heavy Metal Chelating Agents	Smith Nagal Foundation	Ecuador					$19,900	$19,900.00

Raising Community Awareness on Hazards of Exposure to Mercury and Supply Equipment for Mercury-cleaner Gold Processing Technologies in the Tapajós Region, Brazil Raising Community Awareness on Hazards of Exposure to Mercury and Supply Equipment for Mercury-cleaner Gold Processing Technologies in the Tapajós Region, Brazil	IBRAD	Brazil					$135,000	$135,000.00
Campaign for Raising the Awareness of the Hazards of Mercury Exposure and the Demonstration of Cleaner Gold Processing Technologies to Mining Communities within the Geita Mining District of Tanzania	Tan Discovery	Tanzania					$134,462	$134,462.00
the Use of a Remote Sensing Lab to use Satellite Imagery to Monitor and Remediate Small Scale Gold Mining in Brazil and Indonesia	Aqueous Geochemistry Laboratory	Canada					$46,960	$46,960.00
								$1,580,058

5.3 Countries' level of interest and ownership of the project

In all six countries there is manifested interest and high government commitment to an extent that all countries have expressed their interest in writing to UNIDO and indicating that they are willing to co-finance mainly in kind or in kind and cash the second phase of the GMP. The ownership of the project can only be effective if the project activities are synchronised with relevant government activities. Thus, the government has to indicate exactly what their plans are for the sector and the project is expected to help the government to materialise such plans with more resources (financial, technical and human). The ground implementation can be subcontracted to local social organizations or private entities, but the government is expected to monitor and evaluate the subcontractors. In this way there would be sustainability of the project outputs and the outstanding activities would be concluded even outside the scope of the project. The financial and the overall technical management of the project are expected to lie on the implementer agency or a coordination unit.

5.4 Gaps deficiencies and concerns on the project implementation

The deficiencies and concerns on the project implementation are divided in five parts, namely the "assessment studies", the "TDU implementation", the "awareness campaign", "development of the capacity and regulatory mechanism within Government that could enable the sector to minimize Hg pollution" and on general implementation of the project:

5.4.1 General Implementation

- The government involvement was very limited
- The bureaucracy was too heavy for the project
- Prolonged delays in implementation of the project
- The countries needed to have operational budget
- The management structure was too heavy for a small (in terms of budget) project
- The project was too broad in its geographical distribution, especially for a pilot phase
- The countries should have had more say in the budget distribution and priority setting and the budget lines needed to be more flexible especially when dealing with highly dynamic sector such as the ASM.
- The beneficiary countries did not contribute financially to the project
- Some of the pilot sites were too far from the capitals and required complex logistics

5.4.2 Assessment studies

- The use of subcontracts did not look carefully to the sustainability and capacity building
- The results of the Assessment Studies were not fully used in following phases of the project
- The study results were not disseminated enough through the stakeholders

5.4.3 TDU

- The TDU did not capitalize on the previously implemented technology transfer initiatives.
- Some of the demonstrated technologies were not fully and scientifically tested to be better (on the miners' perspective) than the present technology.
- It did not spend enough time in the field in order to make real impact.
- The sustainability issues were not looked properly

5.4.4 Awareness campaign

- Very good as a principle
- It did not spend enough time in the field or in the communities
- The sustainability component was neglected
- The transmission of health issues is quite sensitive and it requires health experts (e.g. most people were concern about what to do after Hg exposure and the explanation by non medical personnel is psychologically non-convincing).

5.4.5 Develop capacity and regulatory mechanism within Government that would enable the sector to minimize Hg pollution

- This component did not capacitate the government officials
- The proposed regulations or amendments needed to be clearly supported by scientific evidences regarding the issues, and most importantly the technologies need to be adoptable by the miners (i.e. miners need to the identify tangible benefits in the technological shift)

5.5 Sustainability of the project outputs

The sustainability of the project results is always a big challenge. For the global projects this challenge is increased due to socio-cultural diversity and attitudes/ behaviours in different countries. For the project like GMP dealing with precious metals that its price is driven by world market forces it is very challenging especially because the number of miners involved in the ASM is poverty driven. The trend of gold price is directly proportional to the number of miners. Thus when the project started in 2002 the price of gold was around 300 USD/oz; by 2007 at the end of the project the price has rose 300%. This implies that the number of ASM increased significantly during the project implementation. The nature of the ASM community include high turnover of miners, this turnover is increased with high gold price. All this aspects affect the sustainability of the project outputs because the number of trained miners reduces with time and new miners come in the community and all practices that the project might have introduced are easily erased.

The use of NGOs or service providers for technology transfer and awareness campaign has proved not sustainable because they only implement project activities if they are paid for, which means that all activities end with end of the project.

The proposed way to guaranty sustainability in such environment of ASM is to empower the government authorities with capacity to implement the project adequately as part of their normal activity, they may outsource part of the services.

The other dimension of the sustainability is regarding the infrastructures such as the laboratory equipment provided by the project; at the moment this equipment is not in use and its future is not clear due to many reasons that included the job abandon of the trained technician. For the sustainability of the laboratory service, it is recommended that more than one person should be trained and for the maintenance of the equipment a fee is charged for the analysis.

The sustainability of most results achieved by GMP is not clear with exception the database running on WWW.globalmercuryproject.org, which can be considered a medium to long-term indicator of sustainability.

The level of adoption of some of the activities developed by GMP are also indication of sustainability, for example the fact that local fabricators adopted the production of retorts and the production of water condensers for mercury recycling. However, the use of retorts by miners is minimum-to-nil, which reduces the sustainability of the fabricators of retorts. It is different in regard to the water condensers which were fully adopted by the gold shops in Indonesia.

6. Project (GMP I) Good Experiences

The table bellow summarises the GMP I good experiences, challenges and the recommendations.

Table 5: Summary of the GMP experiences, challenges and recommendations

Lessons that might benefit the future GEF-funded projects	**Challenges**	**Corrective recommendations for the challenges**
GPM was very proactive and unique in integration of health, ecological, technical, economic and policy concerns in community development	The sustainability of such broad and inclusive approach is very challenging. The use of health messages by non health personnel is counterproductive	Create stakeholders forum for harmonization and optimisation of procedures
Protocols for all contracted work need to be developed carefully and followed closely	Ground supervision of the consultants	The project used in its first phase the ACFP to accompany the consultants especially during the assessment studies
The GMP increased the credibility of GEF/UNDP/UNIDO by teaming with most reputable Geological Surveys of the world (BGS, BRGM and CETEM)	Management of multiple players is very demanding for the CTA	Establish stakeholders forum to discuss the lateral integration and methods

The project capitalised on synergies with similar projects such as the US/GHA/02/006-phase II.	Identification of mutual benefits is challenge	Approach the other project willing to give something before gaining anything.
The GMP made publication in cooperation with BGS, BRGM, CETEM, Universities of Montpellier and Pau	The challenge was to make proper use of such publication.	This valuable information need to the disseminated more among the stakeholders, especially in the countries with ASM
The GMP as a global project is the main good lesson	Several challenges related to implementation of a global project (see 4.5)	1. Simplification of the bureaucracy 2. Establish adequate management structure that empower and entrust the local partners the responsibility of implementing the project 3. The role of the government must be improved to an extent of having the relevant Ministries budgeting for issues promoted by the GMP 4. The introduction of new technologies need to be properly tested and have to add value to the ASM activity, especially improve productivity. 5. The process of introducing new technologies need to be a medium to long term project and time spent with beneficiaries is significantly prolonged. This can only be done properly with use of government structures such as the use of field extensionists (similar to the one used in the agriculture sector). 6. The sustainability of the results and out puts of the project can only be guarantied by the government structures. 7. In global project there is no one solution fits all. Each case is specific and requires full attention.
The use of local and community based organization	The sustainability of the activities after the project.	Although the private service providers are more efficient than the government, they will not continue the activities of the project beyond the project lifetime.
The establishment of communal new technology centres (e.g. communal retort in LAO, processing centres in Tanzania)	The high turnover of the miners in the mining communities	Guaranty continuous awareness campaign that will ensure the compliance of local by laws related to the use of communal centres.
Training on GMP issues of different groups of interest such as miners, millers, buyers, communal leaders, food and	High turnover of people in the mining communities. The funding of the TOT process and the	Need to have permanent program of training of the stakeholders. One approach would be the training of trainers who would roll out the

beverage vendors etc.	supervision of the trainers to guaranty that they deliver trainings in their communities	training towards more communities
Capacitating of the laboratories in Hg analysis.	Sustainability of the service and equipment	For the sustainability of the laboratory service, it is recommended that more than one person is trained in the use of the equipment. For the sustainability of the laboratory equipment, it is recommended that the analysis a paid at subsidized rate.
The interventions are supposed to start soon after the diagnostic studies	To control the community expectations, usually are much higher than the project scope	Establish forum at the community where community representatives would interact with project staff and learn about the project objectives and the plans, outcomes and challenges.
Dealing with commodity like gold is very difficult. Especially considering that the price of gold was below 300 USD/oz when the project started and it is at 950 USD/oz by the time when the project came to an end. This implies that the number of miners increased drastically as a result of high gold prices.	The sudden increase in number of miners posed a big challenge to the project. And the high gold price constituted an added challenge because it became difficult to identify alternative livelihood for miners.	Recognise the ASM sector as integrate part of the rural development program by the governments and legislate and regulate the activity. Capacitate the governments in order to be able to supervise the activity.
The whole GMP was a learning experience	Any learning experience poses a big challenge to the implementer, especially in the attempt to control the high expectation from the different stakeholders.	There is no one solution fits all. Each case is specific and requires full attention. Implementers should not be afraid for making mistakes or implementing solutions that turn to not being adequate for specific community.
The publication of the "Manual for Training Artisanal and Small-Scale Gold Miners"	To get the manual to the miners and to find a structure that can use it as bible for the ASM	Pursue the countries to adopt this manual as a bible for the mining extensionists in the field. Get it translated to local languages.

7. GMP II opportunities

All visited governments have shown high interest in having the GMP II. In most countries this commitment can only be realized in kind and not in cash.
The GMP II has an opportunity of building on the momentum created by the GMP I (the expertise and the experts, the networks and the nodal points in the different regions, some infrastructures, the knowledge base and the credibility).

GMP II can explore the possibility of local funding by the other donors and national organizations pursuing the same objectives, for example in Sudan funding can be mobilized from the human capital rehabilitation programs.

The GMP II may learn from the experiences presented on the table 4 and can avoid making the same mistakes by considering the corrective measures presented on the table 4 column 3.

8. Recommendations and Conclusions

On the basis of the above evaluation reported it is possible to draw the following general recommendations, the country specific recommendations are presented in the appendices D to I:

- The global momentum created by the GMP is very important for the ASM, thus it is recommended that the GMP II be implemented as soon as possible.
- The fact that UNIDO has implemented the GMP suggest that UNIDO has gained experience, it also knows now with whom the GMP needs to partner with in order to implement adequately the project, thus, it is recommended that UNIDO be used as the implementer of the GMP II.
- It is recommended that the management structure is simplified and most of the implementation tasks be entrusted to the country level.
- It is recommended that the project redefine its scope in order to deal with issues in an integrated way (e.g. rural development) where the human being is the centre of the process. This is one of the pillars that can guaranty sustainability of the outcomes of the project.
- The project must have implementation procedures that include the reporting, monitoring and self-evaluation mechanism.
- The “country coordinators” must be recruited as experts to assist technically the implementation of the project in each country and be based in the specific countries.
- In the future projects there is need to redesign the roles of CFP and ACFP.
- It is recognized that most global projects run into problems related to the degree of involvement of the CFP. Thus it is recommended that the project finds ways to interest the CFP, this could be for example financial assistance for him to attend relevant training.
- It is recommended that the diagnostic studies are carried out as swiftly as possible in order to allow the project to start its field implementation as early as possible.
- Being a global project, it would have been advisable more interaction and exchange of experiences among the countries. This would have helped the dissemination of the good practices developed in one country and helped the difficulties faced by any specific country.
- It is known that the introduction of best practices and cleaner technologies can only happen if there is cultural change (very difficult) of the miners. Thus it is

recommended that the training of the miners be a continuous process integrated in the activities of the local government (e.g. mining department extensionists).

- It is recommended that the new technologies are well investigated and scientifically proved and tested at local conditions of the project sites.
- The use of the NGOs or service providers proved to be more efficient in terms of field implementation; however it is not sustainable for interventions that require sustainability of the results beyond the project life. Hence it is recommended that government authorities are empowered to an extent that when required they outsource (can be from the NGOs) specific chapters of the project implementation.
- For the sustainability of the laboratory equipment, it is recommended that more than one person is trained.
- It is recommended that the government commitment on the project be mandatory in order to guaranty sustainability of the project.
- It is recommended that the usage of the website (www.globalmercuryproject.org) and its DATABASE be considered as indicator of sustainability and long-term use of the project results.
- It is called attention here that the use of health issues as a tool to pass messages related to other subjects like cleaner gold extraction technologies can be counterproductive; it needs to be handled with care and by proper health experts.
- The nature of legislative issues requires prolonged interaction with government, thus it is recommended that these issues be dealt with right from the beginning of the project in order to give enough time to produce impact.
- The evaluation recognized the innovative approach in the implementation of the TDU, but it was implemented at late stage of the project, thus some shortcuts were made. Thus it is recommended that field implementation starts very early in the project cycle.
- Due to the size of the countries, the lack of infrastructures in the rural areas and the countrywide spread of the ASM it is recommended a field approach that combines TDU with regional training centres.

9. APPENDICES

List of appendices

9.1 APPENDIX A: Terms of reference for the evaluation

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

Post Title: Expert in Monitoring and Evaluation of mining-related projects

Duration: 1.5 w/m

Date required: ASAP

Duty Station: Home based (Maputo) with travel to Brazil, Indonesia, Laos, Sudan, Tanzania, Zimbabwe and Canada (Vancouver)

Counterpart: MAH Water Management Unit, UNIDO, Vienna

Qualifications: Experience in Artisanal Mining

Language: English

DUTIES/JOB DESCRIPTION

The evaluation will consider the effectiveness, efficiency, relevance, impact and sustainability of the project. It will also identify factors that have facilitated or impeded the achievement of the objectives. While a thorough assessment of the implementation to date is important, the evaluation is expected to also lead to recommendations and lessons learned to assist in defining the second phase of the Global Mercury Project.

Under the direction of the UNIDO Project Manager, the expert will be responsible for the following duties:

- To inspect project sites and to evaluate the achieved results with the planned project objectives and project outputs.
- To hold community meetings with affected stakeholders in order to obtain local views of the project's impact
- To check the extent to which activities have or are facilitating the removal of barriers to the introduction of clean technology and the mitigation measures being promoted by the project.
- To comment on the effectiveness of Transportable Demonstration Units and the quality of training to trainers.
- To assess the effectiveness of the project management structure and processes, including roles and responsibilities, budgeting and work planning, steering committee operations and adaptive management of the project to date.
- To assess the effectiveness and timeliness of the project monitoring and reporting mechanisms, including the efficacy of the project performance indicators and any change in monitoring and reporting that may be needed.
- To review the general cost-effectiveness of the major outputs in terms of the benefits or avoided costs that have been generated by these outputs and comment on the reasonableness of the costs for the outputs produced.
- To review the commitment, support and ownership of the project partners toward the project and the adoption and dissemination of the clean technologies and

mitigation measures being promoted at the site (including expected financial and in-kind contributions).

- To outline any gaps, deficiencies and concerns regarding project implementation.
- To advise on further opportunities regarding the removal of barriers and devise plans of action, if necessary, to manage the identified issues and problems.
- To propose corrective measures regarding execution of project activities and dissemination of results for the second phase of the Global Mercury Project.
- Conduct interviews with country coordinator team based in Vancouver to evaluate project implementation setting.

The evaluation of planned project objectives should include a summary rating of achievements based on the following rating scale:

Highly Satisfactory	**HS**	The outcome is likely to be achieved or exceeded, efficiently with no significant shortcomings
Satisfactory	**S**	The outcome is likely to be achieved, efficiently with only minor shortcomings
Moderately Satisfactory	**MS**	The outcome is likely to be achieved, efficiently with moderate shortcomings.
Moderately Unsatisfactory	**MU**	The outcome has moderate shortcomings that limit or jeopardize its achievement, but resolution is likely.
Unsatisfactory	**U**	The outcome has significant shortcomings that limit or jeopardize its achievement, and resolution is uncertain.
Highly Unsatisfactory	**HU**	The outcome has major shortcomings that limit or jeopardize its achievement, and resolution is unlikely.

Based on the above points, the evaluation should provide a document of 20-25 pages indicating what project activities, outputs and impacts have been achieved to date, and specifically:

- Assess the extent to which the project objectives have been met and where gaps may be evident.
- Draw lessons learned from the experiences of the project, particularly those elements that have worked well and those that have not.
- Provide recommendations to strengthen future intervention.

Main duties	**w/m**	Location	**Expected Results**	**Related Activities**
Review GMP documents and prepare for field trips	0.2	Home based	Understanding of project Detailed mission plan and planned	n/a
Undertake evaluation in Brazil in coordination with Country Coordinator	0.2	Project sites in Brazil	Evaluation in Brazil	n/a

Main duties	**w/m**	Location	**Expected Results**	**Related Activities**
Undertake evaluation in Indonesia in coordination with Country Coordinator	0.2	Project sites in Indonesia	Evaluation in Indonesia	n/a
Undertake evaluation in Laos in coordination with Country Coordinator	0.2	Project site in Laos	Evaluation in Laos	n/a
Undertake evaluation in Sudan in coordination with Country Coordinator	0.2	Project site in Sudan	Evaluation in Sudan	n/a
Undertake evaluation in Tanzania in coordination with Assistant to Country Focal Point	0.1	Project site in Tanzania	Evaluation in Tanzania	n/a
Undertake evaluation in Zimbabwe in coordination with Country Coordinator	0.1	Project site in Zimbabwe	Evaluation in Zimbabwe	n/a
Undertake evaluation of project implementation setting	0.1	UBC, Vancouver	Evaluation of project implementation team	n/a
Prepare report	0.2	Home based	Evaluation report on the GMP	n/a

BACKGROUND INFORMATION:

Mercury is one of the most toxic substances in the world causing significant damage to the environment and to the health of the people who handle it. Mercury, which is used mostly by artisanal gold miners is absorbed by the human organism through drinking water, food or breathed air. Artisanal mining activities provide income to the world's poorest populations and ethnic minorities; a great majority of the miners being women and children. For every gram of gold recovered about two grams of mercury are released into the environment – often resulting in the death of men, women and children and in a permanently ruined habitat. The relevant simplicity and effectiveness of the technology, known as amalgamation, mask its dangers. This process can be improved with procedures using inexpensive and highly efficient devices that can be manufactured locally at a low cost.

The objective of any intervention should be to replace/reduce mercury emission/exposure through introduction of cleaner technologies and strong awareness campaign while improving the income of the miners through more efficient recovery, increasing knowledge and awareness and providing policy advise on the regulation of artisanal gold mining. The primary target beneficiaries should be artisanal miners – men and women alike. The secondary beneficiaries should be governments, local institutions and the society at large due to the very nature and extent of the damage caused by artisanal mining. The activities of an intervention project should be directed towards the introduction of safe and high-yield extraction methods that could pre-empt the use of mercury – i.e. introduction of new technology and its dissemination; training of miners in the application of new technology, training of local manufacturers, awareness creation

on the protection of the environment as well as policy advice to governments and local institutions.

As this pilot phase of the Global Mercury Project reaches the end of implementation, an evaluation should be undertaken to assess the past five years of intervention and to inform any future global intervention. A steep rise in the market value of gold since 2001 has resulted in a surge of artisanal gold mining. There are now at least 15 million artisanal gold miners operating in more than 50 countries, and these numbers are expected to climb. The 2002 Minerals, Mining, and Sustainable Develop report projected that Zimbabwe and parts of Southern Africa will see the number of miners' triple in the next ten years.

At the same time that international political economy is creating conditions conducive to intervention, the last five years of work on the Global Mercury Project have clarified much about the most appropriate and effective forms of intervention. In the lifetime of the Global Mercury Project, the environmental, health, and social consequences of persistent mercury use by artisanal gold miners has been evaluated, with widespread toxification of people and watersheds observed. The Global Mercury Project has established that certain experiences – such as mercury vapour inhalation, methylation of mercury in trans-boundary waterways, inefficiencies in extractive processes, child labour, and extreme poverty – are endemic to artisanal and small-scale (ASM) mining communities, regardless of country or continent, and that efforts to alleviate these conditions must be part of any future intervention.

The existence of the Global Mercury Project has also elevated international awareness about mercury pollution from ASM. Indeed, ASM, emitting 1,000 tonnes/a of mercury to the environment, is now recognised as the second biggest point source of global mercury pollution, next to by-product emissions from coal-fired power plants. As a result of this awareness, there is a growing global imperative to act. The GMP is being sought out by the public, private, civil, and intergovernmental sectors. This has already resulted in working relationships with the governments of the U.S., Canada, Brazil, Netherlands, Germany, and Mozambique, as well as several on-going negotiations with companies and NGOs interested in developing public-private partnerships. As a result, The GMP has at last moved policymaking on mercury and ASM issues beyond the workshop phase.

The specific objectives of the GMP were to:

- Establishment of the programme management structures in each of the six participating countries (Brazil, Indonesia, Lao PDR, Sudan, Tanzania, Zimbabwe)
- Identify project demonstration sites and organize training in technology and raising awareness of miners, Governments, NGOs and the general public
- Assess the extent of environmental (mercury) pollution in surrounding water bodies and devise intervention measures
- Establish a databank comprising of technological requirements relevant to artisanal gold mining and extraction activities
- Demonstrate within the project demonstration sites, the application of affordable high-efficiency clean technology
- Develop country specific policies and legislation that will lead to implementable standards on the application of mercury
- Promote the dissemination of the produced project results and identify opportunities that will allow the project to continue beyond the three-year time frame.

9.2 APPENDIX B: Anonymous evaluation form

Please fill in the following evaluation and return to Salvador.
The evaluation constitute your own judgement, is anonymous, you may elaborate in the provided space.

Project objectives

Obj.		Objective completion	Result dissemination
		[1 (High satisfied) to 6 (highly unsatisfied)]	[1 (High satisfied) to 6 (highly unsatisfied)]
1	to reduce mercury pollution of international waters by emissions emanating from small-scale gold mining,		
2	to introduce cleaner technologies for gold extraction and to train people in their application,		
3	to develop capacity and regulatory mechanisms that will enable the sector to minimize mercury pollution,		
4	to introduce environmental and health monitoring programmes,		
5	to build capacity of local laboratories to assess the extent and impact of mercury pollution.		

Specific comments

Obj.	
1	
2	
3	
4	
5	

Major gaps regarding the project implementation

Obj.	
1	
2	
3	
4	
5	

Do you think the achieved outputs of the project were in general cost-effective in terms of the benefits or avoided costs that have been generated by these outputs.

Outputs	

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Thank you for your time

Salvador

9.3 APPENDIX C: List of Interviewees

Canada – Vancouver

1. Marcello Veiga – UNIDO CTA
2. Rodolfo Sousa – Country coordinator – Brazil
3. Randy Baker – Country Coordinator – LAO PDR
4. Rani Sulaiman – Country Coordinator - Indonesia
5. Sam Spiegel – Policy Development coordinator
6. Bern Klein – Consultant for Technology

Brazil (12 – 19 January)

1. Maria Jandira – Secretaria Municipal de Mineracao e Meio Ambiente; Ex-presidente da COOPA (SEMA)
2. Semi Sefrian – Trainner / facilitatoir for the GMP, member of the Itaituba Municipality (Itaituda)
3. Elias Leao Moraes – Geologist from SEMA (Itaituba)
4. Alain Lestra, Geologo – Consultor da Secretaria de Mineracao e Meio Ambiente
5. Edson, Protótipo filtros USEPA, Artisan and retort and fume hood fabricator
6. Roselito Soares, Mayor of Itaituba
7. Community leader (Carporezão)
8. Artisan (manufacture of the filters for gold shops)
9. Local provider of the retorts
10. Two gold shops
11. Ivan's Garimpo
12. Miner from Cabaçal community (Jose Roberto)
13. Dirceu Sobrinho, Secretario Municipal de Mineracao e Meio Ambiente
14. Ivo Lubrino de Castro (Ivo Preto), AMOT – Associacao dos Mineradores de Ouro do Tapajos – Presidente
15. Paulo Carneiro, Garimpo Canaa (modelo)
16. Jose Dalla Rosa (Joia), community leader, Carporizão
17. Valmir, Dgold (gold shop) Creporizão
18. Marcelo Rodrigues (Informatica)
19. Patricia (Hotel Beira Rio)
20. Emerson, ParaMetal gold shop

Indonesia

1. Ms. Budi Susilorini – Assistant Country Focal Point, Indonesia
2. Mr. Yapeth – New head of the Environmental Office in the District of Katingan
3. Mr. Wirabella – Officer in the Environmental Office, District of Katingan
4. Mr. Bardolf Paul – Director of the YTS
5. Ms. Mayang – Management Assistant at the YTS
6. Ms. Dina – Assistant officer at YTS
7. Mr. Fauzi – Inventor of the Fauzi Retort, GMP facilitator

8. Mr. Ijum – Miner from Kelaruh region
9. Dr. Robert – Former head of the public health clinic in Kereng Pangi, GMP facilitator
10. Mr. Irwanto – Officer at Environmental Office in Katingan District, GMP facilitator
11. Mr. Hanan A. Raba – Mining Commissioner at Katingan District
12. Mr. Sumali – Program Manager at YTS
13. Mr. Abdul Hamid – Gold shop owner (Shop Huda)
14. Mr. Muhamad Yusuf - Gold shop owner (Shop Adinda)
15. Mr. Anum – Head of miners' cooperative
16. Mr. Duwel Rawing – Head of the District of Katingan
17. Mrs. Rimbawati – Miner's wife living on site
18. Mr. Haryono – Miner
19. Mr. Yoyok – Miner
20. Mr. Agung – Miner
21. Mr. Huda – Mine operation unit owner
22. Mr. Harlind Ardi – Mining Commissioner at Central Kalimantan Province
23. Mr. Sygeng Mujiyantu – Deputy Director, Division of Cooperation, Ministry of Energy and Mineral Resources
24. Mr. Adam – Teacher in SMPH and Kereng Pangi, GMP facilitator
25. Mr. Imran Farooque – UNIDO Representative, Indonesia
26. Mr. Wagiman - Driver

LAO PDR

1. Mr. Simon Phichit, Deputy Director General; Department of Mines; Ministry of Energy and Mines
2. Mrs. Chansavath Boupha, Deputy Director General; Department of Geology; Ministry of Energy and Mines; Country Focal Point; LAO PDR.
3. Mr. Soukhansak Sisouk; Deputy Director of Environment And Inspection of Mines Division
4. Mr. Somlith Phannavong; Director of Pollution Control Division and Strengthening Environment Management II Project Manager
5. Mr. Kheungkham Keonuchan; Head of UNIDO Operations in LAO PDR
6. Mr. Nanong Khotpathoum; Executive Director of Earth Systems LAO PDR
7. Ms. Kate Wallace; Senior-Environmental Scientist; Earth Systems LAO PDR
8. Mr. Morten Larsen; Energy Consultant; The World Bank
9. Mr. Vongdara Keomuongchanh; Deputy Director of the LAO National Mekong Committee
10. Mr. Kessanguan; Officer at Department of Mines
11. Mr. Somesavanh; Officer at Department of Mines
12. Mr. Randy Baker; project country coordinator, based in Vancouver
13. Mr. Sinouane; Driver

Sudan

1. Mr. Mohamed S. Ibrahim, Assistant Country Focal Point
2. Mr. Renato Fornocaldo, UNIDO Representative for Sudan, Djibouti and Yemen

3. Mr. Obeid Ahmed, Director General GRAS and CFP
4. Mrs. Buthaina Ahmed Elnaiem; Consultant on Micro finances
5. Mr. Mohamed Majzoub Fidiel; Country Director for Practical Action in Sudan
6. Ms. Aaza Abdalla, Senior National Liason Officer
7. Mr. Rami Abdel Malik; UNIDO National Programme Analyst
8. Mr. Hermann Wotruba, RWTH, Aachen University, Germany
9. Patience Singo, Good Life Enterprises, Bulaweyo, Zimbabwe
10. UNIDO office in Khartoum
11. Ms. Ontibile, UNIDO officer
12. Gillian Davis, Country coordinator, UNIDO and University of British Colombia, Canada

Tanzania

1. Mr. Aloyce Tesha, Assistant Country Focal Point
2. Mr. Rogers Sezinga, TAN Discovery; Consultant and implementer of the TDU and awareness campaign
3. Mr. Peter D. Kafumu, Commissioner for Minerals and CFP for GMP
4. Mr. M. Z. Mraba; Mwanza Zonal Mines Officer, Minerals Division
5. Mr. Mnyamga; senior scientist for Lake Victoria Marine Project
6. Mrs. Muajuma; Water laboratory manager, Mwanza
7. Mr. Juvenal Kessy; Lumex technician at water laboratory in Mwanza
8. Mr. Damas Mbonigaba; ward of Rwamgasa and trainer for GMP
9. Community meeting with leadership of Rwamgasa (see scanned list of attendance) and those of the Mwanza Regional Miners Association (MWAREMA)
10. Mr. Daniel Izengo; Clinical officer in Rwamgasa
11. Mr. Golden Hainga; secretary of the Mwanza regional miners association and GMP Trainer.
12. Community meeting with affected stakeholders of Nyarugusu (see scanned list of attendance)
13. Mr. Andrew Mrinje; African Precious Metals Nyarugusu branch Manager - Fair Gold Shop
14. Mr. Kulwa Kabadi; senior mining technician at Geita mines office and trainer for the GMP
15. Ms. Felister Malima health provider of the Geita District hospital
16. Mr. Omar; Driver

Zimbabwe

1. Mr. Dennis Shoko, Assistant Country Focal Point
2. Mr. Tich Mushayandebvu, UNIDO office in Harare
3. Mr. Titus Nyatsanga, Country Focal Point
4. Mr.Misheck Pharadzai; ZIMA (Zimbabwe Indigenous Miners Association), Kadoma
5. Mr. Philipe; Manager of the TAMUKA Theatre group, Kadoma

6. Mr. Evans Ruzvidro; President of the ZPA (Zimbabwe Panners Association), Kadoma
7. Mr. Steven Banda; Kadoma District Hospital administrator
8. Mrs. Ellen Ncube; Wash West Women in Mining
9. Mr. Prejudice; Miner
10. Mr. Dube; Assistant administrative at Customer Mill – Chimukute; Kadoma
11. Mr. Sambureni; Mine owner
12. Community meeting with participants of the TOT in Kadoma (See list of attendance)
13. Mr. Mhlangeni; Mining Engineer at District Mining Office
14. Mr. Manyarge; District mining commissioner
15. Mrs. Mutepha; Agency for Environmental Management in Kadoma
16. Patiance Sengo; Technology Consultant to the project
17. Mr. Frederick Kunaka; Fidelity Printers
18. Mr. Paul D. Musuka; Fidelity Printers
19. Mr. Moses; Fidelity Printers
20. Mr. Woner Chigwida, Department of Metallurgy, Ministry of Mines
21. Mr. Valentine Vera; Chief Metallurgist, Ministry of Mines
22. Mr. Cuthbert Z. Gambara; Project Manager, IMR
23. Mr. Spencer Kahwai; Director; IMR
24. Mr. Kunene; Deputy Permanent Secretary; Ministry of Environment
25. Stephen Metcalf, Country coordinator to Zimbabwe

UNIDO, Vienna

Mr. Bernaudat Ludovic (GMP Task manager)
Mr. Christian Beinhoff (former CTA of the GMP)
Mr. Johannes Dobinger (Evaluation Officer, UNIDO)
Mr. Pablo Huidobro (Main Allotment Holder)
Ms. Noriko Takahashi (Human Security Officer)
Ms. Svitlana Adler (UNIDO Administrator)

Consultants
German
Prof. Hermann Wotruba, RWTH Aachen University, Germany
Zimbabwe
Patience Sengo, Technology Consultant to the project
Canada
Janis Shandro, GMP II consultant

UNDP, New York
Mr. Andrew Hudson

9.4 APPENDIX D: Country evaluation report: Brazil

The main objectives of the GMP that included the following in Brazil and the rate of implementation according to the present evaluation:

1. to reduce mercury pollution of international waters by emissions emanating from small-scale gold mining activity,

This objective was **satisfactorily** achieved in Brazil, especially because the ASM have removed their sluices from the rivers.

2. to introduce cleaner technologies for gold extraction and to train people in their application,

The project in Brazil did demonstrate cleaner technology for gold extraction. It did carry an awareness campaign on health and environment and did introduce good practices for handling mercury by the miners. A number of “best practices” strongly incorporated to “garimpos” (mercury confinement / pool for amalgamation, reactivation and recycling of mercury, sluice boxes removed from rivers, refilling old pits, use of retorts, construction and use of latrines, garbage disposal). The GMP also provided training equipment for a pilot plant that included a hammer mill, ball mill, prototypes, retorts and centrifuge (still to be delivered). The project also introduced fume hoods in 3 gold shops in Carporizão

3. to develop capacity and regulatory mechanisms that will enable the sector to minimize mercury pollution,

On this objective the project in Brazil conducted a legal study that reviewed the legal integration of the ASM and made relevant recommendations. The study recommended that, it is not enough to train miners to comply with legal requirements. Stakeholders (miners and government representatives) have to discuss alternative solutions to simplify the processes and make formalization a viable action.

4. to introduce environmental and health monitoring programmes,

On this objective, the GMP in Brazil did carry an intensive awareness campaign that resulted in rising conscience of the government offices. It also conducted a study of environmental impacts versus environmental legislation in the Tapajós river basin. The main point is that there is strict environmental legislation created in 1965 (Forest Code, law 4771), however with low effectiveness due to the lack of awareness, education, coercion, and economic alternatives.

5. to build capacity of local laboratories to assess the extent and impact of mercury pollution.

A Lumex portable tester and a semi quantitative apparatus were acquired by the GMP and are house at CETEM in Rio de Janeiro. These equipments were used during the diagnostic studies in Brazil. At the moment the GMP team is recommending that the equipment is donated to the DNPM in Belém. As it stands it is not clear how the equipment will be used for environmental monitoring.

LEVEL OF ACCOMPLISHMENT OF THE SPECIFIC OBJECTIVES OF THE GMP I IN Brazil

Objective 1: Identification of, and provision of resources for the establishment of the programme management structures in each of the six participating countries and the creation and operation of the basin and country specific project task forces.

Programme management structure consisting of one Country Focal Point and one Assistant country focal point were established in Brazil.

Objective 2: Identify project demonstration sites and organize training aimed at increasing knowledge and raising awareness of miners, Governments, NGOs and the general public on the environmental and health impacts associated with the current artisanal mining practices and the environmental, health and economic benefits of employing appropriate technology.

This objective was **satisfactorily** achieved in Brazil.

Objective 3: Identify hotspots in project demonstration sites, conduct geochemical and toxicological studies and other field investigations in order to assess the extent of environmental (mercury) pollution in surrounding water bodies and devise intervention measures.

This objective was **satisfactorily** achieved in Brazil

Objective 4: Establish a databank comprising of technological requirements relevant to artisanal gold mining and extraction activities through field investigations, interviews with miners, miners' associations and other relevant institutions.

This objective was not implemented at country level; however, the project has implemented a database at global level.

Objective 5: Acquire and demonstrate, within the project demonstration sites, the application of affordable high-efficiency clean technology with improved gold processing methods while avoiding environmental degradation from mercury contamination.

This objective was **satisfactorily** achieved in Brazil. The level of adoption is mixed for the different practices. The final country report state that the ASM have removed the

sluice boxes from the rivers as a result of the GMP, it also claims that there was adoption of mercury confinement / pool for amalgamation, reactivation and recycling of mercury, refilling old pits, construction and use of latrines, and garbage disposal.

Objective 6: Based on the acquired experience, develop sustainable extraction indicators and hence assist Governments to develop generic and to the extent possible, country specific policies and legislation that will lead to implementable standards on the application of mercury with special attention to minimization of environmental impacts.

The project in Brazil did develop indicators that can be used for the evaluation of the ASM and can be used to assist the country specific policies and legislation that will lead to implementable standards on the use of mercury. There is an expectation that these indicators can be adapted or modified to local conditions and be adopted in the state of Pará. Thus this objective is considered *satisfactorily* achieved in Brazil.

Objective 7: Promote the dissemination of the produced project results and identify opportunities that will allow the project to continue beyond the time frame through self-financing and to initiate and conduct a Donor Conference to solicit financing.

At country level the results of the project, specifically the awareness campaign and the demonstration of the cleaner technologies has been widely disseminated on a web site and on a specifically dedicated CD. The project in Brazil did conduct workshops, meetings with stakeholders in all Federal, State and Municipal levels. At least 3 workshops were conducted with substantial participation of local miners and authorities. Number /hours of promotional campaigns (local TV station, radio, outdoors, posters, T-Shirts, kits, booklets, flyers, etc). Campaign aired on TV/radio for 3 months, 5 billboards, 1000 posters, 10000 brochures, 10000 flyers, 300 kits and T-shirts. The project did also produce 14 scientific papers.

The future GMP II has a potential for partnership with a Canadian mining Company which is willing to invest US$100,000 in pilot site in Serra Pelada (potential new site for prospective GMP2)

SUMMARY OF THE PROJECT ACHIEVEMENTS IN BRASIL

According to the final report the GMP in Brazil had the following achievements:

Diagnostic analyses and studies

- Socio-economic, health & environmental study in "São Chico" and "Creporizinho" communities. Main point: Mercury vapour exposure represents greater risk than fish consumption
- Micro-credit alternatives study: program not implemented due to the high level of informality. Main point: Necessary to work in partnership with Ministry of Mines in order to formalize the "garimpos"
- Study of environmental legislation for use of mercury. Main point: prohibition of Hg in garimpo has proven to be inefficient and must be combined with awareness and training of good practices for reactivation, recycling and replacement of mercury with alternative technologies.
- Mercury trade and routes. Main point: majority of mercury enters the country illegally or legally for other uses (such as dental)
- Study of environmental impacts versus environmental legislation in the Tapajós river basin. Main point: a strict environmental legislation was created in 1965 (Forest Code, law 4771), however with low effectiveness due to the lack of awareness, education, coercion, and economic alternatives.

Training of trainers

- Number of trainers prepared: 13 trainers, 60 participants
- Training evaluation (express the acceptability of the training): 93.5% (graded by participants)
- TDU (Transportable demonstration unit): it is not practical in the Amazon, due to lack of infrastructure, to move heavy equipment for training. Trainers used basic kits and travelled to garimpos, and a pilot plant for test was implemented in "garimpo modelo".
- System of evaluation was developed in order to verify the consequence of the training (change of behaviour of miners after training)

Multiplication of training

- Improvement of evaluations (change in attitude/ implemented actions): 28.8% general improvement (grades evolve from 22.2% to 51.0% between 1st and 2nd evaluation).
- Number of miners ("garimpeiros") trained and sometimes retrained: 4,200 (10% of the whole miner's population: 40,000 miners)
- Mining sites ("Garimpos") and communities involved: 141 (7% of total existent: 2,000)
- Number of "garimpos" leaving the bottom line (evaluation below 20% conformity with the evaluation criteria): 100% (Originally 35% of garimpos were classified below 20% conformity)
- Number of "best practices" strongly incorporated to "garimpos": 8 (mercury confinement / pool for amalgamation, reactivation and recycling of mercury, sluice boxes removed from rivers, refilling old pits, use of retorts, construction and use of latrines, garbage disposal).

- Equipment for training: pilot plant including hammer mill, ball mill, prototypes, retorts and centrifuge
- Number of biosand filters implemented to be tested: 10
- Number of retorts donated: 60 (part of donation occurred after the 2nd evaluation and impact was not included in the evaluation)
- Fume hoods implemented in gold shops: 3
- Impact on mercury reduction: estimated reduction of 1,752kg

Promotion of the program

- Workshops, meetings and approximation of stakeholders in all Federal, State and Municipal levels. At least 3 workshops were conducted with substantial participation of local miners and authorities. Last workshop on May/2007 put together 91 people, including authorities and miners' representatives.
- Number /hours of promotional campaigns (local TV station, radio, outdoors, posters, T-Shirts, kits, booklets, flyers, etc). Campaign aired on TV/radio for 3 months, 5 billboards, 1000 posters, 10000 brochures, 10000 flyers, 300 kits and T-shirts.
- Number of scientific papers produced and published: at least 14 papers directly related to GMP in Brazil
- Potential partnership with Canadian mining Company willing to invest US$100,000 in pilot site in Serra Pelada (potential new site for prospective GMP2)
- Development of a local supplier to produce fume hoods for all gold shops

COST EFFECTIVENESS

UNIDO's headquarters in Vienna controls the GMP budget. When it comes to the local subcontractor for implementation of training and awareness campaign, the country coordinator has reasonable flexibility to manage the use of resources. The Brazilian subcontractor (IBRAD) implemented the program at the cost of US$135,000. Table 1 shows the distribution of costs. Other costs generated by Aide Memoire are controlled by Vienna headquarters and are not included below.

Table 1: Accounting / costs of training, equipment and awareness campaign

Group of Expenditures	Type of expenditure	**US$**	%
Administration; IBRAD (Subcontractor)	Subtotal Administration IBRAD	**42220.00**	31%
Materials	Subtotal Materials	**18018.00**	13%
Multipliers / trainers	Subtotal Trainers	**45062.00**	33%
Equipment	Subtotal equipment	**27200.00**	20%
Others	Local support for workshops / A. Rogerio + Apiacas	1500.00	
	TV publicity Itaituba	1000.00	
	Subtotal Others	**2500.00**	2%
	Total General	**135000.00**	100%

Administration costs are high in Brazil due to the high cost of taxes. IBRAD administration cost reached 31%. Everything else (materials, trainers, equipment and others) refers to direct expenditures on the field in order to promote training and awareness campaign. The program was implemented in partnership with SEMMA

(Itaituba Municipality) and it did not include the partners' participation with vehicle, boat, staff, publicity, retorts, etc.

The cost effectiveness of the field campaign, considering the remoteness of the sites, lack of basic infrastructure, roads and weather conditions, and the financial breakdown of this component of the project it can be rated as effective.

GOVERNMENT COMMITMENT

Both Municipal and State government officially support a prospective GMP second phase. Itaituba mayor has provided a written commitment to participate in GMP2 by contributing with at least 30% of resources GMP may invest in Brazil in a prospective new phase.

GAPS, DEFICIENCIES AND CONCERNS ON PROJECT IMPLEMENTATION

The involvement of the central and provincial government could have been better and such involvement would have improved the quality of the project results and the possibilities of sustainability of the project initiatives.

Main Challenges

The time allocated for the awareness campaign was too short.

The field campaign was carried during winter which increased the logistical difficulties.

The pilot site was not installed on time due to delays in delivery of the equipment.

The pilot site was too far from most of the beneficiaries.

One of the main challenges of the GMP I was the project management which was very complex and bureaucratic. This management challenges led to delays in payments and fund transfers.

Activities to be completed by the GMP in Brazil

- Follow up with Falcon concentrator to assure the centrifuge will be fully implemented and ball mill supplier to assure the technical problem will be fixed.
- Follow up with UNIDO headquarters and Canadian Company Colossus to discuss eventual participation on GMP 2.
- Follow up with Brazilian authorities to discuss participation in a prospective 2nd phase

FURTHER OPPORTUNITIES FOR THE REMOVAL OF BARRIERS TO INTRODUCTION OF CLEANER AND MORE EFFICIENT TECHNOLOGIES

Priority activities for GMP 2

- To reach at least 70% of garimpos (1400 out of 2000). Currently 11% (213) were visited by trainers although 7% (141) were evaluated both before and after training
- By extending the training to 70% of garimpos, it would reach 28,000 miners.
- Re-evaluate and retrain miners on sites visited in GMP 1
- To reduce at least 80% of mercury consumption. This is possible and measurable (see item 11) by dissemination of best practices, above all mercury recovery, reactivation and recycling.
- Other potential sites should be considered (ex: Serra Pelada and Cachoeira do Juma)
- Pilot plant has to be consolidated (efficient gold recovery from tailing has to be demonstrated, and cyanidation tests to be continued)
- Besides the 7 successful activities mentioned at least more 5 could be consolidated (formalization, use of retorts, gold recovery, accident prevention and internal awareness campaign)
- Strengthen partnership with Federal government to work on regulation (facilitate formalization) and implementation of the micro credit program
- Monitoring rivers, and in addition to traditional analyses of mercury in fish, also analyses suspended sediments and garbage before and after the training
- Have a successful case of Fair Trade Certification
- There is need to develop simple technologies on handling and processing primary ore and introduce in the Amazonia region where miners are only well experienced with alluvial gold.

Improvement on TDU

The TDU as designed with all the technologies to be demonstrated proved not to be viable in Brazil mainly due to lack of road access in Amazonia.
The awareness campaign and the multipliers should have used GPS to position the places of ASM activities; this would allow a geospatial database of the ASM in Brazil.

Good experiences

The principle of multipliers who could transport few types of equipment such as retorts, mercury reactivation kit, DVD, posters and brochures was seen as good alternative to TDU in Brazil.

The GMP I was the first project to reach the area of Tapajós in Brazil

RECOMMENDATIONS

Project implementation

- The improvement of grades from 22.8 to 51.0% is the best evidence that miners respond to training and education better than they respond to the stringent legislation only. Improvement of grades corresponds to changes in behaviour.

- Studies and monitoring are important but actions in the field should have greater priority and allocate most of the resources. The continuous presence in the field in crucial for the success of the objectives.
- Monitoring and intervention can be simultaneous.
- Involvement of other partners at the operating level should be increased. As an example, USEPA (The U.S. Environmental Protection Agency) and GMP implemented fume hoods in gold shops in the same project site.
- Gold production: new tests for increasing gold recovery and reprocessing of tailings should be highlighted in an eventual project second phase. However, the dissemination of the existent best practices is more practical and more effective than the effort of introducing new technologies. Both, however, can be simultaneous.
- Legal aspects: it is not enough to train miners to comply with legal requirements. Stakeholders (miners and government representatives) have to discuss alternative solutions to simplify the processes and make formalization a viable action. GMP can support and strengthen this relationship.
- There is a potential to remove at least 16,780kg of Hg by extending the training for the whole population of 40,000 miners.
- It is recommended to carry a full diagnostic of the ASM in the entire state of Pará.

GMP Results Dissemination

- Interaction between participant countries has to be developed. Example: the fume hood developed for gold shops in Brazil was requested and tested in the Amazon.
- As a pilot project, GMP contributed locally but significantly to reduce water contamination (mercury and sediments) and improve miners' health and sanitation. The magnification of the project for a larger scale can represent significant, and measurable, impact in the Amazon.

GENERAL CONCLUSIONS GMP

The Global Mercury Project (GMP) was initiated to begin a global response to address environmental impacts resulting from mercury released by the artisanal mining sector. This was highly achieved.

The sustainability of the results and achievements of the GMP is not clear, it seems that the pilot processing plant is deactivated and is waiting for the GMP II.

The Lumex will be donated to the DNPM in Belém and there it expected to be used in the environmental monitoring.

ACKNOWLEDGEMENT

The following people are especially thanked for their assistance and support during the field evaluation of the GMP in Brazil; the names are in order of appearance in the process and are presented in the appendix C.

9.5 APPENDIX E: Country evaluation report: Indonesia

The main objectives of the GMP that included the following in Indonesia and the rate of implementation according to the present evaluation:

1. to reduce mercury pollution of international waters by emissions emanating from small-scale gold mining,

This objective was **unsatisfactorily** achieved, especially because the emphasis of the project was more into gold shops.

2. to introduce cleaner technologies for gold extraction and to train people in their application,

The project in Indonesia did introduce any cleaner technology for gold extraction. It did carry an awareness campaign on health and environment and did introduce good practices for handling mercury and has made significant improvement in the fume hoods by adding a water condenser for recovering mercury. The area of Kereng Pangi has reported 100% adoption of the water condenser by the Gold Shops. The main reason for the adoption has been the economic benefits where the shop owners recover mercury and sell it at 67% of the price of new mercury.

3. to develop capacity and regulatory mechanisms that will enable the sector to minimize mercury pollution,

On this objective the project in Indonesia did manage to produce a regulation for handling and trading of mercury in the Katingan District. At the moment the draft regulations are under review by the concerned technical teams of the relevant government offices. During the evaluation the Head of the District of Katingan reviled its commitment to the regulation. Thus there is high probability that the regulations will be published.

4. to introduce environmental and health monitoring programmes,

On this objective, the GMP in Indonesia did carry an intensive awareness campaign that resulted in rising conscience of the government offices such that the Environmental Office and the Energy and Mining Offices have allocated budget lines for environmental and health promotions in 2008. It did not yet progress to monitoring programmes, but it is a promising start of the change in attitude of the government at District level.

5. to build capacity of local laboratories to assess the extent and impact of mercury pollution.

Although the project has acquired a Lumex portable tester, there was neither local laboratory affiliation nor adequate staff training for use of Lumex.

The evaluator would suggest that the Lumex should be donated to the local (District) environmental office and someone from that office must be properly trained for the operation of the Lumex in order to enable the office to carry environmental monitoring of the mercury contamination.

LEVEL OF ACCOMPLISHMENT OF THE SPECIFIC OBJECTIVES OF THE GMP IIN INDONESIA

Objective 1: Identification of, and provision of resources for the establishment of the programme management structures in each of the six participating countries and the creation and operation of the basin and country specific project task forces.

Programme management structure consisting of one Country Focal Point and one Assistant country focal point were established in Indonesia.

Objective 2: Identify project demonstration sites and organize training aimed at increasing knowledge and raising awareness of miners, Governments, NGOs and the general public on the environmental and health impacts associated with the current artisanal mining practices and the environmental, health and economic benefits of employing appropriate technology.

This objective was **satisfactorily** achieved in Indonesia.

Objective 3: Identify hotspots in project demonstration sites, conduct geochemical and toxicological studies and other field investigations in order to assess the extent of environmental (mercury) pollution in surrounding water bodies and devise intervention measures.

This objective was **satisfactorily** achieved in Indonesia

Objective 4: Establish a databank comprising of technological requirements relevant to artisanal gold mining and extraction activities through field investigations, interviews with miners, miners' associations and other relevant institutions.

This objective was implemented in different way but achieved the results expected, although no formal databank was established at country level.

Objective 5: Acquire and demonstrate, within the project demonstration sites, the application of affordable high-efficiency clean technology with improved gold processing methods while avoiding environmental degradation from mercury contamination.

This objective was **satisfactorily** achieved in Indonesia. The gold shops have fully adopted the recycling of mercury by adding a water condenser into their exiting fume hoods; however, literally, there was no adoption of the field clean technologies.

Objective 6: Based on the acquired experience, develop sustainable extraction indicators and hence assist Governments to develop generic and to the extent possible,

country specific policies and legislation that will lead to implementable standards on the application of mercury with special attention to minimization of environmental impacts.

Under this objective the project has drafted a local (District) regulation for the proper handing and trade of mercury in the District of Katingan, in the Central Kalimantan Province. The regulations are at the moment under review by the relevant technical offices and there is a possibility that they will be adopted soon. Thus this objective is considered **satisfactorily** achieved in Indonesia.

***Objective 7*:** Promote the dissemination of the produced project results and identify opportunities that will allow the project to continue beyond the time frame through self-financing and to initiate and conduct a Donor Conference to solicit financing.

At country level the results of the project, specifically the awareness campaign and the demonstration of the cleaner technologies has been widely disseminated on a web site and on a specifically dedicated CD. The opportunities for continuity of the project are being guarantied by the budget allocation at local level (District of Karingan) in the offices of the Energy and Mineral Resources and the Environment. Also constitute continuity initiative the fact that components of the project have been implemented in partnership with other organizations such as the National Park Foundation.

SUMMARY OF THE PROJECT ACHIEVEMENTS IN INDONESIA

1. The introduction of the water condensers as adding to the fume hoods for the recovery of mercury. These condensers have been fully adopted in the gold shops in the village of Kereng Pangi. Additionally some gold shop owners that have collection point if the field are sending these units to the field collection points.
2. The awareness on health and environmental impacts of mercury was quite successful in the District of Katingan, however the results in North Sulawesi were not similarly encouraging. According to the Country report the campaign did raise the public awareness from 41% to 50%, from 83% to 100% of the gold shop owners and from 21% to 93% of the miners.
3. The project awareness efforts managed to raise the public interest and to call attention of the local government offices for the environmental problems.
4. The project has positively developed the preliminary draft of the regulations for trade and proper handling of mercury in the District of Katingan.
5. The GMP in Indonesia did manage to build partnerships with local NGO's such as YTS, FNPF (National Park Foundation), Lestari Foundation, either as contractor for implementation of specific component of the project (e.g. YTS, Lestari Foundation) or as partner (e.g. FNPF).
6. As mentioned earlier the project did manage to involve significantly the local government at District Level; however it has not managed to improve the interest and involvement of the Government at National level. The interviewed government official suggested that the lack of interest at National level has to do with illegality of the majority of the payers in the sector according to Indonesian law. The Government of Indonesia, by recognising the importance of the sector

for the community it has been tolerating the sector while working on possible alternative livelihood for these communities.

COST EFFECTIVENESS

The cost effectiveness could not be properly assessed due to lack of financial breakdown of the project. The only financial information available to the evaluator is the cost of the awareness campaign and acquisition and development of the relevant material and equipment. For this component the results achieved can be considered cost effective.

GOVERNMENT COMMITMENT

In Indonesia three level of government were interviewed, namely local (District), Provincial and National level. There was high interest on the project at local and provincial level; however there was considerably less interest at National level.

GAPS, DEFICIENCIES AND CONCERNS ON PROJECT IMPLEMENTATION

The involvement of the central and provincial government could have been better and such involvement would have improved the quality of the project results and the possibilities of sustainability of the project initiatives.

The absence of internal monitoring and evaluation mechanism has affected the project implementation.

FURTHER OPPORTUNITIES FOR THE REMOVAL OF BARRIERS TO INTRODUCTION OF CLEANER AND MORE EFFICIENT TECHNOLOGIES

Priority activities for GMP 2

According to some of the stakeholders the next phase of the project need to put more emphasis on the environment, especially those environmental aspects that can be coupled with economic benefits. There is need to balance the environmental benefits with economic benefits.

The introduction of new technologies require significant amount of time and field presence coupled by awareness campaign, thus the GMP 2 has the opportunity to capitalize on the GMP 1 results and build on the achievements, specially the water condenser fully adopted by the gold shops.

The mobility of the TDU was an advantage and the cocktail of awareness material ranging from flyers, brochures, video, technological demonstrations were considered a good approach.

RECOMMENDATIONS

Project implementation

It is recommended to build stronger collaboration with relevant government levels, stakeholders, and the communities for wider coverage and necessary support. Higher involvement is expected to encourage the government to give more serious attention to the ASM and mercury issues.

The awareness campaign requires more time and should be the initial stage of the project

The project needs to address the ASM as whole and not only the Hg issues.

The project should have had more interaction and exchange of information among the GMP countries

The project should have had proper procedures for looking at social dynamics in order to avoid wastage of time and resources in try and error.

The project should have had more interaction with CFP in order to win the government at national level.

GMP Results Dissemination

Aside from constraints in the field, GMP 1, in Indonesia for example, has achieved some accomplishments that can be shared with other areas. E.g. the locally made water box condenser and local regulation draft on mercury use and management in ASM. The

inclusion of the accomplishments in the website will make it easier for other areas to get the information.

The existence of local partner with experience and capability of working with communities in addition to a supportive local authority in Katigan District was a good start for the establishment of training centres in Katingan District. The training centre will benefit the other areas that are facing the same problem or any individual/institution that are willing to learn about ASM techniques and management.

GENERAL CONCLUSIONS GMP

The Global Mercury Project (GMP) was initiated to begin a global response to address environmental impacts resulting from mercury released by the artisanal mining sector. This was highly achieved.

In Indonesia the GMP 1 was very challenging especially because the main object of the project are the miners, who are in general illegal.

ACKNOWLEDGEMENT

The following people are especially thanked for their assistance and support during the field evaluation of the GMP in Indonesia; the names are in order of appearance in the process and are presented in the appendix C.

9.6 APPENDIX F: Country evaluation report: LAO PDR

The main objectives of the GMP that included the following in LAO and the rate of implementation according to the present evaluation:

1. to reduce mercury pollution of international waters by emissions emanating from small-scale gold mining,

This objective was **unsatisfactorily** addressed, especially because the in LAO PDR there is no significant mercury pollution due to ASM activity.

2. to introduce cleaner technologies for gold extraction and to train people in their application,

The project in LAO PDR did demonstrate cleaner technology for gold extraction. It did carry an awareness campaign on health and environment and did demonstrate good practices for handling mercury. The field level of adoption of the cleaner technologies for gold extraction is considered very low. The evaluator did not assess the field sites due to absence of ASM activities in the present wet season. The project also introduced a communal retort in one of the sites; according to the main stakeholders the level of adoption of the retorting practice is very low. The main reason according to the main project stakeholder has to do with lack of trust by the miners and the secrecy that involves the gold sector, i.e. no one would like to reveal his production to others.

3. to develop capacity and regulatory mechanisms that will enable the sector to minimize mercury pollution,

On this objective the project in LAO PDR did mange to produce a draft code of practices that might be incorporated in the regulation for Artisanal and Small Scale mining sector in the country. At the moment the code of practices will serve as basis for the regulation that the Ministry of Energy and Mines is expected to produce in the near future. During this evaluation the deputy Director of Mines together with deputy Director of Geology have stressed the urgency for drafting the regulations for ASM, especially because the ASM has been ban until a regulatory framework is approved.

4. to introduce environmental and health monitoring programmes,

On this objective, the GMP in LAO PDR did carry an intensive awareness campaign that resulted in rising conscience of the government officials in the different relevant offices such as the Environmental Office and the Mine and Geology Offices. The conscience in these government offices did not yet progress to monitoring programmes even in the Mekong River Commission, being the main reason the lack of budget.

5. to build capacity of local laboratories to assess the extent and impact of mercury pollution.

The project has acquired a Lumex portable tester and has trained one government officer in the operation and data processing. The Lumex has been assigned to the laboratory of the Department of Geology of the Ministry of Energy and Mines. The programme for usage of the Lumex is not clear, as it is not vocation of the DoG to monitor the environmental pollution due to mercury exposure.

LEVEL OF ACCOMPLISHMENT OF THE SPECIFIC OBJECTIVES OF THE GMP IN LAO PDR

Objective 1: Identification of, and provision of resources for the establishment of the programme management structures in each of the six participating countries and the creation and operation of the basin and country specific project task forces.

Programme management structure consisting of one Country Focal Point and one Assistant country focal point were established in LAO PDR. Both CFP and ACFP are government officials from the Ministry of Energy and Mines.

Objective 2: Identify project demonstration sites and organize training aimed at increasing knowledge and raising awareness of miners, Governments, NGOs and the general public on the environmental and health impacts associated with the current artisanal mining practices and the environmental, health and economic benefits of employing appropriate technology.

This objective was **satisfactorily** achieved in LAO PDR.

Objective 3: Identify hotspots in project demonstration sites, conduct geochemical and toxicological studies and other field investigations in order to assess the extent of environmental (mercury) pollution in surrounding water bodies and devise intervention measures.

This objective was **satisfactorily** achieved in LAO PDR, nevertheless the fact that the assessment studies did not identify any hotspots.

Objective 4: Establish a databank comprising of technological requirements relevant to artisanal gold mining and extraction activities through field investigations, interviews with miners, miners' associations and other relevant institutions.

The project did not establish any database in LAO PDR.

Objective 5: Acquire and demonstrate, within the project demonstration sites, the application of affordable high-efficiency clean technology with improved gold processing methods while avoiding environmental degradation from mercury contamination.

This objective was **satisfactorily** achieved in LAO PDR. The project did acquire and demonstrate clean technologies (crusher, sluice boxes, retorts (Stationary and portable)); however, the adoption level by the miner could not be properly assessed because the demonstrations were done at very late stage of the project implementation.

Objective 6: Based on the acquired experience, develop sustainable extraction indicators and hence assist Governments to develop generic and to the extent possible, country specific policies and legislation that will lead to implementable standards on the application of mercury with special attention to minimization of environmental impacts.

Under this objective the project has drafted a code of practices for ASM in LAO PDR. The code of practices is at the moment in the process of being integrated in the regulations for ASM. Thus this objective is considered **satisfactorily** achieved in LAO PDR, although the project did not develop extraction indicators.

Objective 7**:** Promote the dissemination of the produced project results and identify opportunities that will allow the project to continue beyond the time frame through self-financing and to initiate and conduct a Donor Conference to solicit financing.

At country level the results of the project, specifically the awareness campaign and the demonstration of the cleaner technologies has been disseminated at low pace among the government officials at national and targeted provinces. The opportunities for continuity of the project initiatives remain uncertain; nevertheless the Department of Geology has expressed intention to use the remaining campaign material for display in conferences and in relevant provinces. The Department of Geology is planning to use the equipment acquired by the project, namely the stationary retort, the crusher, the sluice box, and the Lumex in demonstration and monitoring of Hg contamination in Humans.

SUMMARY OF THE PROJECT ACHIEVEMENTS IN LAO PDR

1. It is believed that the demonstration of the clean technologies was successful, however the project did not spend enough time in the field in order to introduce these technologies and this can be one of the reasons for non-adoption of the technologies. The demonstration of technologies as part of one-day workshop is not adequate for the effective introduction of technologies that means change in habits and attitudes.
2. The awareness on health and environmental impacts of mercury was done using posters and brochures that were distributed at Regional Workshops held in Northern, Central, and Southern LAO PDR, attended by participants from Central, Provincial, and District Government from the Ministry of Energy and Mines (Department of Geology and Mines - DGM); Department of Foreign Cooperation; Department of Public Health; Provincial Science Technology and Environment Office; Southern Geological and Mining Sector; LAO National Mekong Committee; representatives from private sector mining companies; and local artisanal miners.
3. According to the final report on LAO PDR the Ministry of Health personnel were trained to deliver the awareness training so that this activity could continue after the GMP project, however, during the evaluation mission it was not possible to track any indication leading to continuation of the activities.

4. The final report does not report the results on the awareness campaign in quantitative way, thus it is very difficult to evaluate the success of this activity.
5. The project has positively developed a code of practices for the ASM in LAO which might be integrated in the regulations that are being developed for the ASM.
6. The GMP in LAO PDR did organise an International Stakeholders Workshop with participants from the Australian Embassy; CARE Laos; Japan International Cooperation Agency (JICA); Mekong River Commission (MRC); World Bank (WB); Wildlife Conservation Society (WCS); and World Wide Fund for Nature – Greater Mekong Programme (WWF).
7. The project did manage to attract National and Provincial government support. The Government of LAO is quite supportive to the project that they offered an equipped office.

COST EFFECTIVENESS

The cost effectiveness could not be properly assessed due to lack of financial breakdown of the project. The only financial information available to the evaluator is the cost of the awareness campaign and acquisition and development of the relevant material and equipment. For this component the results achieved can be considered cost effective.

GOVERNMENT COMMITMENT

In LAO PDR there is centralised government where the processes are top down. On the basis of interviews conducted with government officials at central level revealed high commitment of the government of LAO PDR to the project initiatives.

GAPS, DEFICIENCIES AND CONCERNS ON PROJECT IMPLEMENTATION

The key challenges faced during implementation of the Health Awareness Campaign can be summarized as follows:

1. Miners in Lao PDR have more immediate health concerns, such as malaria, malnutrition, and unexploded ordinance and these tend to take priority over long-term health concerns.
2. Raw materials for manufacturing retorts tend are difficult to acquire and capital funds of villagers are limited, and often represents too large an investment.

The key challenges faced during technology introduction are:

1. Materials required for the plumbing pipe retort were not always locally available. Metals pipes, where available are coated with zinc, which must first be removed.
2. Bowls available in most rural markets are not suitable for the kitchen bowl retort because they are the wrong shape, having a flat bottom which causes evaporated mercury to re-condense and drip back into the crucible instead of being removed to the sand.
3. Technologies demonstrated by the project is in competition with technology introduced from neighbouring countries, such as the copper plates introduced

from Vietnam. Given the significant financial investment to purchase this equipment, miners are unlikely to switch to different technology introduced by the project if more funds are required.

4. There is considerable outside influence on technology from other countries such as Vietnam – it is difficult to overcome this influence without a long-term and dedicate effort.

The absence of internal monitoring and evaluation mechanism has affected the project implementation.

FURTHER OPPORTUNITIES FOR THE REMOVAL OF BARRIERS TO INTRODUCTION OF CLEANER AND MORE EFFICIENT TECHNOLOGIES

Priority activities for GMP 2

Following the ban of all ASM in LAO by the government as a measure to control the illegal proliferation of the ASM; the ban will prevail until such time when the government will approve the appropriate legislation and regulation. Thus, it constitutes priority for the GMP 2 in LAO the assistance to the country in drafting the legislation and regulations on ASM.

There is need to capacitate the local staff in the Mining and geology departments in order to make them more capable to assist technically the ASM.

GMP in LAO is in unique position to prevent environmental disaster due to improper use and handling of Hg, especially because in LAO ASM that uses Hg is not yet over spread countrywide.

The GMP 2 will need to consider the health and safety aspects of the ASM mining and gold extraction methods.

RECOMMENDATIONS

Project implementation

There is need for stronger collaboration with relevant government stakeholders for wider coverage and support. Higher involvement is expected to encourage the government to give more serious attention to the ASM and mercury issues and accelerate the drafting of the legislation and the regulations.

The project need to make effort to follow up the heath assessments especially for those people considered exposed of Hg. Most affected people were only informed about the exposure and were never advised on what to do next. It is recommended that mobile clinics are used and the Hg hazards should be integrated in other health programs.

It is recommended to extend the project to other provinces were there is ASM.

The time spent in the field by the technology expert was not enough to adequately introduce new technologies.

The GMP should have introduced the technologies instead of demonstrating them. There should have been enough time with real miners to try and to assess the technology.

GMP Results Dissemination

There is need to continue the awareness campaign in order to maintain the momentum created by the GMP 1. This would prevent situations such as the one reported in one of the stationary retorts where the custodian of the retort would not allow people to use it.

The GMP worked more with central government, thus, it is recommended that the next phase concentrate more effort on engaging the local governments.

The Department of Geology has shown interest in continuing the dissemination of the GMP message by distributing the remaining posters and fliers in future thematic workshops and conferences.

GENERAL CONCLUSIONS GMP

The Global Mercury Project (GMP) was initiated to begin a global response to address environmental impacts resulting from mercury released by the artisanal mining sector. This was highly achieved.

ACKNOWLEDGEMENT

The following people are especially thanked for their assistance and support during the field evaluation of the GMP in LAO PDR; the names are in order of appearance in the process and are presented in the appendix C.

9.7 APPENDIX G: Country evaluation report: Sudan

The main objectives of the GMP that included the following in Sudan and the rate of implementation according to the present evaluation

1. to reduce mercury pollution of international waters by emissions emanating from small-scale gold mining,

This objective was **unsatisfactorily** addressed, especially because the in Sudan there is not significant mercury pollution due to ASM activity.

2. to introduce cleaner technologies for gold extraction and to train people in their application,

The project in Sudan did demonstrate cleaner technology for gold extraction. It did carry an awareness campaign on health and environment and did demonstrate good practices for handling mercury.

On the basis of interviews with CFP and ACFP the field level of adoption of the cleaner technologies for gold extraction is considered very low. The evaluator did not assess the field sites due to issues related to logistics and authorizations. The project did demonstrate mainly the hammer mill, retorts, sluice, concentrator, and pans, Keene Dryblower, Lumex for mercury contamination monitoring.

The following training was provided: basics of gold ore geology; prospecting and testing; ore communition; ore concentration basics; different sluicing techniques; other gravity concentration techniques; size reduction; screening; amalgamation; mercury handling; hazards; retorting techniques; environmental protection; health and sanitation; organization and legalization of ASM activities and micro-financing options.

3. to develop capacity and regulatory mechanisms that will enable the sector to minimize mercury pollution,

Although it is not clear from the final report how much the GMP managed to influence the regulatory framework the country has passed its Mining and Mineral Resources Development ACT – 2007 in which the issues related to the legalization of miners are addressed.

The country final report state that the project has made recommendations for the development of ASM policies. These recommendations included standards for safety, amalgamation and use of mercury as well as for the legalization of miners.

4. to introduce environmental and health monitoring programmes,

On this objective, the GMP in Sudan did carry awareness campaign that resulted in rising conscience of the government officials at national and local levels. The conscience in these government offices did not yet progress to monitoring programmes.

5. to build capacity of local laboratories to assess the extent and impact of mercury pollution.

The project has acquired a Lumex portable tester and has trained one government officer in the operation and data processing. The project did also acquire a semi quantitative mercury analyser from CETEM (Brazil). Both equipments are at the moment in GRAS offices in Khartoum. The programme for usage of the Lumex and the analyser is not clear at the moment.

LEVEL OF ACCOMPLISHMENT OF THE SPECIFIC OBJECTIVES OF THE GMP IN SUDAN

Objective 1: Identification of, and provision of resources for the establishment of the programme management structures in each of the six participating countries and the creation and operation of the basin and country specific project task forces.

Programme management structure consisting of one Country Focal Point and one Assistant country focal point were established in Sudan. Both CFP and ACFP are government officials from the Ministry of Energy and Mines working at Geological Research Authority of the Sudan. No project steering committees were created in the country.

Objective 2: Identify project demonstration sites and organize training aimed at increasing knowledge and raising awareness of miners, Governments, NGOs and the general public on the environmental and health impacts associated with the current artisanal mining practices and the environmental, health and economic benefits of employing appropriate technology.

This objective was **satisfactorily** achieved in Sudan.

According to the country final report local nurses were trained in health aspects of gold mining. They were also capacitated on gender issues, water and sanitation issues, community decision making and related topics.

Involvement of an NGO body familiar with field implementation of development project facilitates more interaction with community and local politics. One NGO (Practical Action) was involved in the graphic design and awareness campaign material reproduction and they helped in the identification of some of the local consultants. The project also attempted to motivate the dialogue between the Directorate of Demilitarization and Rehabilitation and GRAS in order to capitalize on the GMP knowledge to train the ex-combatants in Sudan.

Objective 3: Identify hotspots in project demonstration sites, conduct geochemical and toxicological studies and other field investigations in order to assess the extent of environmental (mercury) pollution in surrounding water bodies and devise intervention measures.

According to the country final report this objective was **satisfactorily** achieved in Sudan. Although the report is rather vague it claims that “Gugub and Khor Gidad are among the heavily mercury contaminated sites”. The report continues stressing “in a similar manner to the River Nile in the north, artisanal gold production has created many mercury hot spots”.

Objective 4: Establish a databank comprising of technological requirements relevant to artisanal gold mining and extraction activities through field investigations, interviews with miners, miners' associations and other relevant institutions.

The project in Sudan did no implement any database. The ACFP claim that the country has been relaying on the global database hosted at GMP website.

Objective 5: Acquire and demonstrate, within the project demonstration sites, the application of affordable high-efficiency clean technology with improved gold processing methods while avoiding environmental degradation from mercury contamination.

This objective was moderately **satisfactorily** achieved in Sudan. The project did acquire and demonstrate clean technologies (hammer mill, retorts, metallic sluice, concentrator, pans, and Keene Dryblower sluice); although the evaluation mission did not visit the field sites, reports from interviewed officers in Khartoum allege that there was no adoption by the miners.

Objective 6: Based on the acquired experience, develop sustainable extraction indicators and hence assist Governments to develop generic and to the extent possible, country specific policies and legislation that will lead to implementable standards on the application of mercury with special attention to minimization of environmental impacts.

It was not possible to evaluate whether the GMP did manage to influence the drafting of the recently approved Mining and Mineral Resources Development ACT – 2007 in which the issues related to the legalization of miners are addressed. According to ACFP the recommendations made by the GMP on the legal issues have been incorporated in the law.

The project did not develop specific extraction indicator, however it did make recommendations in its final report, which include standards for safety, amalgamation and use of mercury as well as for the legalization of miners.

Objective 7**:** Promote the dissemination of the produced project results and identify opportunities that will allow the project to continue beyond the time frame through self-financing and to initiate and conduct a Donor Conference to solicit financing.

At country level the results of the project, specifically the awareness campaign and the demonstration of the cleaner technologies has been disseminated at low pace among the government officials at national level and in the field site area. The opportunities for continuity of the project initiatives remain uncertain; nevertheless GRAS has expressed

intention to allocate yearly budget to be used in the dissemination of the project initiatives.

SUMMARY OF THE PROJECT ACHIEVEMENTS IN SUDAN

The GMP achieved the following results according to the final country report:

1. Diagnostic Analyses

The socio-economic, health and environmental studies in the project area provided significant information vital for the design of the project. Approximately 90% of individuals tested were educated on their results.

2. Local design and manufacture of appropriate gold mining equipment

The equipment was manufactured in Khartoum. There is now provision to manufacture future equipment in Damazin where suitable factories have been identified by the GMP team.

3. Gold Extraction Practices

According to the final report the GMP trainers delivered technical training to more than 300 miners, representing over 90% of those actively mining at the time. Twelve retorts are now in use at project sites.
The present mission, on the basis of interviews in Khartoum it was revelled that the miners are not using the retorts.

4. Gold Mining Education

During the awareness campaign Twenty-six sets of four brochures and nine sets of nineteen posters were distributed to chiefs. Radio and television broadcasts reached the whole state and one news broadcast was distributed nationally. One educational film was completed.

In addition to the Awareness Campaign and Trainings; the Geological Research Authority of the Sudan GRAS set up a pilot gold processing centre in the Bayuda desert, River Nile State in the north with the aim of producing alluvial gold on small-scale. GMP experts offered valuable advice on equipment adjustment and efficient gold processing techniques. The site is well placed as an education centre in an area of new mining development where mining licenses are being authorized.

Local nurses trained in health aspects of gold mining provided excellent outreach to community members, particularly women and children as they involved groups of women in discussion resulting in significant reduction of amalgam burning in homes. Gender issues, water and sanitation issues, community decision-making and related topics were discussed.

5. Reduction of Mercury Contamination in Gold Shops

Recent recordings of Hg in several gold shops in Damazin revealed that behavior has changed since the first intervention in 2005. Several shopkeepers stated that they had stopped burning inside when they learned of the health risks during the awareness

campaign. Indeed the only area where there was very high level of mercury in the air was outside where active burning was underway. Many of the gold shop owners volunteered to have the EPA ventilation system in their shop.

These results were not verified during the evaluation mission because the evaluator did not visit the field, neither the Damazin village.

6. Legalization/formalization Process

The process for legalization of miners has been commenced with the ratification of the Mining and Mineral Resources Development Act - 2007. The process is under the control of GRAS and due to the GRAS expertise in gold mining it is expected that the process will be implemented in order to allow miners to gain legal status prior to fines being introduced.

There is no clear connection of this activity with GMP.

7. Other achievements

The project did develop collaboration with Khartoum Office of Practical Action with aim to involve this NGO in future GMP II and try to capitalize on their experience on interaction with communities and local politics. During the GMP I Practical Action provided graphic advises on the educational materials for the Awareness and Educational campaigns.

GMP team met with leaders of the Directorate of Demilitarisation and Rehabilitation (DDR) at both the National and State level in order to encourage the exchange of information and training equipment. The mandate of the DDR is to provide appropriate training to help stabilize the many thousands of transient ex-combatants in Sudan.

The fact that the DDR has UN budget it was acknowledged that the GMP could assist them in training the ex-combatants that would be interested in becoming miners.

The GMP I conducted an assessment study to evaluate the Access to Micro credit by ASM in Sudan. The study suggested that there is need to build awareness and promote associations that can then access the micro credit from the official entities devoted to micro finances.

COST EFFECTIVENESS

The cost effectiveness could not be properly assessed due to lack of financial breakdown of the project in Sudan. The financial statement can only be available after the auditing exercise that is at the moment in progress at GRAS. By comparing the number and quality of equipment acquired by the project funds for the field implementation it can be considered cost effective.

The cost effectiveness can also be analysed on the basis of the time (two weeks) that took to train a local workshop in building equipments and the few days to train the

trainers on how to use them were highly effective. This workshop still would require support to optimise the technologies and to complete them.

GOVERNMENT COMMITMENT

In Sudan there is centralised government where the processes are top down. On the basis of interviews conducted with government officials at central level (CFP and ACFP) the government has shown high commitment to the project initiatives, e.g. the project has provided logistics, office, driver, vehicle, financial accounting and administration and trainers to the project free of charge. This can be considered country's "in kind" contribution to the GMP. The evaluation was not in position to convert this contribution in sensible cash terms.

GAPS, DEFICIENCIES AND CONCERNS ON PROJECT IMPLEMENTATION

The key challenges faced during implementation of the Health Awareness Campaign can be summarized as follows:

After a first medical check of the miners and the local population, the results were too late or never transmitted to the people, causing a lot of fear on the one hand and distrust to the project on the other.

The demobilization of thousands of former combatants and the resulting transient nature of many people presents a potentially volatile situation as claims to land, water and natural resources are challenged.

There was very little co-operation of the technical teams, and a very limited evaluation of what has been done and tried (and failed) before, in other projects.

The functioning technologies were demonstrated at the very last moment (for example in Zimbabwe, Laos, Sudan) there was no enough time left for real introduction and dissemination, with the exception of very limited pilot installations.

The absence of internal monitoring and evaluation mechanism has affected the project implementation

The delays in payments mainly due to UNIDO bureaucracy constituted a major concert on the project implementation. It was also a concern the equipment procurement and funds transfers to Sudan due to sanction posed by some countries.

The most important of all concerns is the sustainability of the project results, at the moment the GRAS has promised to allocate yearly budget to pursue project initiatives.

The key challenges faced during technology introduction are:

The mobility of the communities in a country of conflict or post conflict situation was a big challenge. The implementation of field project in a conflict country is a great challenge due to need to select project site on the basis of safety and related population exodus (for example, the project conducted diagnostic studies in 2003 and 2004 to a group of people and when the time came for the field implementation all the target group had migrated somewhere else).

The water shortage in Sudan is also a challenge for the ASM. For example, it was planned that the TDU would be implemented in couple more ASM sites in Qeissan and Bulang within southern Blue Nile region. The ACFP visited the area in early may to access the logistics and the number of ASM and make arrangements with local chiefs for the coordination of the training. Unfortunately, at that time no one was practicing artisanal gold mining due to water shortage.

Activities to be completed by the GMP in Sudan

1. The project in Sudan is still waiting for the ball mill that has been ordered from Germany.
2. The project is also to accomplish the fume hood that must be tested in gold shops.
3. The project is still waiting for the serial port to connect the Lumex and the computer for quantitative analyses.

4. At present plans for EPA equipment is with GRAS and Iyass El Bashir for manufacture prior to installation and testing in gold shops in Khartoum and Damazin.

FURTHER OPPORTUNITIES FOR THE REMOVAL OF BARRIERS TO INTRODUCTION OF CLEANER AND MORE EFFICIENT TECHNOLOGIES

Priority activities for GMP 2

According to the government officials the GMP should continue the awareness campaign on health hazards and environmental impacts.

Improvement on TDU

It is also a priority to introduce clean and more efficient technologies for gold extraction. The TDU as mean for introduction of new technologies for ASM is considered not appropriate for the case of Sudan. The government officials believe that the regional training centers is the best way of transmitting new technologies because it would stay longer in the ASM areas.

It also constitutes a priority in Sudan the roll out of the project to other areas with ASM.

RECOMMENDATIONS

Project implementation

The transience nature of many ASM communities must be put into consideration when implementing similar projects in rural areas. Significant to the Ingessana Hills is the continued movement of communities related to post-civil war tensions. The project area has had approximately 600 people return to the area this year, many of whom mined for gold prior to the civil war. At the same time people who were displaced north, due to fighting further south near Kurmuk, have been forcibly returned to their former home. Damazin has seen an increase of 3 00,000 people since the civil war which has almost doubled the population.

It is recommended that continuation of the technical assistance to institutions responsible to the ASM.

It is recommended a stronger collaboration with relevant government stakeholders for wider coverage and necessary support. Higher involvement of government is expected to encourage the government to give more serious attention to the ASM and mercury issues.

The organization of ASM miners into community-based organizations (CBOs) could serve far better in getting benefit from training offered and options suggested for them to access decision makers, legalization, and micro-credit avenues for equipment/operation financing. Strong synergies with NGOs (e.g. Practical Action) that are more fluent in organizing the communities, building the capacity of CBOs, assisting in assessment of market, include environmental policy, ensure cross cutting issues are carefully considered (livelihoods, environment, gender, sustainability, HIV), develop

complementary activities that address overall health issues (sanitation, water, food security etc), and monitor progress and impact on the ground is recommended.

The role of the technical assistance need to be re-evaluated such that the expert must be host at the same office as the ACFP in order to guaranty knowledge transfer and sustainability of the results.

It is recommended that the project establish a reporting system that allow flow of information through all stakeholders and interested parties at the same time that it creates record and backup of all documents at national level.

GMP Results Dissemination

It is recommended that the educational materials are translation into more languages in order to rich more communities.

The establishment of an educational 'milling centre' in the southern Blue Nile State is recommended. This would continue to introduce efficient technology, training and awareness along with organization and legalization instrument for regulating ASM activities.

Local DDR office already has agreements with local bank to facilitate micro-credit as needed related to employment training.

The GMP policy recommendations provided standards for amalgamation, the use of retorts and for the reduction of mercury loss in gold extraction. The formal acknowledgement and regulation of the mercury trade is a crucial next step and would support the process of legalization and formalization of miners.

It is recommended that the momentum gained in this project is not lost, and that provision be made to support a staff person at the UNIDO office to continue with the next steps.

GENERAL CONCLUSIONS GMP

The Global Mercury Project (GMP) was initiated to begin a global response to address environmental impacts resulting from mercury released by the artisanal mining sector. This was highly achieved.

ACKNOWLEDGEMENT

The following people are especially thanked for their assistance and support during the field evaluation of the GMP in Sudan; the names are in order of appearance in the process and are presented in the appendix C.

9.8 APPENDIX H: Tanzania evaluation of the GMP

0. The final evaluation of the GMP in Tanzania was conducted between 11th and 16th of February 2008 and included field visits, interviews and community meetings with main stakeholders.

1. Summary of the Tanzania Achievements

The GMP project equipped and empowered the Water Laboratory in Mwanza in capacity to determine mercury contamination in the environment and in humans.

Regarding the introduction of cleaner technologies
The project in Tanzania demonstrated cleaner and more efficient technologies for crushing, sluicing, amalgamation and retorting. The level of adoption, depending on the technology, varies from place to place. In crushing the miners were thought that they need to crush more than one time (at least two to three times), however, the miners did not adhere to the practice. The project introduced more efficient sluices (zig zag and ripple). The evaluation did realize that the miners are not using such sluices. The project introduced cemented amalgamation ponds (as way to reduce the contamination of soils by mercury, at the same time allowing the recover of mercury). This practice was significantly adopted by the miners especially in Rwamagasa settlement. The project introduced retorts to the different groups that smelt or burn amalgam. On this exercise the project also trained local fabricators to produce at least two types of retorts (the kitchen bawl and the *alambique*). The fabricator has been producing retort of acceptable quality and standards and did manage to sell some 60 units since the beginning. Although the final report seconded by the interview with the implementer of the TDU and awareness campaign claim that the miners, buyers and brokers use the retort in their activity, the evaluation mission in the field site did not find evidences of these groups using retorts presently. Several reasons are presented on the matter, including the fact that the retorts are too slow (average burning time 20 to 30 minutes), the cost of kerosene was considered as one of the reasons for non use of retorts and some buyers also claimed that usually the amount of gold/amalgam is two little that does not justify the use of retort.

2. The main objectives of the GMP that included the following in Tanzania and the rate of implementation according to the present evaluation:

This section describes the main objectives of the GMP and the level of achievement in Tanzania:

- to reduce mercury pollution of international waters by emissions emanating from small-scale gold mining,

This objective was addressed to ***moderately satisfactory***, especially because the lake Victoria is shared by at least 3 countries. And according to the project's final report artisanal miners have relocated their amalgamation and processing sites to higher grounds, thus reducing the direct discharges in the river systems.

- to introduce cleaner technologies for gold extraction and to train people in their application,

The project in Tanzania did demonstrate cleaner technology for gold extraction. It did carry an awareness campaign on health and environment and did demonstrate good practices for handling mercury.

On the basis of interviews with CFP and ACFP the field level of adoption of the cleaner technologies for gold extraction is considered good. The field inspection during the evaluation revealed that there is considerable knowledge of the technologies but only processing ponds, amalgamation ponds and panning the concentrates were fully adopted. The use of retorts is unclear, because the final report argues that retorts are being used, however in the field all evidences suggest that although some people have bought the retorts, they literally do not use them. The main reason is the time that the retorting process takes, the cost of kerosene and the fact that most miners produce very small quantities usually not suitable for retorting.

The training sessions and demonstration activities included components such as gold extraction methods and ore crushing/grinding, health and sanitation, water recycling and protection, gold amalgamation processes, proper burning of amalgam, and marketing of gold.

- to develop capacity and regulatory mechanisms that will enable the sector to minimize mercury pollution,

Although it is not clear from the final report how much the GMP managed to influence the regulatory framework of the country; according to the ACFP the recommendations built in the legal study for Tanzania were all sent to the policy review committee. As far it is known the committee has accepted the recommendations in regard to ASM. The recommendations emphasize on (i) improving the economic contribution of ASM to poverty alleviation; (ii) women's participation in mining; (iii) child labour in mines; (iv) implementation of the Mineral Policy; (v) legal and regulatory framework; (vi) licensing and registration procedures; (vii) technology assistance and capacity-building

- to introduce environmental and health monitoring programmes,

On this objective, the GMP in Tanzania did carry awareness campaign that resulted in rising conscience of the government officials at national and local levels, local communities, miners etc. The Lumex is host at the water laboratory in Mwanza that carries environmental monitoring of the Lake Victoria together with Lake Victoria Environment Management project (Ministry of Water and Ministry of Environment). The Lumex allowed the laboratory to be able to monitor the presence of mercury in the waters (something that the laboratory was not doing before). The Lumex allowed the laboratory to carry tests of mercury poisoning in humans (hair, blood and urine) and the presence of mercury in fish and sediments.

Regarding the health monitoring programme, the service providers were trained to diagnose the symptoms of mercury poisoning, and they agreed to council such individuals and collect specimen to be sent to the lab to be tested using Lumex.

The achievement of this objective was **highly satisfactory,** especially when compared to other countries.

- to build capacity of local laboratories to assess the extent and impact of mercury pollution.

The project has acquired a Lumex portable tester and has trained one lab official in the operation and data processing. The project did also acquire a semi quantitative mercury analyser from CETEM (Brazil). The Lumex is set and has been used significantly for environmental monitoring of the Lake Victoria, while the semi quantitative mercury analyser was never used mainly due to lack of training and to the fact that the equipment was delivered incomplete.

LEVEL OF ACCOMPLISHMENT OF THE SPECIFIC OBJECTIVES OF THE GMP IN TANZANIA

Objective 1: Identification of, and provision of resources for the establishment of the programme management structures in each of the six participating countries and the creation and operation of the basin and country specific project task forces.

Programme management structure consisting of one Country Focal Point (the mining commissioner) and one Assistant country focal point were established in Tanzania. Both CFP and ACFP are government officials from the Ministry of Energy and Minerals. No project steering committees were created in the country.

Objective 2: Identify project demonstration sites and organize training aimed at increasing knowledge and raising awareness of miners, Governments, NGOs and the general public on the environmental and health impacts associated with the current artisanal mining practices and the environmental, health and economic benefits of employing appropriate technology.

This objective was **satisfactorily** achieved in Tanzania.

Nurses were trained in health aspects related to mercury handling and its possible impacts in the environment and Human being. They were also capacitated on gender issues, water and sanitation issues, community decision making and related topics.
The nurses were from the District hospital, as forma to guaranty continuity of the activities.

Objective 3: Identify hotspots in project demonstration sites, conduct geochemical and toxicological studies and other field investigations in order to assess the extent of environmental (mercury) pollution in surrounding water bodies and devise intervention measures.

The GMP conducted environmental assessment studies in Geita District. The environmental assessment report considers that the swamps and flooded grasslands located 120 to 350 km downstream of Rwamagasa act as an environmental sink, likely preventing migration of mercury downstream. These places, however, can be transformed into environmental hotspots where mercury transported by sediments from mining areas can be methylated. Fish originating from Lake Victoria and sampled from the Rwamagasa market showed very low levels at 0.01 ppm Hg.

According to the country final report this objective was **satisfactorily** achieved in Tanzania.

Objective 4: Establish a databank comprising of technological requirements relevant to artisanal gold mining and extraction activities through field investigations, interviews with miners, miners' associations and other relevant institutions.

The project in Tanzania did not implement any database. Thus, this objective was not addressed at country level.

Objective 5: Acquire and demonstrate, within the project demonstration sites, the application of affordable high-efficiency clean technology with improved gold processing methods while avoiding environmental degradation from mercury contamination.

The GMP acquired and demonstrated during five-month period, application of affordable high-efficiency clean technology with improved gold processing methods in Rwamagasa village (from 7th March to 16th May 2007) and Nyarugusu village (from 18th May 2007 to 8th August 2007). During this period the project team maintained extension services at Rwamagasa and Nyarugusu Villages.

According to the country final report at Rwamagasa 1430 villagers attended class training with an additional 2700 attending field demonstration activities. Training was also given to 522 pupils and 20 teachers from the two primary schools in the village.
At Nyarugusu village 3900 people attended class training courses and 4800 attended the field demonstration activities. Training was also provided to 1885 primary school children from Nyarugusu sub-villages.

This objective was **satisfactorily** achieved in Tanzania. The project evaluation mission visited the field sites.

Objective 6: Based on the acquired experience, develop sustainable extraction indicators and hence assist Governments to develop generic and to the extent possible, country specific policies and legislation that will lead to implementable standards on the application of mercury with special attention to minimization of environmental impacts.

The GMP in Tanzania did develop guidelines and recommendation on issues related to proper handling of mercury, where small-scale gold mining is encouraged within a

formal operating context, which promotes the use of best legal practices for mining and occupational health and environmental protection. The recommendations emphasize on (i) improving the economic contribution of ASM to poverty alleviation; (ii) women's participation in mining; (iii) child labour in mines; (iv) implementation of the Mineral Policy; (v) legal and regulatory framework; (vi) licensing and registration procedures; (vii) technology assistance and capacity-building

Objective 7: Promote the dissemination of the produced project results and identify opportunities that will allow the project to continue beyond the time frame through self-financing and to initiate and conduct a Donor Conference to solicit financing.

At country level the project did not conduct a donor conference, this activity was considered at global level of the project.

The results produced by the project are posted in the GMP website and the awareness campaign and TDU results are also available in CD format which was submitted to the relevant stakeholders. During the project several newspaper articles and interviews did help to disseminate the results and progress of the project.

The launch was covered by the media in 5 newspapers, and on 3 nation wide radio stations (radio free Africa, Radio Tanzania, and radio One). ITV in Dar es Salaam aired the events on their evening news.

THE PROJECT ACHIEVEMENTS IN TANZANIA

It is believed that the demonstration of the clean technologies was successful in Tanzania, especially when compared to the other countries.

32 people including mining technicians, health officials, miners and divisional/village administrators attended the 5 day trainers' capacity building workshop. The topics covered in the training sessions and demonstration activities included components such as gold extraction methods and ore crushing/grinding, health and sanitation, water recycling and protection, gold amalgamation processes, proper burning of amalgam, and marketing of gold. Course duration varied depending on the module and attendees.

The project did successfully transfer technology for making retorts to local manufactures in Geita District who continues the production of retorts even after the project has ended.

At country level, the project did raise the awareness of the government to an extent that it promised to dedicate specific budget at District level to pursue the training and awareness to the ASM in Geita District. At the moment the future use of the TDU equipment stored at the Mines District Office in Geita is very unclear.

The awareness campaign was also aimed at encouraging all members of the community to participate in project activities and to take a collective approach to dealing with the issue of mercury use. The training and TDU activities occurred during two

months. Among the topics covered was health and sanitation focusing on communicable diseases, sanitation and protection of water sources. The teaching methodology was designed in response to educational needs assessment conducted during the 2006 trainers' workshop. The structure of the training allowed for the technical subjects of interest to the attendees to be covered off first, however, all participants were required to attend sessions focused on environmental protection and health and sanitation.

The GMP training site at Blue Reef Mine, Lwamagasa, accommodated more than 60 people and was equipped with a desktop computer, multimedia projector, screen, white board, blackboard and sound system, 1430 villagers attended the courses at the TDU centre. Approximately 220 courses were given between March 14 and May 15 2007. Among those in attendance were owners of gold recover centres, ore grinders, gold brokers, women's groups, gold mining SACCOS, Hekima women SACCOS and private operators. Training was also conducted at two primary schools in the village where 552 students and 20 teachers were involved. A special training session was also provided to village council members in an effort to transform the way the local government viewed issues of environmental protection and the dangers of mercury emissions and tailing disposals.

The project did also equip the water laboratory in Mwanza to be able to conduct Hg analysis, however, the fact that the analysis are for free hinders the sustainability of such infrastructure. For example the atomizer of the Lumex is broken, and the laboratory does not have funds to repair the instrument.

The awareness on health and environmental impacts of mercury was carried in Rwamagasa and Nyarugusu villages aiming at raising awareness of the dangers of exposure to mercury and losses incurred during the use of inappropriate technologies. This goal was complemented by the provision of appropriate technology and skills for improved gold extraction, better health and protection of the environment.

Nyarugusu has a population of approximately 23,000 people making it one of the largest villages in Tanzania. Due to the size of Nyarugusu, 4 training centres were established to ensure participation of more miners in the activities. 220 villagers received mercury testing and counselling from the team of health officers and the Lumex technician during the week of July 6, 2007.

About 3,900 villagers attended the training courses including: owners of gold recovery centres, gold brokers, private operators, primary license holders, sluicing operators, ore porters, and women's groups. In addition to the 1,855 students who attended training at 3 primary schools, 4,800 people attended field demonstrations in Nyarugusu centre and its sub-villages.

An indicator of success in this instance is that since the training session, the village council now has environmental issues on their meeting agendas. The village councils have undertaken to monitor behaviour change within their communities and to take action in response to complaints related to the use of mercury.

The medical Doctor at Nyarugusu began a program whereby he provides patients with informational sessions related to health, sanitation and the dangers of mercury poisoning. The sessions assist not only in teaching the importance prevention but also in identification of symptoms and signs and mercury poisoning.

As part of the awareness campaign, audiovisual displays were used to educate over 8,500 people during 28 video shows.

COST EFFECTIVENESS

The cost effectiveness could not be properly assessed due to lack of financial breakdown of the project in Tanzania. According to the ACFP the contractor for the awareness campaign and TDU did deliver all equipment and material specified in the contract and TOR except for the trailer. The equipment acquired in Tanzania is of laboratory scale, good for class demonstration or individual use. This equipment is relatively different from the equipment in Brazil, Sudan, Indonesia, Lao and Zimbabwe.

GOVERNMENT COMMITMENT

On the basis of interviews conducted with government officials at central level (CFP and ACFP) and at District level, the government has shown high commitment to the project initiatives. The government has expressed in writing to UNIDO its interest to contribute in kind to the possible GMP II.

GAPS, DEFICIENCIES AND CONCERNS ON PROJECT IMPLEMENTATION

The key challenges faced during implementation of the Health Awareness Campaign can be summarized as follows:

The project during the first three years only conducted assessment studies, fact that demoralized the communities because there was no really activity in the field.

The project had big delays between the phases.
It is believed that the project expert did not add value to the project. This is because they were not experienced enough for the tasks.
The ACFP were not given enough power to work independently, they ended being logistics officers rather than ASM experts to implement the GMP.

The funds allocated for the real fieldwork was very little.
The field activities did not have enough time to introduce and crystallize the technologies and the environmental and health messages.
The mobility and the high turnover of the miners in the communities created some problems to the project because the new comers were not aware of the messages and the techniques being implemented.
The UNIDO bureaucracy was seen as a major challenge to the project.

The key challenges faced during technology introduction are:
The location of the project was too remote which made the logistics very difficult.
The TDU equipment had to be procured from the USA which took long time to materialize.

The absence of internal monitoring and evaluation mechanism has affected the project implementation.

Activities to be completed by the GMP in Tanzania

1. The project in Tanzania is recommended to find ways to train one water laboratory technician in the use of semi quantitative analysis for mercury. It also remains to be done the proper training of the laboratory technician in proper operation of the Lumex.
2. The project also did not introduce the wet milling in the demonstration sites.

FURTHER OPPORTUNITIES FOR THE REMOVAL OF BARRIERS TO INTRODUCTION OF CLEANER AND MORE EFFICIENT TECHNOLOGIES

Priority activities for GMP 2

The awareness campaign is supposed to be a continuous activity as it has potential to make people understand the reasons for adopting cleaner and more efficient technologies.

Improvement on TDU
The GMP II can build on the achievements from the GMP I and empower other mining Districts that have ASM. The GMP need to team its TDU activities with District extension services for the miners in order to implement training that can be sustainable even after the end of the project.

The project needs to concentrate on roll out of the project into Districts and communities not involved in the pilot phase.

RECOMMENDATIONS AT COUNTRY LEVEL

Project implementation

Stronger collaboration with relevant government stakeholders for wider coverage and necessary support. Higher involvement is expected to encourage the government to give more serious attention to the ASM and mercury issues.

It is recommended that the authorities responsible to procure a trailer for TDU equipment which will be used by the Geita mines Office to continue with the extension services to the miners.

It is recommended that the UNIDO Representative as well as UNIDO to look at a possibilities of finishing the unfinished business especially in the fixing of the Lumex at Water laboratory as well as to complete the quantitative method especially the consumables and the accessories.

It is also recommended that at least two technicians be properly trained in the operation and data processing of the Lumex and the semi-quantitative method as well as to complete the delivery of all required consumables and accessories.

For the success of the project it is recommended that the implementation phase involves the local leadership, basically they are the one that can continue the monitoring of the issues after the project.

GMP Results Dissemination

The GMP results need to be more disseminated trough distribution of DVDs, workshops and round tables

GENERAL CONCLUSIONS GMP

The Global Mercury Project (GMP) was initiated to begin a global response to address environmental impacts resulting from mercury released by the artisanal mining sector. This was highly achieved.

ACKNOWLEDGEMENT

The following people are especially thanked for their assistance and support during the field evaluation of the GMP in Tanzania; the names are in order of appearance in the process and are presented in the appendix C.

9.9 APPENDIX I: Zimbabwe evaluation of the GMP

Summary of Zimbabwe GMP implementation

The final evaluation of the GMP in Zimbabwe was conducted between 16th and 21st of February 2008 and included field visits, interviews and community meetings with main stakeholders.

Assessment studies

The GMP in Zimbabwe did successfully conduct environmental, health and socio economic assessments in the target areas where it was expected that contamination by mercury to the environment (mainly international water sheds or draining more than one country), human due to poor handling and lack of awareness on mercury hazards by the artisanal and small scale miners. The results of these studies did indicate that both the environment and the human being were sustaining levels of mercury high that the recommended by the WHO.

Regarding the introduction of cleaner technologies

The project conducted a four day *training of trainers* workshop where 32 trainers received instruction in the objectives of the GMP, an overview of Zimbabwe Health and Environmental studies and strategies to effectively communicate the effects of mercury on health, how to minimize exposure, how to use and reuse mercury safely, use of retorts, and how to achieve high efficiency gravity concentration.

The project in Zimbabwe demonstrated cleaner and more “efficient technologies” for sluicing (equipped with vinyl carpet), amalgamation and retorting in two customer milling centres in Kadoma Chakari region.

The GMP’s Transportable Demonstration Unit (TDU) in Zimbabwe was planned to contain a ball mill, a hammer mill, a centrifuge, a generator and a steel sluice equipped with vinyl loop carpets. The TDU was never assembled as planned and the only equipment that the evaluator had access includes a ball mill, a hammer mill, and a generator (presumably second hand and presently out of order). The country final report is rather vague and confusing on the activities of the TDU and claims that 569 miners (188 women and 381 men) had been trained in seven milling centres between September and December 2006. In discussion with IRM (TDU implementer) it was stressed that the TDU was never assembled and only activities related to retort demonstration were carried. Additionally, tests of vinyl carpets on a sluice compared to the cooper plat were conducted at two miller sites by the department of metallurgy of the Ministry of Mines in conjunction with IMR. The preliminary results on 8 charge samples from two sites suggest recoveries of the vinyl carpet between 18.6% and 69.8%. From the report it is not conclusive that the carped recovers more gold than the whole amalgamation on copper plates.

The understanding of the government authorities is that there is need to phase out cooper plates, but an alternative should be provided to the miners. As it stands the tests

conducted by the project are not conclusive as the vinyl carpet was only tested with few samples of ore type.

The level of adoption by the millers is literally nil, and this is supported by the country final report which indicates that “retorts are seldom used by the millers”. The millers and the miners did not adopt the sluice with vinyl carpet method.

There several reasons for non adoption of any technology that might lead to improvement in the recovery, being the most important the gold mining structure highly dependent on customer millers, who make more money on the cyanidation plant that re-treat the tailing from the main processing plant (stamp milling concentrators or cooper plates).

The awareness campaign

The grass roots awareness program in Zimbabwe was built around the community theatre production “Nakai” which illustrates the hazards of mercury use while demonstrating alternatives. The play has performed in seven mining centres. The communication and transmission of message is believed to be very effective in communities, especially where most of the people is illiterate. The evaluation mission believes that although the process may be considered appropriate, the number of plays per community was not enough to be able to transmit effectively the required message.

The main objectives of the GMP that included the following in Zimbabwe and the rate of implementation according to the present evaluation:

- *to reduce mercury pollution of international waters by emissions emanating from small-scale gold mining,*

This objective was addressed to **moderately unsatisfactory**, especially because the TDU was not assembled and that miners did not adopt the technologies demonstrated by the project. It is also known that environmental assessment did not find any hot spots in the rivers or stream sediments.

- *to introduce cleaner technologies for gold extraction and to train people in their application,*

The project in Zimbabwe did demonstrate cleaner technology for gold extraction. It did carry an awareness campaign on health and environment and did demonstrate good practices for handling mercury.

On the basis of interviews with various stakeholders and field observations the field level of adoption of the cleaner technologies for gold extraction is nil. The field inspection during the evaluation revealed that there is considerable knowledge of the importance of using retorts but miners and millers are reluctant to adopt.

The legislation in Zimbabwe requires that each miller must have and use a retort. It seems that millers have retorts to comply with legislation and to exhibit to the inspectors. The main reason for not using the retort is the time that the retorting process takes, the cost of "energy" and the fact that most mines produce very small quantities usually not suitable for retorting.

- *to develop capacity and regulatory mechanisms that will enable the sector to minimize mercury pollution,*

The GMP in Zimbabwe did develop recommendation on the proper handling or mercury and banning of the whole ore amalgamation and cooper plates, these recommendations were filled to the commission reviewing the Mines Act. In interviews with relevant stakeholders in the government it was stressed the lack of field and scientific evidences to support the recommendations filled by the GMP team. Thus, it is very unlikely that the recommendations will be incorporated in the new Mines Act.

- *to introduce environmental and health monitoring programmes,*

On this objective, the GMP in Zimbabwe did carry awareness campaign that resulted in rising conscience of the government officials at national and local levels, local communities, miners etc. The Lumex is host at the IMR and is expected to be used by all stakeholders concerned with environment. At the moment the use of the Lumex for environmental and health monitoring programmes is very unclear, especially because the technician that was trained by the project has left the IMR.

Regarding the health-monitoring programme, the nurses and doctors in Kadoma were trained to diagnose the symptoms of mercury poisoning, and they agreed to give counselling to such individuals.

The achievement of this objective was **moderately satisfactory.**

- *to build capacity of local laboratories to assess the extent and impact of mercury pollution.*

The project has acquired a Lumex portable tester and has trained one lab official in the operation and data processing. The project did also acquire a semi quantitative mercury analyser from CETEM (Brazil), however this equipment was delivered not complete, thus it has never been used. The Lumex is hosted at IMR and according to the Director it is working although the technician that was trained by the project has left the institution.

LEVEL OF ACCOMPLISHMENT OF THE SPECIFIC OBJECTIVES OF THE GMP IN ZIMBABWE

Objective 1: Identification of, and provision of resources for the establishment of the programme management structures in each of the six participating countries and the creation and operation of the basin and country specific project task forces.

Programme management structure consisting of one Country Focal Point (the mining commissioner) and one Assistant country focal point were established in Zimbabwe. The CFP represents the Ministry of Mines and the ACFP was an independent expert from the University of Zimbabwe. No project steering committees were created in the country. However the project conducted regularly consultation workshops with relevant stakeholders.

Objective 2: Identify project demonstration sites and organize training aimed at increasing knowledge and raising awareness of miners, Governments, NGOs and the general public on the environmental and health impacts associated with the current artisanal mining practices and the environmental, health and economic benefits of employing appropriate technology.

This objective was **satisfactorily** achieved in Zimbabwe.

Nurses were trained in health aspects related to mercury handling and its possible impacts in the environment and Human being. They were also capacitated on water and sanitation issues, community decision making and related topics.

The nurses were from the Kadoma District hospital, were directly involved in all project activities related to health impacts associated with ASM, as a form to guaranty continuity of the activities after the end of the project. The present evaluation was conducted six month after the end of the project and it seems that very little is being done on this regard.

Objective 3: Identify hotspots in project demonstration sites, conduct geochemical and toxicological studies and other field investigations in order to assess the extent of environmental (mercury) pollution in surrounding water bodies and devise intervention measures.

The GMP conducted environmental and health assessment studies in Chakari, Kadoma District, the team collected and analysed 163 samples taken from soil, stream sediments, water, dust, and tailing material. High mercury levels were consistently found in soils and sediments near processing areas, particularly near copper plate amalgamation sites. Soil contamination ranged from 7.3 ppm to 43.5 ppm Hg. Dust samples collected near copperplate centres showed levels ranging from 28.8 – 105 ppm Hg. Mercury levels in soils were lower by bowl-concentrators, although still significant. One village used tailing material for local road construction, resulting in elevated mercury concentrations throughout the village (up to 20 ppm). Background mercury levels ranged from 0.02 to 0.12 ppm Hg. Muzvezve River sediment levels only ranged from 0.01 to 0.26 ppm Hg despite river panning.

Total mercury concentrations were measured in 52 fish samples representing six species, collected in the Muzvezve River near milling centres and panning areas. The mean mercury concentration was 0.41 ppm Hg, ranging from 0.03 ppm to 2.61 ppm Hg

(wet weight). Carnivorous fish ranged from 1.05 ppm Hg, and omnivorous species ranged from 0.12 ± 0.09 ppm Hg, except for one species that ranged from 0.88 ± 0.25 ppm Hg. Fish collected were generally small and no correlation of mercury versus length was found. Some fish had concentrations two to four times the WHO safety limit of 0.5 ppm.

According to the country final report this objective was **satisfactorily** achieved in Zimbabwe.

Objective 4: Establish a databank comprising of technological requirements relevant to artisanal gold mining and extraction activities through field investigations, interviews with miners, miners' associations and other relevant institutions.

The project in Zimbabwe did not implement any database. Thus, this objective was not addressed at country level.

Objective 5: Acquire and demonstrate, within the project demonstration sites, the application of affordable high-efficiency clean technology with improved gold processing methods while avoiding environmental degradation from mercury contamination.

The GMP acquired and demonstrated during four-month period, the retorts as mean to recover mercury used in the amalgamation and also tested the use of vinyl carpet in the sluice box as way to recover more gold and initiate a process of phasing down the cooper plates. According to the country final report the project did train (demonstrate for) 569 miners (188 women and 381 men).

This objective was **moderately satisfactory** in Zimbabwe. The project evaluation mission visited the field sites and did not locate any miner that attended the demonstrations.

Objective 6: Based on the acquired experience, develop sustainable extraction indicators and hence assist Governments to develop generic and to the extent possible, country specific policies and legislation that will lead to implementable standards on the application of mercury with special attention to minimization of environmental impacts.

The GMP in Zimbabwe did develop guidelines and recommendation on issues related to proper handling of mercury (amalgamation of the concentrate and not of the whole ore), promote proper trade channels and progressive phase out of the cooper plates. These recommendations were filled to the commission reviewing the Mines Act.

Objective 7: Promote the dissemination of the produced project results and identify opportunities that will allow the project to continue beyond the time frame through self-financing and to initiate and conduct a Donor Conference to solicit financing.

At country level the project did not conduct a donor conference, this activity was considered at global level of the project.

The results produced by the project are posted in the GMP website and the awareness campaign results have been reported on the national newspapers.

The project did also equip the IMR to be able to conduct Hg analysis, however, it is not clear what plans are for the future of the Instruments.

SUMMARY OF THE PROJECT ACHIEVEMENTS IN ZIMBABWE

1. Awareness campaign on health and environmental impacts of mercury, discussions on legislation and how to control the movement of mercury in the country. This was done mainly using theatre drama (presented to 7 mining centres) and multi-stakeholders' Workshops held in Kadoma and Harare, attended by participants from Central, Provincial, and District Government from the Ministry of Mines; Ministry of Environment; Ministry of health; representatives from private sector mining companies; NGOs; and local artisanal miners. The contractor for the awareness campaign did not produce the brochures, posters, cartoons, billboards, flyers, T-shirts or caps.
2. It is believed that the demonstration of the retorts and the sluice box with vinyl carpet did reach some miners. The test and demonstration of vinyl carpet in two sites was clearly not sufficient to introduce such technology.
3. The GMP in Zimbabwe in collaboration with Zimbabwe Panners Association did carry a "national retort campaign" with main objective of massification of the retorts.
4. According to the final report, Kadoma District hospital personnel were trained to deliver the awareness on health impacts of mercury, however, during the evaluation mission it was not possible to track any indication leading to continuation of such activities.
5. The GMP in Zimbabwe did develop recommendation on the proper handling or mercury and banning of the whole ore amalgamation and cooper plates, these recommendations were filled to the commission reviewing the Mines Act.
6. The project did manage to attract National and District government support. The Government of Zimbabwe is quite supportive to the project objectives and would like to be involved on the next phase of the project.

COST EFFECTIVENESS

The cost effectiveness could not be properly assessed due to lack of financial breakdown of the project in Zimbabwe.

On the basis of available information regarding the TDU which was not completed and the awareness campaign material that was not produced, it is likely that the management of the funds was not cost effective in Zimbabwe, especially for the awareness campaign and assembling and delivery of the TDU.

GOVERNMENT COMMITMENT

On the basis of interviews conducted with government officials at central level (CFP, ACFP, Ministry of Environment and the Environmental Management Agency), the

government has shown high commitment to the project initiatives. The government has expressed its interest to contribute in kind to the possible GMP II.

GAPS, DEFICIENCIES AND CONCERNS ON PROJECT IMPLEMENTATION

General implementation

1. There was not enough time allocated to the training component of the project.
2. No resources allocated to monitoring

The key challenges faced during implementation of the Health Awareness Campaign can be summarized as follows:

1. The GMP did contract the AMAKOSI (from Bulawayo) and this group subcontracted a local theatre group in Kadoma. The arrangement of secondary subcontracting did create logistical and financial problems between the main contracted and the sub contracted, and the client (GMP) did not have control over contractual issues between the two. This proved to have affected the results of the awareness campaign by the theatre group, which had to perform without the necessary outfit and spirit due to lack of salaries and budget for equipment and instruments.
2. The IMR did not produce the awareness material, thus the campaign did not have the required impact. For example, during the field inspection by the author of this report, no miner remembered the awareness campaign in one of the site that is claimed to have had three weeks of demonstrations.
3. The IMR did acquire equipment that is not transportable at all and did not change the training strategy to establish a fixed training centre and bring the miners to the site.
4. The IMR did not install the acquired equipment as part of the TDU.
5. The IMR lack experience in working with communities and this is supported by the late realization of the facts that after the so-called “Chikorokoza Chapera” they should have changed the strategy of their field campaign.
6. The fact that the ACFP and the CFP were not directly involved in the awareness campaign did reduce the supervision role of these structures and as a result the contractor (IMR) relaxed in the implementation of the project (TDU and awareness campaign).

The key challenges faced during technology introduction are:

1. The change of well established and accepted technological procedures takes long time and mainly it requires that the new proposed technology is better in efficiency, productivity and affordable and to some extent available in local market. The GMP in Zimbabwe did test and demonstrate the use of sluice box equipped with vinyl carpet. The technology is not conclusively proved to be more efficient than the cooper plates and, the carpet is not available in the local market. Thus it is very unlikely that the miners would adopt the method.
2. The mercury analyser was delivered without accessories and therefore was never used and it is very unlikely that it will be used in the future

3. The structural setup of the mining sector in Zimbabwe is highly dependent on customer processing centres (the millers). The millers' interest is to use technologies that recover very little in the primary processing so that they can recapture the tailed gold in the cyanidation plant. The miners literally recover only between 20 and 30% of gold from their ore while the rest is tailed for the benefit of the millers.
4. The introduction of retort should have been an easy task for the project in Zimbabwe, because in the present structure the amalgam is burn at the miller's premises, thus the program should have targeted the millers' owners. Unfortunately, the millers claim that the retort is slow, it consumes more fuel (extra cost) and the quantity of amalgam produced by the miners is very little to use retort.
5. The economic difficulties in Zimbabwe did affect the project through the differences between the official and the parallel exchange rate. These indirect facts have affected the project management, especially when it comes on making payments of services that are quoted in USD and payable in local currency. There was always high expectations of the service providers to be paid at "black market rates".
6. The erratic water and power supply in some of the sites.

The absence of internal monitoring and evaluation mechanism has affected the project implementation.

Activities to be completed by the GMP in Zimbabwe

1. The project in Zimbabwe is recommended to find ways to produce the awareness campaign and conduct at least two month of field campaign.
2. The project need to complete the installation of the equipment acquired in auspices of the TDU and probably conduct training of trainers for the use of the equipment.
3. The project is recommended to conduct a closing ceremony and invite all relevant stakeholders and donors that might be interested in funding the next phase of the project.
4. Attempt to train a local staff in operation of the Lumex and there is need to complete the semi quantitative analysis and train someone in its operation.

FURTHER OPPORTUNITIES FOR THE REMOVAL OF BARRIERS TO INTRODUCTION OF CLEANER AND MORE EFFICIENT TECHNOLOGIES

Priority activities for GMP 2

Awareness campaign

The process of education people for change in attitudes and processes takes long time; thus, this is a priority activity for the next phase of GMP.

The use of theatre drama is a good idea, provided that they are well equipped to illustrate properly the message to be transmitted.

Improvement on TDU

The TDU is a good principle, provided that there is enough technologies, handy enough to be transportable and the availability of accesses in specific country. The TDU has been designed to carry both health/environment and technical messages and the idea of mobile training centre is good for reaching the remote mining areas.

RECOMMENDATIONS AT COUNTRY LEVEL

Project implementation

The achieved outputs were not cost effective in that all project activities were only carried out when a project officer came down from Canada, as this was the only time resources would be made available.

Transaction costs were too high, mainly due to lack of trust among project staff. A number of outcomes such as the drafted regulations, TDU equipment etc was left hanging and is unlikely going to be ever used.

The trained people (TOT) are also likely never going to use their knowledge beyond the project life due to lack of resources to continue.

GMP Results Dissemination

The dissemination of the results and progress of the project activities in Zimbabwe has been rather weak although the effort done on workshops and newspaper articles.

In the next phase the dissemination of the results need to be centred to the media, TV debates, CD or/and DVD distribution, workshops and public debates.

GENERAL CONCLUSIONS GMP

The Global Mercury Project (GMP) was initiated to begin a global response to address environmental impacts resulting from mercury released by the artisanal mining sector. This was highly achieved also in Zimbabwe

ACKNOWLEDGEMENT

The following people are especially thanked for their assistance and support during the field evaluation of the GMP in Zimbabwe; the names are in order of appearance in the process and are presented in the appendix C.