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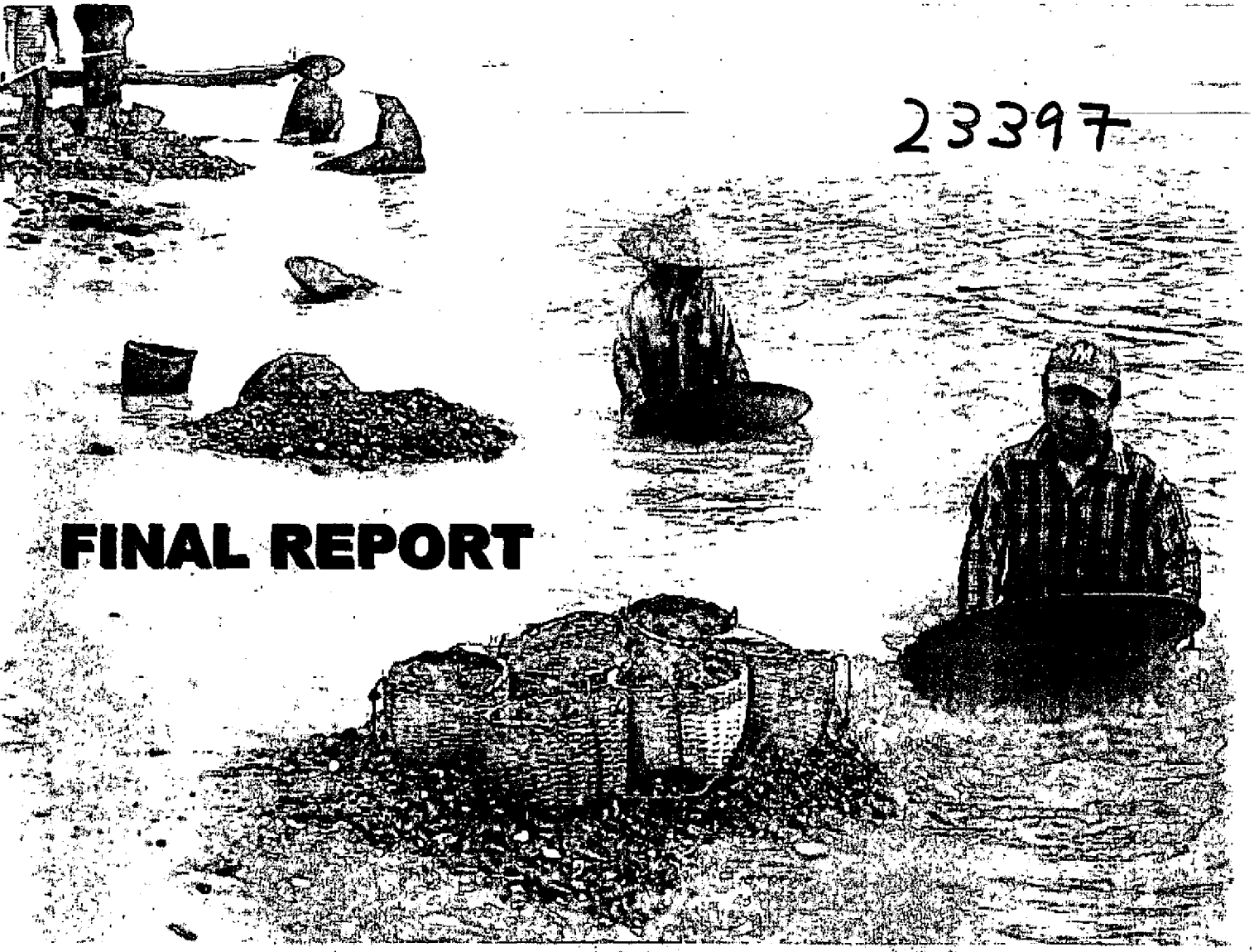

FINAL REPORT

Raising Community Awareness on Hazards of Mercury Exposur Introduction of Small-Scale Gold Mining Equipment and Assessment of Small-Scale Gold Mining Activities in Lao PDR

for

UNIDO GLOBAL MERCURY PROJECT
(EG/GLO/01/G34)

and the

DEPARTMENT OF GEOLOGY AND MINES,
GOVERNMENT OF LAO PDR

APRIL 2007

EARTH SYSTEMS LAO

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EARTH SYSTEMS LAO

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LIST OF ACRONYMS

ADB	Asian Development Bank
ASM	Artisanal and Small-Scale Mining
CASM-Asia	Communities and Small-Scale Mining in Asia
COP	Codes of Practice
DGM	Department of Geology and Mines
EIA	Environmental Impact Assessment
GMP	Global Mercury Project
GOL	Government of Lao PDR
ILO	International Labour Organization
IUCN	International Union on the Conservation of Nature
LNMC	Lao National Mekong Committee
MEM	Ministry of Energy and Mines (formerly Ministry of Industry and Handicrafts) (Lao PDR)
MRC	Mekong River Commission
MWBP	Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme
PSTEO	Provincial Science Technology and Environment Office (Lao PDR)
SEM	Strengthening Environmental Management through STEA (Lao PDR)
STEA	Science Technology and Environment Agency (Lao PDR)
TOR	Terms of Reference
UNIDO	United Nations Industrial Development Organisation
UXO	Unexploded Ordinance
WB	World Bank
WHO	World Health Organization
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

UNIDO engaged Earth Systems Lao in June 2006 to provide consulting services for the *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 Project* (UNIDO Project No. EG/GLO/01/G34), a component of the UNIDO Global Mercury Project.

This summarizes all of the activities, including significant outcomes and any challenges faced, undertaken over the ten (10) month project implementation period.

For the purpose of this report, artisanal mining is defined as individuals participating in supplementary mining using non-mechanized equipment, whereas small-scale mining is characterized as being the primary source of income, using mechanized equipment, and being carried out by small companies.

Scope of Mining Activities in Lao PDR

1. Artisanal mining was reported by Provincial Government officials in eleven (11) of the seventeen (17) provinces in Lao PDR and was estimated to involve upwards of 8,000 people in the country.
2. Small-scale mining was reported by Provincial Government officials in nine (9) of the seventeen (17) provinces in Lao PDR and was estimated to employ upwards of 1,000 people.
3. To confirm Government reports of small-scale mining activities, NGOs and private companies working within Lao PDR were contacted. Further, the consultant undertook a targeted review of areas with known gold resources. Neither of these initiatives identified areas of small-scale mining in addition to those already reported by the Provincial Government.
4. Provincial government officials confirmed the following general characteristics regarding the artisanal mining sector:
    a. Growth has been observed in the sector in recent years.
    b. There is limited consideration of health, safety and environment issues.
    c. Subsistence activity is primarily undertaken by local residents (rather than migrants), on nearby land, to supplement agricultural income.
    d. Mining tends to be non-mechanised, deploying manual tools such as pans and screens.
    e. Mining is seasonal involving the exploitation of alluvial deposits during the dry season from January to June.
    f. Mercury use was confirmed in four (4) of the artisanal mining areas.
5. Following the Ministerial Notice in July 2005, which instructed provincial authorities to enforce the cessation of small-scale mining, provincial authorities reported that all small-scale mining activities have stopped. Evidence collected during field visits indicates that this may not be entirely accurate. For example, both a Chinese company and a Vietnamese company were observed undertaking small scale alluvial gold mining in the Bolikhamxay Province.
6. Provincial Government officials confirmed the following general characteristics regarding the small-scale mining sector:
    a. Growth has been observed in the sector in recent years.
    b. Mining employs both mechanised and manual technologies. Methods vary depending on the type of resource exploited. The exploitation of alluvial deposits typically involves barges fitted with excavators, conveyors, and

sluices. The exploitation of primary ore deposits typically involves manual excavation methods, mechanized crushing and sluices.

c. There is limited consideration of health, safety and environment issues.

d. Activities largely proceed without formal licensing or regulation, often with support from foreign investors from neighbouring countries (e.g. China, Vietnam and Thailand).

e. Mining is seasonal involving the exploitation of both alluvial and primary deposits during the dry season from January to June.

f. Mercury use was confirmed in five (5) of the small-scale mining areas. Use of mercury in 'open circuit' sluice boxes was confirmed In Attapeu, Bolikhamxay and Xiengkhouang provinces.

Health Awareness Campaign

7. The Mercury Health Awareness Campaign objectives were integrated into all Project activities. Health awareness materials (in Lao language) were disseminated to Central, Provincial, and District DGM, other Government of Lao PDR agencies (i.e. Dept. of Foreign Cooperation, Dept. of Public Health, Lao National Women's Union, Science Technology and Environment Agency, Southern Geological and Mining Sector, Lao National Mekong Committee), representatives from private sector mining companies, gold shop owners, and local artisanal miners.

8. A pilot 'Health Awareness Campaign' was developed for a primary ore mining area near Nakadok Village in the Bolikhamxay Province. The campaign was developed and coordinated by the UNIDO GMP consultant, but field implementation was led by a multi-disciplinary government team, including staff from the Ministry of Health, DGM, and STEA. This team was supported in the field by the consultant.

9. Introduction of the stationary retort, designed to reduce mercury loss while increasing gold recovery, was undertaken at the same time to maximize the effectiveness of both campaigns.

10. The Health Awareness Campaign included a session that specifically targeted women and children to emphasize the increased sensitivity of children and unborn babies to the negative health effects of mercury. This separate session also functioned to create a space where women would feel comfortable asking questions about mercury and health.

Technology Introduction

11. The following technology was introduced to Lao Government and local miners during the implementation of the Project:

    a. Carpet sluice boxes (zig zag and tray sluices)

    b. Portable retorts (plumbing pipe and kitchen bowl)

    c. Stationary retort

    d. Fire blower

12. Technology was introduced during field demonstrations presented at the Central and Provincial levels during the Regional Workshops, and at the local level during field visits. During the field visits one set of equipment (1 of each sluice design, 1 of each portable retort design, and 1 fire blower) were donated to the Local Government of the pilot areas (Attapeu and Bolikhamxay provinces) to be leant to miners for their use and replication.

Field Visits

13. Four (4) sets of field visits were undertaken during project implementation. These visits were to the following areas:

    a. Bolikhamxay Province – Lak Sao area (FV1 – 3)

    b. Attapeau Province – Sanamxai, along the Sekong River (FV1)

    c. Luang Prabang Province – seasonal artisanal alluvial mining on the Mekong River south of Ban Pak Ou (FV4).

    d. Luang Nam Tha and Bokeo Provinces – artisanal alluvial mining on the Nam Tha and Mekong Rivers in the Nalea, Pha Oudom and Paktha Districts (FV4).

Policy Development

14. With the assistance of DGM and the UNIDO experts, draft Codes of Practice (COP) for artisanal and small-scale gold mining were developed. The Codes of Practice are divided into the following three categories: Mine Safety, Environmental Protection, and Protection of Human Health. The COP regulations were trialed during the third field visit to Bolikhamxay Province, 26 March – 6 April 2007.

Recommendations for future activities have also been identified and are listed in the next section.

KEY CHALLENGES AND ACHIEVEMENTS

The key challenges faced during project implementation can be summarized as follows:

1. **Limited Government Resources:**

    a. The Government of Lao PDR has only limited resources (both human and financial) available to support the implementation of project initiatives. Human resource availability (both in terms of numbers and capabilities – refer to the challenge below) was an impediment during the implementation of project activities. While financing provided by the project has helped overcome financial barriers during project implementation, this is expected to be a major barrier to ongoing work, such as continued health awareness and technology introduction.

    b. There is limited technical expertise in artisanal and small-scale mining among staff at the Ministry of Energy and Mines (MEM) at all levels of Government. While there are some qualified people within these departments, they tend to be very busy, and therefore, could only provide limited input into project activities.

    c. The major focus within the MEM is currently large scale industrial mining, which only started in Lao PDR six years ago. Since large scale mining provides significant financial benefit to the Government of Lao PDR most of the MEM's resources are focused on large scale mining activities.

    d. Artisanal and small-scale mining is perceived as an activity that is difficult to manage, requiring significant resources to do so properly, and providing little benefit in return. Without sufficient resources, regulation of this activity will only have limited success.

2. **Difficulty in Obtaining Information:**

    a. There were some difficulties regarding communication between different organizations and Ministries within Government, and between different levels of Government (i.e. central, Provincial and District).

    b. Villagers were hesitant to provide information on small-scale mining when Government personnel were present because, following the Ministerial Notice, all small-scale mining activity is illegal. Note: In Lao PDR, it is necessary to involve Government in field visits and community consultations.

3. **Procurement of Materials for Construction of Equipment**

    a. Materials required for the plumbing pipe retort were not always available locally because in many places, plumbing pipes are made of plastic and those that are available tend to be coated with zinc, which, by forming an amalgam with mercury, can reduce mercury recovery.

    b. The bowls available in most rural markets are not suitable for the kitchen bowl retort because they are the wrong shape (they have a flat bottom which causes evaporated mercury to re-condense and drip back into the crucible instead of being removed to the sand).

4. **Communication of Health Impacts**

    a. It is difficult to communicate the potential impact of mercury exposure because the health effects of mercury contamination tend to be long-term, and are often masked by other conditions.

    b. Miners in Lao PDR have more immediate health concerns, such as malaria, malnutrition, and unexploded ordinance. These tend to take priority over long-term health concerns.

5. Other Challenges

a. Technology introduced by the project is in competition with technology introduced from neighbouring countries, for example, mercury-plated sluice boxes have been introduced from Vietnam. It requires significant financial investment for miners to purchase this equipment, so if they have already purchased it, they are unlikely to switch to the technology introduced by the project.

b. It is difficult to get the miners together as a group to discuss potential health impacts or to introduce new technology because they are working.

Key achievements of the Project include:

1. A set of three Regional Workshops were held in Northern, Central, and Southern Lao PDR. Approximately 70 people participated in the workshops. Participants were from the following organizations: Central, Provincial, and District Government from the Ministry of Energy and Mines (Department of Geology and Mines - DGM); Dept. of Foreign Cooperation; Dept. 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. Workshop outcomes include:

   a. Increased awareness of GMP objectives to Central and Local Government, small scale mining companies, and artisanal and small scale gold miners;

   b. Increased understanding of the scale of artisanal and small scale mining (ASM) in Lao PDR;

   c. Dissemination of mercury health awareness materials (brochures, see Section 4.2); and

   d. Introduction of more efficient and safer gold mining technology (sluice boxes and retorts) to increase the amount of gold mined and decrease the amount of mercury lost to the environment and humans.

2. During the Regional Workshops, technology demonstrations were undertaken to introduce workshop participants to carpet sluice boxes and plumbing pipe retorts. Participants were generally very interested in the technology and its potential to increase the livelihood and provide health benefits for their people. Participants from Bolikhamxay and Attapeu invited the Project to visit mining areas in their provinces.

3. An International Stakeholders Workshop was held in Vientiane. Approximately 15 people participated in the workshop. Participants were from the following organizations: 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). Workshop outcomes include:

   a. Increased awareness of GMP objectives to NGOs and International Organizations;

   b. Increased understanding of artisanal and small scale mining (ASM) in Lao PDR;

   c. Facilitation of a dialogue on mining in Lao PDR between participants – what relevant projects / initiatives they are involved in; what relevant projects they are planning; any mining activities they have witnessed at the local level during field visits; and

   d. Dissemination of mercury health awareness materials (brochures, see Section 4.2).

4. A series of field visits to government identified areas with increased mining activity. Field visits functioned to:

   a. Introduce efficient gold mining technology to Village Heads and miners of 11 villages in 2 provinces;

i. Bolikhamxay Province – 6 villages – approximately 115 participants

ii. Attapeu Province –5 villages – approximately 75 participants

b. Increase communication between Central and Local DGM;

c. Disseminate of information and awareness materials pertaining to mercury and health to villages including brochures, posters, and technical guidelines;

d. Increase capacity of Central and Local DGM to carry out technology demonstrations and health awareness campaigns;

e. Identify further areas of concentrated mining activity;

f. Adapt Project activities to the actual mining situation in Lao PDR; and

g. Increase understanding the scale and dynamics of ASM in Lao PDR.

5. Introduction of the stationary retort to the primary ore mining area near Nakadok Village in Bolikhamxay Province, including capacity training for Central DGM to use and introduce the retort.

6. Development and implementation of a targeted Mercury Health Awareness Campaign for the miners and families of the newly formed village in the primary ore mining area near Nakadok Village in Bolikhamxay Province. Ministry of Health personnel were trained to deliver the awareness training so that this activity could continue after the GMP project.

7. Dissemination of technology and health awareness posters (Mercury and Family Health; and Retort Use) to each province of Lao PDR through DGM's annual conference.

8. Development of pilot Codes of Practice for Mining Safety, Environmental Protection, and Protection of Human Health in ASM Gold Mining in Lao PDR (see Appendix 6).

9. Introduction of pilot Codes of Practice to the primary ore mining area near Nakadok Village in Bolikhamxay Province.

RECOMMENDATIONS

Recommendations resulting from this Project are directed to two separate groups:

- Ministry of Energy and Mines, Government of Lao PDR (GoL)
- United Nations Industrial Development Organization (UNIDO) Global Mercury Project

Recommendations to the Government of Lao PDR

1. Revise the Mining Law to include the following:
    a. Clarifications of mine site management responsibility; and
    b. More clear definitions of mine sizes – artisanal, small-scale, medium-scale, and large-scale
2. Continue to develop appropriate regulations for artisanal and small scale gold mining to support implementation of the revised Mining Law, including:
    a. Artisanal and small scale mining licenses;
    b. Regulations for mercury use;
    c. Appropriate systems for the management of mine safely, environmental protection, and the protection of human health
3. Incorporate draft Codes of Practice into official regulations for artisanal and small gold mining, including a ban on the use of the following mining technology / practices:
    a. Amalgamation plate sluice boxes
    b. Whole ore amalgamation
    c. Burning of amalgam without a retort
    d. Amalgamating in streams / rivers
4. Improve existing legislation to include mechanisms to obtain financial resources from the profits of small scale mining (i.e. a transparent regulatory and tax system for small scale mining).
5. Develop mechanisms to distribute these financial resources between different Government offices – Central, Provincial, and District DGM Offices.
6. Build capacity of provincial and district DGM personnel to allow for decentralization of licensing procedures once new mining law comes into effect.
7. Once new legislation is available, seek aid funding and / or technical assistance to support legislation implementation.
8. Establish a 'training mine' which can be used to train MEM employees, District and Provincial Government employees and miners in new technologies, mining best practice, legislation implementation, site inspection, etc.
9. Implement a follow up program in Bolikhamxay Province to:
    a. Determine whether or not artisanal miners have adopted the new technology next mining season, as well as to offer technical support for equipment use and modification to fit the local context;

b. Determine whether or not miners at the primary ore mining site have adopted the new technology, as well as to offer technical support for equipment use and modification to fit the local context; and

c. Reinforce the draft "Codes of Practice."

10. Follow up in Attapeu Province pilot villages to determine whether or not miners have adopted the new technology next mining season, as well as to offer technical support for equipment use and modification to fit the local context.

11. Implement a technology demonstration and mercury health awareness campaign in the mining villages identified in Luang Prabang.

Recommendations for UNIDO:

12. Conduct Phase 2 of the Global Mercury Project in Lao PDR. As mercury use in artisanal and small-scale mining is not yet as prevalent in Lao PDR as it is in other countries in the region, the Global Mercury Project in Lao PDR is an opportunity to undertake preventative measures instead of reactive measures.

13. Phase 2 should include a focus on mine safety and environmental rehabilitation in addition to mercury awareness.

14. Support the Government of Lao PDR to implement the above recommendations.

15. Future GMP activities, and any projects on artisanal and small-scale mining, should focus primarily on field activities as these proved to be effective.

1. Project Introduction

1.1 Background

UNIDO engaged Earth Systems Lao (the Consultant) in June 2006 to provide consulting services for the *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 Project* (UNIDO Project No. EG/GLO/01/G34), a component of the UNIDO Global Mercury Project.

This report summarizes all of the activities, including significant outcomes and any challenges faced, undertaken over the ten (10) month project implementation period.

Lao PDR is one of the priority countries for the United Nations Industrial Development Organization's (UNIDO) Global Mercury Project. The project's goal is to protect international waters from mercury pollution, as well as to improve the quality of life of the miners. The project will achieve this through health awareness campaigns to educate miners on the impacts of mercury on their health and the environment, and through modifying existing technology and introducing new technology (for example, retorts and hand sluices) to make the mining process more efficient, thereby increasing miners' income and decreasing environmental impacts. The project will also work closely with the Government of Lao PDR to improve existing legislation and to facilitate the implementation of the regulatory framework.

1.1.1 Global Mercury Project

The Global Mercury Project (GMP) began in August 2002. The GMP aims to demonstrate ways of overcoming barriers to the adoption of best practices and pollution prevention measures that limit the mercury (Hg) contamination of international waters from artisanal and small-scale gold mining (ASM). Six countries are participating in the GMP: Brazil, Lao PDR, Indonesia, Sudan, Tanzania and Zimbabwe. In addition, the GMP aims to introduce cleaner technologies, train miners, develop regulatory mechanisms and capacities within Government to conduct environmental and health assessments.

As stated in the Consultant's Terms of Reference, the overall goals of the GMP are to improve existing technology, increase gold recovery and efficiency to increase income, and reduce the release and exposure of people to mercury and minimize off-site and environmental contamination. The overall GMP objectives are to:

- Improve community health by reducing mercury exposure to miners/panners, their families and vulnerable members of the community; and by promoting health seeking behaviors through the implementation of awareness and education strategies that reduce actual stressors on mining communities.
- Build local capacity in local government, health care services, and the mining community and people that support miners/panners and their operations.
- Encourage local equipment and manufacturing suppliers to provide necessary equipment to improve gold recovery and to reduce mercury contamination.
- Improve community quality of life by means of increasing miners' income as a result of improved mining and gold extraction techniques.
- Educate women and children, both working as miners and mineral processors, and in homes and schools to encourage behavioral changes to avoid hazardous activities involving mercury.

- Involve other stakeholder groups (e.g., federal, regional and local government, UN agencies, NGOs, etc.) to assist in implementation of GMP goals.
- Reduce environmental contamination and collateral damage to humans, wildlife and their food sources, by properly containing mining and milling wastes.
- Reduce global mercury contamination by reducing local emissions from artisanal mining activities.
- Recommend policies that will insure that human, animal and aquatic ecosystems are protected from mercury contamination and other mining waste.

1.1.2 Results of Previous GMP Studies in Lao PDR

In July 2003, Earth Systems Lao was engaged by the United Nations Industrial Development Organisation (UNIDO) to conduct a baseline sociological survey in Chomphet and Pak-Ou districts within Luang Prabang Province, Lao PDR where artisanal (or small-scale) gold mining is undertaken. A particular focus of the survey was the collection of information about the use of mercury for artisanal gold mining and the identification of 250 volunteers for participation in a subsequent health survey.

Primary data was collected by means of interview with the heads and elders of each village, and using questionnaires from a total of 271 randomly selected volunteer households in the villages of Ban Houay Gno, Ban Houay Koh, Ban Houay Lo, Ban Kiad, Ban Latthahai, Ban Pakchek, Ban Pak-Ou and Ban Thinhông.

Among the surveyed villages, small-scale artisanal gold mining (ASM) began in the mid-1970s, and was a widespread activity by 1980. ASM is typically carried out at the family level involving men, women and children who are generally lacking in technical skills and sophisticated equipment. The extent of mining activities and the resultant gold outputs vary among villages in the region, with between 45% and 96% of the surveyed households having at least one household member engaged in the activity. The peak mining season is short, primarily between January and April at the end of the dry season when water levels are low, exposing ephemeral islands and other areas of alluvial sediment. Typically, men will operate the equipment, such as shovels and chisels, used for ore / alluvium extraction, while women and children transfer the ore / alluvium to bowls and sluice boards, pan the ore and perform the gold extraction processes (which are usually carried out in the home).

The process of ore extraction on the riverbank, on ephemeral islands or from the riverbed using simple tools is similar for each of the surveyed villages. However, for villages along the Mekong River, mercury is traditionally added at the panning stage to form an amalgam with alluvial gold particles. The amalgam is subsequently heated to cause the separation of the two elements as the mercury evaporates. Conversely, villages on the Nam Ou River do not typically use mercury to form an amalgam with the gold, but rather use gravity separation by heating the sieved and panned material and periodically blowing away the concentrate surrounding the gold particles. It is not clear why there is a difference in techniques, although it may be influenced by the size of gold particles within the respective rivers.

Mercury is a relatively expensive input to the mining process in Lao PDR, thus providing an incentive for its recovery and re-use. This is typically carried out in the home, where, being a confined space with limited air displacement, the potential for the inhalation of vaporized mercury is high. In some villages there appears to have been a decline in the industry with a reduction in gold output and mercury use. Mining sites are invariably located in close proximity to the village, and a concentration of activity during the history of mining has possibly reduced the gold content of the alluvial sediments to marginal levels.

In many instances mining appears to be an important source of cash income, although agricultural activities represent the principal occupation of village inhabitants in the region. Typically, households involved in gold mining produce between 10 and 40 grams of gold per year (an average of approximately 24 grams). This corresponds to an average village total of approximately 0.6 Kg per

annum. Gold resulting from ASM in the region is sold directly to a gold merchant who periodically visits each of the villages engaged in mining. The gold merchant may be required to further refine the gold prior to sale at a regional market or directly to jewellers.

No obvious signs of mercury poisoning were identified, although a detailed health survey would be needed to confirm this. Household awareness of the potential health implications of exposure to mercury is invariably low. Only a small number of households recorded a general perception of a risk, and generally lacked any data or specific information on what hazards mercury use presented or how these hazards could be avoided. The addition of mercury to the excavated ore generally occurs on the riverbank, thus potentially resulting in contamination of the soil substrate and the adjacent watercourse. This in turn may lead to bioaccumulation in the aquatic food chain upon which village nutritional intake, through fish and other aquatic fauna, is highly dependent.

Women in the surveyed villages are arguably not provided with the opportunities afforded men. Gold mining potentially contributes to bridging inequality due to the sharing of the activity by men and women. However, it may be the women who are primarily exposed to mercury and therefore they should be a focus of future health studies and educational campaigns.

In July 2003 the BRGM was contracted by UNIDO to carry out environmental and health surveys in the Pak Ou and Chomphet districts in the Province of Luang Prabang (BRGM, 2004). The sampling campaign and health survey took place from February 29th to March 20th, 2004. A previous report (Laperche et al., 2004) details the information collected in the field and the sampling methodology.

The aim of this survey was to collect environmental and health data in some selected villages of Pak Ou and Chomphet districts and to evaluate the potential impacts caused by mercury to the local population and their close environment. The environmental and health assessments, based on a preliminary sociological survey (Earth System Lao, 2003), was performed on 5 villages, North of Luang Prabang, along the Mekong (Houay Gno, Houay Koh, Pak Ou) and the Ou river (Latthahai, Pak Chek). An extra village without practice of artisanal mining was selected as a reference (Houay Yen Gnai) located on the Khan River, South East of Luang Prabang.

In each village both environmental and health surveys were carried out with the exception of Pak Chek where only the environmental survey was performed.

The main risk of exposure to mercury occurs in the villages, as Hg is mostly manipulated at home by the artisanal miners without specific precaution. This risk is increased because the exposed population is mostly composed by women and their young children.

The monitoring of air quality showed that Hg concentrations may reach relatively elevated concentrations. However amalgam roasting seems to be an occasional procedure performed on a weekly or monthly basis. People are only exposed to elevated mercury concentrations for about 10 to 20 mn. However as roasting is performed mostly by women and at home, we should also consider the possible exposure of children.

In the described system, there is a way of oral exposure related to dust ingestion in addition to fish and seaweed consumption. Domestic dust may reach elevated concentrations (up to 335,000 ng g-1) and is dispersed both in the kitchen and living rooms. We consider that it constitutes the main risk of exposure for peoples, and particularly children. Dust (soil+domestic dust) is relatively important for children (especially in the living conditions of local peoples), and this may cause a potential risk of contamination of the miners and their family.

Soils around the houses of artisanal miners show moderate levels of contamination (100-300 ng g-1). Such concentration are relatively low compared to threshold values for soils in residential areas (7,000 to 10,000 ng g-1 in Europe). Thus there is no apparent risk related to soil ingestion.

The other risk of exposure is related to the consumption of fishes and seaweed which could be explored in a separate study.

1.2 GMP Objectives

As described in the Terms of Reference provided by UNIDO, the specific objectives of this Study are to:

- Increase awareness of the GMP objectives to local government agencies, and where possible, local communities involved in small-scale gold mining using mercury;
- Introduce appropriate artisanal and small-scale (ASM) mining equipment to the Department of Geology and Mines to increase capacity;
- Hold introductory workshops/training in Vientiane and Luang Prabang;
- Work with the central government to introduce new legislation specific to ASM activities; and
- Understand the extent and magnitude of small-scale and intermediate gold mining activities in Lao PDR.

1.3 Artisanal and Small-Scale Mining

Artisanal and small-scale mining generally refers to mining by individuals, groups, families or cooperatives with minimal or no mechanization, often in the informal or illegal sector of the mining industry (MMSD, 2005). Whilst a common definition of artisanal and small-scale mining has yet to be established in some countries a distinction is made between 'artisanal mining' that is purely manual and on a very small-scale, and 'small-scale mining' that has some mechanization and is on a larger scale. This distinction will be used throughout this report.

In the study area, there are generally two different types of small-scale mining: subsistence and professional. Subsistence small-scale mining is primarily undertaken by local residents, on nearby land, to supplement agricultural income. This type of small-scale mining tends to be non-mechanised (i.e. work is done by hand or using manual tools and no machinery is used) and have a low to negligible impact on local ecosystems. Professional miners, on the other hand, are generally immigrants to the area that they mine. Typically, professional miners begin as subsistence miners, but as they develop their skills, they cease agricultural activities and migrate to better deposits. This type of mining has some mechanization, and tends to have a higher impact on surrounding areas.

A review of small-scale mining activities world wide indicates that most projects tend to exhibit the following characteristics:

- Operate without legal mining titles;
- Limited concern for occupational health and safety;
- Little or no consideration of environmental issues;
- Lack of qualifications of personnel at all levels of the operation, and limited use of mechanization;

- Rarely rehabilitate a site once mining is completed;
- Inefficient exploitation and processing techniques,
- Exploitation of marginal and/or small deposits, which are not economically exploitable by mechanized mining;
- Low level of productivity, salary and income;
- Periodic operation by season or according to market prices; and
- A strong relationship between poverty and small-scale mining activity.

When considered by unit of output, the environmental costs of small-scale mining are, in many circumstances, higher than those of other types of mining. This is often the result of the great individual number of polluters, normally concentrated in a specific area. It is difficult for governments to control or monitor environmental violations or enforce regulations because of the lack of resources and the inaccessible nature of most operations. Studies have shown the key environmental and social issues that are often associated with small-scale mining include:

- Chemical pollution (particularly mercury and cyanide) resulting in environmental and health issues;
- Release of untreated tailings, wastes and effluents into rivers;
- Introduction of disease (e.g. malaria, HIV/AIDS);
- Exploitation of culturally significant lands;
- Erosion, land clearance and deforestation;
- Abandonment of sites without rehabilitation or closure; and
- Small-scale mining activities in environmentally sensitive protected areas.

There are often a range of causes for the severe environmental and social impacts that result from small-scale mining including:

- Inadequate environmental legislation;
- Lack of control and enforcement;
- Lack of knowledge, education and training;
- Inefficient technology;
- Poverty; and
- Lack of information about good practice.

During the last two decades, concern over environmental and social issues with the mining sector has steadily increased. As a result, environmental laws appropriate to mining have been formulated in most countries and governmental environment agencies have been set up.

The implementation of these laws is fairly straightforward for large scale mining enterprises. However, many countries have not yet been able to include small-scale mining in this system, and as a result, small-scale mining is usually illegal because of noncompliance with legislation.

It has been recognized that new concepts are required to effectively deal with the social and environmental issues associated with small-scale mining.

2. Extent of Artisanal and Small-Scale Mining in Lao PDR

2.1 Background Information

Most small-scale mining in Lao PDR is for gold, though precious stones such as sapphires are also mined in some areas of the country (specifically, the Northern province of Bokeo). Information on small-scale in Lao PDR is relatively limited, though some resources are available from Phase 1 of the UNIDO Global Mercury Project (2003) and the World Bank's *Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR* (November 2006).

The structure of the mining industry in Lao PDR includes: medium to large mines with modernized production systems; small mines without modernized production systems; and artisanal gold mining without registered mining rights (World Bank, 2006). The characteristics of the small and artisanal mining sector in Lao PDR are summarized in Table 2.1.

Table 2.1 Characteristics of Small and Artisanal Mines in Lao PDR*

CHARACTERISTICS	SMALL MINES	ARTISANAL MINERS
Investment capital	Local / neighbouring countries	None
Technology	Traditional	None
Products	Metal concentrate / industrial materials	Gold particles
Employees per mine	10 – 150 workers	Household
Environmental consideration	None	None
Mining rights	Existing	None (or partially existing)
Presence of engineers	Partially distributed	None
Sales	US$ 10,000 – 1 million	US$200-800 per household

***Adapted from Table 11 *Characteristics of the Laotian Mining Industry*, Interim Progress Report: Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR (World Bank, 2006)**

In 2006, it was reported that there were 32 small mines (i.e. those without modernized production systems) operating in Lao PDR. Of these, 13 were nationally owned (including 7 managed by the Ministry of Industry and Handicrafts, 5 mines managed by the Ministry of Defence and 1 managed by the Ministry of Commerce) and 12 were mines with foreign investment (including 6 Chinese, 3 Thai and 2 Vietnamese) (World Bank, 2006). Since the ban on small-scale mining was introduced, it has been reported that all of these mines have stopped operating. In reality, however, this is not likely to be the case – e.g. two foreign owned small-scale mines were observed to be operation during field visits undertaken for this project. These mines often represent important livelihood opportunities for residents in rural communities.

It is difficult to know the extent of artisanal mining activities in Lao PDR, as there is no data for unregulated activities. Estimates, however, indicate that between 7,000 and 15,000 people are involved in unlicensed artisanal gold mining across the country (World Bank, June 2006). Village households can produce an average of 10 – 40 grams of gold per year (UNIDO 2003). Artisanal mining contributes only 4 million USD in sales to the Lao economy, as compared with 200 million by medium-

large mines, but has proportionately large social and environmental impacts on the country due to its tendency to be unregulated (World Bank 2006).

Artisanal gold mining in Lao PDR is most often a supplemental activity that farmers become involved in after fulfilling their agricultural responsibilities. Activities therefore, tend to be seasonal, occurring at the end of the dry season (January – April) when water levels are lower. Most artisanal mining is alluvial, thus lower water levels allow miners to access additional deposits (UNIDO 2003).

Small mines without modernized production systems are also having an impact. These mines contribute approximately 1,500 workers to the sector and constitute 15 million USD in sales per year. These mines share characteristics with artisanal mining in that they often do not account for environmental impacts, and cause similar social impacts to artisanal mining, but have the potential to do both on a larger scale (World Bank 2006).

In both artisanal and small-scale mining, mercury is sometimes used to extract the gold from slurry by forming an amalgam with the gold particles, though some areas separate the gold by using gravity. The Department of Geology and Mines reports, however, that cyanide is used mostly by military mining companies and large mining operations. Local miners pan for gold in alluvial deposits and sometimes use rock crushers and mercury coated sluices to extract the gold. Small-scale companies use basic machinery, such as rock crushers and mobile dredges, to mine alluvial and hard rock deposits. The gold mined from small-scale mining activities is generally sold directly to a gold merchant who travels between mining villages. The gold merchant may be required to further refine the gold prior to sale at a regional market or directly to jewelers (Boungnaphalom, E., 2003).

2.2 Information from Regional Workshops

The Department of Geology and Mines reports that small-scale mining occurs country-wide, though much artisanal mining is conducted on the Mekong River and its tributaries.

The information reported by provincial authorities at the GMP Regional Workshops is tabulated in Appendix 2. As expected the incidence of ASM in Lao PDR corresponds with the location of gold resources as shown in Figure 2.1 and concessions as shown in Figure 2.2. : Map of Gold Resources in Lao PDR (Mindeco 2006).

Figure 2.1 Map of Gold Resources in Lao PDR (MINDECO, 2006)

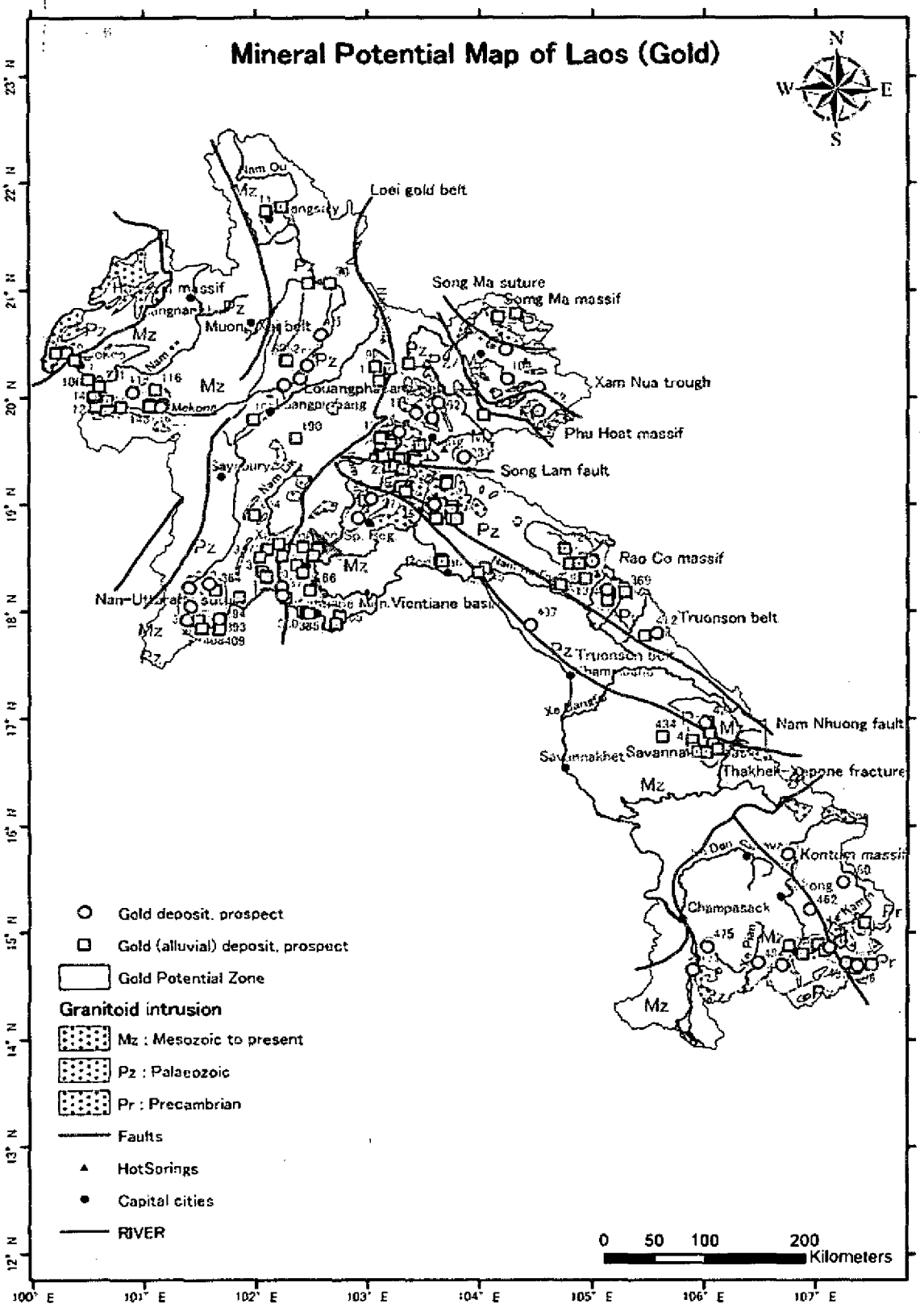
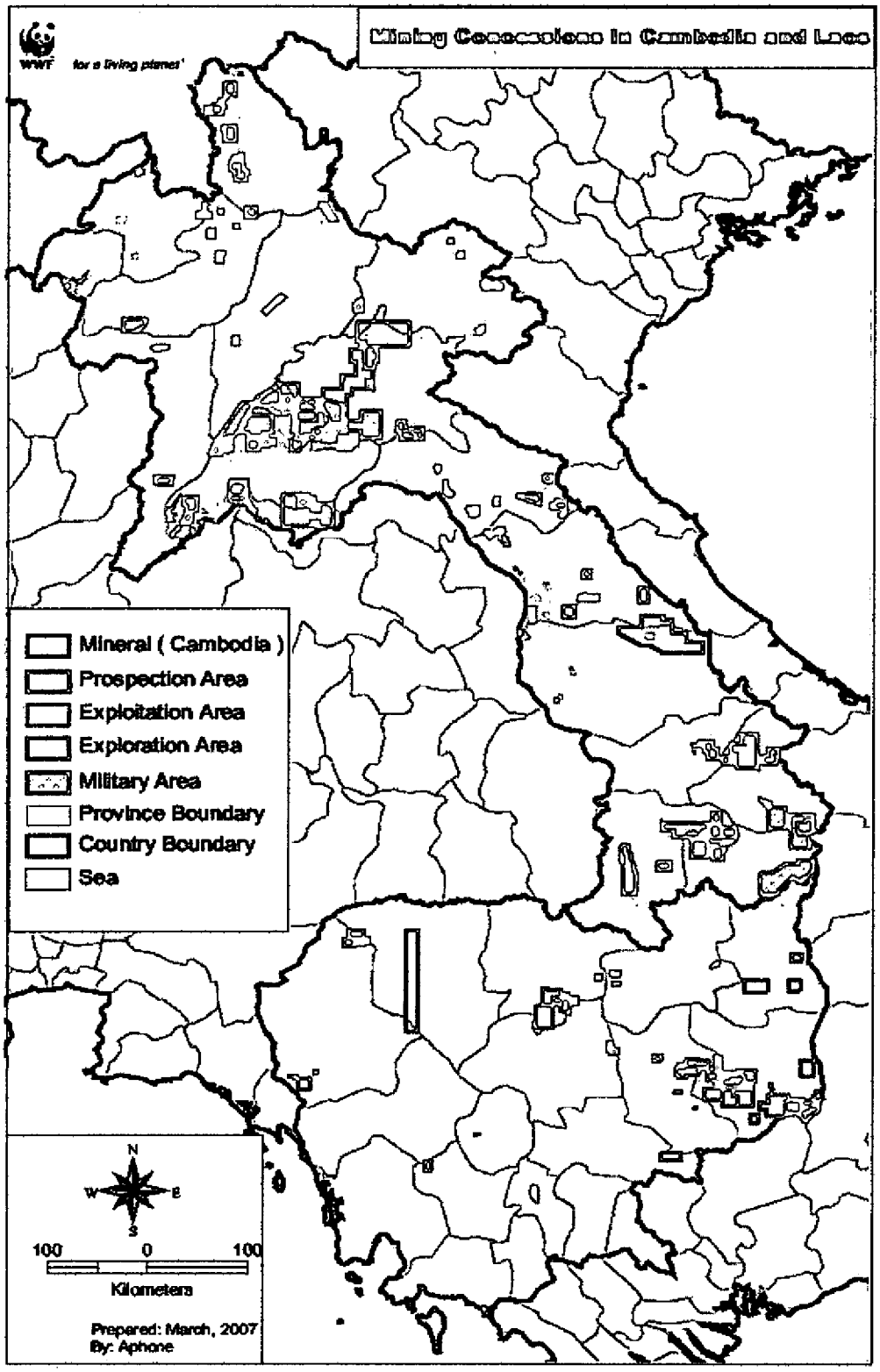


Figure 2.2 Mining Concessions in Cambodia and Laos



2.2.1 Artisanal Mining

Artisanal mining was reported by provincial government officials in eleven (11) of the seventeen (17) provinces in Lao PDR and was estimated to involve upwards of 8,000 people, although data was not available for all provinces. The areas reported to have the highest intensity of artisanal mining included:

1. Attapeu Province along the Sekong River (Sanamxai District); and
2. Bolikhamsay Province, in the Lak Sao area (near Nakadok Village).

Bokeo and Luang Prabang provinces also reported significant numbers of people involved in artisanal mining, however it is understood that these activities arenot the primary source of income in the village, but rather provide supplementary income.

This estimate of the number of artisanal miners is likely to be under reported resulting from: limited capacity for field monitoring of mining activities by government authorities; no licensing procedures and hence no data for artisanal miners; and the subsistence nature of artisanal activities. The results are however comparable to a World Bank study which estimated that there are between 7,000 and 15,000 people involved in artisanal gold mining (Mindeco, 2006).

Provincial government officials confirmed the following general characteristics regarding the artisanal mining sector:

i. Growth has been observed in most areas in recent years.
ii. There is limited consideration of health, safety and environment issues.
iii. Subsistence activity is primarily undertaken by local residents (rather than migrants), on nearby land, to supplement agricultural income.
iv. Mining tends to be non-mechanised, deploying manual tools such as pans and screens.
v. Mining is seasonal involving the exploitation of alluvial deposits during the dry season from January to June.
vi. Mercury use was confirmed in four (4) of the artisanal mining areas.

2.2.2 Small-Scale Mining

Small-scale mining was reported by provincial government officials in nine (9) of the seventeen (17) provinces in Lao PDR and was estimated to employ upwards of 1,000 people. The highest intensity of small-scale mining activity was reported in:

1. Attapeu Province along the Sekong River ;
2. Bolikhamsay Province, in the Lak Sao area; and
3. Xiengkhouang Province.

As for artisanal mining, the estimate of the number of small-scale miners is likely to be under reported resulting from: limited field monitoring of mining activities by government authorities; and unclear licensing procedures for small-scale miners and hence limited data. The results are however comparable to a World Bank study which estimated that there are approximately 1,500 people employed in small-scale mining (Mindeco, 2006).

All small-scale mining activities were reported to have stopped following the release of the Ministerial Notice in July 2005, which instructed provincial authorities to enforce the cessation of small-scale mining operations. However some provincial authorities, in particular Attapeu and Xiengkhouang, requested the DGM to consider the resumption of small-scale mining as a priority action – to enable the return of valuable provincial revenue streams sourced from these activities.

Provincial government officials confirmed the following general characteristics regarding the small-scale mining sector:

i. Growth has been observed in the sector in recent years.

ii. Mining deploys both mechanised and manual technologies - methods vary depending on the type of resource exploited. The exploitation of alluvial deposits typically involves barges fitted with excavators, conveyors, and sluices. The exploitation of primary ore deposits typically involves manual excavation methods, mechanized crushing and sluices.

iii. There is limited consideration of health, safety and environment issues.

iv. Activities largely proceed without formal licencing or regulation, by local investors with support from foreign investors from neighbouring countries – i.e. China, Vietnam and Thailand.

v. Mining is seasonal involving the exploitation of both alluvial and primary deposits during the dry season from January to June.

vi. Mercury use was confirmed in five (5) of the small-scale mining areas. Use of mercury in 'open circuit' sluice boxes was confirmed In Attapeu, Bolikhamxay and Xiengkhouang provinces.

2.2.3 Mercury Use

Provincial governments reported mercury use in both artisanal and small-scale mining. It is most often used where the gold particles are too fine to permit efficient gravity separation by manual methods.

Artisanal miners commonly add mercury to the mining concentrate. It was reported that some miners recover mercury during the burning of the amalgam using traditional methods such as bamboo retorts, however open burning of the amalgam is more common.

Small-scale mining operators in Attapeu, Bolikhamxay, and Xiengkhouang provinces are allegedly using mercury in 'open-circuit' sluice boxes for the processing of crushed primary ore. Tailings from these operations, which are likely to contain elevated levels of mercury, are reportedly discharged directly to riparian environments.

Mercury is readily available in Lao PDR, where in town centres it can be purchased directly from gold shops. The current market value is upwards of US$ 60 per kg. Regional sources of mercury include China and Kyrgyzstan where mines are known to operate. It is likely that the transport of mercury from these mines to ASM areas in Lao PDR involves numerous 'middle-men' and an informal trading network. Mercury was reported to enter Laos via Vietnam and Thailand.

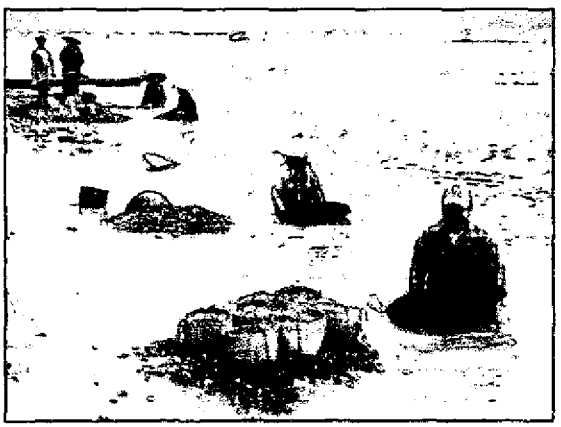
2.3 Findings of the Field Visits and Consultations with NGOs

In addition to the regional workshops and field visits to the identified focal areas, non-governmental organizations (NGOs), aid agencies and private companies working within Lao PDR were contacted to gather further information on mining sites in Lao PDR.

NGOs, aid agencies and private companies reporting witnessing mining activity in the following areas during their field work:

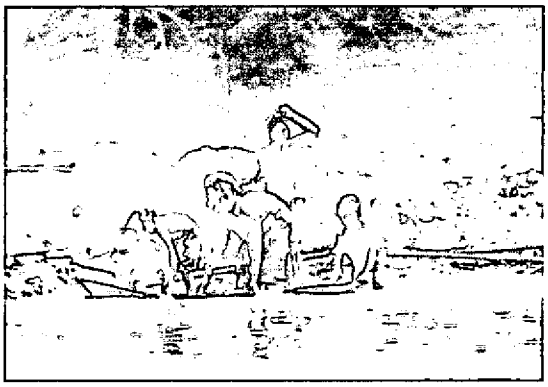
- Alluvial mining in Sepone District, (near Sepon Copper-Gold Mine – large scale copper-gold mine) Savannakhet Province. Traditional methods, no reported mercury use. Identified by Handicap International France.
- Alluvial mining in Kengbit Village, Khamkeut District, Bolikhamxay Province. Traditional methods, mercury use unknown. Identified by Wildlife Conservation Society.
- Alluvial mining on the Nam Kading River, near Phon Ngam and Phon Si Villages, Pakkading District, Bolikhamxay Province. Four gold dredges in operation, mercury use assumed, but unconfirmed. Vietnamese owned. Identified by Wildlife Conservation Society.
- Alluvial mining on Mekong River near Phakhao Village, Meung District and Hatsa Village, Paktha District in Bokeo province. Traditional methods, mercury is not used. Identified by VECO (Vredeseilanden)

The consultant undertook a targeted review of areas where there is known to be gold resources (refer to Figure 2.1 above). It was confirmed that seasonal artisanal mining (including use of mercury for extraction) is still taking place along the Mekong River upstream of Luang Prabang (the site of the 2003 study) (Plates 2.1 – 2.4). Artisanal mining was also identified along the Nam Tha River in the Bokeo and Luang Namtha Provinces, though discussion with miners and observations found no evidence of mercury use (Plates 2.5 - 2.7). Findings from discussions with NGOs, aid agencies and private companies and a targeted review of known resource areas were largely consistent with the extent of mining reported by Government officials during regional workshops.



Plates 2.1 – 2.2 Panning for gold in the Mekong River north of Luang Prabang.

Plates 2.3 – 2.4 Mercury-gold amalgam resulting from panning in the Mekong River.



Plates 2.5 – 2.7 Panning for gold in the Nam Tha River.

3. Focal Areas

Based on information from government authorities, two case study areas, where there was reported to be significant mining activity, were selected:

- Sekong River, Sanamxai District, Attapeu Province; and
- Lak Sao area, Khamkeut District, Bolikhamxay Province.

Criteria applied in the selection of these areas included:

i. Political support at the central and provincial level;

ii. Reported mercury use in the conduct of mining activities;

iii. Recognised environmental and social impacts arising from mining activities and hence an anticipated willingness for mining communities to adopt interventions proposed under the GMP; and

iv. Potential for these focal areas to be suitable case studies for other mining communities in Lao PDR.

The first round of field activities was held in January 2007 to coincide wit the start of the mining season. The first site visit involved a reconnaissance survey of existing ASM activities and confirmation of the work program.

The Consultant has endeavoured to disseminate the results and lessons learnt at the focal areas to the broader ASM community in Lao PDR by:

i. Direct involvement of district and provincial government staff in the implementation of the field program;

ii. Conduct of site visits by government and mining representatives from other provinces to the focal areas;

iii. Preparation of literature and visual media for distribution to government and mining representatives from other provinces;

A description of the nature and extent of mining in each of these proposed focal areas as reported by provincial government representatives is presented below.

3.1 Lak Sao Area, Bolikhamxay Province

There is a long history of artisanal mining in the area surrounding Lak Sao. In total five (5) ASM areas were identified by the provincial government, involving the exploitation of both alluvial and primary deposits. Lak Sao is approximately 50 kilometers from the Vietnam border, in central Lao PDR. Mining activities were brought to the attention of the Consultant and project partners when water quality tests, as part of a resettlement program for the Nam Theun 2 Hydroelectric Dam, determined water quality was not suitable to support the population due to upstream mining activities. In 2005 there were at least three different hard rock mining operations in the area, plus alluvial mining by villagers.

A Chinese company was granted a license for small-scale primary ore mining. After this, village mining activity seemed to increase, possibly motivated by the activities of the Chinese company. Villagers began to mine the primary ore deposits in groups of 10-15 people, using rock crushers bought from Vietnam. It appears that migrants have also moved in from other areas to participate in mining activities.

The number of gold shops in nearby markets increased from four (4) in mid-2004 to fifteen (15) in December 2005. Mining occurred for approximately six (6) months in 2005, until miners were asked to stop mining the primary ore deposits. They returned to alluvial mining near their village, but in a very organized manner and with almost total village involvement. The military had also been issued a primary ore mining license, and established a presence (two (2) camps of approximately twenty-five (25) people each) in the area. In mid-2005, the government issued a notice banning all small-scale mining

activities in the country until more appropriate legislation can be developed to monitor and regulate activities. The ban on small-scale mining activities targets mechanized activities and is not expected to be applied to non-mechanized artisanal mining activities (which are much more difficult to control).

Currently, ASM activities in the Lak Sao area are concentrated around Ban Nakadok, where between 1,500 and 2,000 people are believed to be involved in mining activities. Miners include local residents, both local and foreign companies, and a military mining company.

With respect to the criteria outlined above for the selection of focal areas, the Lak Sao area near Nakadok Village, Bolikhamxay Province was selected as a focal area because:

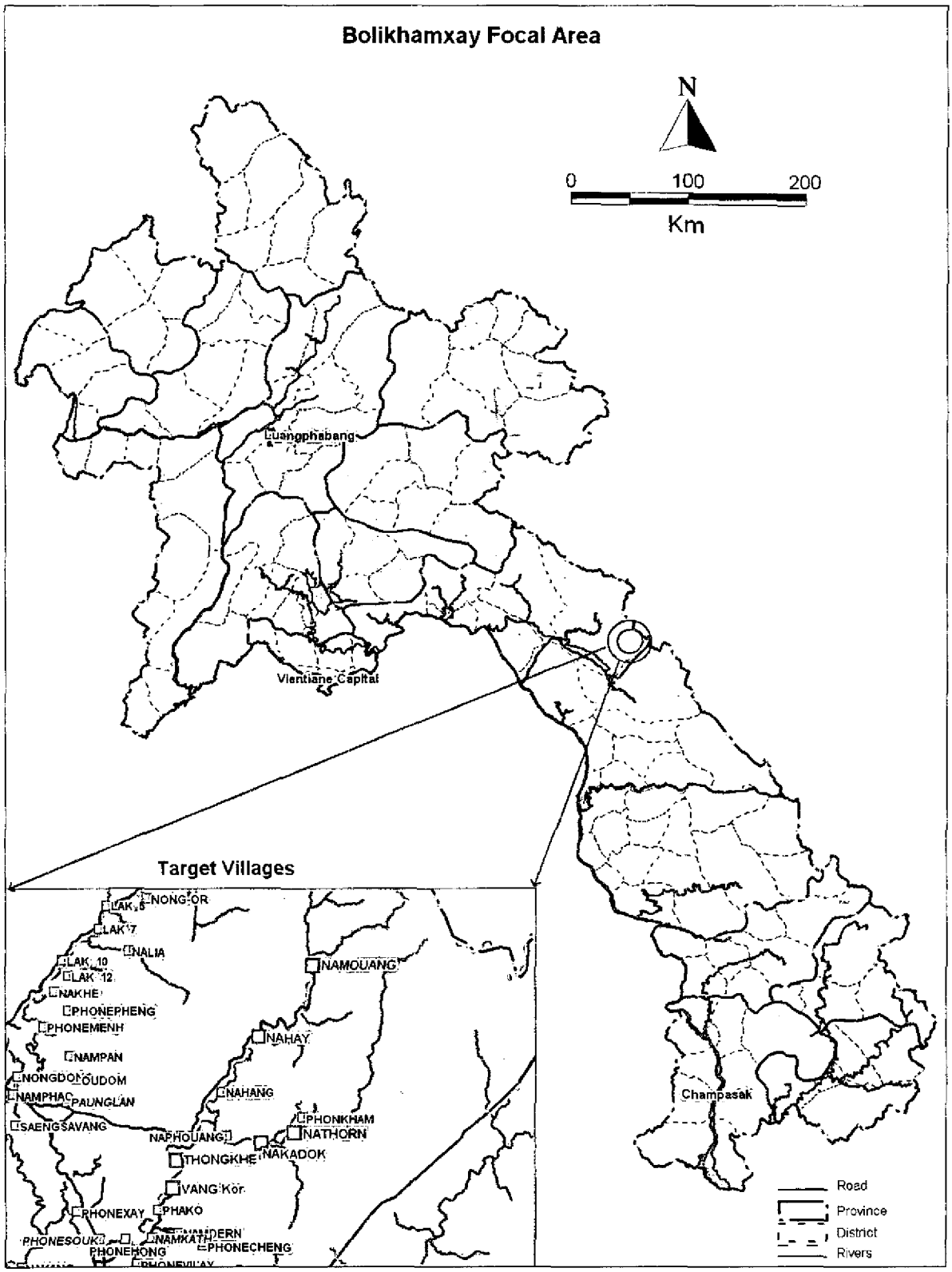
i. There is strong support by the provincial and district government for implementation of the GMP. Specifically the provincial government has requested: clarification with respect to licencing procedures for ASM; a better understanding of the nature and extent of impacts arising from mining activities.

ii. Mercury use was reported in small-scale mining operations of both alluvial and primary deposits, including the use of mercury in 'open-circuit' sluice boxes.

iii. Environmental impacts associated with mining in the Lak Sao area, came to the attention of the government following a water quality and sampling investigation of the Nam Pan undertaken by the Nam Theun 2 Power Company (NTPC). The investigation identified (i) high levels of metals, including mercury, that were considered to pose a significant health risk to local villagers; and (ii) increased sedimentation. Environmental impacts on the Nakai-Nam Theun – NBCA include logging to collect timber for houses and mine shafts, and fishing with explosives to feed the mining population. Since this investigation concerns have been raised over the quality of water for drinking (and particularly the feasibility of district government plans for developing an offtake on the Nam Phao for distribution to the township of Lak Sao); and reports of reduced fish stock.

iv. It is proposed that implementation of the GMP field activities in the Lak Sao area is done with the involvement of the GoL Environmental Management Unit (EMU). The EMU operates under the direction of the Science Technology and Environment Agency (STEA) to monitor and supervise the implementation of the Environmental Measures of the GoL and the NTPC in accordance with the Concession Agreement and the Environmental Protection Law. (The Lak Sao area is located in the buffer zone of the catchment for the Nam Theun 2 Hydropower Project, however the Lak Sao sub-catchment enters the Nam Theun via the Nam Phao downstream of the dam and hence outside the reservoir.) The involvement of the EMU will provide an opportunity for the GMP and the DGM to mobilize additional political will through the Nam Theun 2 Project to achieve its objectives.

Figure 3.1 Bolikhamxay Focal Area



There are six (6) villages near Lak Sao town that have been given permission to mine in a six (6) hectare concession granted by the Prime Minister's Office in early 2007. The Watershed Management Protection Authority (WMPA) has estimated, however, that approximately twenty (20) ha are currently actually being mined. The six (6) villages are: Ban Nakadok, Ban Thongkhe Khae, Ban Nahay, Ban Vang Kor, Ban Namouang and Ban Nathorn.

The six (6) ha site is located near Nakadok village, on a concession previously mined by a military mining company. The military mining company offered the site to six local villages, who petitioned for permission to mine the site through the District government. Ultimately, the Prime Minister's Office granted permission for the six (6) villages to mine the six (6) ha concession. The permission is not an official license, and it does not identify the exact area of the concession, have a validity period or identify what equipment the miners may use. It also fails to cite any legislation or allocate responsibility for managing the mining activity in the area. At the time of the second field trip, DGM project counterparts were unaware of the extent of mining activity at the newly formed concession. During the third field visit, the Nakadok village chief reported that there currently ninety-six (96) mining groups with approximately 800 people registered to mine in the six (6) ha concession.

In this area, mining is the main source of income for the villagers apart from agriculture. People have been mining here for over 100 years. Traditionally, only alluvial deposits were mined using panning techniques, and the gold in the Nam Thop River was coarse enough to allow miners to remove it from the concentrate with their fingers. Much of the coarse gold, however, has been extracted by a foreign-owned company that began operations in the area approximately five (5) years ago.[1]

Currently, both alluvial and primary ore deposits are mined. People prefer to mine primary ore because it can result in greater profits, and therefore, there are now more people involved in primary ore mining than alluvial mining. Mining primary ore requires an economic input that not all miners can afford, and therefore the only miners still mining alluvial deposits tend to be those who cannot afford to mine primary ore deposits. These miners intend to upgrade to primary ore mining if and when they can afford it.

The majority of alluvial miners in Nakadok Village are of the Thong Leuang ethnic group – an ethnic group originally from the hills, which was moved by government policy to Nakadok village approximately five (5) years ago in order to improve their lifestyle by improving access to infrastructure and services. In general, this group is not as well off as the Sek ethnic group, which is indigenous to the area and tends to mine primary ore.

Alluvial deposits are still primarily mined by panning, but now mercury is sometimes used to process the ore. Miners still use traditional wooden pans, and can process approximately 75 kg of ore per day by panning. During FV2 there was only one group of alluvial miners working. Miners were digging deep holes in a dry riverbed by hand, until they reached the level of the gold. They cleaned the mud and panned to find gold. The gold was quite coarse – one piece found during the Project Team's visit was approximately 1mm x 3mm. Due to the size of the gold found, mercury was not used to extract the gold.

Primary ore deposits have been mined for approximately three (3) years, though activities have recently intensified. While traveling to the mining sites and between villages, the Project Team witnessed many hand tractors on the road transporting primary ore from mining sites to processing areas. Primary ore deposits are mined using a combination of manual and machine labour.

The primary ore mining site that the team visited during FV1 was next to the former village of Na Feuang. At this site, miners remove ore from a hillside using steel bars and hammers. The ore is then crushed with a hammer before being transported in bags approximately 1 km to the river. Near the river the ore is fed into a combination mill / mercury sluice machine, which is

[1] The company has a special agreement with the DGM, which has allowed it to continue operations during the ban on small scale gold mining.

used to extract the gold. The machines consist of a motor, a crushing machine, and a sluice box containing copper plates covered with mercury. Water is pumped from the nearby river into the machine.

These machines are imported from Vietnam and cost approximately $600. As a result of the expense, these machines are often bought cooperatively by the households. During the site visit, it was not possible to get an exact number of the machines in operation, or how many of the six villages own such machines. The villagers are aware that using the mechanized mining equipment is illegal thus they did not want to provide many details. Although it is illegal to conduct mechanized mining while the ban on small-scale gold mining is in effect, the villagers reported that it is necessary to use the equipment to extract enough gold to make mining worthwhile.

The tailings from these machines are not treated and are discharged directly into the environment. Miners reported that they run the machines continuously for eight (8) hours each day, and remove the amalgam every two days. They did not want to provide many details on the amount of gold mined; for tax reasons and also because they do not want to attract other miners to the area. Miners did mention that when they are lucky they have pieces of amalgam the size of an egg.

Once it is removed, amalgam is typically burned on a spoon over a kitchen fire, inside the house. This process only takes a few minutes, but no specific precautions are taken while burning the mercury. Miners travel to Lak Sao to sell their gold, and purchase mercury at the same time. During FV1, mercury was procured for approximately $53 USD per kilogram at a gold shop in Lak Sao. By FV3, mercury was no longer available in any gold shops, but had to be procured from a Vietnamese equipment shop (selling other mining equipment such as mills and generators). The price had increased to $60 USD/kg – a difference of $7 in 2 months.

It has come to the attention of the Project Team that this focus area is also an area of concern for the Nam Theun 2 Hydropower Project (NT2) because the mining activity is impacting on the Nakai-Nam Theun NBCA, which the NT2 Project has committed to preserving. Small-scale gold mining in Bolikhamxay has also affected NT2 Project resettlement activities (i.e. one identified resettlement area was changed due to water quality issues resulting from mercury use in small-scale mining). As a result, in addition to DGM, there are other Government of Lao PDR agencies interested in minimizing the environmental impacts of small-scale mining in this area, including the NT2 Environmental Management Unit (EMU) of the Science Technology and Environment Agency (STEA) – Department of Environment and the NT2 WMPA Executive Secretariat.

During a meeting with the Head of Nakadok Village the following information was gathered about the mining activities at the primary ore mining site:

- Mean wage is approximately $3/day;
- Approximately 1 – 1.5 tonnes of ore are processed per mill per day;
- Excavating ore is the limiting factor for the mining, thus mills operate approximately half time (or less);
- Mercury coated copper amalgamation plates are used in sluices to capture the gold;
- 3g of mercury is used for each 1g of gold;
- Half of this mercury is allegedly recovered by retorts, however no retorts were seen at the mining site.
- It is estimated that approximately 150 to 500 kg of mercury is lost to the environment per annum (i.e. 1 kg to 4 kg per day based on a four month mining season).

The Head of Nakadok Village reported that villagers are familiar with the dangers of mercury and how to protect themselves. It was confirmed that all Village Heads had held meetings with their villagers as requested by the Project and the DGM, to disseminate information mercury safety and awareness donated by the Project during FV1. After visiting the field and speaking with miners, it was determined that this had not been accomplished.

The primary ore mining site is well organized. There are three distinct areas for mining, processing, and living.

Approximately 1500 people involved in underground mining activities. Working groups consist of approximately 12-20 people, often families. The Head of Nakadok Village has reported that there are 96 of such working groups. Groups are composed of investors (which pay for anything from equipment, accommodation, food) and miners. Investors do not partake in any of the actual labour.

Miners are tunneling into the hill following the gold veins. Within the tunnels miners are digging shafts straight down, to a maximum of 50m. Miners are using compressors and percussion drills to dig the tunnels and shafts. They are removing ore from these shafts using electrical winches. Outside of the hill diesel-electric generators are used to supply power. The air supply inside the mines is the compressed air for the drills. Miners are beginning to use electric fans also. Electric lights inside the mines provide the source of light.

There is no map or plan for tunneling, so as mining continues, safety hazards will increase.

Explosives are also being used. Two detonations were heard during the site visit. DGM is unclear as to whether or not it is illegal to use explosives for mining in Lao PDR, or within the primary ore mining site. Note, there have also been reports of explosives being used for fishing.

Three tailings pits have been excavated, and small shelters have been constructed around their perimeter. Each mining group has a shelter with a number and their name on the door. Doors are kept locked, walls extend up to the roof, and many shelters have plastic sheeting lining the walls so that you cannot see through spaces in the bamboo. Mills, amalgamation plates, torches, and ore are kept inside the shelters. Some shelters also have a sleeping area. Inside the shelters miners process the ore and burn amalgam. Ore is crushed to approximately >20mm by hammer, then fed into a mill. Amalgamation plates are used after the mill to separate the gold. Sizes of amalgamation plates are approximately 30cm wide and between 1.5 - 3m long. Tailings from all amalgamation plates run into central pits. The pits are quite large, and were excavated by backhoe, most likely by the military mining company.

The primary ore mining site is on an old military mining company concession. The military mining company recently left the concession area and has allowed the miners to request the government for permission to mine there. The military mining company has organized with the miners to return at a later date to reprocess the tailings collected in the tailings pits. Cyanide is reportedly being used by the site operators at the military mining concession. Mercury from the amalgamation plates in the tailings ponds at the primary ore mining site could be mobilized if cyanide is used to extract gold from this material. It is important that project operators and the regulator understand the significance of this risk.

Amalgam is being burned inside these sealed shelters for privacy. During FV2 the Team witnessed a piece of amalgam approximately 300g in size being burned. The burner was covering his face with a cloth – demonstrating that he is aware that mercury holds some dangers. However, the cloth will not protect him from mercury, and there was another miner in the small room sleeping while amalgam was being burned thus they do not understand what safety measures should be taken to protect against mercury exposure. It was decided to hold a Mercury Health Awareness Campaign for the miners and families working at the primary ore mining site near Nakadok Village.

In the village you could hear people breaking stones in the mornings and evenings. This is most likely the crushing of rich pieces of ore that have been brought home to be processed separately. Amalgam from this activity is most likely being burned inside the home, over the kitchen fire.

Problems to be addressed at the primary ore mining site include:

- Lack of concern for environmental protection (including water sanitation)
- Lack of environmental rehabilitation
- Lack of plans for tunneling or mapping of tunneling

- Lack of structural reinforcement of tunnels
- Lack of fresh air in tunnels
- Miners burning amalgam in enclosed areas
- Miners using mercury coated copper amalgamation plates in sluices
- Miners likely burning inside their homes at night
- Likely use of explosives for mining

3.2 Sanamxay, Attapeu Province

The focal area, along the Sekong River, is an area with a long tradition (over 200 years) of artisanal alluvial mining. Currently, miners still use panning methods to concentrate the ore. Traditionally, mercury was not used because the gold was coarse enough to easily separate from the concentrate by blowing. Mercury was introduced to the area in 2004 by the Sittxay Company, a joint Lao-Chinese venture licensed for exploration activities along the Sekong River, and now a majority of the miners use mercury to mine alluvial gold.

As at the April 2005 Mekong Wetlands Biodiversity Programme field visit, 25 mining units were in operation along the Sekong, with another 20 on order from China. The mining operations were funded by the Sitthisay Saysana Company, and supported on technical matters by the State Geological Exploration Unit. The Sittixay Company was licensed to conduct exploration activities in the area in 2004. The mining units were composed of moored motor boats with attached excavating equipment (dredges) and conveyer belts. Gold slurry was processed using sluices, mercury, and acid. During processing, mercury may be leaked to the environment as vapour during the heating process, as residuals from the recovery process, and from human error in the form of accidental spillage (MWBP & PSTEO 2005). Mining along the river is not easily regulated, and impacts can reach as far as Cambodia (Cambodia MOE).

The focal area for the implementation of Project activities in Attapeu Province was changed from the Vang Tat area in Sanxay District to 5 villages in Sanamxay District (refer to Figure 2). The primary reason for this is that the Vang Tat area is difficult to access – it is best accessed from Vietnam and requires several hours of walking. Access is also limited because the Vang Tat area lies within a military mining company concession area.

The 5 villages comprising the new focal area, including the number of households per village, are: Ban Somsanouk (35), Ban Oudomsouk (88), Ban Ha Phila (60), Ban Tha Hinh (30), and Ban Ha Saykham (65).

In total eleven (11) ASM areas were identified by the provincial government, of which five (5) involve the exploitation of alluvial deposits and six (6) primary deposits. Activities are concentrated along the Sekong River.

Approximately 1000 people are believed to be involved in ASM activities including local communities, local and foreign companies and the military.

With respect to the criteria outlined above for the selection of focal areas, Sanamxay was selected because:

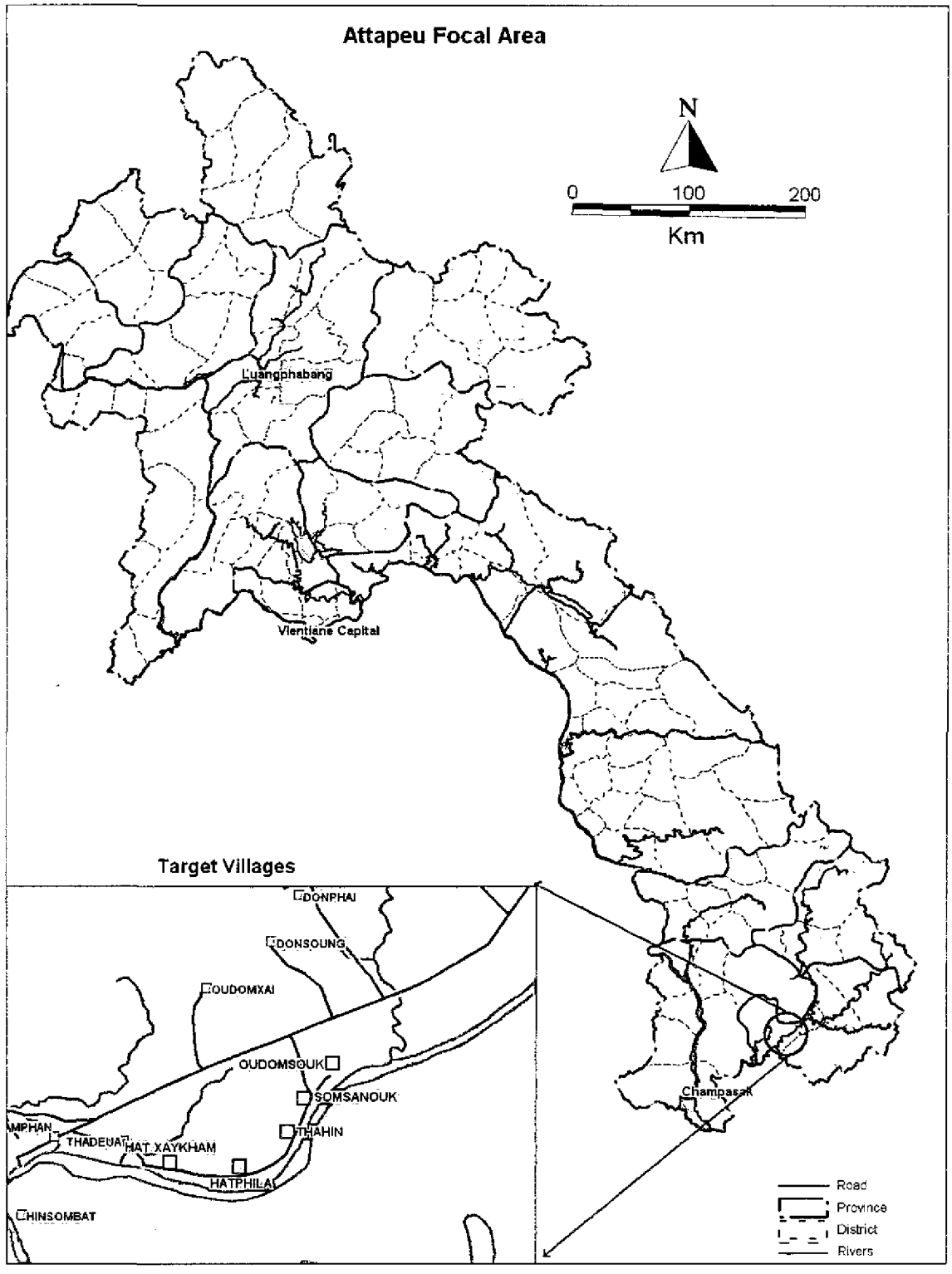
i. There is strong support by the provincial government for implementation of the GMP. Specifically the provincial government has requested: clarification with respect to licencing procedures for ASM and the respective roles of district / provincial / central level government agencies in this process; the resumption of small-scale mining activities following the issuance of the Ministerial Notice in 2005; and support with the management of recognized environmental and social impacts arising from mining activities.

ii. Mercury use was reported in small-scale mining operations of both alluvial and primary deposits. This has included the use of mercury by a military mining company in 'open-circuit' sluice boxes.

iii. Environmental and social impacts arising from mining activities were reported by the provincial government. These impacts include: increased turbidity and reduced amenity of downstream waterways; fears of reduced fish stock; increased noise in village areas associated with the operation of dredges and damage to fish nets.

iv. The DGM Southern Geological Survey Team is based in Pakse, is mandated to oversee the management of mineral concessions in the southern provinces of Attapeu, Sekong, Champassak and Salavan, and they are therefore well positioned to disseminate the results and lessons learnt from the Attapeu focal area.

Figure 3.2 Attapeu Focal Area



Mining activity in this area is primarily undertaken as a supplemental and seasonal activity. Over the past 4-5 years gold panning had become more popular, but now activity has decreased due to lower yields of gold (most likely related to the activities of the Sittixay Company). In the past, villagers would mine when they required extra income for something specific, such as a village festival. Now mining is seen as a general extra source of income, but yields have decreased to the point where many villages no longer mine. Of the five (5) villages involved in demonstrations, only two (2) were still actively mining (Ban Somsanouk and Ban Oudomsouk).

Gold traders travel to the villages to buy gold from and sell mercury to the miners. These traders reportedly sell mercury for close to the same price they buy the gold, leaving the miners nearly without profit.

Amalgam is typically burned on a spoon over a kitchen fire. Prior to the field visit, villagers did not know that it was possible to recover and recycle the mercury used for amalgamation.

The villagers were not aware of the potential health impacts of mercury use and exposure.

After the demonstrations, the Permanent Secretrary of the Sanamxay District Office was briefed on Project activities. The Permanent Secretary asked whether the Project is planning to extend awareness activities further down the Sekong River where there are 15 more villages involved in gold panning. The project intended to visit these villages during the final month of implementation; however, additional information from the field indicated that the mining situation downstream was similar to that of the original focus area (i.e. much of the mining activity had ceased).

4. Health Awareness Campaign

One of the primary objectives of the GMP is to increase awareness of potential hazards associated with using and handling mercury. In addition to the health awareness activities, the Project has also introduced improved technology to improve gold recovery and decrease exposure to mercury (refer to Section 5 – Technology Introduction).

4.1 Activities

4.1.1 Workshops

Regional workshops were held in three areas – Southern (Pakse), Central (Vientiane), and Northern (Luang Prabang) Lao. An International Stakeholders Workshop was also held in Vientiane. Workshop agendas, Participant Lists, and Minutes are included in Appendix 1.

The workshops increased the awareness of GMP objectives to Central and Local Government, small scale mining companies, and artisanal and small scale gold miners. During the workshops, health awareness materials (listed in Section 4.2) were presented and disseminated.

Most participants were unaware of the negative effects of mercury on the body, and many were unaware of the way mercury is used by local miners to process gold. The Health Awareness Campaign provides participants with a reason to adopt the new technology, and is therefore an integral to its successful introduction. Government officials were interested to learn about how they can protect their citizens. The Bolikhamxay Government invited the Project to their province to conduct a Health Awareness Campaign in the future. The workshops succeeded in increasing participants' knowledge regarding methods of mercury poisoning, how mercury can enter and persist in the environment, symptoms of mercury poisoning, who is most sensitive to mercury poisoning, and how to protect oneself and one's family from mercury poisoning.

4.1.2 Training Sessions

Mercury Health Awareness Campaign

A specific Mercury Health Awareness Campaign was developed for miners working in the primary ore mining area in Bolikhamxay. This campaign was held during the first week of FV3, from 26-30 March. The team was led by Dr. Vilayvone Mangkhaseum from the Department of Hygiene and Prevention, Ministry of Health, and other team members included individuals from the Department of Hygiene and Prevention, Bolikhamsay Province, and the Environmental Management Unit from the Science Technology and Environment Agency. The team was supported in the field by the Consultant.

The health campaign was held over three days. Miners at the primary ore mining site near Nakadok were divided into three groups, each participating in the campaign on separate days. On each day, a morning session was held for both men and women, and a separate afternoon session was conducted for women and children. The afternoon session specifically targeted women and children due to their increased sensitivity to mercury poisoning. The health campaign focused on informing participants of mercury exposure pathways, particularly those related to mining, the potential health affects of long-term mercury exposure, and ways to prevent exposure.

Approximately one hundred (100) people attended the health presentations over the three day period. Rain on the first day disrupted the presentation and prevented some people from attending. Miners were generally receptive to the information provided, and asked many questions during the question and answer period. Most questions focused on the symptoms of mercury poisoning and whether there was any medication available to prevent / cure the affects of mercury exposure. Many participants later confessed to the health team that they are not concerned about the health affects of mercury, as they have more immediate health concerns, including mine accidents (i.e. cave-ins, accidents with machinery or explosives, etc.), diarrhea, malaria, sexually transmitted diseases, pneumonia and dermatological problems.

In addition to mercury use, the health team also identified several hygiene issues in the living area, for example, most of the houses in the area are of a temporary nature and do not have toilets.

Upon return from the field, the team recommended that health awareness presentations should be provided regularly in the area, and that the scope of those presentations should be increased to include other hygiene issues in addition the mercury exposure. Further, the team noted the importance of having Government support for the campaign, i.e. other Government authorities visiting the area should repeat and re-enforce the potential health affects of mercury use. Some health materials were left with the Bolikhamsay Provincial Department of Hygiene and Prevention.

CARE

On 7 January 2007 the Consultant conducted a half day information session on Project activities for CARE Field Managers. The training included the following topics:

a. Project overview;
b. Project activities (including field visits);
c. Nature of artisanal and small-scale gold mining activity in Lao PDR;
d. Technology used for gold mining; and
e. Health hazards of mercury exposure.

The training was followed by a question and answer period. Participant interested focused on the dangers associated with mercury exposure – methods of exposure and symptoms of poisoning; and where to report mining activity.

4.2 Materials

The following sections detail the dissemination of health awareness materials during the length of the Project.

4.2.1 GMP Presentations

Four Global Mercury Project presentations were provided by UNIDO and translated into Lao language. They were presented at each of the regional workshops. The GMP presentations are included in Appendix 3 of this report.

- Mercury & Family Health
- GMP Lao PDR Introduction
- GMP Next Steps in Lao PDR

The Technology for Small-Scale Mining and Mercury & Family Health presentations were presented at the Introductory Meetings of the first Field Visits (in Lak Sao and Sanamxai).

A presentation on the status of artisanal and small scale mining in Lao PDR was developed by the Consultant and presented during the regional workshops. .

CDs with the presentations and the health awareness brochures were disseminated to the following parties:

- Lao PDR Department of Geology and Mines
  - Vientiane Central DGM
  - Bolikhamxay Provincial DGM
  - Attapeu Provincial DGM

- International Non-Governmental Organizations
  - WWF
  - CARE
  - SEM2

4.2.2 Health Awareness Brochures

Five Health Awareness Brochures were provided by UNIDO and modified to fit the local context by inserting local photos and translating the brochures into Lao language. The health awareness brochures are included in Appendix 4 of this report. The health awareness brochures are titled as follows:

- How to get more gold
- How to protect your water
- How to use and reuse mercury
- Mercury and family health
- Mercury in gold shops

The brochures were disseminated to all participants during the Regional Workshops in Pakse, Vientiane, and Luang Prabang, and during the International Stakeholders Workshop in Vientiane.

During the first Field Visits in Bolikhamxay and Attapeu, the brochures were disseminated to the Heads of focal villages for sharing with the villagers.

As well, CDs with the presentations and the health awareness brochures were disseminated to the following parties:

- Lao PDR Department of Geology and Mines
  - Vientiane Central DGM
  - Bolikhamxay Provincial DGM
  - Attapeu Provincial DGM
- International Non-Governmental Organizations
  - WWF
  - CARE
  - SEM2

4.2.3 Posters

As requested by the miners and villagers in Bolikhamxay during Field Visit 1, awareness posters were produced detailing the health impacts of mercury and how to use a retort. 500 of each poster theme have been printed. The posters are included in Appendix 5 of this report.

Posters are being disseminated:

- During the second Field Visit to Bolikhamxay
- During DGM's Annual Conference in Vientiane. Posters will be given to the Provincial DGM representatives, who will disseminate them to District DGM, who will disseminate them to the Villages.

Posters are intended to be displayed at the home of the Village Head, where meetings are held, where they are available for all villagers to view, and where they will be able to discuss and ask questions about the posters if they do not understand the material.

4.2.4 Draft Mining Regulations

Draft mercury guidelines were approved by DGM and disseminated during the first Field Visits at the Introductory Meetings and to the Village Heads. During the second Field Visit to Bolikhamxay, it was decided to upgrade the mercury guidelines to Codes of Practice for small-scale gold mining in Lao PDR (see Appendix 6). These Codes of Practice were approved by the Ministry of Energy and Mines, and introduced to the primary ore mining site near Nakadok Village during FV3 to Bolikhamxay.

Details on the outcomes of this introduction will be included in the Final Report.

4.3 Health Awareness Campaign Challenges and Achievements

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

1. It is difficult to communicate the potential impact of mercury exposure because the health effects of mercury contamination tend to be long-term, and are often masked by other conditions.
2. Miners in Lao PDR have more immediate health concerns, such as malaria, malnutrition, and unexploded ordinance. These tend to take priority over long-term health concerns.

Key achievements of the Health Awareness Campaign include:

1. Mercury health awareness materials (brochures) were disseminated at the Regional Workshops held in Northern, Central, and Southern Lao PDR. Approximately 70 people participated in the workshops. Participants were from the following organizations: Central, Provincial, and District Government from the Ministry of Energy and Mines (Department of Geology and Mines - DGM); Dept. of Foreign Cooperation; Dept. 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.
2. Mercury health awareness materials (brochures) were disseminated at the International Stakeholders Workshop held in Vientiane. Approximately 15 people participated in the workshop. Participants were from the following organizations: 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).
3. Mercury health awareness materials (brochures, posters, and technical guidelines) were disseminated to villagers and miners during the series of field visits to government identified areas with increased mining activity.
4. Development and implementation of a targeted Mercury Health Awareness Campaign for the miners and families of the newly formed village in the primary ore mining area near Nakadok Village in Bolikhamxay Province. Ministry of Health personnel were trained to deliver the awareness training so that this activity could continue after the GMP project.
5. Technology and health awareness posters (Mercury and Family Health; and Retort Use) were disseminated to each province of Lao PDR through field visits and DGM's annual conference.

5. Technology Introduction

The Project endeavoured to introduce the following technology to the artisanal and small-scale mining sector in Lao PDR. Sluice boxes and retorts were introduced to the GoL during the Regional Workshops in Vientiane, Pakse, and Luang Prabang. Sluice boxes, retorts, and fire blowers were introduced to mining communities during Field Visits 1 – 3 (see Section 6).

5.1 Sluice Box Technology

Two styles of sluice boxes were presented to miners during the practical demonstrations. The project commissioned the construction of 8 demonstration sluice boxes – 1 metal and 3 wooden of each the zig zag and tray sluice models. The sluice boxes are lined with a rubber carpet to use the gravity concentration method of catching gold. Water is mixed with ore and passed through the sluice. Gold is heavier than sand and thus sinks to the bottom of the slurry, getting caught in the carpet. The carpets are washed and their contents panned to concentrate the gold and heavy minerals. If the gold is coarse enough it may be removed manually. If it is very fine, mercury is used to form an amalgam with the gold to separate it from the heavy minerals. This amalgam must then be burned to separate the gold from the mercury.

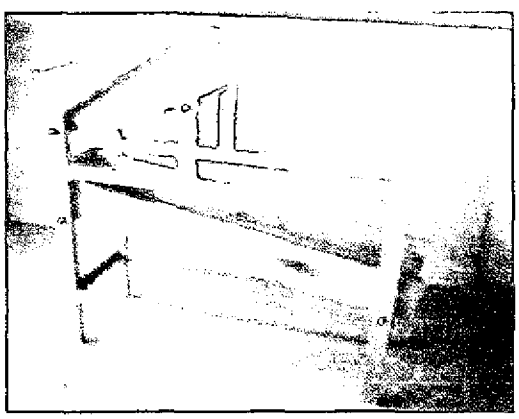


Figure 5.1 Zig Zag Sluice and Figure 5.2 Tray Sluice

The Government of Lao PDR now has 5 sets of sluices (a "set" includes 1 zig zag and 1 tray sluice), with one set in each of the following locations:

- Vientiane, Vientiane Municipality, Central DGM Office
- Luang Prabang, Luang Prabang Province, Provincial DGM Office
- Nakadok Village, Bolikhamxay Province, under the control of the Provincial DGM Office
- Sanamxay District Office, Attapeu Province, under the control of the Provincial DGM Office

5.2 Retort Technology

Two styles of retorts, plumbing pipe and kitchen bowl, were presented to miners during the practical demonstrations. Retorts are used to capture and recycle the mercury vapour given off when burning mercury-gold amalgam. The amalgam is burned

inside the retort, trapping the mercury vapour. The trapped mercury vapour condenses to form liquid mercury, which can be retrieved from the retort and reused.

Plumbing Pipe Retort

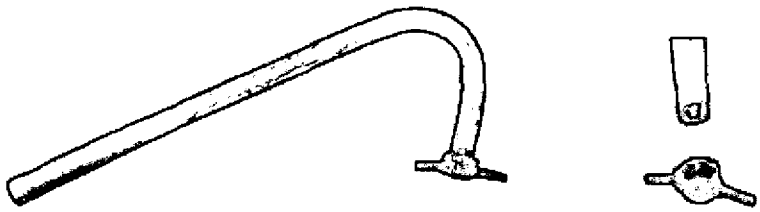


Figure 5.3 Medium-Sized Plumbing Pipe Retort

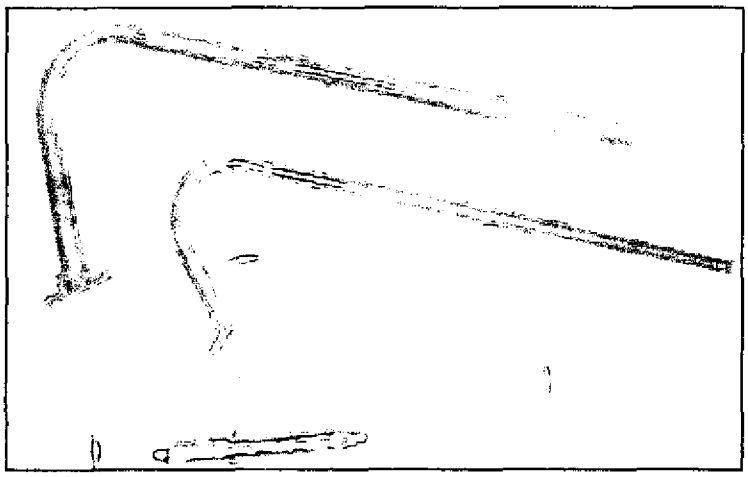


Figure 5.4 Small and Medium-Sized Plumbing Pipe Retort

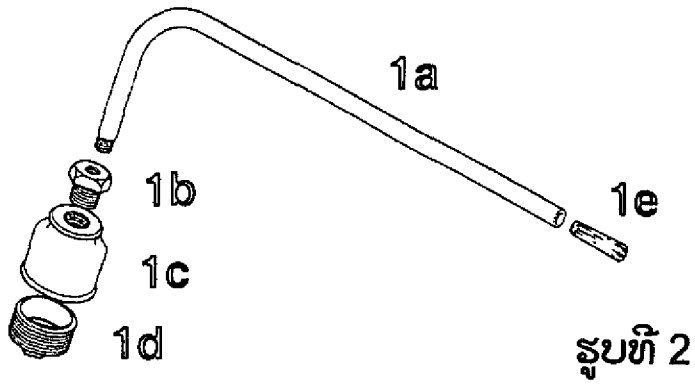


Figure 5.5 Schematic Representation of Large-Sized Plumbing Pipe Retort

Three different plumbing pipe retort sizes have been developed for Lao PDR to accommodate the amount of gold mined (and therefore the typical size of amalgam) in different areas of the country.

The medium-sized retort can be modified to accommodate larger-sized amalgam by fitting an 'increaser' piece on the original pipe, and fitting a larger-sized stopper on the end to act as a crucible.

Villagers were also taught to make wooden plugs for the end of the retorts to prevent remaining mercury vapour from entering the environment.

Kitchen Bowl Retort

The use of kitchen bowl retorts was also demonstrated to the miners. A glass bowl was used as the retort cover during the demonstrations to allow miners to watch the process. However, during the training, it was stated that the glass bowl was being used only for the demonstration and that a metal kitchen bowl should be used for the actual retort for the following reasons:

- Metal is more durable than glass
- Due to the addition of water to sand during the amalgamation process, there is a chance that the glass bowl could break (i.e. if cool water makes contact with hot glass, the glass is likely to break).
- A metal handle could be fitted to the top of the metal bowl making it easier to remove once the amalgam has been burned.

Villagers were reminded that any materials used for burning amalgam should NEVER be used for cooking or eating.

Figure 5.6 Kitchen Bowl Retort in Use

Figure 5.7 Kitchen Bowl Retort with separated copper wire and mercury droplets

Stationary Retort

Two stationary retorts were designed by the UNIDO ASM Specialist and built by the Project to address the issue of mercury loss in areas of concentrated mining where miners are burning large volumes of amalgam. One such area is the primary ore mining site near Nakadok Village in Bolikhamxay province. The stationary retort is composed of a burning chamber, condensation pipes which are passed through a tub of water for cooling, a mercury collection chamber, a charcoal filter, and a fan. The fan is run on a diesel generator. Amalgam is placed in the burning chamber and burned with a burner. The fan creates a light suction which causes the mercury vapour to pass through the pipes where the mercury condenses and collects in the mercury collection chamber. The air finally passes through the charcoal filter which removes and stores any remaining mercury. The design of the retort enables miners to burn amalgam in a similar fashion to what they are used to, and the resulting gold is a bright yellow (it does not become dull like gold burned in closed retorts). The retort can support itself economically once enough mercury is collected to be recycled: the mercury can be resold to miners at a lower than market price, and profits can be used to buy fuel for the burner, fuel for the generator, the wage of a person responsible for caring for the retort, and any extra maintenance costs. The free fuel adds further incentive for miners to use the stationary retort.

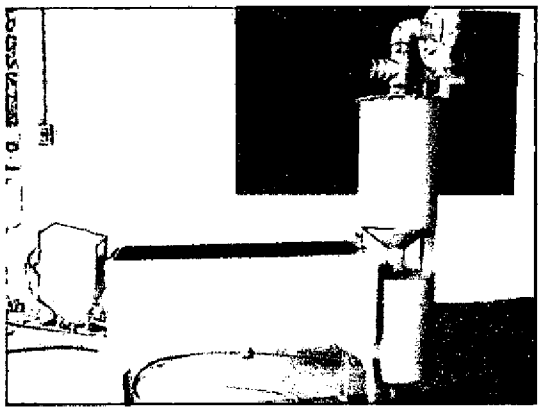


Figure 5.8 The stationary retort.

Figure 5.9 Stationary retort in use in Nakadok village.

5.3 Fire Blower Technology

A fire blower enables miners to increase the temperature of their fires and decrease the amount of time needed for burning amalgam. For the first set of field visits, a fire blower was developed using local materials. As shown in the photo below, a cookie tin was used to keep the bag open, making it easier to take in and blow out more air. In general, villagers were quite happy with this invention, and saw it as having potential use for all activities requiring a hot fire. They are also interested to use it to start fires more quickly.

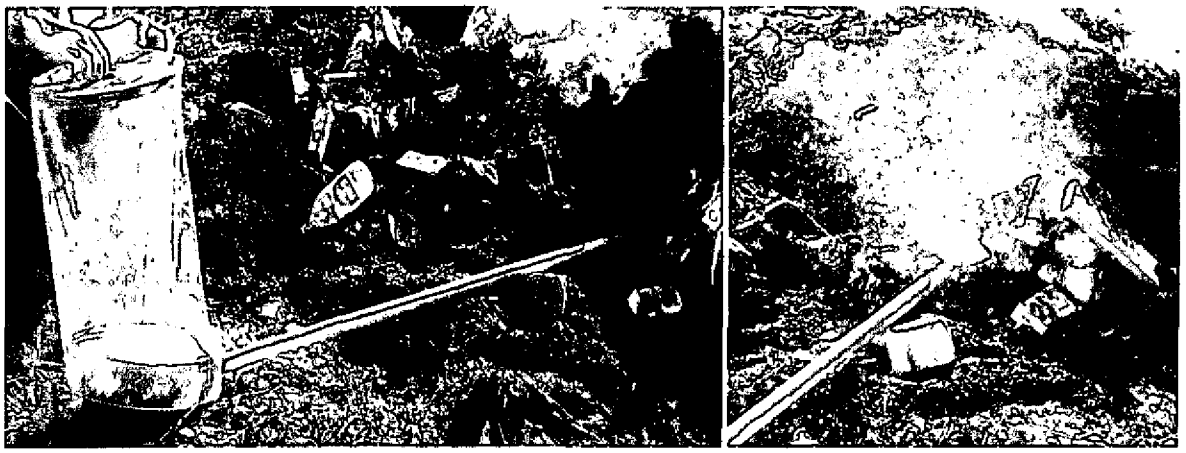


Figure 5.10 and Figure 5.11 Fire Blower in Use

5.4 Equipment Procurement

In consultation with the UNIDO Representative, it was decided not to procure the Brazilian hammer mill listed in the original equipment procurement list, and to instead replace this mill with a local mill. The rationale for this decision is that the mill would not arrive in time for the UNIDO ASM Specialist (Hermann Wotruba) to provide training on the equipment for DGM staff, and that it is not possible within the current budget for these staff to be sent to Germany at a later date to receive training from

Hermann Wotruba. Without proper training it will be difficult for DGM staff to use the mill to its full capabilities. The local mill was procured in Lak Sao during FV3.

Table 5.1 Equipment Procurement

Item	Procured to Date	Cost per Unit (USD)	Quantity	Cost (USD)
Laboratory 10" stainless steel screens (set) Mesh size (mm): 4, 2, 1, 0.5, 0.25, 0.125, 0.063, 0.032	YES	500	1	500
Binocular microscope	YES	100 271	2	371
Mill and spare parts for DGM Central	YES	500	1	500
Motor and associated equipment for mill for DGM Central	YES	425	1	425
Modified Stationary Retort set (including frame, pipes and valves, fan and burner) 1 for DGM Central	YES	900	1	900
Stationary Retort set (including frame, pipes and valves, fan, and burner) 1 for Field (primary ore mining site Bolikhamxay)	YES	732	1	732
Generator + Diesel Motor for stationary retort 1 for Field and 1 for DGM Central	YES	480	2	960
Other equipment for Stationary Retort (control board, spare belts, oil, fuel, tools, etc)	YES	-	-	100
Demonstration zig zag sluices: 1 x 4 m, 0.5 x 2 m	YES	150	4	600
Tray sluice	YES	60	4	240
Demonstration plumbing pipe retorts	YES	5	25	125
Demonstration upgraded plumbing pipe retort + stand	YES	25	1	25
Demonstration kitchen bowl retorts	YES	5	10	50
Spare zig zag screen	YES	-	-	75
Spare carpets	YES	3	15	45
Amalgamation accessories: Hg; stove; bellows; burner	YES	-	-	500
Buckets / tubs / shovels	YES	-	-	500
Contingency		-	-	1,000
TOTAL				$7,648

Note: The remaining equipment budget was used for additional expenses associated with equipment procurement (e.g. construction of a shed with a lock for the stationary retort in Bolikhamxay; purchase of mercury to saturate the retort; etc.)

5.5 Technology Introduction at the Central Level

5.5.1 Regional Workshops

Each Regional Workshop was followed by a ½ day technology demonstration. Participants were introduced to the concept of the sluice box using the zig zag sluice model during a demonstration by the UNIDO ASM Specialist. The plumbing pipe retort was demonstrated using copper wire to make amalgam. Participants were generally very interested in the technology and its potential to increase the livelihood and provide health benefits for their people. Participants from Bolikhamxay and Attapeu invited the Project to visit mining areas in their provinces.

A presentation on Technology for Small-Scale Mining was provided by UNIDO and translated into Lao language. This presentation was given at each of the regional workshops, and at the Introductory Meetings of the first Field Visits (in Lak Sao and Sanamxai). The presentation is included in Appendix 3 of this report.

5.5.2 Central DGM Training on Stationary Retort

The stationary retort was tested at Central DGM prior to introduction to the miners at field level. Consultant staff trained Mr. Eravanh from Central DGM on use of the stationary retort and the burner. Mr. Eravanh was then the primary demonstrator for introducing the equipment at the primary ore mining site near Nakadok Village in Bolikhamxay province. The training was successful. With ESL support, Mr. Eravanh introduced the stationary retort to the field level, and will train other DGM staff on the second stationary retort to be kept at DGM Central Offices in Vientiane.

5.6 Technology Introduction Challenges and Achievements

The key challenges faced during technology introduction can be summarized as follows:

1. It was sometimes difficult to source materials for the construction of mining technology, i.e.:
   - Materials required for the plumbing pipe retort were not always available locally because in many places, plumbing pipes are made of plastic and those that are available tend to be coated with zinc, which, by forming an amalgam with mercury, can reduce mercury recovery.
   - The bowls available in most rural markets are not suitable for the kitchen bowl retort because they are the wrong shape (they have a flat bottom which causes evaporated mercury to re-condense and drip back into the crucible instead of being removed to the sand).
2. Technology introduced by the project is in competition with technology introduced from neighbouring countries, for example, mercury-plated sluice boxes have been introduced from Vietnam. It requires significant financial investment for miners to purchase this equipment, so if they have already purchased it, they are unlikely to switch to the technology introduced by the project.
3. It is difficult to get the miners together as a group to discuss potential health impacts or to introduce new technology because they are working.

Key achievements of the technology introduction include:

1. Introduction of more efficient and safer gold mining technology (sluice boxes and retorts) was introduced at the Regional Workshops held in Northern, Central, and Southern Lao PDR to increase the amount of gold mined and decrease the amount of mercury lost to the environment and humans. Approximately 70 people participated in the workshops. Participants were from the following organizations: Central, Provincial, and District Government from the Ministry of Energy and Mines (Department of Geology and Mines - DGM); Dept. of Foreign Cooperation; Dept. 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.
2. During the Regional Workshops, technology demonstrations were undertaken to introduce workshop participants to carpet sluice boxes and plumbing pipe retorts. Participants were generally very interested in the technology and its potential to increase the livelihood and provide health benefits for their people. Participants from Bolikhamxay and Attapeu invited the Project to visit mining areas in their provinces.

3. Introduction of the stationary retort to the primary ore mining area near Nakadok Village in Bolikhamxay Province, including capacity training for Central DGM to use and introduce the retort.

6. Field Visits

A series of Field Visits (FV) were undertaken during the 2007 mining season (January – April). Focal areas for the field visits were identified as the Lak Sao Area, Bolikhamxay province and Sanamsay, Attapeu province by GoL during the regional workshops. Field visits functioned to:

- Introduce efficient gold mining technology to Village Heads and miners of 11 villages in 2 provinces;
- Increase communication between Central and Local DGM;
- Disseminate information and awareness materials pertaining to mercury and health to villages including brochures, posters, and technical guidelines;
- Increase capacity of Central and Local DGM to carry out technology demonstrations and health awareness campaigns;
- Identify further areas of concentrated mining activity;
- Adapt Project activities to the actual mining situation in Lao PDR; and
- Further understand the scale and dynamics of ASM in Lao PDR.

6.1 Lak Sao Area, Bolikhamxay

6.1.1 FV1

15-19 January 2007

Demonstrations were carried out over two days at three sites as summarized in Table 6.1. Demonstrations consisted of:

- Short technical presentation on equipment
- Zig zag sluice demonstration
- Tray sluice demonstration
- Pipe retort demonstration
- Kitchen bowl retort demonstration

Participants were encouraged to ask questions throughout the demonstrations, and to try the equipment for themselves.

Table 6.1 Bolikhamxay Demonstration Summary

Site	Location	Participants (approx.)	Details
1	On Nam Thop river Near primary ore processing area (using Hg sluices)	11 males 6 females (2 females left during the presentation and 2 females joined the demonstration) 2 children	Sluice Demonstration – Day 1 • Flip chart technical presentation prior to demonstration • 1st demonstration, zig zag sluice – alluvial sand was processed, result: one speck of gold • 2nd demonstration, zig zag sluice – a small bucket of tailings from the Vietnamese mercury sluices was processed, result: a drop of mercury (Plate 1.3.14) and a (very) small piece of amalgam (Plate 1.3.15). • 3rd demonstration, tray sluice - a washing basin full of sand taken from the dry river floor was processed, result: small drop of

			mercury, did not squeeze for gold amalgam
2	At the primary ore processing area (2 Hg sluices present)	5 males 3 females	Retort Demonstration – Day 1 • 1st demonstration, plumbing pipe retort – demonstrated to primary ore miners, used small piece of gold amalgam, burning took a long time (approximate time), fire blower used the entire time, result: gold was grey in colour, gold stuck to inside of the retort.
3	At alluvial and primary ore gold mining site on Nam Thop river / stream Near Nakadok village	11 males 5 females 10 children 3 Chinese men working for the Chinese mining company joined the presentation for a short time (10min)	Sluice and Retort Demonstration – Day 2 • Flip chart technical presentation prior to demonstration • 1st sluice demonstration, zig zag sluice – mud from the holes miners were excavating was processed by the sluice – mud described as waste by the miners, result: small amount of gold (2-3 particles – not kept). Miners said they had not yet reached the level containing gold. • Did not demonstrate the tray sluice because the river was not flowing fast enough in this area • 1st retort demonstration, kitchen bowl retort – used copper wire to make trial amalgam, approximate burning time was less than 10 minutes • 2nd retort demonstration, plumbing pipe retort – used copper wire to make trial amalgam, approximate burning time: 10 minutes • Used fire blower for the entire burning time • This second day of demonstrations fell on a Buddhist holiday. The villagers respect this day to not disturb the forest, so there were no people mining on this day, and few miners joined the demonstration. All the village heads from the 6 villages joined the demonstration and will disseminate the information in their villages.

Material was distributed to Village Heads during the practical demonstrations as follows: ten (10) sets each to Ban Nakadok and Ban Thongkhe; 5 sets each to Ban Nahay, Ban Vang Kor, Ban Namouang and Ban Nathorn.

Each set of material contains:

- Technical guidelines for the construction of sluice boxes
- Technical guidelines for the construction of retorts
- Mercury use guidelines

The Village Heads also received presentation handouts during the meeting in Lak Sao.

Interest in New Technology

Sluice Boxes

Alluvial miners showed interest in the sluice technology. Miners were generally more interested in the tray sluice due to its simpler design. Also, one comment was that the zig zag sluice is too tall for them. The efficiency of the sluice box for trapping gold was not clear during the demonstrations and consequently villagers are not sure they would like to change to the new technology. The villagers themselves did not state whether they would make the equipment and experiment with it, but the Head of Nakadok Village is interested in using the sluices and said that his villagers will experiment with the equipment.

Primary ore miners showed interest in substituting the carpet for mercury-covered plates because they will be able to trap more gold, spend less money on mercury, and stop discharging mercury-ridden tailings into the environment. The miners are aware, due to Project activities, that mercury entering the environment will cause a problem for their own health and future generations. They spoke of creating barriers to try to stop the tailings from entering the river, though these would not be successful in the wet season. The miners are interesting in changing technology from mercury covered plates to carpet, though they said they are not able to change technology immediately because it will take time to go to Lak Sao to purchase the carpet.

Many questions were asked during the demonstration, including:

- Will gold particles be lost by using the sluice box for processing?
- What is the standard gradient of the sluice box?
- What is the standard width of the sluice box?
- Where can we purchase the carpet?
- How do you make the mix of material and water?
- How fast can the sluice box perform / what is the output delivered?
- Can the project supply the technology for sale to the miners?

The project team did their best to answer all questions. For the last question, it was explained that this technology is easy replicate using inexpensive, locally available materials. The miners were also provided with instruction on how to construct the sluice boxes.

Retorts

The miners were very interested in the retorts, and automatically saw the potential for saving money. It is generally understood that mercury simply disappears when it is burned – the miners found it surprising that mercury persists in the air, on their clothes, in the soil and in the rivers. Primary ore miners also think it is a good idea to recycle mercury, and are interested in using a retort to protect them from mercury vapour. The Village Heads who attended the demonstration are excited to disseminate the knowledge they learned about the health hazards associated with mercury, and how to work safely with mercury to their villagers.

The miners in Bolikhamxay were more interested in the kitchen bowl retort than the plumbing pipe retort for the following reasons:

Advantages of the kitchen bowl retort:

- Material is available in local markets
- Fire does not need to be as hot as for plumbing pipe retort
- Resulting gold is yellow
- More closely mimics current procedure for burning amalgam (on a spoon)

Disadvantages of the plumbing pipe retort:

- Too complicated
- Takes too long
- Left the resulting gold grey (though this was likely due to residue in the retort)

- Metal plumbing pipes not available in nearest town centre (Lak Sao); though it is possible that they are easily imported from Vietnam.

Fire Blower

The miners were quite interested in the fire blower as a method for quickly making fires hot, and not only for its use regarding amalgam burning. The villagers make machetes out of metal which requires a very hot fire. Traditionally they use a piece of bamboo as a blower by placing one end in the fire and blowing by mouth through the other end. The introduced fire blower is much less physically demanding and safer (*i.e.* it does not cause dizziness while operating).

At the end of the site visit, the following equipment was donated to Bolikhamxay Provincial DGM:

- One zig zag sluice
- One tray sluice
- One plumbing pipe retort (medium size)
- One kitchen bowl retort

The equipment is currently being held in Nakadok village to give the miners the opportunity to replicate it. The plan is for the villagers to experiment with the equipment before the second field visit (26-28 February).

6.1.2 FV2

26-28 February 2007

On the first day the Team met with the Deputy Head of Nakadok Village to discuss the interest of miners in the set of mining equipment which was left behind in the village for their trial. The set included both models of sluice boxes (zig zag and tray), both types of retorts (kitchen bowl and plumbing pipe), and the fire blower. The Deputy Head said that there was so much interest in borrowing the equipment, that they were having difficulty managing it. Currently, the equipment is not being lent out until an appropriate lending system can be established.

The Team visited an alluvial mining site, however there was only one small group mining as most miners have abandoned alluvial mining to pursue the possibility of greater rewards from primary ore mining.

As planned, the following technology demonstrations were conducted at the primary ore mining site on 28 February 2007. Demonstrations began with a brief presentation on mercury health and safety to ensure the miners understood why it was important to use a retort. Approximately 60 miners attended the demonstrations over the course of the morning.

Kitchen bowl retort demonstration:

The miners were involved in the construction of the kitchen bowl retort, and in building a fire for the demonstration. There were some problems during the demonstration where the mercury remained liquid in the crucible. At first it was thought this was due to the fire not being hot enough, but it turned out to be due to the shape of the bowl used in the retort: the bottom of the cover bowl was too flat, so when the Hg evaporated it stuck to the top of the bowl, condensed and fell back into the crucible, instead of running down the sides and into the sand. This however did not seem to deter the miners from being interested in the retorts. They understood the principal behind the equipment, and how it could protect their health and save them money.

Plumbing pipe retort demonstration:

Again, there were some problems demonstrating this retort to the miners. The type of burner the miners use to burn amalgam was used in the demonstration to mimic the real life situation, but it was not hot enough to melt the amalgam. It took

approximately 25 minutes to evaporate the mercury. Again, the miners were not too deterred as they understood the principle. They were discussing different ways to accomplish the result.

The technology initially brought to site did not meet the needs of the miners. A more efficient retort was designed by the UNIDO ASM Specialist for demonstrations. This retort will be effective at demonstrating the principle of recycling mercury, but it cannot be built at the local level. To resolve this issue, it was determined that the construction of a stationary retort for the primary ore mining site near Nakadok Village would be the best solution.

6.1.3 FV3

26 March – 6 April 2007

The purpose of FV3 was to introduce the draft "Codes of Practice" for mine safety, environmental safety and protection of human health, and to instruct miners in the use of the stationary retort at the primary ore mining site near Nakadok Village. FV3 took place between the 26 March and the 6 April 2007. The first week of this visit also overlapped with the Health Awareness Training in order to maximize the effectiveness of both programs.

The Project team included the central Department of Geology and Mines (DGM), the Bolikhamsay Provincial DGM, and the Environmental Management Unit, Bolikhamsay Province. The team was supported in the field by the Consultant.

Mr. Eravanh from the DGM led the introduction of the "Codes of Practice" and the stationary retort instruction. In general, as the miners were very busy, it was difficult to get them to attend the stationary retort training. It was difficult to get them to test out the retort in front of others, as they did not want to reveal the amount of gold that they had. Approximately 50 miners attended the instructional sessions. The village chief and one experienced miner received in depth training, and will continue to instruct other miners in the use of the stationary retort. Further, the one experienced miner has been trained in the maintenance of the retort. A permanent hut has been constructed for the stationary retort. The hut is located near the guard booth to prevent equipment from being stolen. Initially, the recovery rate of mercury was relatively poor, as the equipment required mercury saturation.

The draft "Codes of Practice" appeared to be well received. The miners asked questions, which indicated that they understood the codes. It is recommended that the training regarding the codes be repeated at the beginning of the next mining season.

6.2 Sanamxay, Attapeu

6.2.1 FV1

22-26 January 2007

Demonstrations were carried out over 2 days at 4 sites as summarized in Table 6.2. On the second day, Provincial DGM staff, Mr. Vannalai and Mr. Soubanh, took the lead in introducing and demonstrating the technology. Both sites for sluice demonstrations were held along the Sekong River using soil previously mined by the Sittixay Company. Both sites for retort demonstration were held in the villages near the sluice demonstration sites. The following equipment was demonstrated to the villagers:

- Short technical presentation on equipment
- Zig zag sluice demonstration
- Tray sluice demonstration
- Pipe retort demonstration
- Kitchen bowl retort demonstration

Participants were encouraged to ask questions throughout the demonstrations, and to try the equipment for themselves.

Table 6.2 Attapeu Demonstration Summary

Site	Location	Participants (approx.)	Details
1	Sekong River near Ban Oudomsouk	about 30 people Equal numbers of men, women, and children Participants from the following villages: Ban Somsanouk,, Ban Oudomsouk, Ban Ha Phila	Sluice box demonstration – Day 1 • Did not use flip chart for the demonstration • 1st demonstration, zig zag sluice – the Consultant took alluvium from along the river and processed it with the sluice box, result: some gold (Plate 1.4.13) • 2nd demonstration, zig zag sluice – Provincial DGM took the lead, asked villagers to choose soil they thought contained gold, they took alluvium from the riverbed, result: slightly more gold and a small amount of mercury (less than in Bolikhamxay) • 3rd demonstration, tray sluice – short demonstration to show main idea of tray sluice, villagers took initiative to use sluice, angle of tray needed to be adjusted to change water flow, result: no gold • After the demonstration villagers experimented with the zig zag sluice, result: small amount of mercury and some gold
2	Ban Oudomsouk	About 30 people Equal numbers of men, women, and children Participants from the following villages: Ban Somsanouk,, Ban Oudomsouk, Ban Ha Phila	Retort demonstration – Day 1 • Retort demonstration included a presentation using the flip chart on sluice boxes, retorts, and the health effects of mercury • 1st demonstration, kitchen bowl retort – used pea-sized piece of amalgam, finished burning in approx. 5 minutes • 2nd demonstration, plumbing pipe retort – used copper wire to make trial amalgam, also burned quite quickly • Used fire blower to start the fire, but it was windy area so blower was not necessary to keep the fire hot
3	Sekong River near Ban Hat Xaykham	About 35 peoples. More men than women, 6-7 children Participants from the following villages: Ban Hat Xaykham Ban Tha Hin.	Sluice box demonstration – Day 2 • Did not use flip chart for the demonstration • 1st demonstration, zig zag sluice – demonstrated on pile of tailings from Sittixay Company's actions, Provincial DGM took the lead, dug a hole in the middle of waste pile to extract soil for demonstration, result: small amount of mercury (much less than in Bolikhamxay) and some gold – did not amalgamate • 2nd demonstration, tray sluice – water was flowing too slowly for a good result but the basic principle was demonstrated
4	Ban Hat Xaykham	About 40 people More men than women, 6-7 children Participants from the following villages: Ban Hat Xaykham Ban Tha Hin.	Retort demonstration – Day 2 • Retort demonstration included a presentation using the flip chart on sluice boxes, retorts, and the health effects of mercury • 1st demonstration, kitchen bowl retort – used copper wire to make trial amalgam, approximate burning time: 8 minutes • 2nd demonstration, plumbing pipe retort – burned a little slowly, fire may not have been hot enough, approximate burning time: more than 10 minutes • Used fire blower for the entire burning time

Material was distributed to Village Heads during the practical demonstrations as follows: 10 sets to Ban Oudomsouk; 5 sets each to Ban Somsanouk, Ban Ha Phila, Ban Hat Xaykham and Ban Tha Hin.

Each set of material contained the following items:

- Technical guidelines for the construction of sluice boxes
- Technical guidelines for the construction of retorts
- Mercury use guidelines

The Village Heads also received presentation handouts during the meeting in Sanamxay.

Interest in New Technology

People are interested enough in the equipment to want to start mining again.

Sluice Boxes

Participants were enthusiastic about the new technology. They immediately understood the technology and were able to operate the sluice boxes without difficulty. Some miners preferred the tray due to its simpler design. They suggested adding a rock separator (screen) to the tray sluice. Other miners preferred the zig zag sluice design, because it seemed more professional, and has the screen for separating rocks. They suggested attaching a water pump for washing the sand on the sluice.

Overall, the people commented that the sluice box is much more efficient and faster than panning for gold. Some villagers who have not mined in a few years are considering mining again, using the new technology.

Questions asked by participants during the demonstrations include:

- Can the size of the sluice box be changed? Can it be made larger? *Most villagers would like to construct a sluice box 50-100cm wide.*
- How much does the carpet cost?
- What is the best water flow in the sluice box and how do we attain it?

Retorts

A brief presentation on the health hazards of mercury and how to work safely with mercury was held villages Ban Oudomsouk and Ban Hat Xaykham. Then the plumbing pipe and kitchen bowl retorts were demonstrated to villagers using copper wire to form an amalgam with mercury.

The following comments were made by participants after the demonstration:

- Villagers were interested to hear about the dangers of mercury and how to prevent them. They were not previously aware of these potential hazards (e.g. in the past, they would just burn mercury on a spoon, and then sometimes even use that utensil for eating or cooking).
- A village gold trader mentioned that he routinely burns gold amalgam in the open with no consideration of recovering the mercury or of the health hazards involved.
- One family which has been mining for many years, started using large amounts of mercury after its introduction to the area. They complained of health problems in their 6 year old child, wondering if they were caused by mercury, listing the following symptoms: headaches; feeling cold; blood leaking out of skin (similar to dengue fever, though a health practitioner told them it was not dengue).

- The Head of the District Office explained to the villagers that recycling mercury will save them money. He encouraged villagers to pass the message about the safe use of mercury to other people. Regarding acquiring sluice boxes and retorts in the future, he suggested people form groups and take loans from their village administration, if necessary, for the purchase of needed parts. When people sell the gold they will be able to pay back their loans in installments.
- The Head of the District Office suggested that equipment use should be monitored in the future, if Central DGM is not available then perhaps Provincial DGM could take the role.
- Children play with mercury with their bare hands, and also burn mercury on their own to watch it disappear.

The miners in Attapeu preferred the plumbing pipe retort to the kitchen bowl retort. The advantages of the plumbing pipe retort include:

- It is less complicated than the kitchen bowl retort (i.e. easier to construct, requires fewer materials);
- It is more durable;
- It is easier to handle and operate ; and
- There is no need to pan the sand for mercury.

One difficulty is that villagers may have to source materials from Pakse (Champassak Province) to construct the plumbing pipe retort. The Project donated one plumbing pipe retort to each village.

Fire blower

Villagers found the fire blower helpful because it saves time, but they were not as interested in it as the villagers in Bolikhamxay.

Donated Equipment

The following equipment was donated to the Attapeu Provincial DGM Office.

- One zig zag sluice
- One tray sluice
- Two plumbing pipe retorts (medium size)
- One kitchen bowl retort
- Fire blower

This equipment is currently being held at the Sanamxay District Office to allow miners to replicate it. After approximately one month the equipment will be moved to the Attapeu Provinical DGM office where miners from all of the districts in the Province, will be able to borrow it. A 'memorandum' on the equipment handover to Sanamxay was signed between Central DGM, Provincial DGM, the District Office, and District STEO.

Additionally, the Project donated one plumbing pipe retort to each of the 5 villages involved in the demonstrations.

6.3 Field Visit Challenges and Achievements

The key challenges faced during the field visits can be summarized as follows:

1. The Government of Lao PDR has only limited resources (both human and financial) available to support the implementation of project initiatives. Human resource availability (both in terms of numbers and capabilities – refer to the challenge below) was an impediment during the implementation of project activities. While financing provided

by the project has helped overcome financial barriers during project implementation, this is expected to be a major barrier to ongoing work, such as continued health awareness and technology introduction.

2. There is limited technical expertise in artisanal and small-scale mining among staff at the Ministry of Energy and Mines at all levels of Government. While there are some qualified people within these departments, they tend to be very busy, and therefore, could only provide limited input into project activities.
3. Artisanal and small-scale mining is perceived as an activity that is difficult to manage, requiring significant resources to do so properly, and providing little benefit in return. Without sufficient resources, regulation of this activity will only have limited success, and therefore, it is difficult to convince Ministry personnel that it is worthwhile to invest time and resources in regulation.
4. Difficulties regarding communication between different organizations and Ministries within Government. This difficulty also applies to communication between Central Government and Provincial / District Government staff.
5. Villagers were hesitant to provide information on small-scale mining when Government personnel were present because, following the Ministerial Notice, all small-scale mining activity is illegal. Note: In Lao PDR, it is necessary to involve Government in field visits and community consultations.

Key achievements of the field visits include:

1. A series of field visits to government identified areas with increased mining activity. Field visits functioned to:
    a. Introduction of efficient gold mining technology to Village Heads and miners of 11 villages in 2 provinces;
        i. Bolikhamxay Province – 6 villages – approximately 115 participants
        ii. Attapeu Province –5 villages – approximately 75 participants
    b. Increased communication between Central and Local DGM;
    c. Increased capacity of Central and Local DGM to carry out technology demonstrations and health awareness campaigns;
    d. Identification of further areas of concentrated mining activity;
    e. Adaptation of Project activities to the actual mining situation in Lao PDR; and
    f. Increased understanding the scale and dynamics of ASM in Lao PDR.

7. Contract Administration

7.1 Reporting

Throughout the Project implementation period, a number of reports were submitted as per the contract (Table 7.1).

Table 7.1 Reporting Milestones

Progress Report	Submission Date	Status
Report 1: July and August	August 15, 2006	Complete
Report 2: September and October	October 15, 2006	Complete
Report 3: Update Report	End November 2006	Complete
Report 4: Field Report - Reconnaissance Survey	February 15, 2007	Complete
Report 5: Draft Final Report	March 31, 2007	Complete
Report 6: Final Report	April 30, 2007	Complete

7.2 Financial Statement

During the Project implementation, no proposed amendments to the Lump Sum Fee of US$ 74,500 were required. Table 7.2 shows the detailed breakdown of Project costs.

Table 7.2 Study Costs

Activity	Frequency	Unit Cost	Cost per Unit	Subtotal	Cost to Date
1. Organize a multi-stakeholder technical workshop in Vientiane and regional workshops as deemed necessary.					
Organize up to 4 meetings with relevant agencies prior to the workshops	8	person/day	500	4,000	4,000
Venue and equipment for workshops	3	days hire	1,000	3,000	3,000
Translate and develop material for presentation	2	person/day	500	1,000	1,000
Translation services, transport, material preparation for onsite workshop	3	person/day	500	1,500	1,500
Develop and translate campaign materials	2	person/day	500	1,000	1,000
Report to UNIDO and meeting summary to participants	1	person/day	500	500	500

Regional workshops (Luang Prabang and Pakse)	3	person/day	1,000	3,000	3,000
Sub total				*14,000*	*14,000*
2. Determine the status of small-scale artisanal gold mining and mercury use in Laos and develop partnerships and coalition among stakeholders with similar interests.					
Labour costs (3 people to 6 sites)	18	person/site	500	9,000	9,000
Travel air/ground, transportation, per diem	18	person/day	500	9,000	9,000
Sub total				*18,000*	18,000
3. Health Awareness Material and Distribution.					
Adapt existing brochures to Lao PDR situation, translate; adapt to other situations as necessary	5	person/day	1,000	5,000	5,000
Create additional training materials or develop strategies under UNIDO direction and/or approval	5	person/day	1,000	5,000	5,000
Ancillary costs (publication and distribution)				4,000	4,000
Sub total				*14,000*	*14,000*
4. Equipment Acquisition.					
Review suppliers and equipment	1	person/day	500	500	500
Purchase of equipment				10,000	10,000
Sub total				*10,500*	*10,500*
5. Legislation introduction.					
Assist UNIDO with introduction of appropriate legislation to central government agencies	5	person/day	500	2,500	1,000
Sub total				*2,500*	*1,000*
6. Establish a project management system and reporting schedule for regular liaison with UNIDO.					
Monthly progress reporting to UNIDO	14	person/day	500	7,000	7,000
Sub total				*7,000*	*7,000*
7. Final Report					
Production of final report	10	person/day	500	5,000	5,000
Photographic records, mapping, etc	3	person/day	500	1,500	1,500
Sub total				*6,500*	*6,500*
8. Other Project Operating Costs.					
Miscellaneous identifiable expenses				1,000	1,000
Contingency funds				1,000	1,000
Sub total				*2,000*	*2,000*
Grand total				**74,500**	**74,500**

7.3 Payment Schedule

Consistent with the Consultant's request for amendment to the Study reporting requirements, the payment schedule is presented in Table 7.3.

Table 7.3 Payment Schedule

Milestone	Date	Payment
Receipt of Contract	June 2006	10,000
Placement of order for equipment	September 25, 2006	10,000
Report 2: September and October	October 15, 2006	20,000
Report 3: Field Report - Reconnaissance Survey	*February 15, 2007*	*20,000*
Report 5: Final Report	April 30, 2007	14,500

8. Recommendations

Recommendations resulting from this Project are directed to two separate groups:

- Ministry of Energy and Mines, Government of Lao PDR (GoL)
- United Nations Industrial Development Organization (UNIDO) Global Mercury Project

Recommendations to the Government of Lao PDR

1. Revise the Mining Law to include the following:
    a. Clarifications of mine site management responsibility; and
    b. More clear definitions of mine sizes – artisanal, small-scale, medium-scale, and large-scale
2. Continue to develop appropriate regulations for artisanal and small scale gold mining to support implementation of the revised Mining Law, including:
    a. Artisanal and small scale mining licenses;
    b. Regulations for mercury use;
    c. Appropriate systems for the management of mine safely, environmental protection, and the protection of human health
3. Incorporate draft Codes of Practice into official regulations for artisanal and small gold mining, including a ban on the use of the following mining technology / practices:
    a. Amalgamation plate sluice boxes
    b. Whole ore amalgamation
    c. Burning of amalgam without a retort
    d. Amalgamating in streams / rivers
4. Improve existing legislation to include mechanisms to obtain financial resources from the profits of small scale mining (i.e. a transparent regulatory and tax system for small scale mining).
5. Develop mechanisms to distribute these financial resources between different Government offices – Central, Provincial, and District DGM Offices.
6. Build capacity of provincial and district DGM personnel to allow for decentralization of licensing procedures once new mining law comes into effect.
7. Once new legislation is available, seek aid funding and / or technical assistance to support legislation implementation.
8. Establish a 'training mine' which can be used to train MEM employees, District and Provincial Government employees and miners in new technologies, mining best practice, legislation implementation, site inspection, etc.
9. Implement a follow up program in Bolikhamxay Province to:
    a. Determine whether or not artisanal miners have adopted the new technology next mining season, as well as to offer technical support for equipment use and modification to fit the local context;

b. Determine whether or not miners at the primary ore mining site have adopted the new technology, as well as to offer technical support for equipment use and modification to fit the local context; and

c. Reinforce the draft "Codes of Practice."

10. Follow up in Attapeu Province pilot villages to determine whether or not miners have adopted the new technology next mining season, as well as to offer technical support for equipment use and modification to fit the local context.

11. Implement a technology demonstration and mercury health awareness campaign in the mining villages identified in Luang Prabang.

Recommendations for UNIDO:

12. Conduct Phase 2 of the Global Mercury Project in Lao PDR. As mercury use in artisanal and small-scale mining is not yet as prevalent in Lao PDR as it is in other countries in the region, the Global Mercury Project in Lao PDR is an opportunity to undertake preventative measures instead of reactive measures.

13. Phase 2 should include a focus on mine safety and environmental rehabilitation in addition to mercury awareness.

14. Support the Government of Lao PDR to implement the above recommendations.

15. Future GMP activities, and any projects on artisanal and small-scale mining, should focus primarily on field activities as these proved to be effective.

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APPENDIX 1
REGIONAL WORKSHOPS: AGENDAS, PARTICIPANTS AND MINUTES

Outline of Workshop Agenda – Day 1

Time	*Presenter*	*Topic*
8:30 am	Nanong Khotpathoum *Earth Systems Lao*	*Workshop design and facilitation*
8:45 am	Mr Thongphat Inthavong Chansavath Boupha *DGM*	Introduction and opening remarks
9:00 am	Randy Baker *UNIDO Representative*	Introduction to the Global Mercury Project program, and overview of 2003 results
9:30 am	Randy Baker *UNIDO Representative*	Health hazards of mercury exposure
Break		
10:30 am	Hermann Wotruba *ASM Specialist*	Best mining practices and introduction to new mining technology (hand sluices; retorts)
11:30 am	Open forum	Comments, questions and answers
Lunch		
1:30 pm	Paul Cannon *Earth Systems Lao*	*Overview of mining and mercury use in Laos/Mekong* region
2:00 pm	Eravanh Boungnaphalom and Randy Baker *DGM / UNIDO Representative*	Next steps and solutions (e.g., training, technology, legislation, licencing, awareness raising)
2:30 pm	Provincial Representatives	Brief presentation of provincial level mining activities
Break		
3:30 pm	Open forum	Comments, questions and answers
4:00 pm	Nanong Khotpathoum *Earth Systems Lao*	Wrap-up
4:15 pm	Chansavath Boupha *DGM*	Closing remarks

Outline of Workshop Agenda – Day 2

(Day 2 activities in Vientiane are scheduled for the morning only)

Time	*Facilitator*	*Topic*
8:30 am	Nanong Khotpathoum *Earth Systems Lao* Eravanh Bounphalom *DGM*	Equipment demonstration, training of trainers
Lunch		
1:30 pm	Nanong Khotpathoum *Earth Systems Lao* Eravanh Bounphalom *DGM*	Equipment demonstration, training of trainers Consultation with gold-shop owners
3:00 pm	Nanong Khotpathoum *Earth Systems Lao* Eravanh Bounphalom *DGM*	Further discussion regarding use of equipment
4:00 pm	Chansavath Boupha *DGM*	Closing remarks

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

Vientiane, 18-19 September 2006

Name	City	Institute / Organization
Mr. Thongpath Inthavong	Vientiane Captial	Director General, DGM
Ms. Chansavath Boupha	Vientiane Capital	Country Focal Point, DGM
Mr. Eravanh Boungnaphalom	Vientiane Capital	Assistant to Country Focal Point
Mr. Nanong Khotpathoum	Vientiane Capital	Earth Systems Lao
Mr. Paul Cannon	Vientiane Capital	Earth Systems Lao
Mr. Xiong Tsechalicha	Vientiane Capital	Earth Systems Lao
Ms. Erin Aucoin	Vientiane Capital	Earth Systems Lao
Ms. Vilinthone Sacklokham	Vientiane Capital	Earth Systems Lao
Mr. Bouavong Luangkhot	Vientiane Capital	Earth Systems Lao
Mr. Randy Baker	Canada	CTA, UNIDO
Mr. Hermann Wotruba	Germany	Expert, UNIDO
Mr. Khampa	Vientiane Capital	DGM
Mr. Oudom	Vientiane Capital	DGM
Mr. Khamfeung	Vientiane Capital	Dept. of Energy and Mines
Mr. Vilayvone	Vientiane Capital	Dept. of Public Health
Dr. Wattana	Vientiane Capital	Center for Water Supply and Environmental Health
Ms. Vilaythone	Vientiane Capital	Dept. of Foreign Cooperation
Mr. Phonepaseuth	Vientiane Capital	Lao National Mekong Committee
Dr. Kheungkham	Vientiane Capital	UNIDO Head of Operation
Mr. Soraphay	Vientiane Province	Dept. of Energy and Mines
Mr. Saykham	Bolikhamxay Province	Dept. of Energy and Mines
Mr. Manilai	Bolikhamxay Province	DEM, Khamkeut (Lak Sao) District
Mr. Somphone	Bolikhamxay Province	Dept. of Energy and Mines
Mr. Phaymany	Khammounane Province	Governor's Office
Mr. Keo Oudone	Khammounane Province	Dept. of Energy and Mines
Mr. Phetsadong	Khammouoane Province	Dept. of Industry and Handicraft
Mr. Somlith	Vientiane Capital	Miner, private sector
Mr. Viengsamay	Vientiane Capital	Miner, private sector
Ms. Maork	Vientiane Province	Miner, private sector

Outline of International Stakeholder Workshop Agenda

Time	***Presenter***	***Topic***
1:15 pm *(15min)*	Thongpath Inthavong Chansavath Boupha *DGM*	Introduction and opening remarks
1:30 pm *(15min)*	Eravanh Boughnphalom and Randy Baker *DGM / UNIDO Representative*	Introduction to the Global Mercury Project
1:45 pm *(15min)*	Randy Baker *UNIDO Representative*	Health hazards of mercury exposure
2:00 pm *(15min)*	Hermann Wortuba *ASM Specialist*	Best mining practices and introduction to new mining technology (hand sluices; retorts)
2:15 pm *(15min)*	Paul Cannon *Earth Systems Lao*	Overview of small-scale mining and mercury use in Lao PDR
Break (15min)		
2:45 pm *(15min)*	Randy Baker *UNIDO Representative*	UNIDO / DGM activity program in Lao PDR (technology, legislation, licensing, awareness raising)
3:00 pm *(45min)*	*To be identified*	Brief presentations by select participants on their current involvement in, and/or perspectives on, the small-scale mining sector
3:45 pm *(30min)*	*Open forum*	Comments and questions
4:15 pm *(10min)*	Chansavath Boupha *DGM*	Closing remarks

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

International Stakeholders Workshop

Vientiane, 19 September 2006

Name	City	Institute / Organization
Mr. Thongpath Inthavong	Vientiane Captial	Director General, DGM
Ms. Chansavath Boupha	Vientiane Capital	Country Focal Point, DGM
Mr. Eravanh Boungnaphalom	Vientiane Capital	Assistant to Country Focal Point
Mr. Nanong Khotpathoum	Vientiane Capital	Earth Systems Lao
Mr. Paul Cannon	Vientiane Capital	Earth Systems Lao
Mr. Xiong Tsechalicha	Vientiane Capital	Earth Systems Lao
Ms. Erin Aucoin	Vientiane Capital	Earth Systems Lao
Ms. Vilinthone Sacklokham	Vientiane Capital	Earth Systems Lao
Mr. Randy Baker	Canada	CTA, UNIDO
Mr. Hermann Wotruba	Germany	Expert, UNIDO
Ms. Emily Russell	Vientiane Capital	Third Secretary, Australian Embassy
Mr. Frank Reimann	Vientiane Capital	Country Director, CARE
Mr. Sota Sekine	Vientiane Capital	Assistant Res. Rep., JICA
Mr. Mitthavisouk Rattana	Vientiane Capital	Assistant Program Officer, JICA
Mr. Hans Guttman	Vientiane Capital	Programme Coordinator, Env. Div., Mekong River Commission
Mr. Morten Larsen	Vientiane Capital	Infrastructure Officer, World Bank
Mr. Stephen Ling	Vientiane Capital	Environmental Specialist, World Bank
Mr. Martin Fodor	Washington, USA	Environmental Specialist, World Bank
Mr. Dominic Cooper	Vientiane Capital	Research Assistant, Wildlife Conservation Society
Ms. Pauline Gerrard	Vientiane Capital	Ecoregion Coordinator, World Wildlife Fund

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

Vientiane, 18-19 September 2006

Workshop Minutes

Monday September 18

The workshop in Vientiane began at 08:30 at the DGM offices. There were formal introductions by Nanong, Dr. Khenungkham Keonuchan (head, UNIDO operations) and Mr. Thongphat Inthavong, Director of DGM in Vientiane. Both Kheungkham and Mr. Thongphat left within the first hour. There were approximately 17 individuals, mostly from DGM, three miners and a few STEA representatives.

The specific objectives of the workshops are:

- Increase awareness of the UNIDO Global Mercury Project and its objectives to government agencies.
- Introduce appropriate small-scale mining techniques and equipment to the Department of Geology and Mines and to local communities and miners.
- Increase awareness of the potential environmental and health impacts of small-scale mining activities, and identify effective awareness raising methods.
- Understand the extent and magnitude of small-scale and intermediate gold mining activities in Lao PDR, and identify potential focus areas for the implementation of pilot programs.
- Understand the permitting processes for small-scale and intermediate gold mining activities, and evaluate requirements for the introduction of new legislation / guidelines / institutional support specific to small-scale mining activities.

The workshop was moderated and translated by Nanong. Presentations on Current Status of the GMP project, results of the Luang Prabang Environment & Health Assessment and next steps were delivered by Randy Baker (and Eravanh Boungnaphalom), mining technologies by Hermann Wotruba and current status in Lao PDR by ESL (Paul Cannon).

Absent from the Monday meetings were all other stakeholders from the various donor and aid agencies. There were also three private sector miners in attendance. Important information that emerged over the course of the day from various people includes the following:

- The market price of Hg is about $60 US. Most probably comes from Viet Nam or directly via China.
- Mining has increased, particularly in the southern provinces, where dredging in the Sekong is also occurring. The government is not able to manage this activity due to no regulations and lack of training.
- I encouraged DGM staff and ESL to collaborate and provide us with as much information as possible for the next workshop to be held in April 2007. This will be held after final field visit – which should be near the middle of the mining season – tentatively scheduled for early April.
- Mr Soraphay of Vientiane province indicated that Hg was being used on a tributary to the Nam Neum reservoir, north of VT. In 2003, licenses were issued to carry out intermediate activities along the Mekong with a one-time annual renewal. In 2005 this was halted based on ministry decree until such time as appropriate legislation can be developed.
- About 620 gms of gold produced in this area with about 1.7 – 1.8 kg of mercury purchased/lost. No impact to river because of rapid dilution downstream because of hand digging of ore. Use Hg and a nylon fabric to squeeze the amalgam. A bamboo tube is used to retort Hg.
- Mr. Khamsing, Bolikhamxay province indicated that alluvial and primary ore is being processed. This is an unlicensed activity, but have allowed 4 families to carry this out. The army is now involved and although the statistics were unclear, perhaps up to 60 small crushing machines may be operating in up to 10 villages. The provincial authorities in Bolikhamxay would like help from UNIDO.
- The military operation, like Sepon mine, uses cyanide.
- Also seems that communities mining primary ore use mercury on copper amalgamation plates to trap gold. Regulations are needed to clearly define the difference between small scale and intermediate mining activities.

- Mr. Khamphou of Khammouane province indicated that since 2005 when the ministry stopped mining activities (except subsistence) that the gold may contain Hg that may be lost when processed in shops.

The workshop wrapped up about 4:30 pm. In the late afternoon we investigated an appropriate location along the Mekong to conduct a trial sluicing operation but could not find any because of high water and very muddy shorelines that would not be conducive for a demonstration to government officials in nice clothing. It was decided to hire some local guys to get some sand and deliver it to the DGM office to hold the demonstration there.

Tuesday September 19 – Vientiane

The morning was spent organizing everyone and the sluice and amalgamation materials for demonstration. The wooden sluice box was used to demonstrate how the hand sluice operation works. About 200 kg of sand and gravel was put through the sluice and a very small amount of gold was found. Everyone was very interested in this. All local materials and locally made.

Copper wire and mercury were combined to form an amalgam. A stove (not hot enough) was used to partially separate the two in a plumbing pipe retort. This did not work well enough as there was not enough heat. After burning, I used the Lumex to determine the amount of mercury in the area in various areas, which was very interesting to the participants. Back of Xiong's car where retort was stored was 35,000 ng/m^3; outside was 200 ng, inside room was 550 ng – simply from all of us "carrying" Hg into the room from our clothing, my breath went from 100 to 500 ng. This is despite that fact that a brand new, uncontaminated retort was used. It is clear that retorts are not completely effective at containing Hg and residual mercury is released. This raises issues about proper storage of all retorts and any other materials that come in contact with evaporated mercury.

Sluice and Retort Demonstration:

All local guys and provincial officials left at lunch. At 1:30 we met with representatives from WWF (Pauline Gerrard), Australian embassy (Emily Russell), Wildlife Conservation Society (Dominic Cooper), World Bank (Stephen Ling, Morten Larsen), and Martin Fodor (WB Washington), Mekong River Commission (Hans Guttman), Mr. Sekine Sota and Mitthavisouk Rattana of Japan International Cooperation Agency (JICA) and CARE (Frank Reimann).

Hans Guttmann indicated that they have concerns about Hg lost and biodiversity impacts from ASL on the Sekong River. Pauline Gerrard echoed this and area aware of dredge operations on this river. The also have concerns because of the trans-boundary issues of Hg.

Morten Larson of WB indicated that 1) there is a Sector Plan for the mining industry in progress to address both large and small-scale operations. This should be ready in draft form in a month or so. 2) A set of recommendations has been prepared for government to form sector policy for mining to revise and strengthen the Lao PDR Mining Law. WB recognizes that small scale mining is critical for direct poverty alleviation. Need to form this sector into a more coherent body. DGM is responsible for monitoring and evaluation for ASM, especially at the provincial level.

Sekine Sota (JICA) indicated that geological maps (desktop) study is being compiled in Lao PDR at different scales (1:million to 1:10,000 scale) in special areas (Phu Bia and Attepeu). There is also a GIS component.

Pauline Gerrard (WWF) expressed concern about the Sekong region, discussed contract results to ESL, mining is BIG in Viet Nam and increasing in Cambodia, similar concern in Lao PDR.

Emily Russell (AusAid and Embassy) presented information developed by AusAid on developing water quality guidelines in Lao, including for mercury and Lao drinking water quality guidelines/standards. Their main focus is on arsenic in drinking water. They encourage sustainable development of the mining sector, especially because of the large presence of Australian companies in Lao PDR.

Stephen Ling (WB) spoke of NamTheun II hydroproject and the concerns that the company has regarding overlap of the NamPon resettlement area and ASM. The Watershed Management and Protected Area (WMPA) includes villages outside the

protected area with whom the WB works to alleviate poverty. I spoke at some length about the issue of hydroelectric development and its relationship with causing increased mercury in fish. This could lead to the potential for some confusion as to what group will be responsible for the inevitable increase in mercury observed in fish in the new reservoir. I contended that the power company will blame the miners despite the fact that it will likely be the result of flooding. No baseline data on fish Hg have been collected or are planned to be collected.

Stressed that these organizations can be our "eyes and ears" on the ground and to communicate information to ESL, DGM and us directly; also if they need any technical information on ASM, Hg, etc to contact us, DGM and ESL. The meeting adjourned about 4:30 pm.

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

Pakse, 20-21 September 2006

Name	City	Institute / Organization
Ms. Chansavath Boupha	Vientiane Capital	Country Focal Point, DGM
Mr. Eravanh Boungnaphalom	Vientiane Capital	Assistant to Country Focal Point
Mr. Nanong Khotpathoum	Vientiane Capital	Earth Systems Lao
Mr. Paul Cannon	Vientiane Capital	Earth Systems Lao
Ms. Erin Aucoin	Vientiane Capital	Earth Systems Lao
Ms. Vilinthone Sacklokham	Vientiane Capital	Earth Systems Lao
Mr. Randy Baker	Canada	CTA, UNIDO
Mr. Hermann Wotruba	Germany	Expert, UNIDO
Ms. Phaymany	Champassak Province	Dept. of Energy & Mines
Mr. Vilakone	Champassak Province	Admin. Office of Champassak
Mr. Phetsamone	Champassak Province	Dept. of Public Health
Mr. Chonekao	Champassak Province	PSTEO
Mr. Vilaxay	Champassak Province	Mines Section, DEM
Mr. Sitthixai	Champassak Province	Miner, Private Sector
Mr. Khoun	Champassak Province	Southern Geological and Mining Sector
Mr. Bountong	Champassak Province	Dept. of Energy & Mines
Mr. Chansamone	Sekong Province	Dept. of Energy & Mines
Mr. Phetsamone	Sekong Province	Mines Section, DEM
Mr. Kikoe	Saravan Province	Dept. of Energy & Mines
Mr. Vaikhoun Ta in	Saravan Province	Mines Section, DEM
Mr. Vithaya Phommachanh	Attapeu Province	Dept. of Energy & Mines
Mr. Vannalay	Attapeu Province	Mines Section, DEM
Mr. Phomma	Savannakhet Province	Dept. of Energy & Mines
Mr. Vongvilay	Savannakhet Province	Mines Section, DEM

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

Pakse, 20-21 September 2006

Workshop Minutes

September 20

The workshop was held at the Provincial Offices in Pakse, and began at 8:30am.

Randy Baker and Hermann Wotruba delivered the introductory, mining and health and awareness of Hg presentations to about 16 people, mostly from the local DGM office (including Energy and Mines), Survey unit, provincial STEA, and local provincial government offices/agencies.

After lunch, Erin Aucoin-Wenkoff delivered the ESL "where are we now talk" and Eravanh Boungnaphalom spoke of next steps in Lao PDR. Erin Aucoin-Wenkoff and Paul Cannon presented information on the current status of ASM in Lao PDR, based mostly on their recent WWF contract. Chansavath Boupha made statements about the uncertainty of the ASM situation in Lao PDR; becoming more common but not following best practice, uncertain of Hg use and hazards. No laws or legislation regarding Hg use. In collaboration with UNIDO and ESL, with help from provinces, situation can be improved.

Pakse Workshop Southern Lao PDR:

Provincial government officials, asked "where does small scale mining stop and "intermediate" or semi-industrial mining start". The latter is currently banned, but uncertain at what level of village organization would small scale mining no longer be considered such. DGM had no good answer.

Presentations were then made by DGM representatives from the five southern provinces in Lao PDR.

Attapeu

Introductory statements by Energy and Mines from Attepeu province indicated that ASM is active in at least 11 sites, six primary and five alluvial involving many people. Three large "trial" surveys have been permitted in Vang Tat area by the local government. Others have been allowed to explore and survey. A license has been provided to "Sitthixai" of Vientiane for sand and gravel from the Mekong. The owner, Mr. Sithat Xaysoulivong was in attendance and is starting to use a sluice to capture *gold before he separates sand and gravel.*

In Attepeu, there has been an influx of people from Viet Nam with an introduction of technology. All units use Hg; the Army uses Hg for primary gold with "iron plates" coated with Hg to recover gold. The government advised that the army dig a pond to amalgamate gold. Amalgam is squeezed and burned openly. The Hg comes from Viet Nam. Some people do not use Hg, but dry and mouth blow to separate the gold. Many people are worried about the health effects of Hg and on environment, *although the government is allowing its use. This, and concerns about siltation and erosion resulted in a decree from the* central government to halt mining in this area in 2005. Locals want the activity to continue because of the need for this income. It is difficult to differentiate between ASM and a more "organized" mining activity, which would require licencing.

Alluvial gold production is 9 – 10 gm/d per dredge. About 18-20 people working on boat style dredges, 5 – 6 people per machine. Primary gold production by military is about 12 to 13 g gold/d per machine.

700 – 800 people in the province are mining, but only about 10% are using mercury. This may or may not change, depending on influence from Vietnam, and the increasing price of mercury.

September 21

Continuation of provincial presentations.

Sekong

Both primary and alluvial mining occurs along the Sekong and Sekaman rivers mostly during dry season from December to April. Mining occurs in 3 districts:

- District 1 there are 3 villages with 25 households doing panning to concentrate, although Hg is not used in favor of manual separation
- District 2 there are 8 families with 30 people using a similar process with no Hg
- District 3 there are 3 villages along Sekaman next to Vietnam

About 15 families with 50 people pan along the Sekong, using manual separation of large gold pieces. Panning occurs after rice harvest from January to May. Au is sold to Vietnam. Some people use machines, but whether Hg is used is not known. Local government wants to encourage people to work in groups to alleviate poverty, but the work is hard, benefits are uncertain and there are greater impacts to the environment.

For primary mining, the government has given a licence to one company to explore a concession area in association with an Australian company in cooperation with Sitthixai Group/Sekong River Mining Company. Mr. Xaysoulivong of Sitthixai Group seems to be a wealthy and influential person.

Saravan

Head of Energy and Mines, Saravan Province described that there is less activity here than in other provinces. Gold panning is a seasonal activity and no mercury is used. Panning areas are close to Vietnam and gold is sold across the border. Workers also move across the border. Possibly 2 – 3 villages pan, with only a few families per village.

Savannakhet

Savannakhet Province Department of Industry and Handicrafts has the Sepon Gold Project, only one of two gold mines in the country. Alluvial gold is panned but is very fine. This is an itinerant dry season activity conducted by a few people along the Nam Kok River.

Champassak Province is the most southerly in Lao PDR. The geological survey team has investigated all five southern provinces and has collected data at the village level. The Sekaman and Sekong river tributaries all have alluvial gold that is exploited by a small number of people. To mine, the husband gets into the middle of the river to collect heavy sand and gives to the wife to pan. This is hard work, therefore, they prefer to pan from along the river banks, although this yields less gold. Sometimes a "chick" machine from Thailand is used to get precious stones, including gold. Mercury is used to amalgamate the gold.

Earth Systems will generate a database of the number of people actively involved in gold mining and will integrate this with an estimate of gold production and mercury used/lost.

Later in the afternoon, all of the government officials, Hermann Wotruba, Randy Baker and Earth Systems Lao traveled to the sand and gravel extraction operation run by S.T Group to observe their equipment and to demonstrate the sluice box and retort in action.

Sitthixai Group is a major player and are keen to also extract gold before they sell sand and gravel.

Demonstration in Pakse

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

Luang Prabang, 2-3 October 2006

Name	City	Institute / Organization
Mr. Eravanh Boungnaphalom	Vientiane Capital	Assistant to Country Focal Point
Mr. Nanong Khotpathoum	Vientiane Capital	Earth Systems Lao
Mr. Paul Cannon	Vientiane Capital	Earth Systems Lao
Mr. Xiong Tsechalicha	Vientiane Capital	Earth Systems Lao
Ms. Erin Aucoin	Vientiane Capital	Earth Systems Lao
Mr. Bouavong Luangkhot	Vientiane Capital	Earth Systems Lao
Mr. Houmpheng	Luang Prabang Province	Administration Office
Mr. Houmpheng	Luang Prabang Province	Dept. of Energy & Mines
Mr. Somsanit	Luang Prabang Province	Dept. of Energy & Mines
Mr. Sumith	Luang Prabang Province	PSTEO
Ms. Bouachanh Nammavong	Luang Prabang Province	Vice President, Lao Women's Union
Mr. La	Luang Prabang Province	Gold Shop Representative
Mr. Thongkeo	Phongsaly Province	Dept. of Energy & Mines
Mr. Khamgnaeng	Bokeo Province	Dept. of Energy & Mines
Mr. Vanla	Oudomxay Province	Dept. of Energy & Mines
Mr. Thongsouk	Houaphanh Province	Dept. of Energy & Mines
Mr. Vanhthong	Xaiybouly Province	Dept. of Energy & Mines
Mr. Siphanh	Luangnamtha Province	Dept. of Energy & Mines
Mr. Thongphet	Xiengkhouang Province	Dept. of Energy & Mines
Mr. Houmphanh	Pak Ou District, LP	Administration Office
Mr. Bounkhong	Pak Ou District, LP	Dept. of Energy & Mines
Mr. Khampheui	Pak Ou District, LP	Dept. of Public Health
Mr. Chanpheng	Pak Ou District, LP	Experienced Miner, Ban Pak Ou
Mr. Sombouon	Pak Ou District, LP	Experienced Miner, Ban Houay Lo
Mr. Bouonkong	Pak Ou District, LP	Experienced Miner, Ban Kiad
Mr. Chai	Pak Ou District, LP	Experienced Miner, Ban Latthahai
Mr. Mai Onkeo	Pak Ou District, LP	Experienced Miner, Ban Pakchek
Mr. Sisouvanh	Chomphet District, LP	Administration Office
Mr. Sisavath	Chomphet District, LP	Dept. of Energy & Mines
Mr. Chan	Chomphet District, LP	Dept. of Public Health
Mr. Pheng	Chomphet District, LP	Experienced Miner, Ban Houay Koh
Mr. Siphanh	Chomphet District, LP	Experienced Miner, Ban Thinhong
Mr. Kham	Chomphet District, LP	Experienced Miner, Ban Houay Gno

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

Luang Prabang, 2-3 October 2006

Minutes of Workshop

A two-day workshop of the UNIDO GMP Project on '*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*' was successfully held in Luang Prabang on 2-3 October 2006. This workshop, one of a series of three regional workshops, was held with support from the United Nations Industrial Development Organization and organized by the Department of Geology and Mines, Ministry of Energy and Mines in association with Earth Systems Lao. Twenty-nine participants attended the workshop from the 8 Northern provinces of Lao PDR: Bokeo, Houaphan, Luangnamtha, Luang Prabang, Oudomxay, Phongsaly, Sayaboury, and Xieng Khouang provinces along with central government representatives from DGM and project officers from ESL. Following are proceedings of the workshop.

DAY ONE: 2 October 2006

MORNING SESSION

The morning session was devoted to DGM and ESL presentations followed by presentations by the Luang Prabang province participants.

Luang Prabang Province

Mr. Houmpheng Souvannaphakdi of the Department of Energy and Mines provided the following comments and issues:

There is a need for further awareness raising about mercury hazards to health in the future. He also inquired if there has been any assistance provided to those people who used mercury in gold mining and experienced health impacts. Mr. Eravanh clarified that the focus of this project is not on providing treatment, also that the extent of mercury health impacts to date remains insignificant.

Whether the current GMP Project will extend to a new GMP Phase 2, for there is still a need for more awareness building and capacity building support for the introduction of the new technology to miners.

He inquired where does mercury come from? While the definite source of mercury is not well known, it was said that mercury can be purchased at local gold shops in small glass bottles.

DGM considers maintaining its supportive role of monitoring of Luang Prabang equipment trial and awareness building (in collaboration with ESL), even though the degree and frequency of such support has not yet been defined.

With respect to the possibility for extension of the GMP project in Luang Prabang area, Mr. Nanong commented that our consultancy completes in February 2007. There may be a next phase but it is subject to the outcomes of evaluation and assessment of the current GMP 1.

AFTERNOON SESSION

Phongsaly Province

Represented by Mr. Thongkeo Larchomsy, Department of Industry and Handicrafts

Artisanal alluvial gold mining in Phongsaly Province is carried out in Khoa district where more than 180 people are involved from 3 villages. Activities are carried out during March-June every year. Hand panning tool is applied with no use of chemicals. The panning is on the Nam Phak River, a tributary of the Nam Ou.

When asked about the trend, the participant said that the mining has a tendency to increase.

Luang Nam Tha Province

Mr. Siphanh, Department of Energy and Mines

No gold mining of any scale has been allowed in the province but other deposits – lime, lignite, copper, sand – are mined.

Lignite mining has been carried out since 1994 in Vieng Phukha district in a concession area of 8 km^2. Two million tons/year of lignite have been produced for export. This is an investment by a Thai investor. No chemicals have been used.

Copper mining has been taking place in Long district since 2004 in a concession area of 4.25 ha. So far production for export was 790.98 tons. Chemicals used include sodium carbonate, sodium sulphate. Dynamite is used for blasting.

There were some gold mining activities dating before 1975 but people have stopped and shifted to other production such as rubber plantations.

Oudomxay Province

Mr. Phonkham, Department of Energy and Mines

Artisanal gold mining is carried out in two districts:

La district:

Three villages with a total of 148 households have been practicing family-based gold mining. Activities are carried out during March-June every year on the Nam Phak River. No chemicals and no mercury have been used. Gravity (blowing) method is applied for gold separation. Technology used includes hoes, chisels, shovels and wooden pans.

Pakbeng district:

Artisanal gold mining has been practiced on the Houay Xeng River involving 5 villages with at total of 223 households. Mining is carried out during March-June each year. Chemicals and mercury have been used. The mining involves extracting sand and alluvial deposits on the Houay Xeng River. Technology used includes hoes, chisels, shovels and wooden pans.

When asked about future trends, the participant replied that the Houay Xeng River is included in a concession area now, and so a survey is on-going.

Sayaboury Province

Mr. Vanh Thong, Department of Energy and Mines

(The description of the mining exploration given below was stopped following the 2005 Ministerial Notice.)

The participant started by giving a general overview of the mineral availability in the province. Mineral exploration (including for gold deposit) has been carried out by a Vietnamese company *'Duc Tian'* in a joint venture with Laotian. Exploration has been conducted in area close to Ban Vanphamon, Pak Lai district. Sixty workers are employed (five are Lao).

The exploration is done in two ways. The first method involves digging tunnels sized 1.2m x 1.5m into a mountain range, 10-12m deep. Machinery is employed in exploration work (in 7 sites). The second method is by using excavators to dig open pits on the mountain. The pits are of 10-15 wide and 5-8 m deep.

A number of mineral deposits are being tested in the exploration including for gold and copper, but so far there has been no laboratory analysis of the ore contents in each of the occurring deposits. Currently the company cannot determine the exact site of the main deposits.

When asked by the UNIDO project team if there will be any rehabilitation of the bored pits, the response was that it is only exploration stage, suggesting that issue of site rehabilitation is not yet considered.

There are some difficulties faced by the Sayaboury DEM in carrying out information gathering with the company due to the lack of necessary equipment. The participant put forward a request to the higher authority to provide some funding for the purchase of necessary equipment for the Mines Section. It was proposed also that DGM provide technical staff to work with the staff of the Sayaboury's Mines Section to monitor the exploration work of the company.

Xieng Khouang Province

Mr. Thongphet, Department of Energy and Mines

The Xieng Khouang participant reported that there was massive move to alluvial gold panning in Phou Kud district:

- On the headwaters of Nam Phae, within the Phu Bia Mining concession area, involving 3 villages with an estimate of over 100 households. Due to coarse gold no chemicals have been used. Average production was 1 *Baht* (i.e., approximately half an ounce) per month.
- In Nong Het district alluvial mining has been carried out on the Nam Khian River with a similar method as described above.
- There is small-scale mining activity undertaken by a mining industry group in a joint venture with a Vietnamese company who was granted the concession license in April 2005, employing 15 workers. The activities continued until December 2005 and were subsequently stopped following the Ministerial Notice. The equipment employed included 3 units of machinery and sluice boxes where mercury is added into the crushed ore in an open circuit with water pumped from the stream. Slurry is discharged into a pond of 4m x 4m x 15m after processing. When one pond fills up, another one is dug out and used. The mercury was reported to be from Vietnam.

The Xieng Khouang participant asked whether the mining of gold particles (alluvial gold) could be allowed for people to pan in the Nam Khian river area.

Mr. Nanong asked in relation to the alluvial gold panning in Phu Kud district whether there is any link with Phu Bia Mining that has motivated the people to mine. The participant confirmed that Phu Bia Mining does have this effect on artisanal mining activities in the area.

Luang Prabang

Mr. Houmpheng, Luang Prabang DEM then provided the following information of small-scale gold panning in Luang Prabang province. Mining has been carried out on the Nam Ou, Nam Khan and Nam Xeuang rivers, all tributaries of the Mekong, and on the Mekong itself. Mercury is used, although the impact remains negligible. The following are districts where gold panning is carried out in Luang Prabang:

- Viengkham disctrict 8 villages
- Pak Ou district 37 villages
- Pak Xeng district 5 village
- Nan district 7 villages
- Chomphet district 7 villages
- Ngoi district 10 villages

Mr. Houmpheng also noted that a Chinese company was mining on the Nam Ou just prior to the Ministerial Notice. Also, in the Pha Pun area there had been an economic feasibility study of gold mining conducted by a Chinese company (currently on halt pending central level decision). If the assessment turns out to be economical a mining concession may be resumed.

He made a proposal to DGM on the consideration to have both the regulation of mercury use and the promotion of alluvial mining.

Houaphan Province

Mr. Thongsouk, Department of Energy and Mines

Sand mining has been practiced for construction purposes for which one domestic business unit was already granted the investment concession. There are 11 villages with about 400 households involved in sand mining. Production is 300 m^3 per month. No gold mining activities.

Bokeo Province

Mr. Khamgnaeng, Department of Energy and Mines

Practice of alluvial gold mining on the Mekong has a long history in Bokeo. The panning is done during the dry season from March to May, especially by residents along the Mekong River banks. Two districts are engaged:

- Pak Tha district involving 6 villages with approximately 1,500-2,000 people/year.
- Tonh Pheung district – 1 village involved about 50-60 people per year.

The method used is hand panning with wooden pans and use of other tools like hoes, shovels, chisels, etc. Mercury is applied to the slurry to form amalgam concentrate. Gold production is 2-3 *Huns* (about 0.76 – 1.14g) per person per day. In Pak Tha district mercury is bought from Luang Prabang, whereas in Tonh Pheung district it is imported from Thailand. On average 2-3 *Thae* of mercury is used every year per person. One *Thae* (about 0.95g) of mercury is good for 4-5 applications.

Amalgam burning is done by having a plate or bowl as a container where the amalgam concentrate is placed. A bamboo pipe with one end cut off is then used to cover the bowl with the amalgam. It is then burnt and the vaporized mercury is captured in the bamboo retort. The mercury is collected from the bamboo tube by using a feather to gather the condensed mercury for re-use.

In addition to gold mining, people in Houay Xay district also engage in the artisanal mining of sapphires. The method does not involve any use of chemicals, however for industrial mining with government licenses, chemicals such as hydroxide of 10-70% and soda-ash (sodium sulphate) have been used for cleaning.

The Bokeo participant proposed (in his written notes) to the workshop that in view of expanding the awareness raising, would DGM in cooperation with UNIDO make a trip to Bokeo to collect further data. Alternatively, it was proposed if the project can provide a budget and coordinate with the local government for the dissemination of awareness materials.

DISCUSSION

The following discussions were held after the completion of the provincial presentations:

1. The Ban Kiad headman noted that there is no regular panning, only during the dry season, and that mercury is not used on the Nam Ou. There are only 10-20 households out of the 130 household of the village engaged in gold panning. Perhaps, with the new technology there may be more people interested in the mining.
2. Pak Ou village (Luang Prabang) representative asserted that of the whole village only 9 households have been doing mining (though there used to be more people previously).
3. In Houay Loh village (Luang Prabang) people mine alluvial deposits by diving into deep water with oxygen pumps and breathing tubes, and gather underwater alluvial sand into plastic bags. With this method, miners produce

approximately 2 Huns[2] (about 0.76g) of gold per day, and sometimes as much as 1 Salung (3.8g). Mercury is used to amalgamate the concentrate.

4. The Xiengkhouang DEM representative made an inquiry addressed to Mr. Eravanh, DGM, that his province wishes to have clarification on whether alluvial mining is allowed to resume now (following 2005 Ministerial Notice).
5. Mr. Eravanh responded by admitting that he would be unable to provide a direct answer to the question but can instead provide some information about the situation. The new Ministry (Ministry of Energy and Mines) is still considering the whole issue – it is a complex one. We still cannot clearly differentiate between the medium and small-scale mining. The issue is that appropriate rules and regulations must still be developed.
6. Regarding the alluvial gold mining, Mr. Eravanh pointed out that as a policy the priority is primarily given to Lao people to pan but in reality this is not always the case. Also, the environmental impact of this mining is not yet well determined and understood. So, a re-assessment is required for all of these. If we know all the problems then we can solve them together.

CONCLUSION – DAY ONE

Mr. Eravanh reminded the participants that any further contacts could be made directly to DGM and ESL for information, clarification, etc. We will together support the implementation of this project to achieve a successful result. Please convey the awareness information further to other people including your families.

The workshop closed at 4:30pm.

DAY TWO: 3 October 06

Equipment demonstration; comments and feedback session

Actual demonstration of the equipment lasted for about 3 hours. Mr. Bouavong of ESL showed the operational procedure of the zig-zag hand sluice and then the retort for burning mercury. Explanation was given, for example, to question raised by participants on the degree of inclination of the sluice box, which can be adjusted just to ensure proper run-off, at the same time, to maximize gold particles to be trapped. Operation of an alternative model, "on-the water current" sluice box was also explained.

Following the collection of the concentrate, Ms. Chanpheng, an experienced miner from Pak Ou village, demonstrated the hand panning to get the slurry before mercury was added for the demonstration burning using a retort.

Plenary discussion and feedback includes:

1. *With the new sluice box the ore processing will be a lot faster. It will even be much faster if the on-water current* sluice is used (this seems more suitable along the Nam Ou)
2. A concern with the new sluice is that more labour will be required (at least 2 people needed to operate the equipment) – raised by Ms. Chanpheng of Pak Ou village.
3. It could be even more productive to increase the size of the sluice box so that bigger carpets can be used.
4. Need to know more about the effectiveness of sluice box compared with the hand pans.
5. Comments made by Mr. Houmpheng Khammany, Governor Office on the sluice box was that it would enable faster ore processing while the retort can enhance the recovery of mercury, thus reducing the environmental impact.
6. Mr. Eravanh explained the different possible types of retorts (eg, kitchen bowl is one simple possibility).

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[2] The traditional units of weighing remain a subject of systematization, and thus the calculations are just approximate.

7. ESL suggested that DEM Luang Prabang continue to conduct equipment demonstration and health awareness in mining communities, including gathering feedback from miners on the equipment operation and the health awareness dissemination. Mr. Eravanh suggested if the project could provide some financial support for DEM to further organize the demonstration. ESL sees this could be possible.

The session closed at 12:00.

APPENDIX 2
REPORTS OF ASM ACTIVITIES IN LAO PDR

Province	District	Village	River	Primary Gold	Alluvial Gold	No. people	Technology	Hg Used	Seasonal	Comments
Attapeu	Numerous sites in Sanxai, Phouvong, Saysetta and Samnamxai Districts	Activities concentrated in Vang Tat (Sanxai district)	Xekaman and Sekong		✓	700 - 800	Manual excavation, panning; gravity separation of coarse gold	×	✓	None
Bokeo	Pak Tha	Paktha, Houay Sa Gnuak, Hat Sa, Hat Donekeo, Paksoua, Done Tiun	Mekong		✓	1500-2000	Manual excavation, panning, mercury amalgamation of concentrate	✓	✓	- Mercury sourced from Luang Prabang - Mercury recovered using bamboo retorts - Gold production: ~ 0.76-1.14g/day - Mercury use: ~ 1.9-2.85g/yr
	Tonh Pheung	Nam Kuengkao	Nam Keung and Mekong		✓	50 -60	Manual excavation, panning, mercury amalgamation of concentrate	✓	✓	- Mercury sourced from Thailand - Mercury recovered using bamboo retorts - Gold production: ~ 0.76-1.14g/day - Mercury use: ~ 1.9-2.85g/yr
Bolikhamxay	Khamkeut	Numerous villages but concentrated in Nakadok	Nam Kata		✓	1000	Manual excavation, panning, amalgamation of concentrate.	✓	✓	- Vietnamese influence has resulted in increased mechanization and exploitation of primary ore - Mercury sourced from Vietnam
	Viengthong	NC	Nam Kading		✓	NC	Manual excavation, panning, gravity separation of coarse gold	×	✓	- Compressors and diving equipment deployed for the excavation of deep water deposits
Champassak	No reported artisanal gold mining activities									
Houaphan	No reported artisanal gold mining activities									

Province	District	Village	River	Primary Gold	Alluvial Gold	No. people	Technology	Hg Used	Seasonal	Comments
Khammouane	Boulapha	NC (close proximity to Vietnamese border)	NC		✓	NC	Manual excavation, panning, gravity separation of coarse gold	x	✓	Vietnamese influence confirmed
Luangnamtha	No reported artisanal gold mining activities									
Luang Prabang	Viangkham	8 villages	Nam Xeng		✓	NC	Manual excavation, panning, gravity separation of coarse gold / amalgamation of concentrate for fine gold	NC	✓	- Between 20-30 people are mining per village - The government specified these statistics are not current (from 2005) and that they have been unable to conduct a more recent survey
	Pak Ou	37 villages	Nam Ou, Mekong		✓	NC	*See above*	✓	✓	*See above*
	Pak Xeng	5 villages	Nam Xuang		✓	NC	*See above*	NC	✓	*See above*
	Nan	7 villages	Mekong		✓	NC	*See above*	✓	✓	*See above*

Province	District	Village	River	Primary Gold	Alluvial Gold	No. people	Technology	Hg Used	Seasonal	Comments
	Chomphet	7 villages	Mekong		✓	NC	*See above*	✓	✓	*See above*
	Ngoi	10 villages	Nam Ou		✓	NC	Manual excavation, panning, gravity separation of coarse gold	×	✓	*See above*
Oudomxay	La	Hat An, Houay Pea, Houay Jiea	Nam Phak		✓	148	Manual excavation, panning, gravity separation of coarse gold	×	✓	None
	Pakbeng	Houay Xengkham, Moksouk, Lay, Kham, Chieng	Houay Xeng		✓	223	Manual excavation, panning, amalgamation of concentrate for fine gold	✓	✓	None
Phongsaly	Khoa	Natoun, Hat Deua, Sopkai	Nam Phak, Nam Ou		✓	180	Manual excavation, panning, amalgamation of concentrate for fine gold	NC	✓	None
Saravan	Samouay	2-3 villages (not specified)	Xe Pon		✓	NC	Manual excavation, panning; gravity separation of coarse gold	×	✓	None
Savannakhet	Sepon	Ban Phonha	Nam Kok and Xe Bang Hiang		✓	NC	Manual excavation, panning; gravity separation of coarse gold	NC	✓	None

Province	District	Village	River	Primary Gold	Alluvial Gold	No. people	Technology	Hg Used	Seasonal	Comments
Sayaboury	No reported artisanal gold mining activities									
Sekong	Kalum	3 villages (not specified)	Sekong		✓	60	Manual excavation, panning; gravity separation of coarse gold	×	✓	Vietnamese influence from Quang Nam province
	Lamam	2 villages (not specified)	Sekong		✓	30	Manual excavation, panning; gravity separation of coarse gold	×	✓	None
	Dakchung	Ban Adoune, Ban TangGner, Ban Lai	Sekaman		✓	50	Manual excavation, panning; gravity separation of coarse gold	NC	✓	Vietnamese influence in recent times. Increased use of mechanized methods and possibly Hg
Vientiane Municipality	No reported artisanal gold mining activities									
Vientiane Province	No reported artisanal gold mining activities									
Xiengkhouang	Phou Kud	3 villages (not specified) ~ 100 households	Nam Phae		✓	200-300	Manual excavation, panning; gravity separation of coarse gold	×	✓	- Mining activities are believed to have increased due to influence of larger scale activities (Phu Bia Gold Mine)

Province	District	Village	River	Primary Gold	Alluvial Gold	No. people	Mining Unit	Technology	Hg Used	Additional Comments
Attapeu	Sanxai	Vang Tat Area	Xekaman	✓		NC	Military	Crushers, sluice boxes equipped with 'open-circuit' amalgam plates	✓	- Tailings released to river - Open burning of amalgam - Mercury sourced from Vietnam - Gold production: 12-13g/machine/day - Impacts on water quality observed by downstream communities
	Samnamxai	NS	Sekong		✓	100	Sitthixai Comany	18-20 mobile dredges (boats), sluice boxes, amalgamation of concentrate	✓	- Activity is seasonal - Open burning of amalgam - Gold production: 9-10g/dredge/day - Impacts on water quality observed by downstream communities - Activities have ceased since release of Ministerial Notice in 2005.
Bokeo	No reported small-scale gold mining activities									
Bolikhamxay	Khamkeut	Nakadok	Nam Kata	✓		100	Vietnamese-Lao joint venture	Manual excavation / tunneling; crushers, sluice boxes equipped with 'open-circuit' amalgam plate	✓	- Vietnamese influence has resulted in increased mechanization and exploitation of primary ore - Mercury sourced from Vietnam - Activities have ceased since release of Ministerial Notice in 2005.
	Khamkeut	Vangkor, Thongkhae	Nam Kata		✓	NC	Vietnamese-Lao joint venture	3-4 mobile dredges (boats), sluice boxes, amalgamation of concentrate	✓	None
	Khamkeut	Nakadok	Nam Kata	✓		100	Lao Military	Manual excavation; crushing machines; sluice boxes	NC	None

Province	District	Village	River	Primary Gold	Alluvial Gold	No. people	Mining Unit	Technology	Hg Used	Additional Comments
	Khamkeut	NC	Nam Phan	✓		NC	Lao Military	NC	NC	- Using cyanide - Have a tailing dam to trap cyanide tailings
Champassak	No reported small-scale gold mining activities									
Houaphan	No reported small-scale gold mining activities									
Khammouane	No reported small-scale gold mining activities									
Luangnamtha	No reported small-scale gold mining activities									
Luang Prabang	NC	NC	Nam Ou		✓	NC	Chinese company	NC	NC	- Production activities have ceased since release of Ministerial Notice in 2005.
	NC	Pha Phon area	NC	✓		NC	Chinese company	NC	NC	- Feasibilty studies have been suspended since release of Ministerial Notice in 2005.
Oudomxay	No reported small-scale gold mining activities									
Phongsaly	No reported small-scale gold mining activities									
Saravan	No reported small-scale gold mining activities									

Province	District	Village	River	Primary Gold	Alluvial Gold	No. people	Mining Unit	Technology	Hg Used	Additional Comments
Savannakhet	Sepon	NC	Xe Pon		✓	NC	Exploration company	NC	NC	- Exploration activities have ceased since release of Ministerial Notice in 2005.
Sayaboury	Pak Lai	Vang Phamon	NC	✓		60	Joint Lao-Vietnamese company	Mechanised methods for excavation and tunneling	NC	- Exploration for gold and copper
Sekong	Lamam	NC	Xekong		✓	NC	Sitthixai & Sekong River Mining Company	Exploration only	✓	- Activities have ceased since release of Ministerial Notice in 2005.
	Kalum	NC	Xekong	✓		30	Sekong River Mining Company (employed Bunthin Company)	Exploration only	NC	- Activities completed in 2004
Vientiane Municipality	No reported small-scale gold mining activities									
Vientiane Province	Keo-oudom, Thourakhom	Keo-oduom, Chieng	Nam Ngum		✓	6	NC	Compressors and diving equipment used for the excavation of deep water deposits; panning; amalgamation of concentrate; amalgam burning	✓	- Activities have ceased since release of Ministerial Notice in 2005 but resumed in February 2006 - Gold production: 540-620 g per year - Mercury use: 1.7-1.8 kg per year - Bamboo retorts used for burning amalgam

Province	District	Village	River	Primary Gold	Alluvial Gold	No. people	Mining Unit	Technology	Hg Used	Additional Comments
Xiengkhouang	Nong Het	Ja Meun	Nam Khian		✓	NC	Numerous small companies	NC Some use gravity separation of coarse gold	✓	- Average gold production: ~ 15 gr / mth
	Khun	NC	Nam Loi	✓		15	Joint: Lao-Vietnamese company	3 crushing machines; sluice boxes equipped with 'open-circuit' amalgam plate	✓	- Activities have ceased since release of Ministerial Notice in 2005 - Tailings are discharged to ponds - Mercury sourced from Vietnam - Mining 50m from Nam Loi

APPENDIX 3
AWARENESS MATERIALS: GMP PRESENTIONS IN LAO LANGUAGE

ສະເໜີລວມກ່ຽວກັບການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ ແລະ ການນຳໃຊ້ສານປາຫຼອດໃນສປປ ລາວ

ຄຸນລັກສະນະຂອງການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍໃນ ສປປ ລາວ

- ມີຂະແໜງການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍທີ່ດຳເນີນການຢູ່ໃນ ສປປ ລາວ
- ແຫຼ່ງລາຍຮັບທີ່ສຳຄັນສຳລັບປະຊາຊົນທີ່ຢູ່ໃນເຂດຊົນນະບົດ
- ກິດຈະກຳເຫຼົ່ານີ້ສ່ວນຫລາຍແມ່ນບໍ່ມີລະບຽບການຄຸ້ມຄອງ (ເຊັ່ນ: ບໍ່ມີການອອກໃບອານຸຍາດ)
- ການພິຈາລະນາກ່ຽວກັບບັນຫາສຸຂະພາບ, ຄວາມປອດໄພ ແລະ ສິ່ງແວດລ້ອມແມ່ນຢູ່ໃນລະດັບຈຳກັດ
- ບຸກຄົນທີ່ດຳເນີນງານຂາດຄວາມຮູ້ຄວາມສາມາດ

ຄຸນລັກສະນະຂອງການຂຸດຄົ້ນແຮ່ຂະໜາດນ້ອຍໃນ ສປປ ລາວ (ຕ)

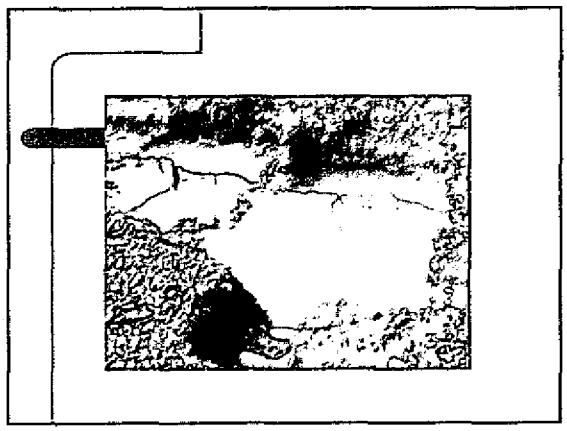
- ຜົນຜະລິດ, ເງິນເດືອນ ແລະ ລາຍຮັບຕ່ຳ
- ການດຳເນີນງານອີງຕາມລະດູການ ຫຼື ອີງໃສ່ລາຄາຕະຫຼາດ
- ເຕັກນິກການຂຸດຄົ້ນ ແລະ ການຜະລິດບໍ່ມີປະສິດທິພາບ
- ການຂຸດຄົ້ນເອົາແຮ່ທີ່ບໍ່ມີສ່ວນປະສົມຄຳສູງ/ຫຼືແຮ່ປະລິມານໜ້ອຍ
- ພາຍຫຼັງການຂຸດຄົ້ນໄດ້ສິ້ນສຸດລົງບໍ່ຄ່ອຍຈະໄດ້ຟື້ນຟູພື້ນທີ່ດິນ

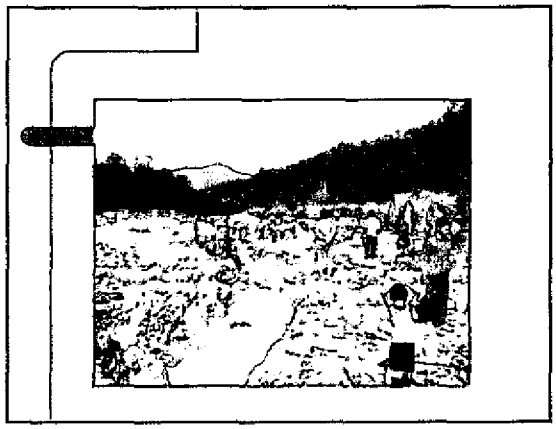
ຄຸນລັກສະນະຂອງການຂຸດຄົ້ນບໍ່ແຮ່ແບບຫັດຖະກຳຂະໜາດນ້ອຍ (ASM) ໃນ ສປປ ລາວ

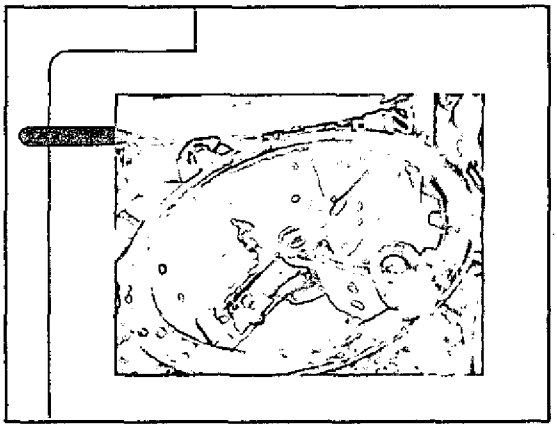
ຄຸນລັກສະນະຕ່າງໆ	ບໍ່ແຮ່ຂະໜາດນ້ອຍ	ຜູ້ຂຸດຄົ້ນແຮ່ແບບຫັດຖະກຳ
ຕົ້ນທຶນສຳລັບການລົງທຶນ	ຕ້ອງທຶນ / ປະເທດໃກ້ຄຽງ	ບໍ່ມີ
ເຕັກໂນໂລຢີ	ແບບພື້ນເມືອງ	ບໍ່ມີ
ຜົນຜະລິດ	ແຮ່ໂລຫະເຂັ້ມຂຸ້ນ / ວັດຖຸອຸດສາຫະກຳ	ເນື້ອຄຳຝອຍ
ຈຳນວນຄົນງານຕໍ່ບໍ່ໜຶ່ງແຫ່ງ	ກຳມະກອນ 10 – 150 ຄົນ	ຄົວເຮືອນ
ການພິຈາລະນາດ້ານສິ່ງແວດລ້ອມ	ບໍ່ມີ	ບໍ່ມີ
ສິດໃນການຂຸດຄົ້ນບໍ່ແຮ່	ມີຢູ່	ບໍ່ມີ (ຫຼື ມີຢູ່ສ່ວນໃດສ່ວນໜຶ່ງ)
ມີວິຊາວະກອນຊ່ວຍນຳ	ມີກະຈາຍຢູ່ສ່ວນໃດສ່ວນໜຶ່ງ	ບໍ່ມີ
ຍອດຂາຍ (ຕໍ່ປີ)	US$ 10,000 – 1 ລ້ານ	US$200-800 ຕໍ່ຄົວເຮືອນ

ລະດັບຂອງການຂຸດຄົ້ນບໍ່ແຮ່ແບບ ຫັດຖະກຳຂະໜາດນ້ອຍໃນ ສປປ ລາວ

- ຈຸດທີ່ຮູ້ຈັກດີ ແລະ/ຫຼື ຈຸດເກືອດທີ່ອາດເປັນໄປໄດ້ ລວມມີ:
  - ບັນດາລາຂາຂອງນ້ຳພາວ, ຫຼັກ 20
  - ຊະນະຄາມ; ກາສີ;
  - ສາຍນ້ຳ ເຊກອງ, ອັດຕະປື
  - ຊຳເໜືອ; ປາກແບງ; ຂວາ
- ຄວາມເປັນໄປໄດ້ສູງທີ່ປະເທດໃກ້ຄຽງເປັນຕົ້ນ ຫວຽດນາມ ແລະ ຈີນ ທີ່ດຳເນີນກິດຈະກຳນີ້ຫລາຍສິ່ງເປັນສະທ້ອນໃຫ້ມີຄົນເຂົ້າມາ ແລະ ນຳໃຊ້ວິທີການຕະຫຼອດຮອດເຕັກໂນໂລຢີຂອງພວກເຂົາຢູ່ໃນລາວ.







ລັກສະນະທຳມະຊາດຂອງ ASM ໃນ ສປປ ລາວ - *ເຕັກນິກ*

- ການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ ໂດຍສະເພາະຢ່າງຍິ່ງແມ່ນແຮ່ຄຳແຕ່ກໍ່ມີການຂຸດຄົ້ນຫີນລ້ຳຄ່າ (ຕົວຢ່າງເຊັ່ນ ແກ້ວປະເສີດ (sapphires) ຄືກັນ
- ການກິດຈະກຳຕາມລະດູການໃນຊ່ວງທີ່ນຳ້ລົງຕ່ຳ ສຳລັບຜູ້ຂຸດຄົ້ນທີ່ບໍ່ເປັນອາຊີບ
- ຄຳທີ່ໄດ້: ການຊ່ອນ, ດູດແຮ່, ຂຸດເຈາະ/ຂຸດຮ່ອງໃຕ້ດິນ, ຈັກບົດຫີນ, ເຄື່ອງແຍກແຮ່
- ຂະບວນການຜະລິດຄຳ: ໃຊ້ສານບາຫຼອດໂຮມແຮ່ປະສົມ, ການແຍກແຮ່ໂດຍໃຊ້ການພັດເປົ່າ, ສານໄຊຍານາຍ (?)

ຜົນກະທົບຂອງ ASM ໃນ ສປປ ລາວ

- ຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມທາງນ້ຳ:
  - ຜົນກະທົບຂອງຕະກອນຕໍ່ສິ່ງແວດລ້ອມທາງນ້ຳ
  - ການທຳລາຍປ່າ ແລະ ບຸກເບີກພື້ນທີ່
  - ການຕົກຄ້າງມົນລະພິດທາງເຄມີ (ສານບາຫຼອດ, ໄຊຍານາຍ (?))
- ຜົນກະທົບຕໍ່ສຸຂະພາບຂອງຄົນ ທີ່ກ່ຽວພັນກັບການໃຊ້ສານບາຫຼອດ :
  - ຄວາມເປັນໄປໄດ້ໃນການຊຶມຜ່ານເຂົ້າຫາລາຍໃນອາຫານ ໂດຍຜ່ານລະບົບນິເວດວິທະຍາທາງນ້ຳ
  - ການຫາຍໃຈເອົາອາຍທີ່ມີສານໄອລະເຫີຍເປື້ອນເຂົ້າໄປ
  - ຜົນກະທົບທີ່ກ່ຽວພັນກັບການນຳປະຊາຊົນເຂົ້າຫາພື້ນທີ່ເຂດໃໝ່:
  - ມີການຂຸດຄົ້ນຊັບພະຍາກອນເພີ່ມຂຶ້ນ
  - ຜົນກະທົບຕໍ່ເສດຖະກິດຂອງທ້ອງຖິ່ນ
  - ການນຳພະຍາດເຂົ້າໄປ

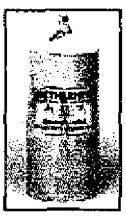
ກໍລະນີສຶກສາ – ການຫຼັ່ງໄຫຼໄປຂຸດຄຳ ທີ່ແຂວງ ກວາງນາມ, ຫວຽດນາມ

- ປະສົບການການຫຼັ່ງໄຫຼໄປຫາຂຸດຄຳໃນຊ່ວງໄລຍະ 5 ປີ ມານີ້
- ມີຂໍ້ຕົກລົງສຳປະທານຂຸດຄົ້ນຫລາຍກວ່າ 50 ແຫ່ງ ແລະ ມີການຂຸດແຮ່ຜິດກົດໝາຍຈຳນວນນັບບໍ່ຖ້ວນ. ໄດ້ຄາດຄະເນວ່າ ມີຜູ້ຂຸດຄົ້ນຄຳ ລະຫວ່າງ 5,000 ຫາ 10,000 ຄົນທີ່ກຳລັງດຳເນີນການຂຸດຄົ້ນ, ສ່ວນຫລາຍແມ່ນຜິດກົດໝາຍ.
- ຜົນກະທົບຕ່າງໆລວມມີ:
  - ມີມົນລະພິດເຄມີ ແລະ ຕະກອນຕໍ່ຊັບພະຍາກອນນ້ຳ
  - ມີການປ່ຽນແປງໂຄງສ້າງຂອງສາຍນ້ຳ
  - ສູນເສຍຊັບພະຍາບເປັນເນື້ອເປັນເຂດປ່າສະຫງວນ
  - ບໍ່ມີການຄວບຄຸມການຍົກຍ້າຍເຂົ້າໄປ ແລະ ມີຂໍ້ຂັດແຍ້ງກັບປະຊາຊົນທ້ອງຖິ່ນ

ການຄ້າສານບາຫຼອດໃນ ສປປ ລາວ

- ມີຄວາມຮູ້ໜ້ອຍກ່ຽວກັບການຄ້າສານບາຫຼອດຢູ່ໃນ ສປປ ລາວ, ອາດເປັນໄປໄດ້ວ່າມັນກ່ຽວຂ້ອງກັບ "ພໍ່ຄ້າມືກາງ" ຫລາຍຄົນ
- ຄວາມເປັນໄປໄດ້ແຫຼ່ງທີ່ມາຂອງສານບາຫຼອດຈາກອາຊີກາງລວມມີ ກຽກກິດສະຖານ ແລະ ຈີນ ຊຶ່ງ ອາດສາມາດສົ່ງເຂົ້າມາລາວຕາມທາງບົກຜ່ານດ່ານຊາຍແດນ ຫວຽດນາມ ແລະ ຈີນ
- ຂົນສົ່ງມາໃນລັກສະນະທາດແຫຼວໃສ່ບັ້ງ 76 lb ປອນ (35 kg)
- ລາຄາຕະຫຼາດໃນປະຈຸບັນແມ່ນ $60 USD / kg

ບັ້ງບັນຈຸສານບາຫຼອດໃນການຂົນສົ່ງ



- 76lbs ປອນ / 35kg
- ຂະໜາດບັນຈຸ 3 ລິດ
- ບັ້ງໃຊ້ຄືນໄດ້
- ເປັນບັ້ງເຮັດດ້ວຍເຫຼັກ

ກົນໄກລະບຽບການຄວບຄຸມ

- ກົດໝາຍຄຸ້ມຄອງທາງດ້ານບໍ່ແຮ່ລວມມີ:
  - ກົດໝາຍບໍ່ແຮ່ (1997)
    ດຳລັດວ່າດ້ວຍການຈັດຕັ້ງປະຕິບັດກົດໝາຍບໍ່ແຮ່(2002)
  - ກົດໝາຍປົກປັກຮັກສາສິ່ງແວດລ້ອມ (1999)
  - ລະບຽບການວ່າດ້ວຍການປົກປັກຮັກສາ ແລະ ຄຸ້ມຄອງສິ່ງແວດລ້ອມໃນວຽກງານບໍ່ແຮ່(2004)
- *ຜູ້ຂຸດຄົ້ນບໍ່ແຮ່ແບບພື້ນເມືອງທີ່ເປັນອາຊີບ ຕ້ອງໄດ້ຮັບໃບອານຸຍາດຈາກຫ້ອງການພະລັງງານ ແລະ ບໍ່ແຮ່ຂອງແຂວງທີ່ກ່ຽວຂ້ອງ, ຊຶ່ງຕ້ອງໄດ້ລາຍງານຕໍ່ຫ້ອງການຂອງກະຊວງ (ມາດຕາ 35, ກົດໝາຍບໍ່ແຮ່)*
- ແຈ້ງການຂອງລັດຖະມົນຕີກ່ຽວກັບການຢຸດຕິການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ (2005) ກົດໝາຍເພີ່ມເຕີມທີ່ຕ້ອງມີເພື່ອການດຳເນີນງານບໍ່ແຮ່ຂະໜາດນ້ອຍ
- ມີການຄວາມເຂັ້ມແຂງຕໍ່ຈັດຕັ້ງປະຕິບັດລະບຽບກົດໝາຍຈະຮຽກຮ້ອງເຖິງການເພີ່ມຊັບພະຍາກອນດ້ານການເງິນ ແລະ ມະນຸດ, ແລະ ການສ້າງຈິດສຳນຶກ

ບັນດາຜູ້ມີສ່ວນຮ່ວມ ແລະ ແຜນງານປະຈຸບັນ

- ລັດຖະບານລາວ
  - ກົມທໍລະນີສາດ-ບໍ່ແຮ່
  - ອົງການວິທະຍາສາດ ເຕັກໂນໂລຊີ ແລະ ສິ່ງແວດລ້ອມ
  - ອົງການຈັດຕັ້ງພາກລັດໃນການບັງຄັບໃຊ້ລະບຽບກົດໝາຍ
- ບໍລິສັດຂຸດຄົ້ນບໍ່ແຮ່ຂະແໜງເອກະຊົນ
- ຜູ້ໃຫ້ທຶນ ແລະ ອົງກອນຫລາຍຝ່າຍ
  - ອົງການແມ່ນ້ຳຂອງສາກົນ / ຄະນະກຳມະການແມ່ນ້ຳຂອງແຫ່ງຊາດລາວ
  - ອົງການ UNIDO / ອົງການ UNDP / ອົງການ ILO
  - ທະນາຄານໂລກ
  - ອົງການອົດສະເລຍ (AusAID) / ອົງການໄຈກາ (JICA)
- ອົງການຈັດຕັ້ງສາກົນທີ່ບໍ່ສັງກັດພາກລັດ (INGOs)
  - ອົງການ WWF / ອົງການ IUCN

ການປະເມີນຜົນຄວາມຕ້ອງການ

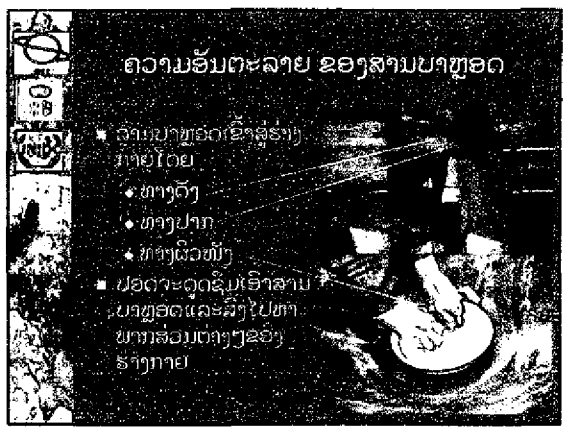
- ໂດຍທົ່ວໄປ ກິດຈະກຳຕ່າງໆບໍ່ຄວນຢຸດເຊົາ ແຕ່ຕ້ອງມີການເຂົ້າໄປມີສ່ວນກ່ຽວ ເພື່ອປັບປຸງທາງດ້ານສຸຂະພາບ, ຄວາມປອດໄພ ແລະ ການປະຕິບັດງານດ້ານສິ່ງແວດລ້ອມ.
- ມີການປັບປຸງ/ການດັດແກ້ລະບຽບກົດໝາຍ:
  - ແນະນຳກົນໄກດ້ານລະບຽບກົດໝາຍ ເພື່ອທີ່ຈະໄດ້ຮັບຊອນການເງິນຈາກຜົນກຳໄລຂອງການຂຸດຄົ້ນແຮ່ຂະໜາດນ້ອຍ (ຕົວຢ່າງ, ການອອກໃບອະນຸຍາດ)
  - ປັບປຸງລະບຽບກົດໝາຍເພື່ອໃຫ້ສອດຄ່ອງໃນການນຳໃຊ້ເຂົ້າກັບການຂຸດຄົ້ນແຮ່ຂະໜາດນ້ອຍ, ເຊັ່ນ: ການຈັດຕັ້ງປະຕິບັດດຳລັດ
  - ການປັບໃໝທີ່ເໝາະສົມຕໍ່ຜູ້ຂຸດຄົ້ນບໍ່ແຮ່ແບບຫັດຖະກຳ
  - ຄວບຄຸມກ່ຽວກັບການດູແລ ແລະ ນຳໃຊ້ສານບາຫຼອດ

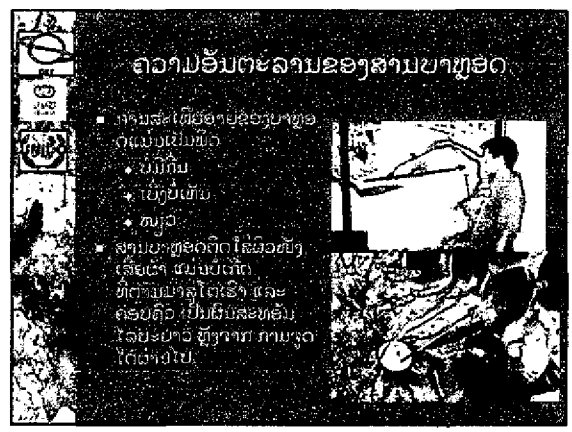
ການປະເມີນຜົນຄວາມຕ້ອງການ *(ຕໍ່)*

- ການສ້າງຄວາມສາມາດ – ການຕິດຕາມກວດກາ ແລະ ປະເມີນຜົນ
  - ການຝຶກອົບຮົມໃນລະດັບແຂວງ ເພື່ອສ້າງຄວາມເຂັ້ມແຂງຕໍ່ການຄວບຄຸມດ້ານລະບຽບກົດໝາຍ ແລະ ການຕິດຕາມກວດກາກັບທີ່
  - ກຸ່ມປະສານງານລະຫວ່າງລັດຖະບານສູນກາງ ແລະ ແຂວງ
- ການສ້າງຄວາມສາມາດ – ການຝຶກອົບຮົມດ້ານຜົນກະທົບສິ່ງແວດລ້ອມຂອງກິດຈະກຳຂຸດຄົ້ນບໍ່ແຮ່
  - ສ້າງຄວາມສາມາດດ້ານເຕັກນິກແກ່ລັດຖະບານຂັ້ນແຂວງ ແລະ ເມືອງ
  - ຜູ້ດຳເນີນການຂຸດຄົ້ນໄດ້ຮັບການຝຶກອົບຮົມກ່ຽວກັບການນຳໃຊ້ເຕັກນິກຂຸດຄົ້ນບໍ່ແຮ່ຢ່າງຖືກຕ້ອງ
- ການສຶກສາພາກສະໜາມ ແລະການເກັບກຳຂໍ້ມູນ
  - ລະດັບ ແລະ ລັກສະນະຂອງການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ
  - ປະເມີນກ່ຽວກັບລະດັບມົນລະພິດຕ່າງໆສິ່ງແວດລ້ອມ ເພື່ອກຳນົດບູລິມະສິດຂອງກິດຈະກຳຕ່າງໆ

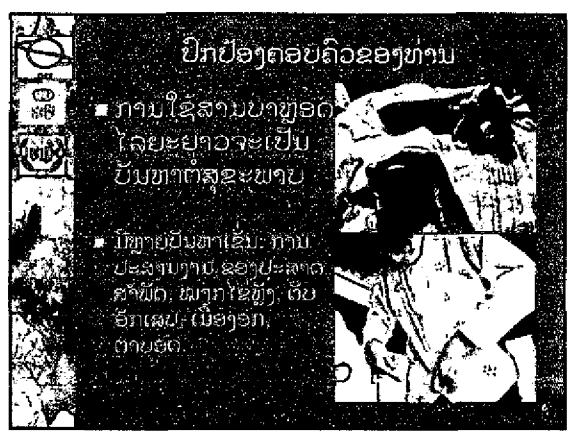

GEF-UNDP-UNIDO
Lao PDR

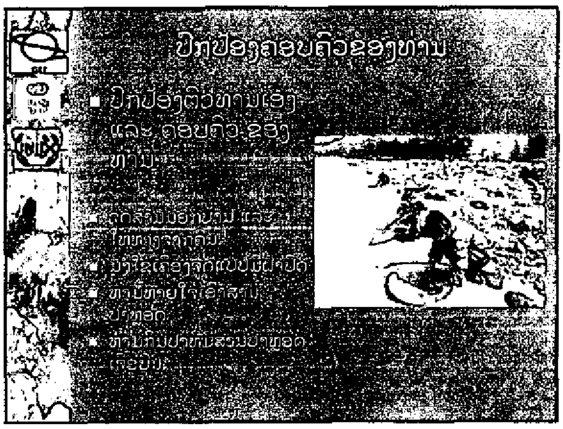

ການນຳໃຊ້ບາຫຼອດອາດມີອັນຕະລາຍໄດ້


ຄວາມອັນຕະລາຍ ຂອງສານບາຫຼອດ

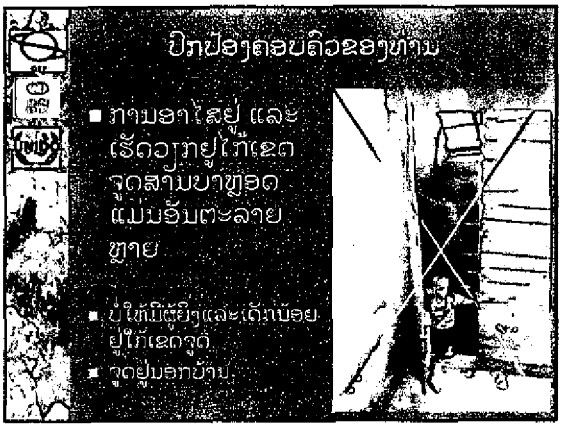

ຄວາມອັນຕະລາຍຂອງສານບາຫຼອດ

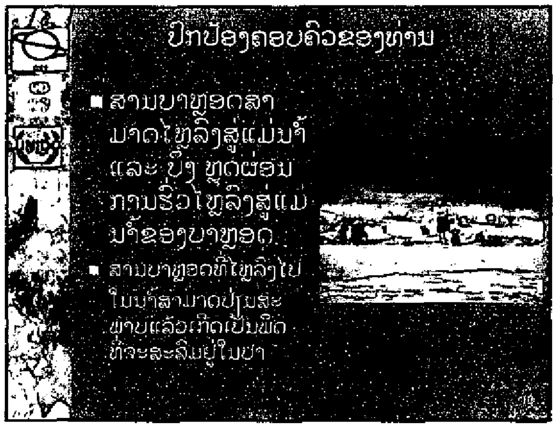

ປົກປ້ອງຄອບຄົວຂອງທ່ານ

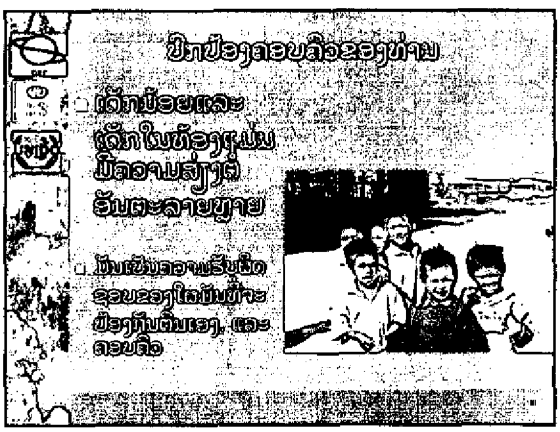

ປົກປ້ອງຄອບຄົວຂອງທ່ານ

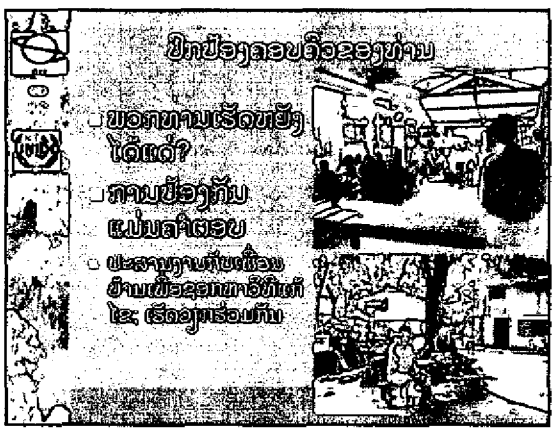

ປົກປ້ອງຄອບຄົວຂອງທ່ານ
ປົກປ້ອງຕົວທ່ານເອງ ແລະ ຄອບຄົວ ຂອງ ທ່ານ

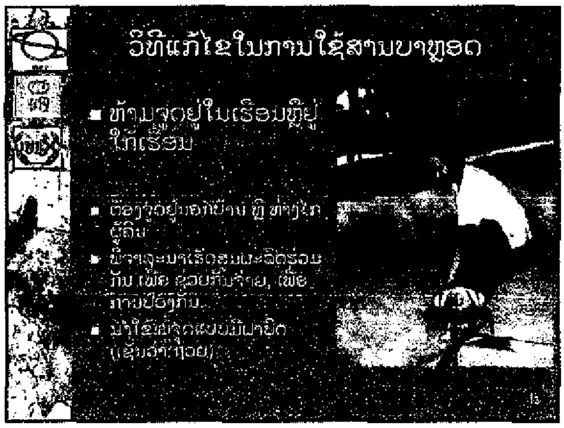

ປົກປ້ອງຄອບຄົວຂອງທ່ານ
ການຈູດສານບາ ຫຼອດແມ່ນອັນຕະ ລາຍທີ່ສຸດ

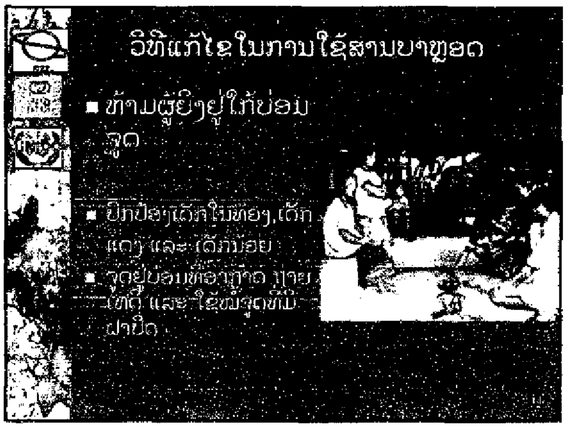

ປົກປ້ອງຄອບຄົວຂອງທ່ານ
ການອາໄສຢູ່ ແລະ ເຮັດວຽກຢູ່ໃກ້ເຂດ ຈູດສານບາຫຼອດ ແມ່ນອັນຕະລາຍ ຫຼາຍ
ບໍ່ໃຫ້ມີຜູ້ຍິງແລະເດັກນ້ອຍ ຢູ່ໃກ້ເຂດຈູດ
ຈູດຢູ່ນອກບ້ານ.


ປົກປ້ອງຄອບຄົວຂອງທ່ານ
ສານບາຫຼອດສາ ມາດໄຫຼລົງສູ່ແມ່ນ້ຳ ແລະ ບຶງ ຫຼຸດຜ່ອນ ການຮົ່ວໄຫຼລົງສູ່ແມ່ ນ້ຳຂອງບາຫຼອດ.
ສານບາຫຼອດທີ່ໄຫຼລົງໄປ ໃນນ້ຳສາມາດປ່ຽນສະ ພາບແລ້ວເກີດເປັນພິດ ທີ່ຈະສະສົມຢູ່ໃນປາ


ປົກປ້ອງຄອບຄົວຂອງທ່ານ
ເດັກນ້ອຍແລະ ເດັກໃນທ້ອງແມ່ນ ມີຄວາມສ່ຽງຕໍ່ ອັນຕະລາຍຫຼາຍ

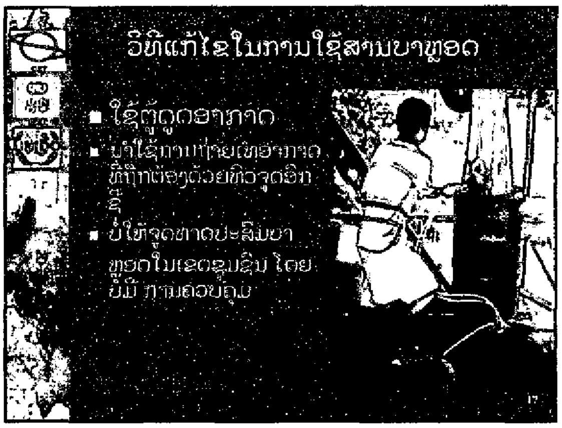

ປົກປ້ອງຄອບຄົວຂອງທ່ານ
ພວກທ່ານເຮັດຫຍັງ ໄດ້ແດ່?
ການປ້ອງກັນ ແມ່ນຄຳຕອບ
ປະສານງານກັບເພື່ອນ ບ້ານເພື່ອຊອກຫາວິທີແກ້ ໄຂ, ເຮັດວຽກຮ່ວມກັນ

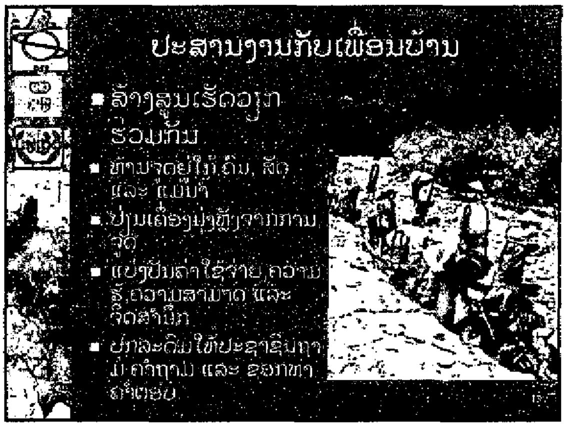

ວິທີແກ້ໄຂໃນການໃຊ້ສານບາຫຼອດ
ຫ້າມຈູດຢູ່ໃນເຮືອນຫຼືຢູ່ໃກ້ເຮືອນ
ຕ້ອງຈູດຢູ່ນອກບ້ານ ຫຼື ຫ່າງໄກຜູ້ຄົນ


ວິທີແກ້ໄຂໃນການໃຊ້ສານບາຫຼອດ
ຫ້າມຜູ້ຍິງຢູ່ໃກ້ບ່ອນຈູດ
ປົກປ້ອງເດັກໃນທ້ອງ, ເດັກແດງ ແລະ ເດັກນ້ອຍ
ຈູດຢູ່ບ່ອນທີ່ອາກາດ ຖ່າຍເທດີ ແລະ ໃຊ້ໝໍ້ຈູດທີ່ມີຝາປິດ

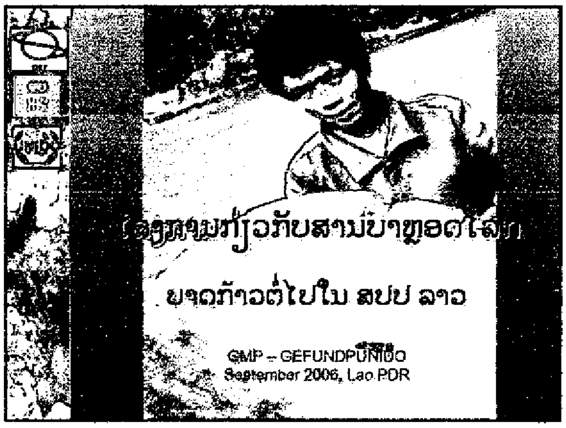

ວິທີແກ້ໄຂໃນການໃຊ້ສານບາຫຼອດ
ໃຫ້ເດັກນ້ອຍຢູ່ໄກຈາກເຂດຈູດສານບາຫຼອດ
ໃຊ້ອຸປະກອນຈູດທີ່ມີຝາປິດ

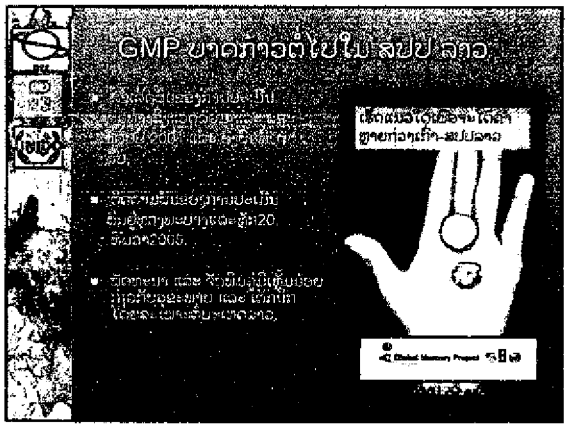

ວິທີແກ້ໄຂໃນການໃຊ້ສານບາຫຼອດ
ອຸປະກອນຈູດທີ່ມີຝາປິດ

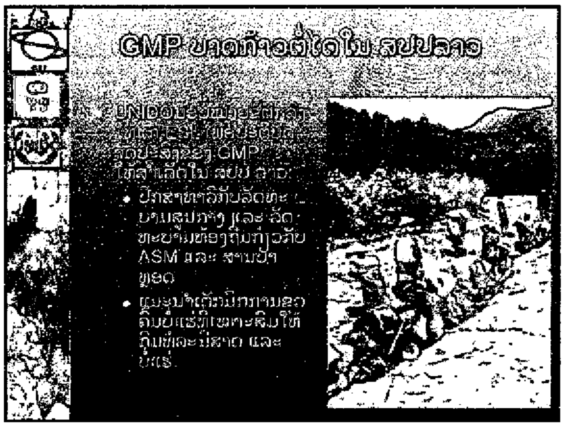

ວິທີແກ້ໄຂໃນການໃຊ້ສານບາຫຼອດ
ໃຊ້ຕູ້ດູດອາກາດ
ບໍ່ໃຫ້ຈູດທາດປະສົມບາຫຼອດໃນເຂດຊຸມຊົນ ໂດຍບໍ່ມີ ການຄວບຄຸມ

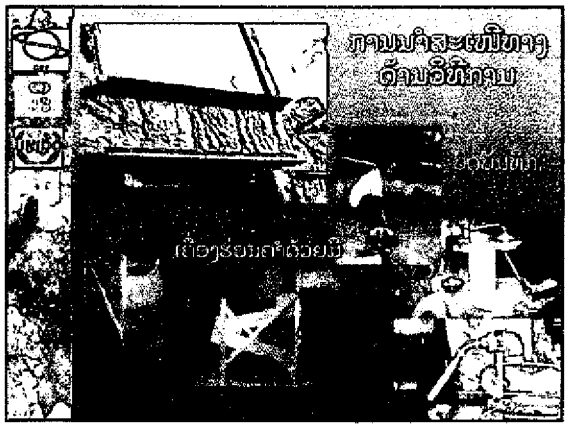

ປະສານງານກັບເພື່ອນບ້ານ
ສ້າງຊຸມເຮັດວຽກຮ່ວມກັນ
ແບ່ງປັນຄ່າໃຊ້ຈ່າຍ, ຄວາມຮູ້, ຄວາມສາມາດ ແລະ ຈິດສໍານຶກ

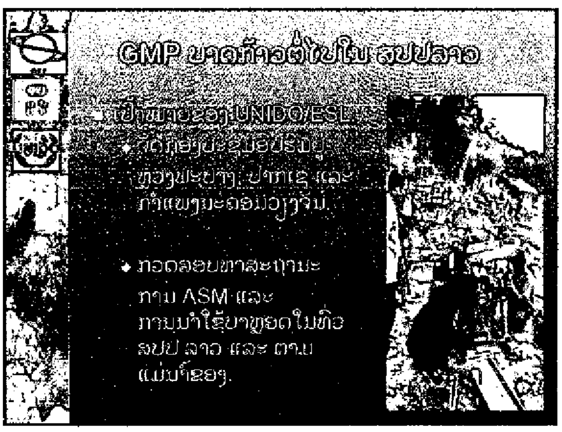

Global Mercury Project

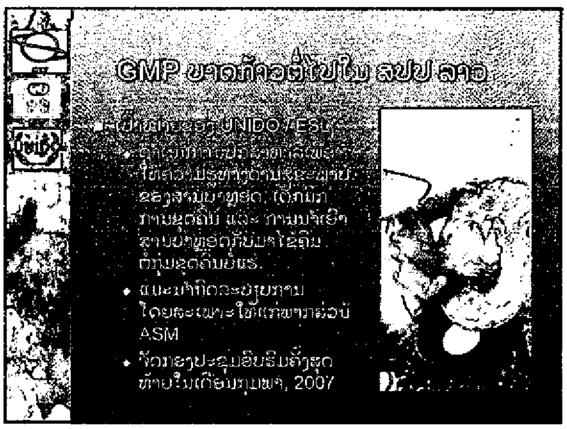

GMP – GEFUNDPUNIDO
September 2006, Lao PDR

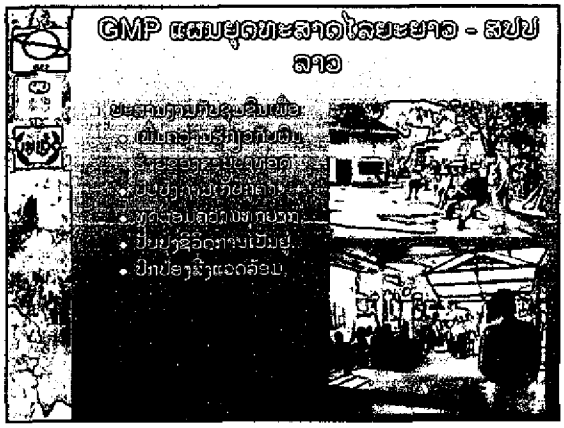


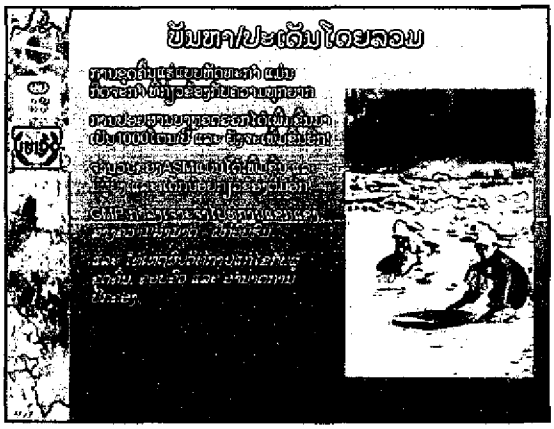




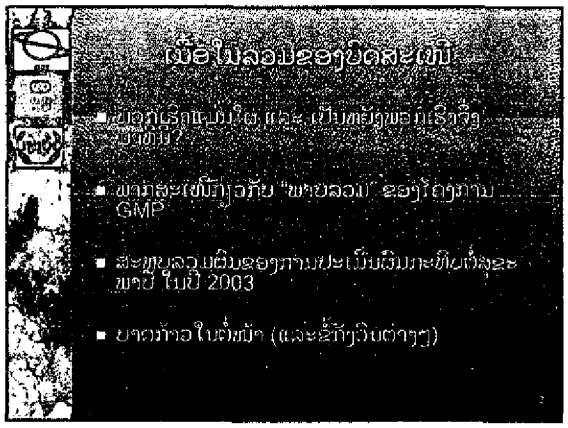

ASM

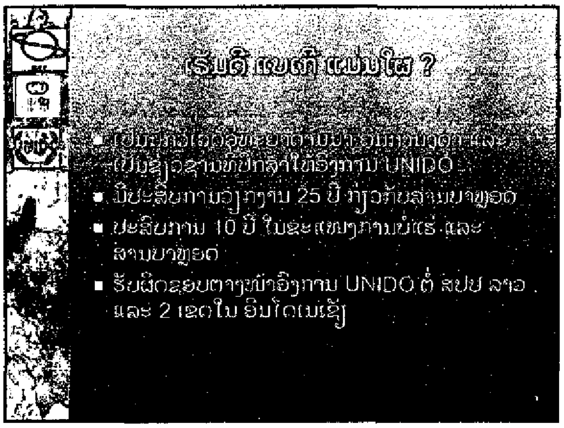

ASM

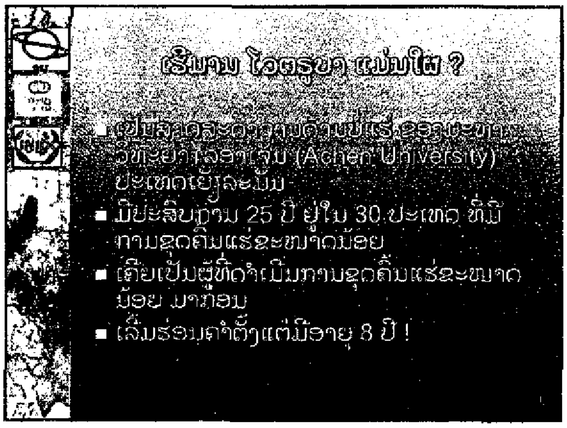

GMP ແຜນຍຸດທະສາດໄລຍະຍາວ - ສປປ ລາວ

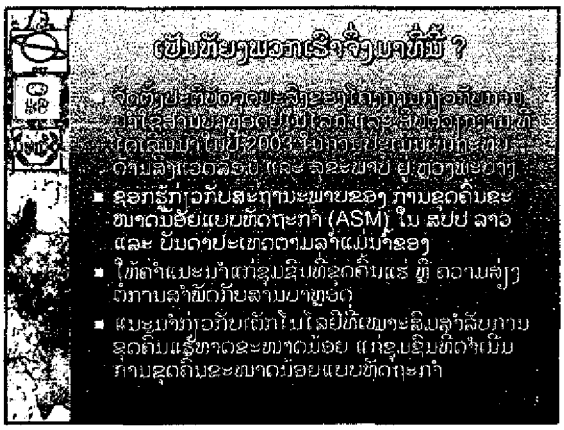

ບັນຫາ/ປະເດັນໂດຍລວມ

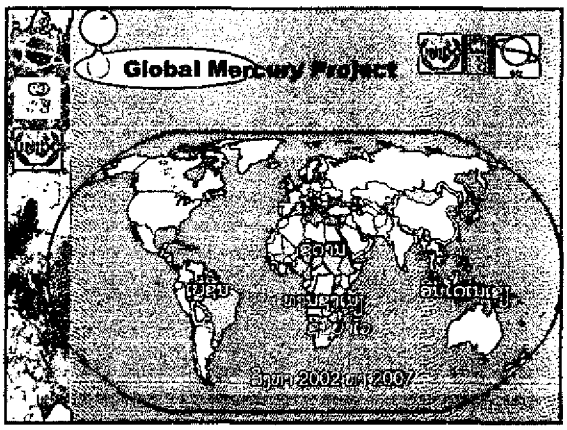

ໂຄງການກ່ຽວກັບການນຳໃຊ້ສານ
ບາຫຼອດທົ່ວໂລກ(GMP)
ການຂຸດຄົ້ນຄຳຂະໜາດນ້ອຍຢູ່ ສປປ ລາວ –
ຈຸດປະສົງຂອງ GMP ແລະ ສະຖານະພາບ
ໃນປະຈຸບັນ
Global Mercury Project – GEF-UNDP-UNIDO
September 2006, Lao PDR

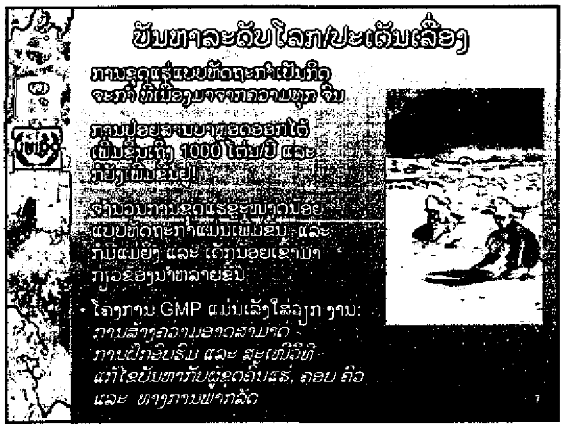

ເນື້ອໃນລວມຂອງບົດສະເໜີ
ພວກເຮົາແມ່ນໃຜ ແລະ ເປັນຫຍັງພວກເຮົາຈຶ່ງມາທີ່ນີ້?
ພາກສະເໜີກ່ຽວກັບ "ພາບລວມ" ຂອງໂຄງການ GMP
ສະຫຼຸບລວມຜົນຂອງການປະເມີນຜົນກະທົບດ້ານສຸຂະພາບ ໃນປີ 2003
ບາດກ້າວໃນຕໍ່ໜ້າ (ແລະຂໍ້ກັງວົນຕ່າງໆ)

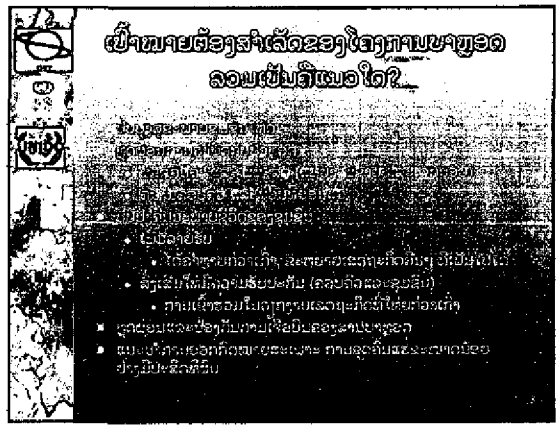

ເຣັນດີ ເບເກີ ແມ່ນໃຜ ?
ເປັນຊ່ຽວຊານທີ່ປຶກສາໃຫ້ອົງການ UNIDO
ມີປະສົບການວຽກງານ 25 ປີ ກ່ຽວກັບສານບາຫຼອດ
ປະສົບການ 10 ປີ ໃນຂະແໜງການບໍ່ແຮ່ ແລະ ສານບາຫຼອດ
ຮັບຜິດຊອບຕາງໜ້າອົງການ UNIDO ຕໍ່ ສປປ ລາວ ແລະ 2 ເຂດໃນ ອິນໂດເນເຊຍ

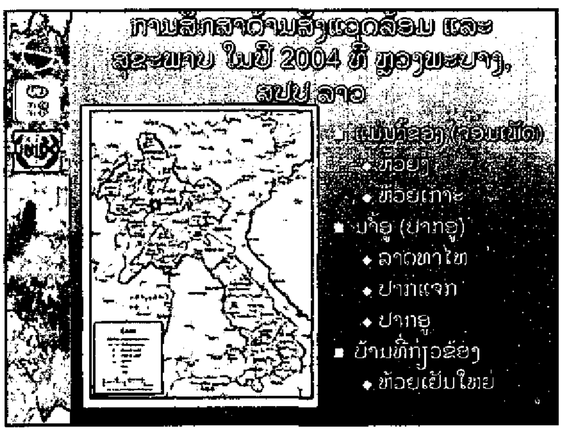

ເຣີນານ ໂວຕຣູບາ ແມ່ນໃຜ ?
ວິທະຍາໄລອາເຈັນ (Achen University) ປະເທດເຢຍລະມັນ
ມີປະສົບການ 25 ປີ ຢູ່ໃນ 30 ປະເທດ ທີ່ມີການຂຸດຄົ້ນແຮ່ຂະໜາດນ້ອຍ
ເຄີຍເປັນຜູ້ທີ່ດຳເນີນການຂຸດຄົ້ນແຮ່ຂະໜາດນ້ອຍ ມາກ່ອນ
ເລີ່ມຮ່ອນຄຳຕັ້ງແຕ່ມີອາຍຸ 8 ປີ !

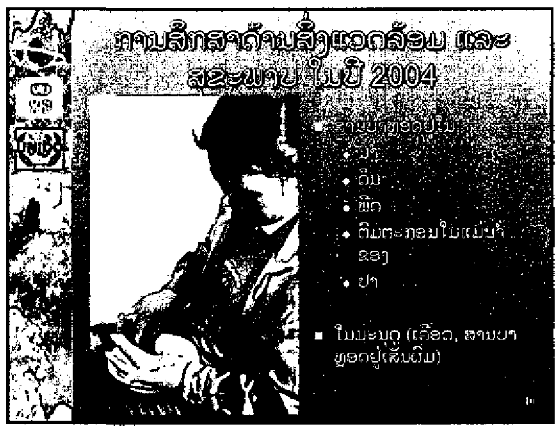

ເປັນຫຍັງພວກເຮົາຈຶ່ງມາທີ່ນີ້ ?
ຊອກຮູ້ກ່ຽວກັບສະຖານະພາບຂອງ ການຂຸດຄົ້ນຂະໜາດນ້ອຍແບບຫັດຖະກຳ (ASM) ໃນ ສປປ ລາວ ແລະ ບັນດາປະເທດຕາມລຳແມ່ນ້ຳຂອງ
ໃຫ້ຄຳແນະນຳແກ່ຊຸມຊົນທີ່ຂຸດຄົ້ນແຮ່ ຫຼື ຄວາມສ່ຽງຕໍ່ການສຳພັດກັບສານບາຫຼອດ
ແນະນຳກ່ຽວກັບເຕັກໂນໂລຢີທີ່ເໝາະສົມສຳລັບການຂຸດຄົ້ນແຮ່ທາດຂະໜາດນ້ອຍ ແກ່ຊຸມຊົນທີ່ດຳເນີນການຂຸດຄົ້ນຂະໜາດນ້ອຍແບບຫັດຖະກຳ

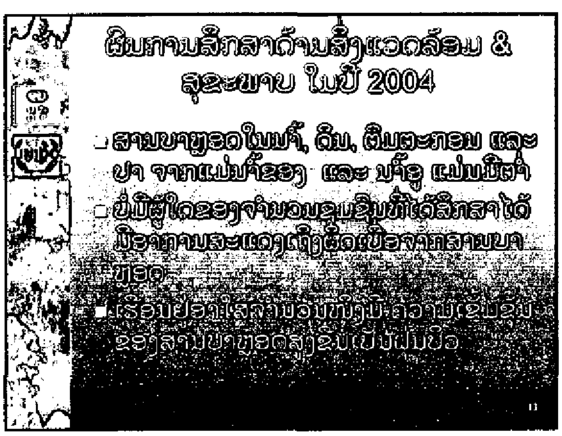

Global Mercury Project
ອິນໂດເນເຊຍ
ສິງຫາ 2002 ຫາ 2007


ບັນຫາລະດັບໂລກ/ປະເດັນເລື່ອງ
ການຂຸດແຮ່ແບບຫັດຖະກຳເປັນກິດຈະກຳທີ່ເນື່ອງມາຈາກຄວາມທຸກຈົນ
ການປ່ອຍສານບາຫຼອດອອກໄດ້ເພີ່ມຂຶ້ນເຖິງ 1000 ໂຕນ/ປີ ແລະ ກໍຍັງເພີ່ມຂຶ້ນ!
ຈຳນວນການຂຸດແຮ່ຂະໜາດນ້ອຍແບບຫັດຖະກຳແມ່ນເພີ່ມຂຶ້ນ ແລະ ກໍມີແມ່ຍິງ ແລະ ເດັກນ້ອຍເຂົ້າມາກ່ຽວຂ້ອງນຳຫລາຍຂຶ້ນ
• ໂຄງການ GMP ແມ່ນເລັງໃສ່ວຽກງານ:
ການສ້າງຄວາມອາດສາມາດ - ການຝຶກອົບຮົມ ແລະ ສະເໜີວິທີແກ້ໄຂບັນຫາກັບຜູ້ຂຸດຄົ້ນແຮ່, ຄອບຄົວ ແລະ ທາງການພາກລັດ
7

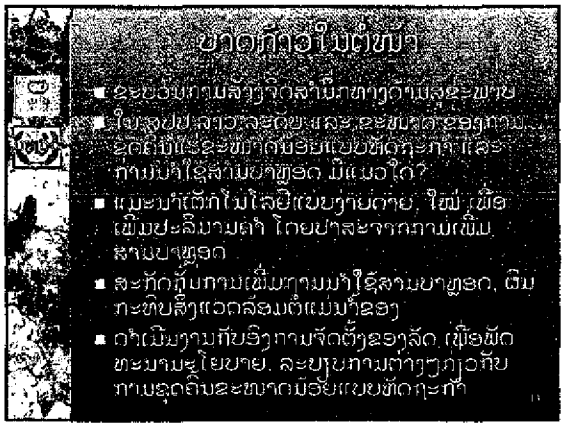

ເປົ້າໝາຍຕ້ອງສຳເລັດຂອງໂຄງການບາຫຼອດລວມເປັນຄືແນວໃດ?


ການສຶກສາດ້ານສິ່ງແວດລ້ອມ ແລະ ສຸຂະພາບ ໃນປີ 2004 ທີ່ ຫຼວງພະບາງ, ສປປ ລາວ
■ ແມ່ນ້ຳຂອງ (ຈອມເພັດ)
◆ ຫ້ວຍເກົາະ
■ ນ້ຳອູ (ປາກອູ)
◆ ລາດທາໄທ
◆ ປາກແຈກ
◆ ປາກອູ
■ ບ້ານທີ່ກ່ຽວຂ້ອງ
◆ ຫ້ວຍເຢັນໃໝ່

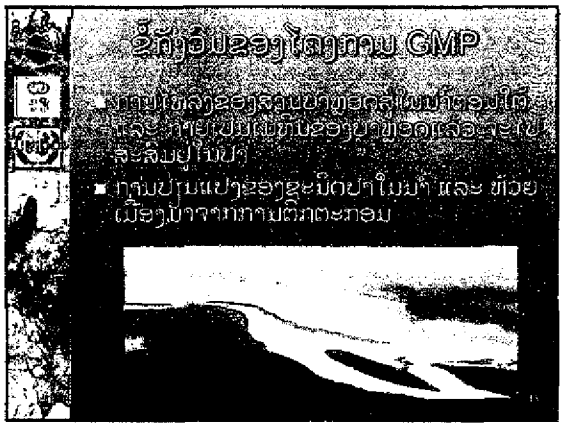

ການສຶກສາດ້ານສິ່ງແວດລ້ອມ ແລະ ສຸຂະພາບ ໃນປີ 2004
■ ສານບາຫຼອດປົນໃນ
◆ ນ້ຳ
◆ ດິນ
◆ ພືດ
◆ ດິນຕະກອນໃນແມ່ນ້ຳຂອງ
◆ ປາ
■ ໃນມະນຸດ (ເລືອດ, ສານບາຫຼອດຢູ່ເສັ້ນຜົມ)
10

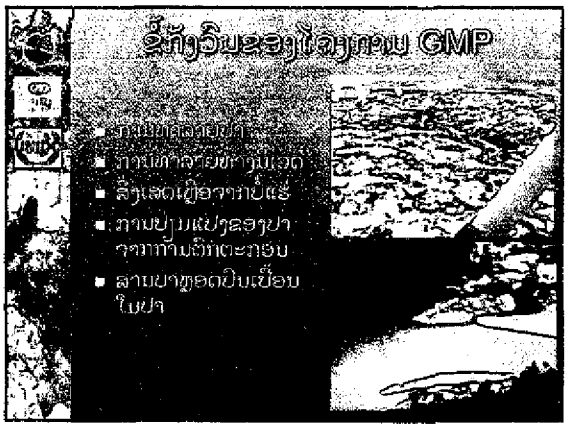

ຜົນການສຶກສາດ້ານສິ່ງແວດລ້ອມ & ສຸຂະພາບ ໃນປີ 2004
□ ສານບາຫຼອດໃນນ້ຳ, ດິນ, ດິນຕະກອນ ແລະ ປາ ຈາກແມ່ນ້ຳຂອງ ແລະ ນ້ຳອູ ແມ່ນມີຕ່ຳ
□ ບໍ່ມີຜູ້ໃດຂອງຈຳນວນຊຸມຊົນທີ່ໄດ້ສຶກສາໄດ້ມີອາການສະແດງເຖິງພິດເບື່ອຈາກສານບາຫຼອດ
■ ເຮືອນຢອງໃສ່ຄຳບ່ອນໜຶ່ງມີຄວາມເຂັ້ມຂຸ້ນຂອງສານບາຫຼອດສູງຂຶ້ນ
11


ສະຫຼຸບຜົນການສຶກສາດ້ານສິ່ງແວດລ້ອມ & ສຸຂະພາບ ໃນປີ 2004
□ ສານບາຫຼອດແມ່ນ ບໍ່ ໄດ້ຖືກນຳໃຊ້ຕາມ ສາຍນ້ຳອູ
□ ມີປະລິມານສານບາຫຼອດໜ້ອຍທີ່ໄດ້ໃຊ້ໃນແມ່ນ້ຳຂອງ ເພື່ອຈັບແຮ່ຄຳໃຫ້ປະສົມທ້ອນໂຮມກັນເຂົ້າ
■ ການຂຸດແຮ່ຂະໜາດນ້ອຍແບບຫັດຖະກຳເປັນກິດຈະກຳໃນລະດູແລ້ງ ຊຶ່ງການປະສົມທ້ອນໂຮມແມ່ນບໍ່ໄດ້ເຮັດຂຶ້ນເລື້ອຍໆ
■ ແມ່ຍິງເປັນພວກເຮັດ ໂດຍມີເດັກນ້ອຍຢູ່ຮ່ວມນຳ
■ ປະຈຸບັນ, ຄວາມສ່ຽງຕໍ່ສຸຂະພາບແມ່ນ ຕ່ຳ
12

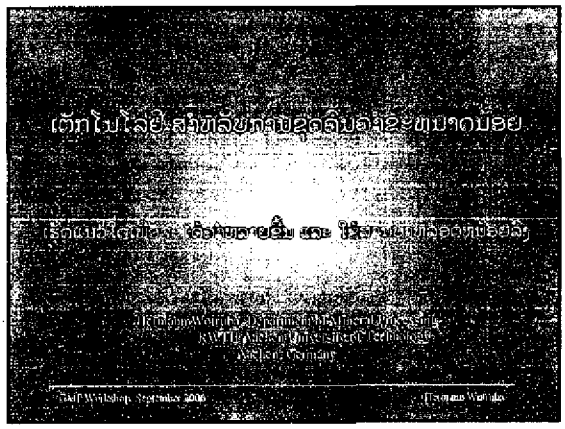

ขาดกำอบໃນຕ່ຳ
ຂະບວນການລ້ຽງຈົນລ້ຳສົກຫາງດ້ານສຸຂະພາບ
ໃນລະຫວ່ານລະດັບ ແລະ ຂະໜາດຂອງການ
ຂຸດຄົ້ນ ຂະໜາດນ້ອຍແບບຫັດຖະກຳ ແລະ
ການນຳໃຊ້ສານປາຫຼອດ ມີແນວໃດ?
ແມ່ນບໍ່ເຫັນໂລຍີແບບງ່າຍດາຍ, ໃໝ່ ເພື່ອ
ເພີ່ມປະລິມານຄຳ ໂດຍບໍ່ລະຈາກການເພີ່ມ
ສານປາຫຼອດ
ລະຫັດຫຸ້ມການເພີ່ມການນຳໃຊ້ສານປາຫຼອດ, ຜົນ
ກະທົບສິ່ງແວດລ້ອມຕໍ່ແມ່ນ້ຳຂອງ
ການເພີ່ມງານທີ່ຍົ້ງການຈັດຕັ້ງຂອງລັດ ເພື່ອຜັດ
ທະນາມະໂຍບາຍ, ລະບຸບການຕ່າງໆກ່ຽວກັບ
ການຂຸດຄົ້ນຂະໜາດນ້ອຍແບບຫັດຖະກຳ

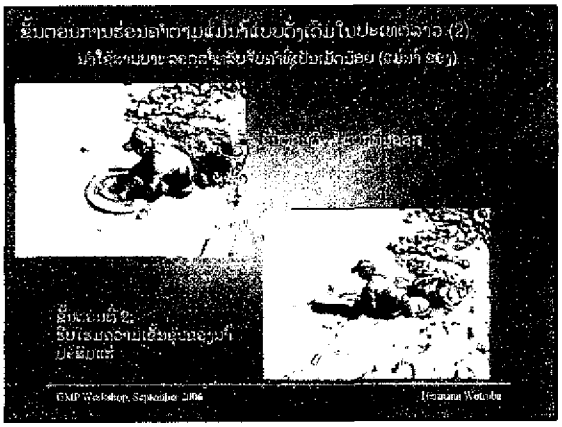

ຂໍ້ກຳນົດຂອງໂຄງການ GMP
ການດຳເນີນກິດຈະກຳທີ່ນຳໃຊ້ເຕັກໂນໂລ
ລ້ຽງໄຍຫາການຕົກຕະກອນ ແລະ ສ້ຳ
ໄປໄດ້ເຮັດໃຫ້ສານປາຫຼອດລົ້ນເຂົ້າໃນ
ບານສູງ
ລ້ຳໆຄວາມເສ ຍຫາຍ, ບໍ່ມີການຄຸ້ມຄອງ,
ບໍ່ມີການລ້ວຍລ້ຳ

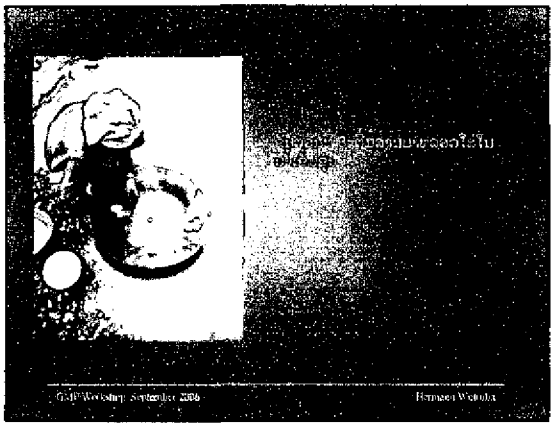

ຂໍ້ກຳນົດຂອງໂຄງການ GMP
ການໄຫລ ຂອງຈຸລະນ ຫຼອດສ ໃນ ຳ ຄອງໃຫ
ແລະ ຫາຍ ເປັນ ໝັ ນ ຂອງ ຳ ຫ ອດເລ ະ ໃ
ລະລ ຍ ໃນ ຳ
ການປ ນແປ ຂອງ ະ ດ ຳ ໃນ ຳ ແລະ ຫ ວ
ເ ຍ ງ ຳ ຈ ກ ການຕ ກຕະກອນ

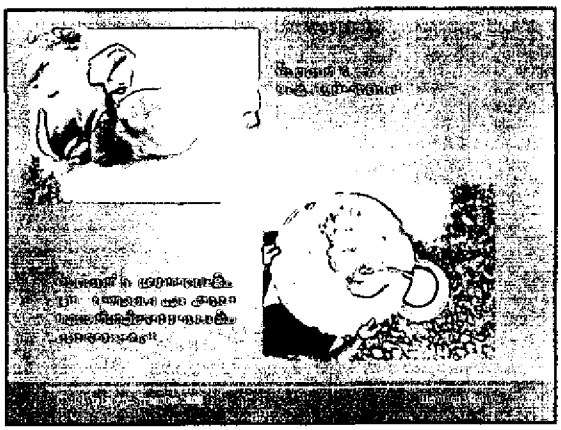

ຂໍ້ກຳນົດຂອງໂຄງການ GMP
ການ ະ ດ ຳ ລ
ການ ຳ ລ ຍ ຳ ນ ເ ດ
ລ ງ ເ ດ ເ ຍ ຈ ຳ ຍ ຮ
ການ ປ ນ ແ ປ ຂ ງ ຳ
ຈ ກ ການ ຕ ກ ຕ ະ ກ ນ
ສ ນ ຍ ຫ ອ ດ ປ ນ ເ ປ ອ ນ
ໃ ນ ຳ

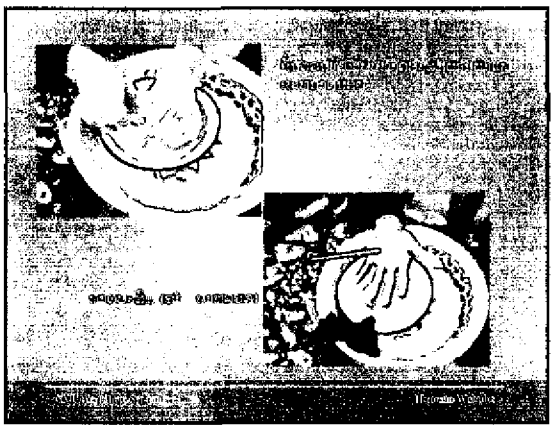

ໃຫ້ມີຄວາມຍັ ຍ ໆ, ມີ ຂ ຍ ຍ ຍ ,
ຕ ມ ະ ບ ບ ,

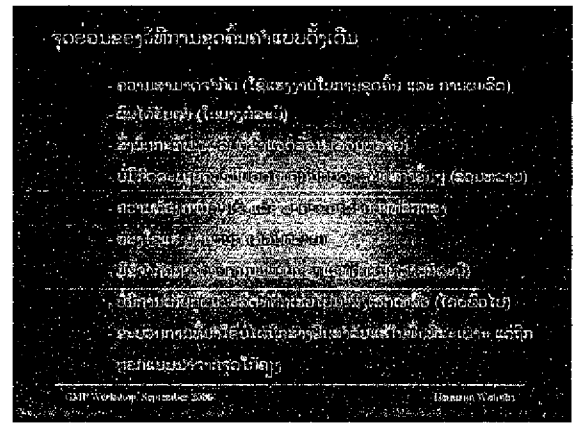


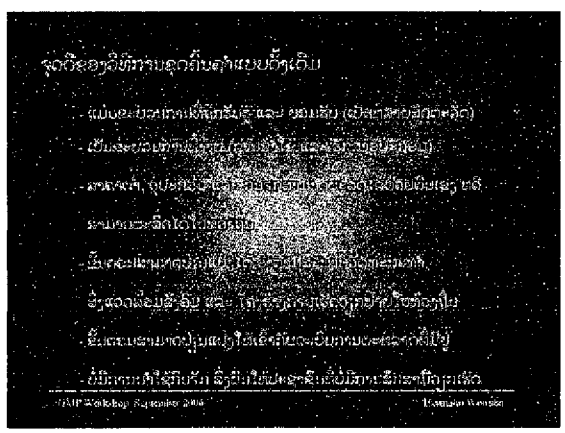


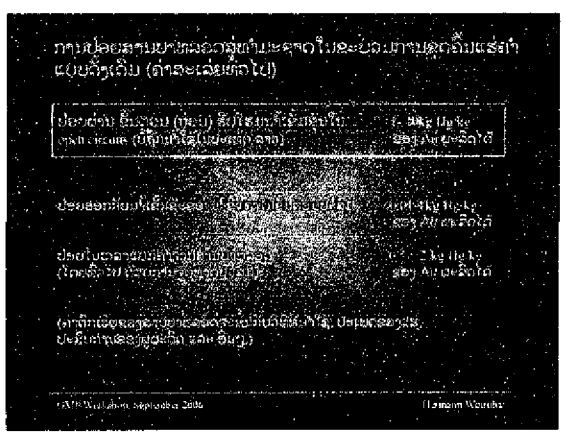


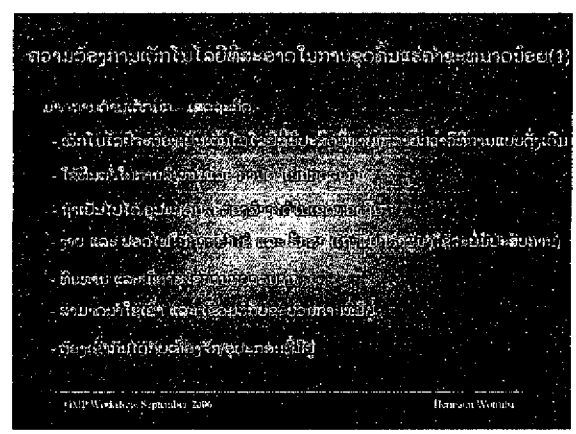


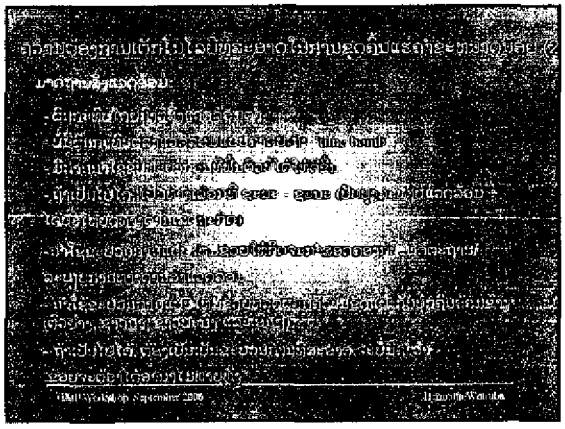


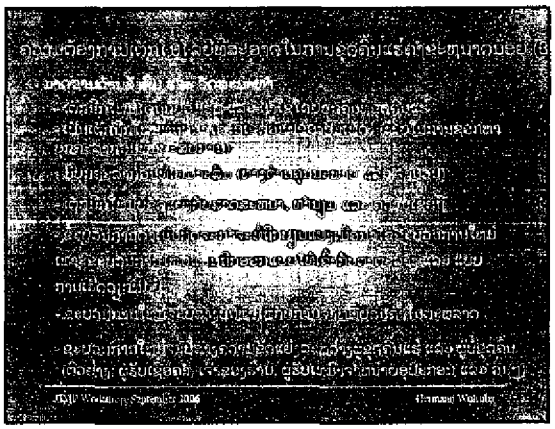


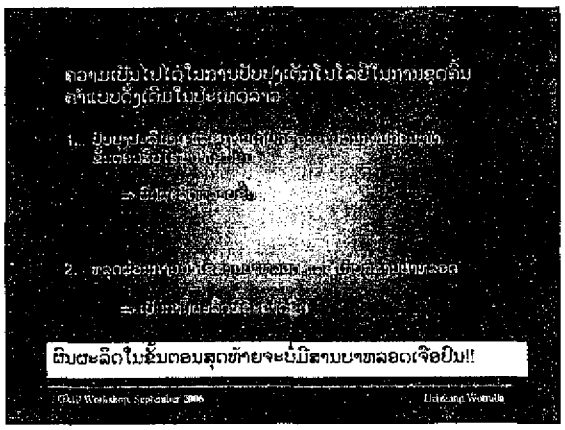


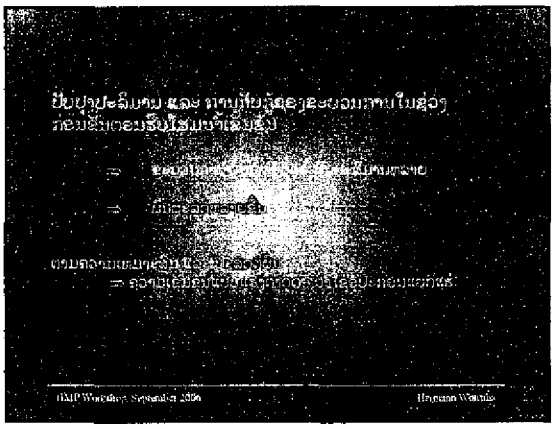


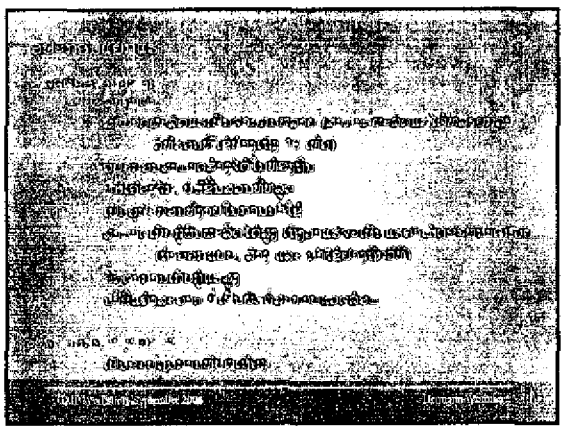


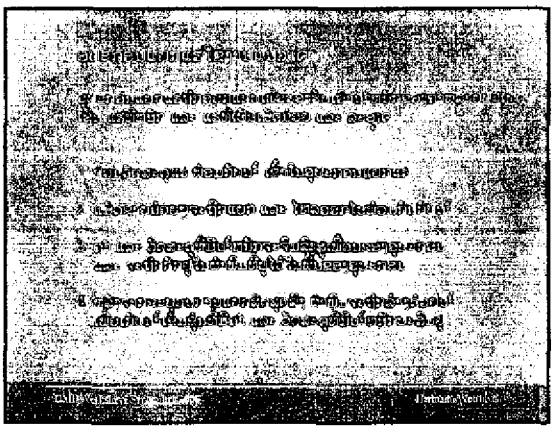


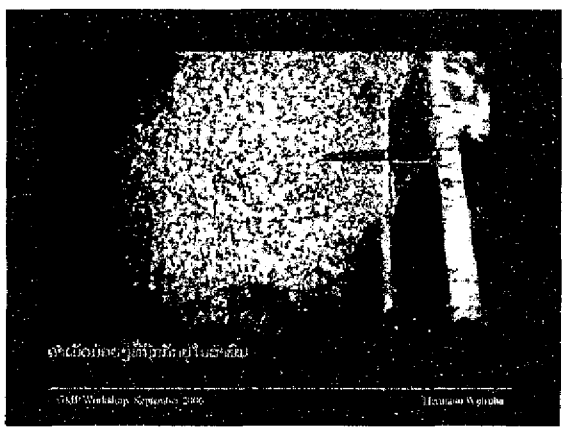


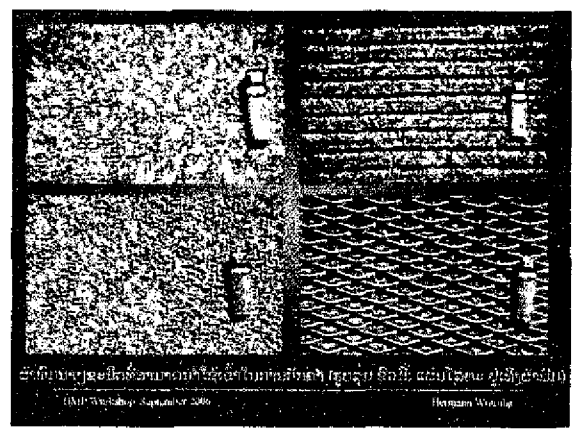

ຄິນຕະລິດໃນຂັ້ນຕອນສຸດທ້າຍຈະບໍ່ມີສານບາຫລອດເຈືອປົນ!!

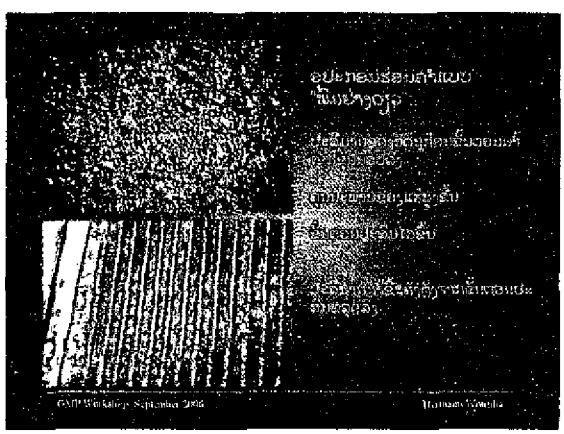


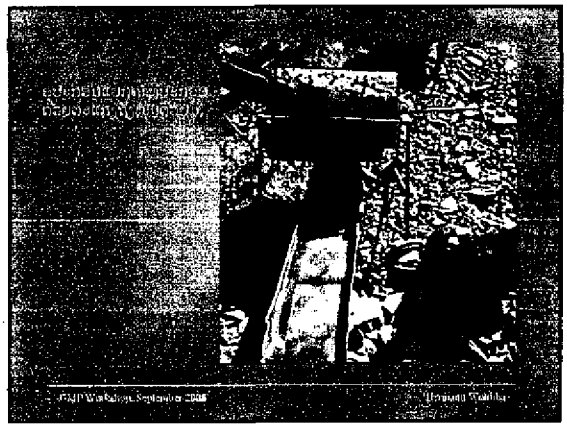


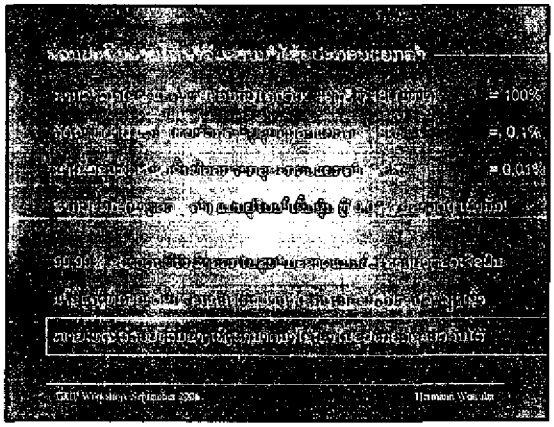


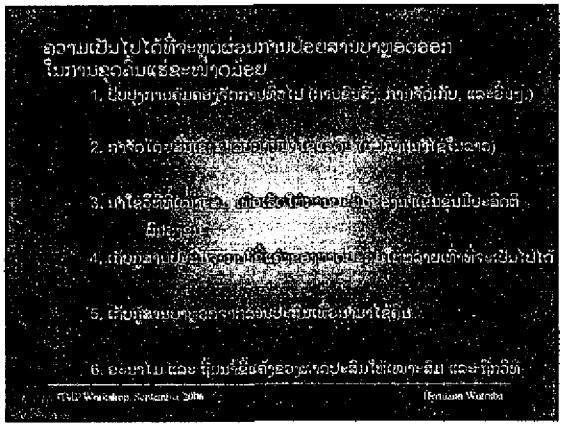


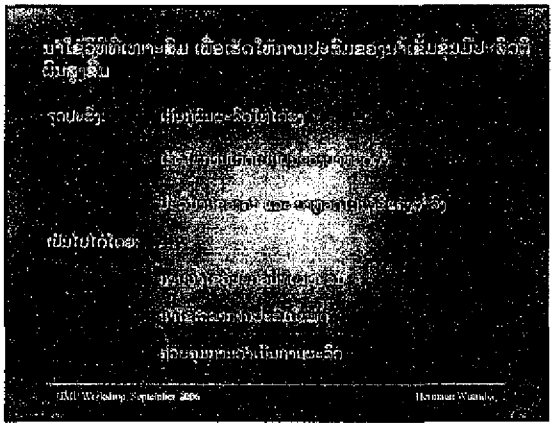


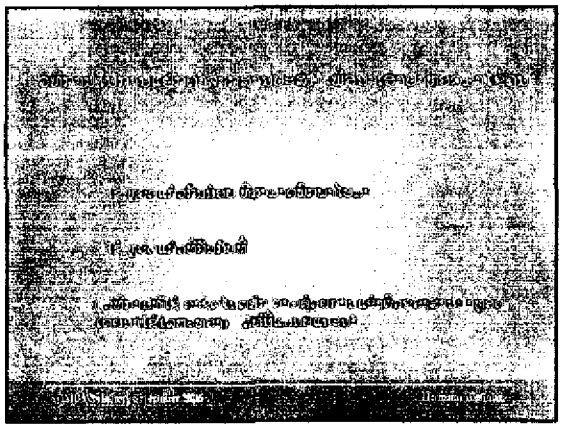


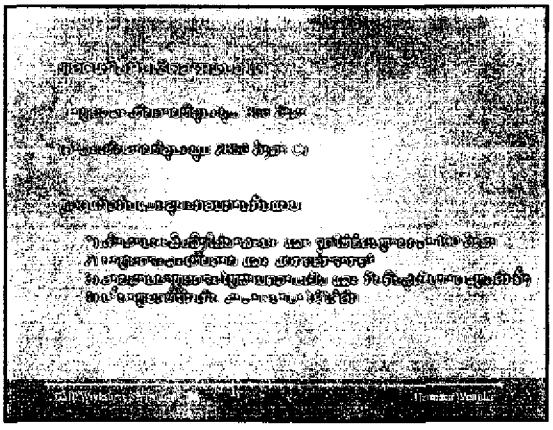


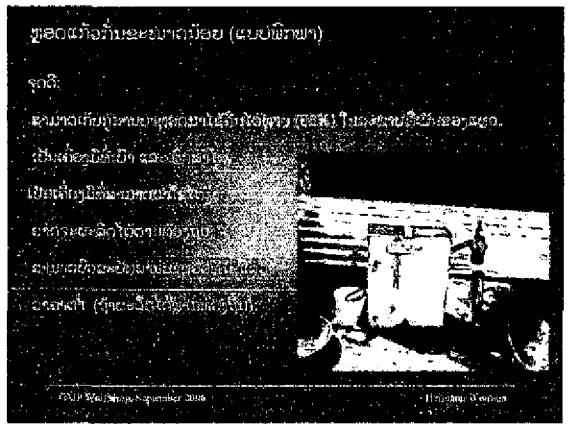


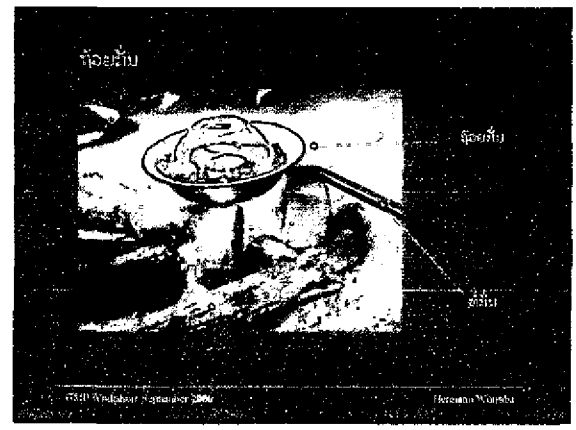


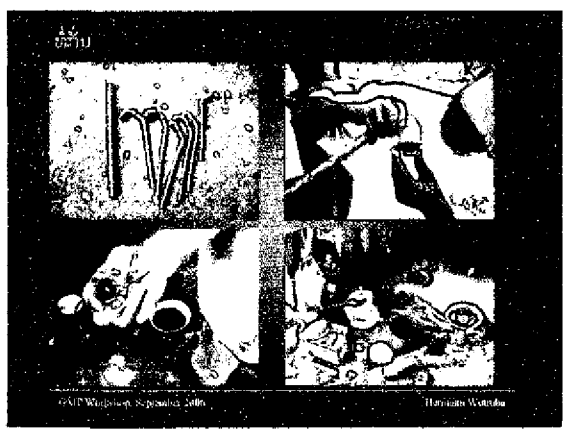


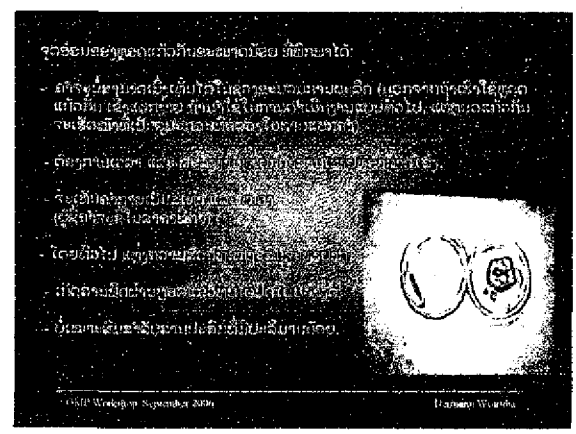


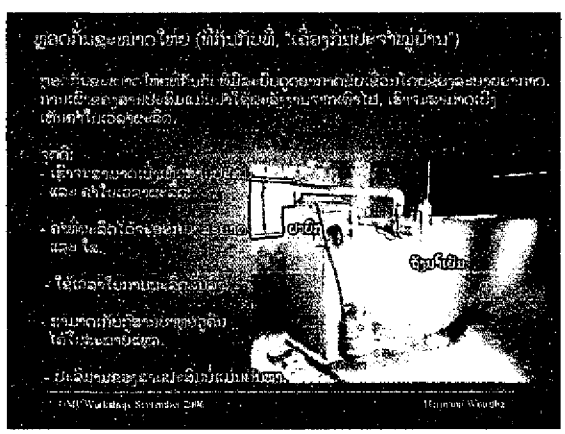


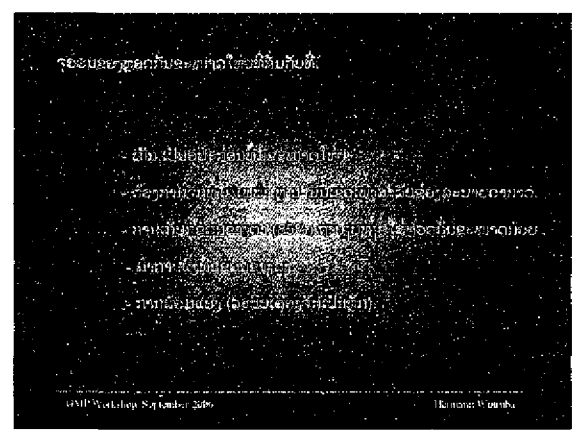


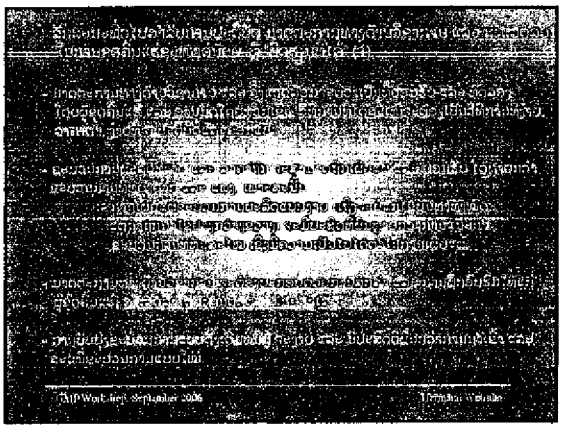

ข้อดี

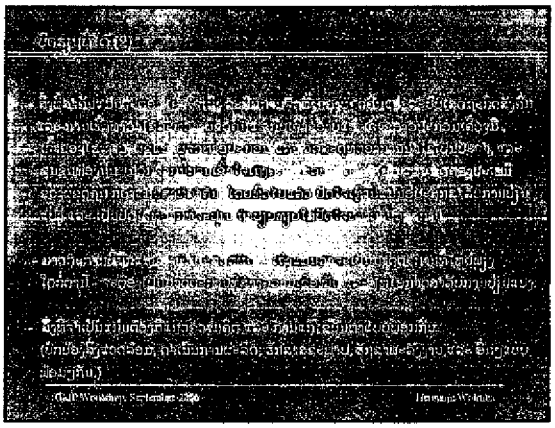

ข้อเสีย

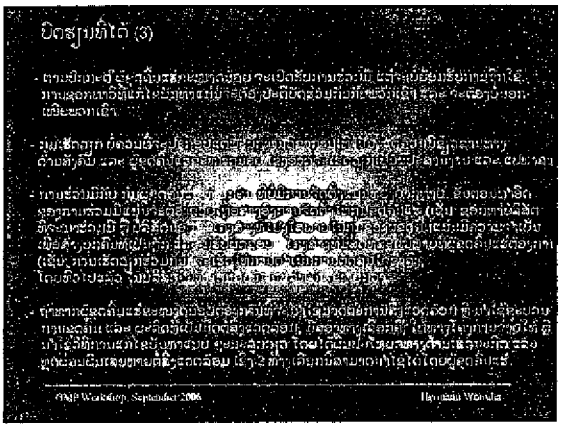


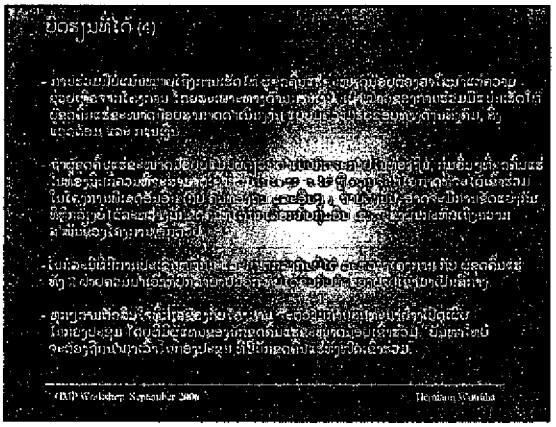


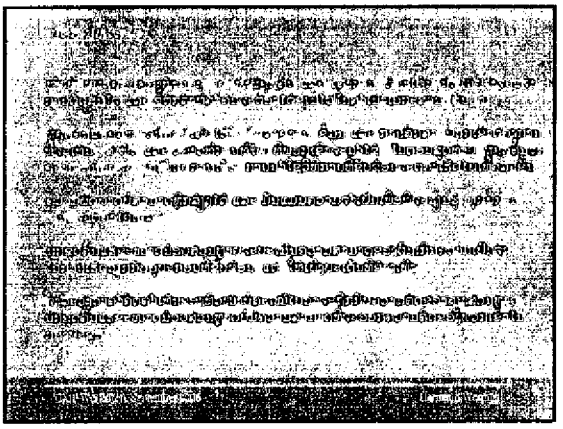


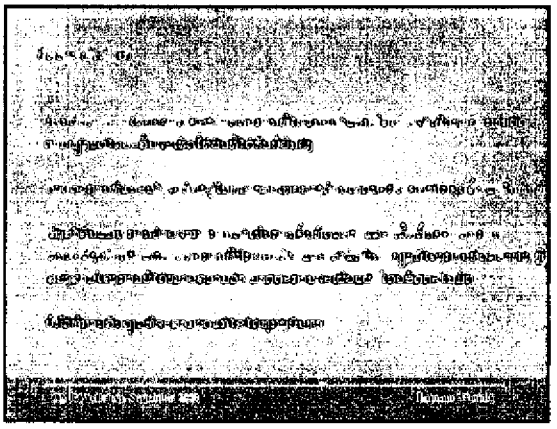


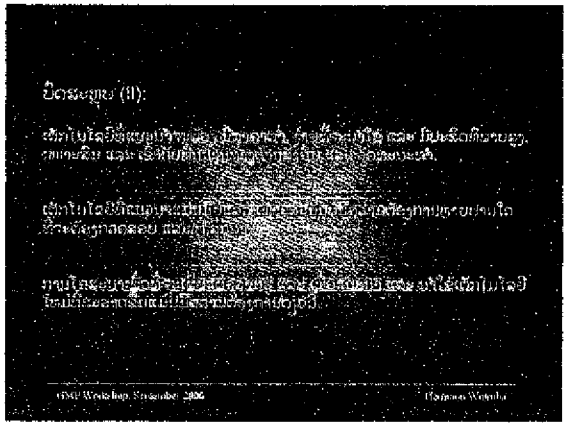



ບົດຮຽນທີ່ໄດ້ (3)


ບົດຮຽນທີ່ໄດ້ (4)







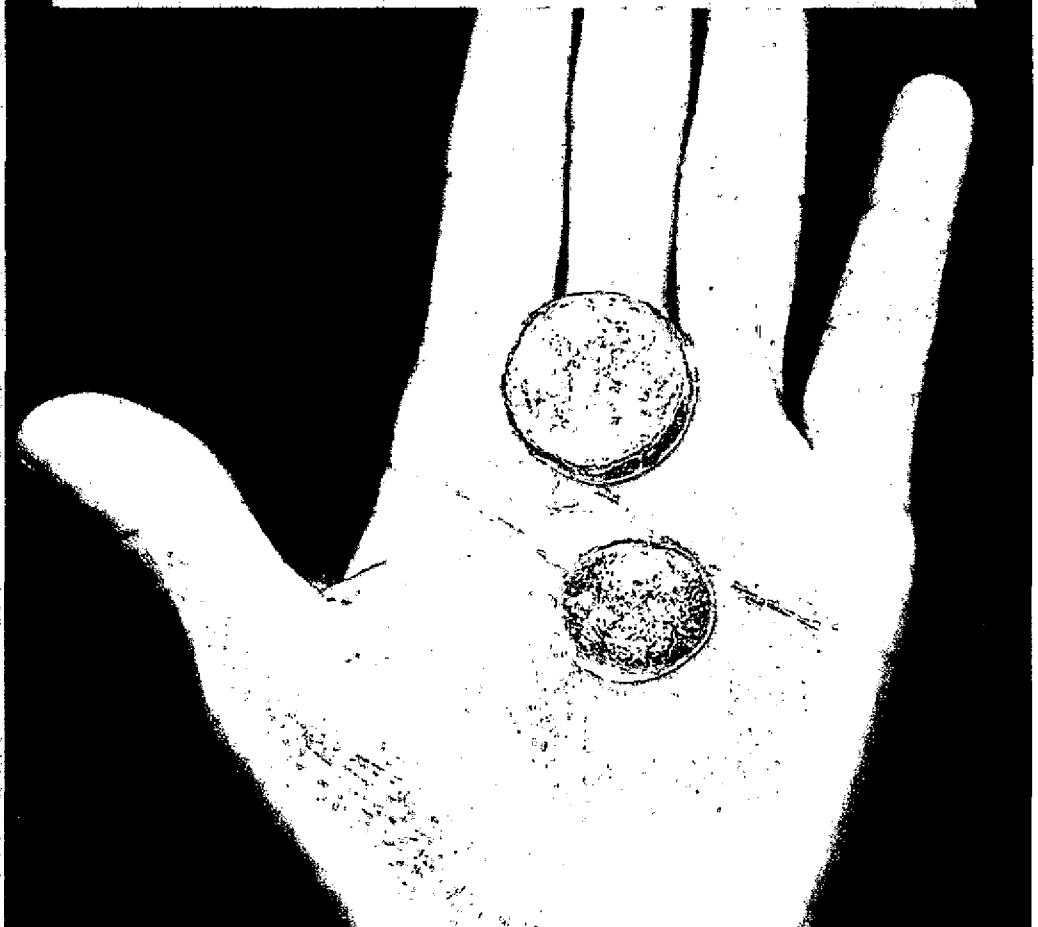
APPENDIX 4
AWARENESS MATERIALS: HEALTH AWARENESS BROCHURES

ປົກປ້ອງອະນາຄົດຂອງ ເດັກນ້ອຍ

Global Mercury Project

Less Mercury, More Gold and Better Health

จะเร็ดแมวใดให้ได้ ถำทายฮั้น — สปป ลาว



Global Mercury Project

Less Mercury, More Gold and Better Health

ຈຳນວນຂອງຄຳທີ່ຖືກຄົ້ນ
ພົບ ແມ່ນມີການພົວພັນ
ກັນດັ່ງນີ:

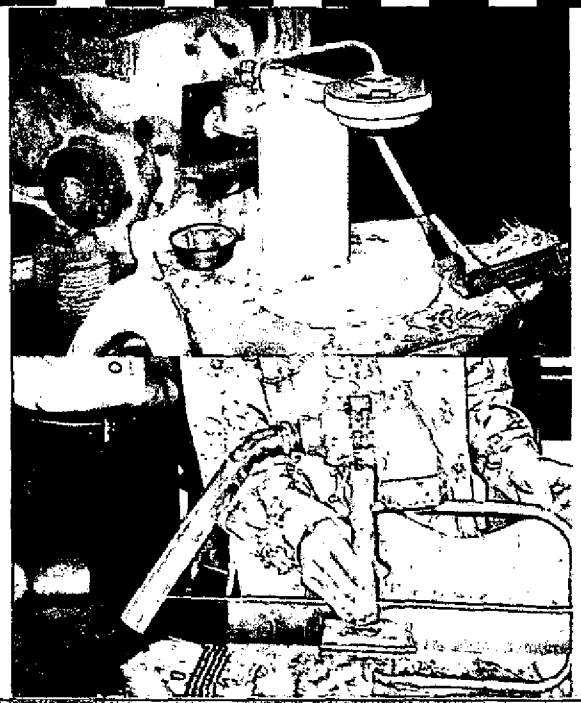
ຄວາມໜາແໜ້ນຂອງຄຳຢູ່
ໃນຊາຍ ແລະ ຫີນ

ຈຳນວນຂອງຊາຍ ແລະ ຫີນ
ທີ່ໄດ້ຜະລິດຂຶ້ນແຕ່ລະມື

ການນຳໃຊ້ ຫຼອດແກ້ວ
ເພື່ອປົກຫຸ້ມ ແລະ ນຳ
ໃຊ້ບາຫຼອດຄືນ

ບໍ່ໃຫ້ຈຸດສານ
ບາຫຼອດແບບເປີດແປນ ຫຼື
ຢູ່ໃກ້ກັບຄົນ

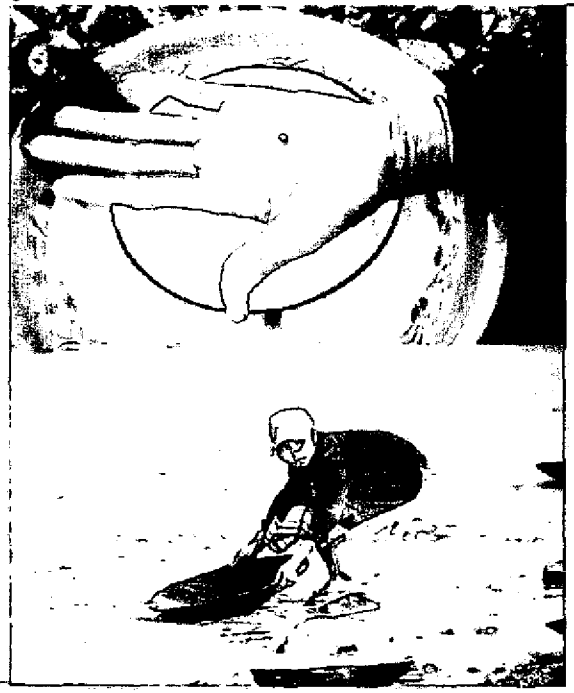
ໃຫ້ເດັກນ້ອຍຢູ່ອອກຫ່າງ
ບໍ່ຈຸດໃກ້ກັບແມ່ຍິງຖືພາ



ການຂຸດຄົ້ນເພີ່ນຂຶ້ນ

ປະສິດທິຜົນຂອງ
ການຮວມສານບາຫຼອດ

ນຳໃຊ້ເທັກໂນໂລຍີໃໝ່ເຊັ່ນ
Sluice



ສຸຂະພາບ ແລະ ຄວາມປອດໄພ

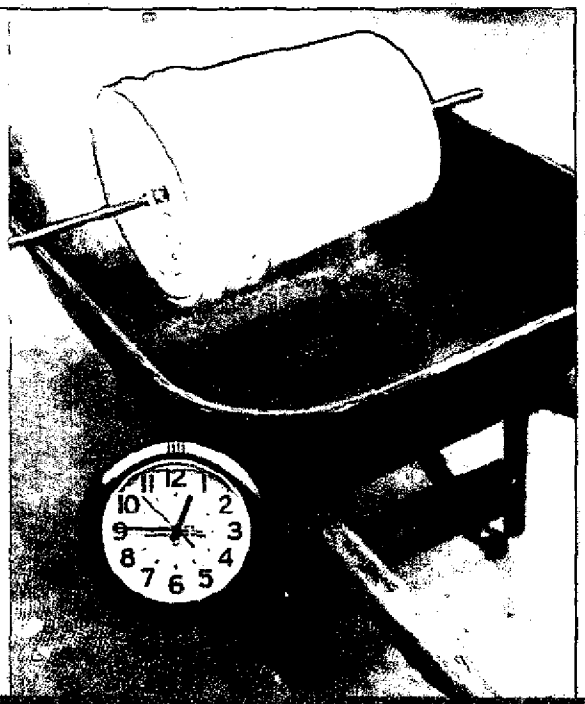
ປ້ອງກັນຕົວທ່ານ
ແລະ ເດັກຂອງທ່ານ

ຖ້ານຳໃຊ້ສານ ບາຫຼອດ

ການປະສົມຄວາມເຂັ້ມຂຸ້ນ ແລະ ຈຳນວນນ້ອຍຂອງສານ ບາຫຼອດ (25ກຼາມ)

ໃຊ້ການປະສົມຂອງສານ ບາຫຼອດຢູ່ໃນຖັງ

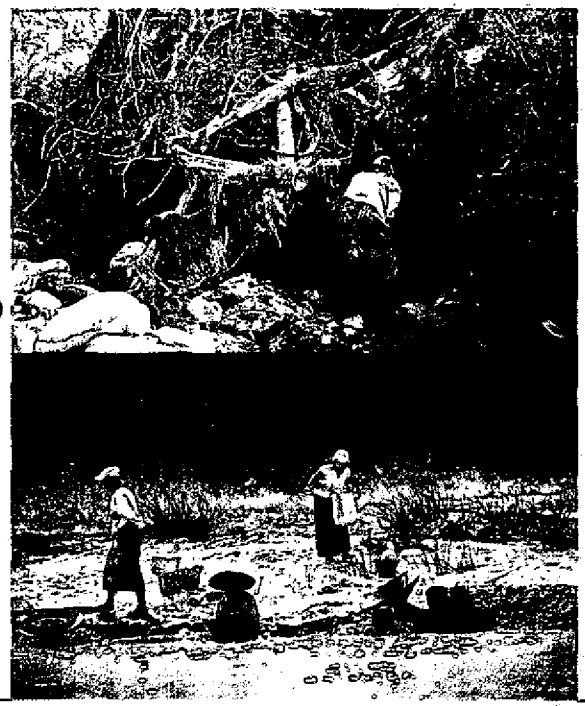
ປະສົມກັນປະມານ 30 – 45 ນາທີ



ເຂດເປົ້າໝາຍທີ່ ອາດຈະມີຄຳຢູ່ຫຼາຍ

ມີການກວດສອບຢູ່ຫຼາຍເຂດ ກ່ອນການຮ່ອນຄຳ

ຊາຍທີ່ເປັນເປົ້າໝາຍທີ່ຢູ່ໃນ ອ່າງນ້ຳ ຫຼື ພາກສ່ວນທີ່ຢູ່ໃຕ້ ນ້ຳເລິກ



ປະສິດທິຜົນຂອງການປະສົມທາດບາຫຼອດ ແລະ ໂລຫະ ຂອງຄຳ

ຫຼີກລ້ຽງການ ສຳພັດໂດຍກົງ

ຫ້າມປະສົມສານບາຫຼອດ ໄກ້ແມ່ນ້ຳເພື່ອຫຼີກລ້ຽງການ ຕົກເຮ່ຍ ຂອງສານບາຫຼອດ ລົງສູ່ແມ່ນ້ຳ

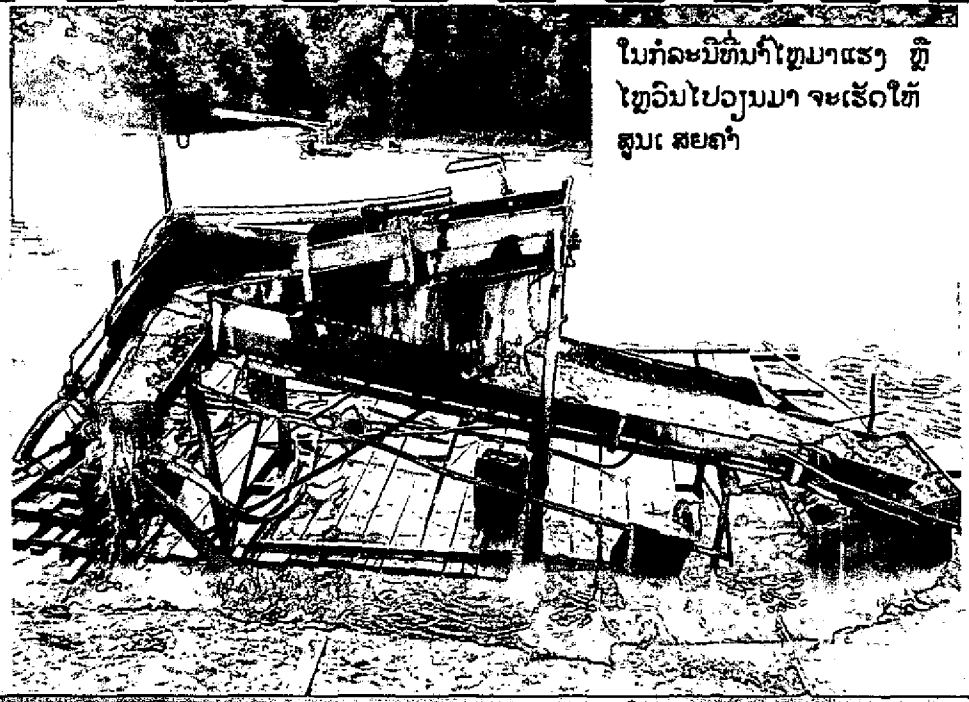
ເຂົ້າໃຈເຖິງຜົນ ກະທົບໂດຍກົງ ຂອງ ຄຳທີ່ຢູ່ໃນຫີນຫຼືຊາຍ

ຢູ່ບ່ອນນ້ຳຕົ້ນ ຫຼື ບ່ອນນ້ຳ ເລິກ?

ສິ່ງສຳຄັນຂອງ SLUICE ແບບທຳມະດາ

ເອົາຫີນ ຫຼື ຕະກອນ ໄວ້ທາງເທິງ SLUICE

ເອົານ້ຳສີດໃສ່ SLUICE

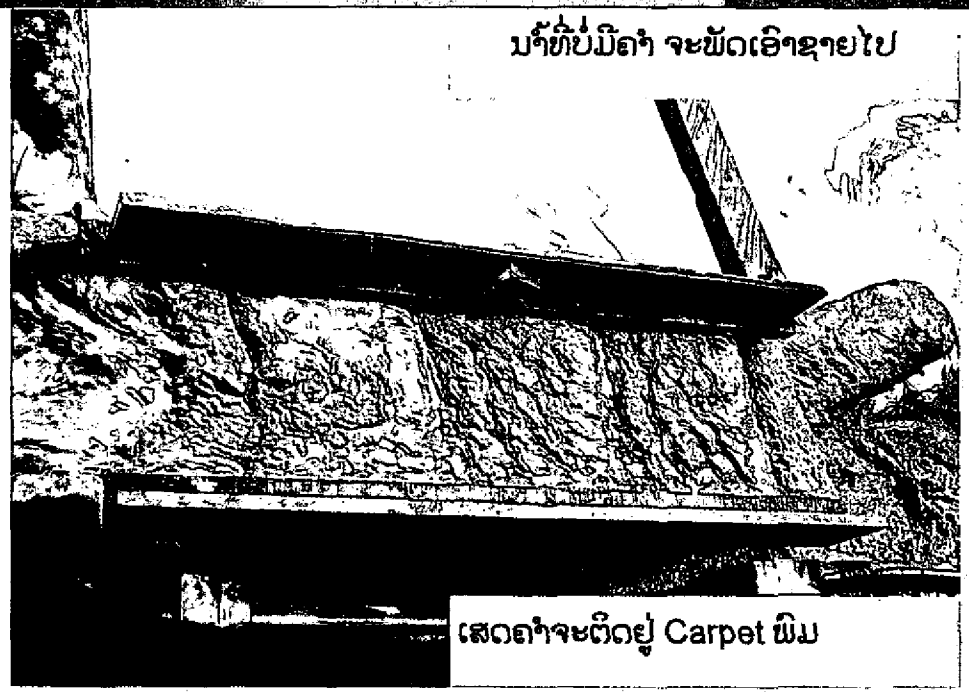


ໃນກໍລະນີທີ່ນ້ຳໄຫຼມາແຮງ ຫຼື ໄຫຼວົນໄປວຸນມາ ຈະເຮັດໃຫ້ ສູນເ ສຍຄຳ

ການນຳໃຊ້ຂອງ SLUICE

ທົດລອງການອອກແບບທີ່ແຕກຕ່າງ

ນ້ຳທີ່ບໍ່ມີຄຳ ຈະພັດເອົາຊາຍໄປ

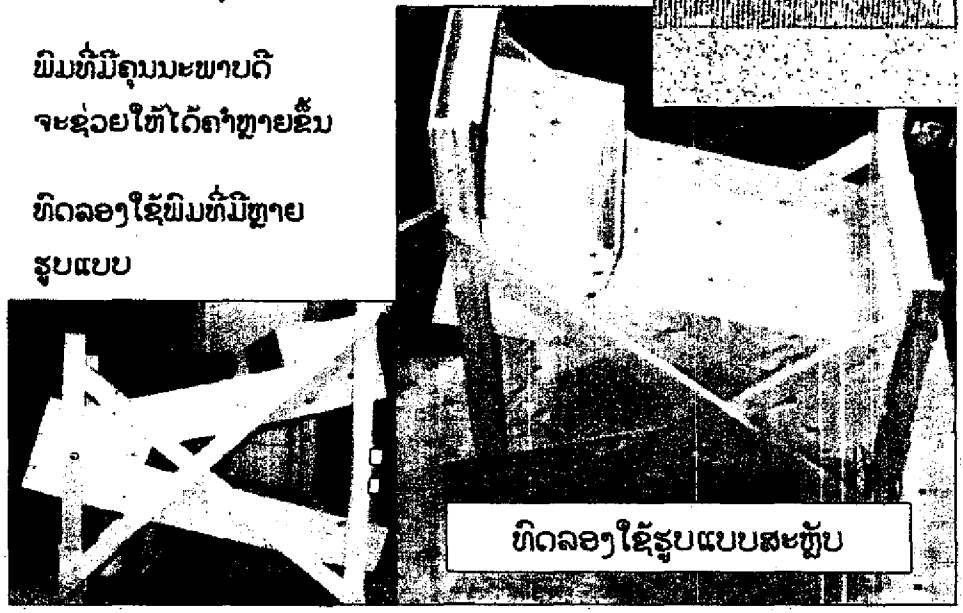


ເສດຄຳຈະຕິດຢູ່ Carpet ພົມ

ໃຊ້ພົມທີ່ມີຄຸນນະພາບດີ

ພົມທີ່ມີຄຸນນະພາບດີ ຈະຊ່ວຍໃຫ້ໄດ້ຄຳຫຼາຍຂຶ້ນ

ທົດລອງໃຊ້ພົມທີ່ມີຫຼາຍ ຮູບແບບ



ທົດລອງໃຊ້ຮູບແບບສະຫຼັບ

ປ້ອງກັນອະນາຄົດຂອງເດັກ

ຮັກສາທຳສະອາດຂອງທ່ານ

ປົກປ້ອງນ້ຳໄດ້ດີແນວໃດ

Global Mercury Project

Less Mercury, More Gold and Better Health

ຄົນຕ້ອງການນ້ຳ ສະອາດ

ສຳລັບ

ແຕ່ງກິນ,
ດື່ມ,
ອາບ

ນ້ຳ

ນ້ຳດື່ມສະອາດ

ແມ່ຍິງຕ້ອງໄດ້ເຂົ້າຮ່ວມໃນ ການວາງແຜນ

ຊຸມຊົນຮ່ວມກັບການ ຈັດຕັ້ງຕ່າງໆ

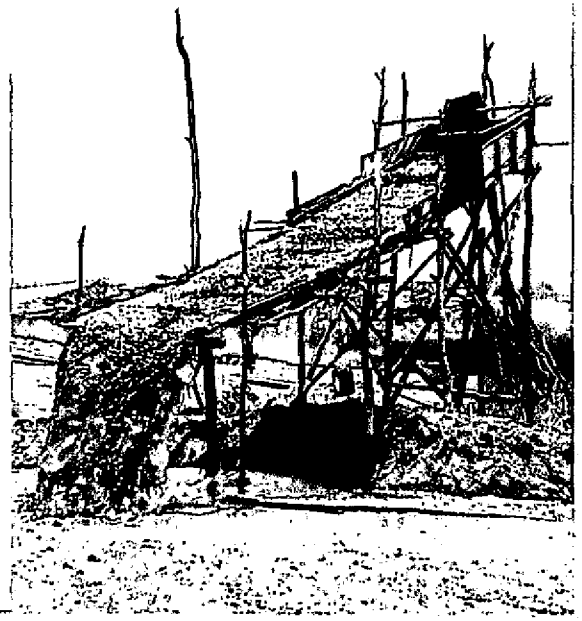
ຮ່ວມກັນອອກແບບ, ສ້າງ ແລະ ນຳໃຊ້ນ້ຳ

ການແກ້ໄຂ

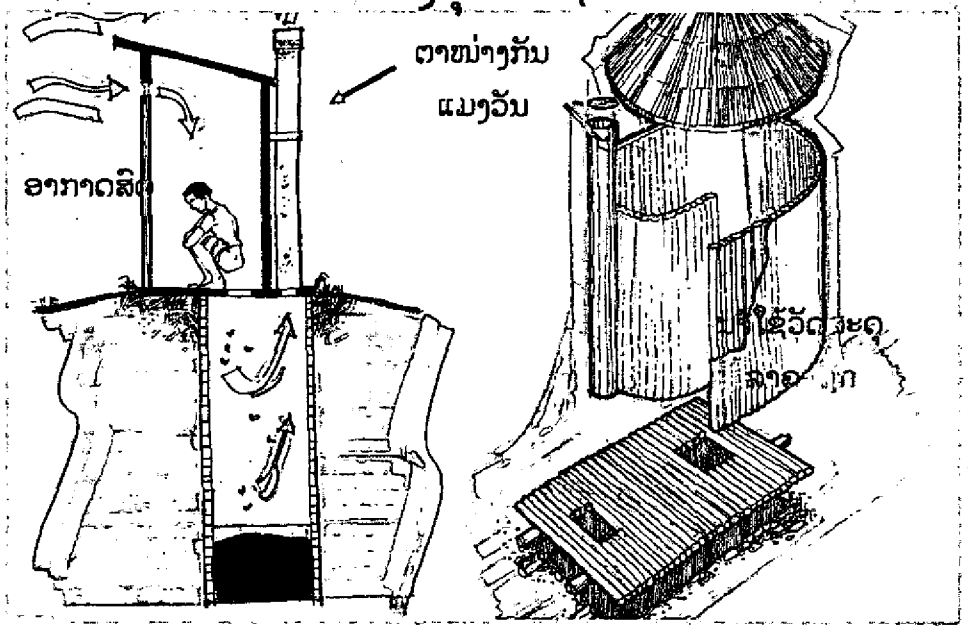
ນ້ຳເປື້ອນເຮັດໃຫ້ຄົນ ເຈັບເປັນໄດ້

ເກັບສານບາຫຼອດໃຫ້ໄກ ຈາກນ້ຳ

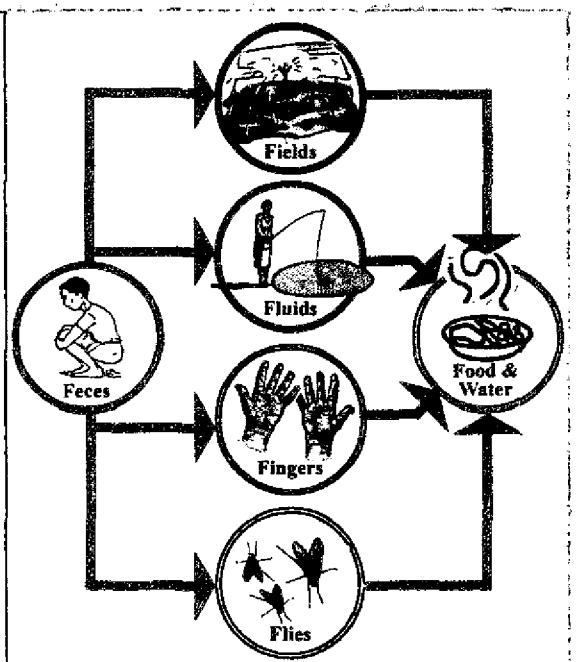
ບາຫຼອດບໍ່ດີ ຕໍ່ປາ, ສັດ, ແລະ ຄົນ



ສ້າງຊຸມວິດຊຶມ



ອາຈົມຂອງຄົນ ແລະ ສັດ ເຮັດໃຫ້ນ້ຳເປື້ອນ

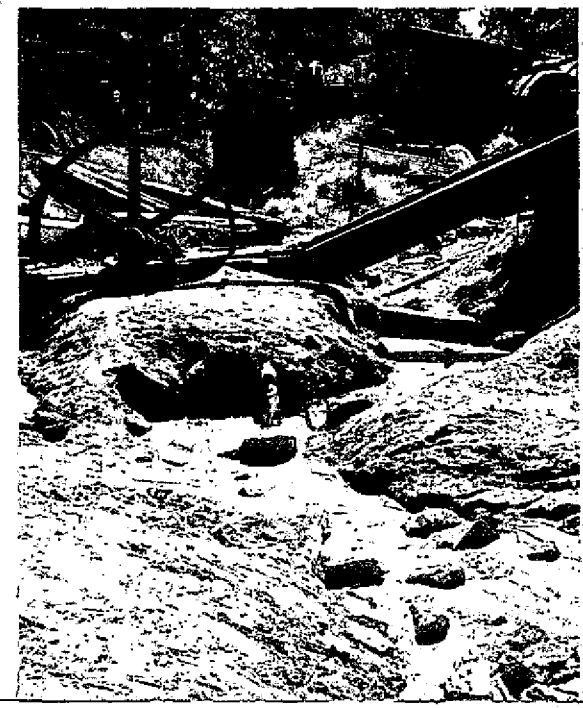


ຮັບປະກັນວ່າ ທ່ານຮັກສາ ລະບົບນ້ຳໃຊ້ຂອງພວກທ່ານ ໃຫ້ສະອາດ

ບາຫຼອດໄຫຼລົງສູ່ ແມ່ນ້ຳ

ສານບາຫຼອດສາມາດ ໄຫຼໄປໄດ້ໄກໃນແມ່ນ້ຳ

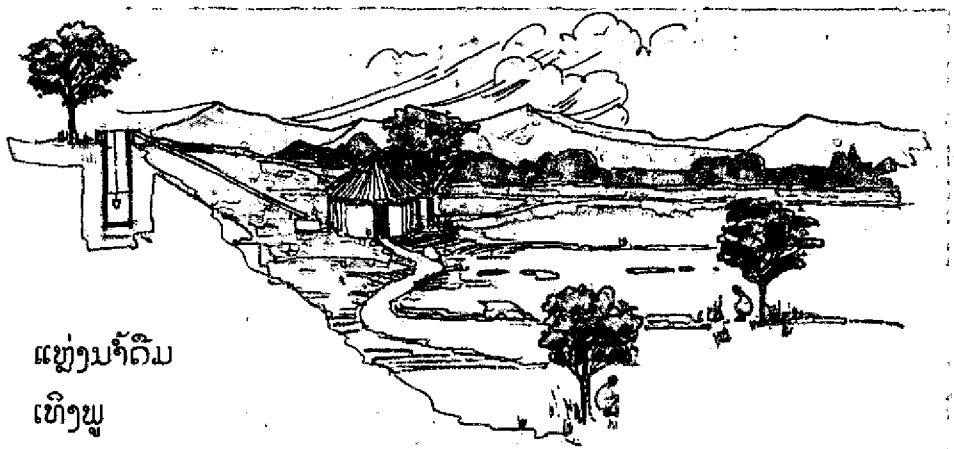
ສານບາຫຼອດເຮັດໃຫ້ຄົນທີ່ ອາໄສຢູ່ຕາມແຄມນ້ຳທ່ຳໆ ໄກຈາກບ່ອນປ່ອຍສານ ເຈັບປ່ວຍໄດ້ເຊັ່ນກັນ



ນ້ຳ

ນ້ຳດື່ມສະອາດ

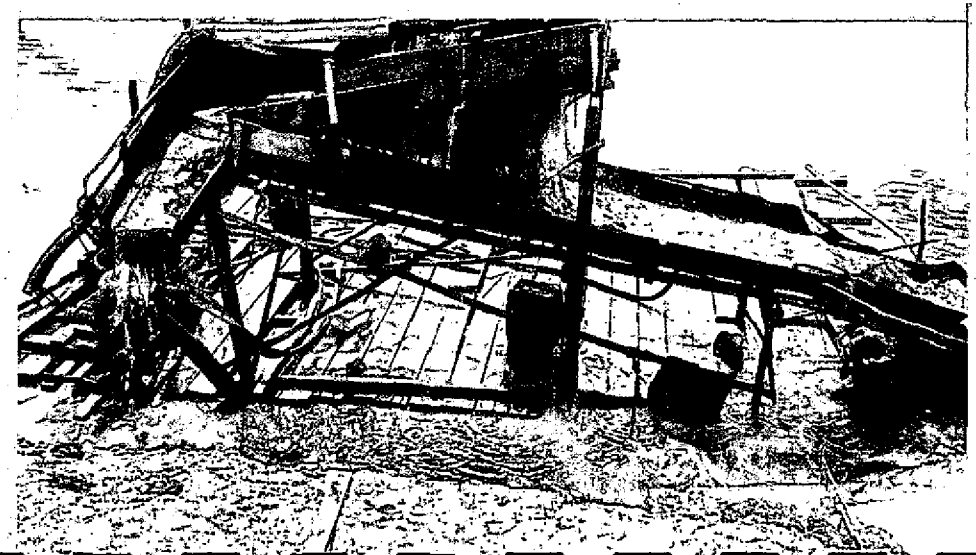
ເອົານ້ຳຢູ່ເທິງພູ ຫຼື ເບື້ອງເທິງຂອງແມ່ນ້ຳ ທີ່ຢູ່ເໜືອອາຈົມຂອງຄົນ ແລະ ສິ່ງປົນເປື້ອນຈາກການຮ່ອນຄຳ



ແຫຼ່ງນ້ຳດື່ມ ເທິງພູ

ອັນຕະລາຍ

ບາຫຼອດ ແລະ ຂີ້ຕົມທີ່ປົນເປື້ອນໃນນ້ຳ ຈະໄຫຼລົງສູ່ນ້ຳຕອນ ລຸ່ມເປັນໄລຍະໄກ



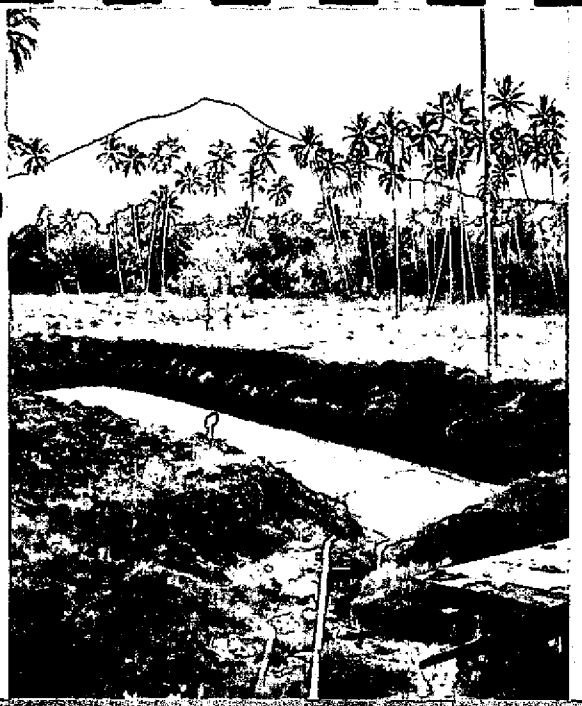
ຫ້າມໃຊ້ສານ ໄຊຍາ
ນາຍປົນກັບສານ
ບາຫຼອດໃນອ່າງ
ຂີ້ແຄ້ງ

ຮ່າງກາຍຂອງຄົນ ສາມາດ
ດູດຊຶມສານບາ
ຫຼອດໄດ້ຢ່າງ
ງ່າຍດາຍ

ຖິ້ມຂີ້ຕົມປົນເປື້ອນ
ໃນໜອງທີ່ຢູ່ຫ່າງໄກ
ຈາກແຫຼ່ງນ້ຳ

ຖິ້ມໜອງດັ່ງກ່າວເມື່ອມັນ
ເຕັມ

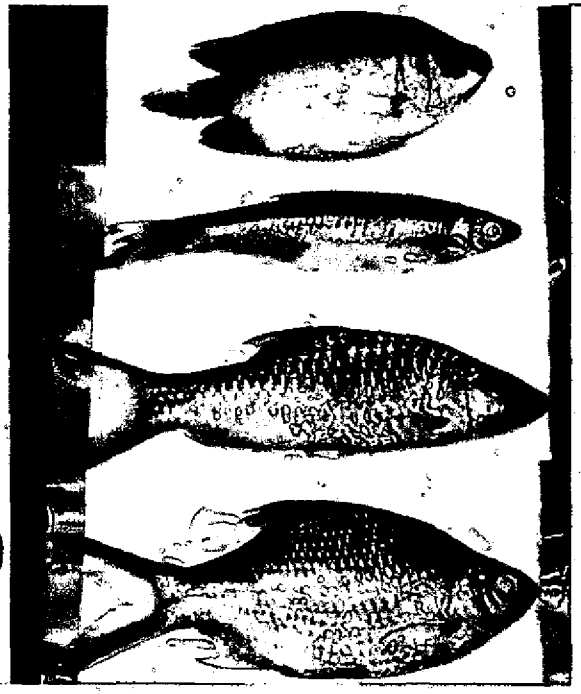
ເຮັດຮົ້ວອ້ອມໜອງດັ່ງກ່າວ



ແລະ ການແກ້ໄຂ

ປາ

ໄຊຍານາຍ ແລະ ບາຫຼອດ
ທີ່ຢູ່ໃນແມ່ນ້ຳ ແລະ ໜອງປາ
ສາມາດປົນເປື້ອນໃນຕົວປາ
ເຊິ່ງເປັນອັນຕະລາຍຕໍ່ຄົນ



ຢ່າຖິ້ມຂີ້ຕົມປົນ
ເປື້ອນໃກ້ແມ່ນ້ຳ

ມັນບໍ່ດີຕໍ່ປາ ແລະ
ສິ່ງແວດລ້ອມ

ຢ່າປະສົມສານ
ບາຫຼອດດ້ວຍມືເປົ່າ

ໃຊ້ຖົງມື ຫຼື ຖົງຢາງ
ປລາສຕິກໃນການປະສົມ
ບາຫຼອດໃນຖັງ

ນ້ຳ

ຫ້າມໃຫ້ໜອງຖິ້ມຂີ້ຕົມປົນເປື້ອນ
ລົ້ນລົງສູ່ບັນດາຫ້ວຍທີ່ຢູ່ໃກ້ໆ

ແລະ ອັນຕະລາຍ

ປະສົມບາຫຼອດຢູ່ໃນໜອງ ທີ່ຢູ່ຫ່າງໄກ
ຈາກບຶງ ແລະ ແມ່ນ້ຳ

ໜອງນ້ຳເປື້ອນສານໄຊຍານາຍທີ່ປະໄວ້ໂດຍບໍ່ຕັ້ນ
ມີຫ່າສ່ຽງຕໍ່ຄົນ ແລະ ສັດ

ຫ້າມໃຊ້ສານ
ບາຫຼອດໃນໂຮງໂມ້
ທີ່ໃຊ້ລູກປືນ

ທ່ານຈະເສຍທັງຄຳ ແລະ
ສານບາຫຼອດ

ນ້ຳ

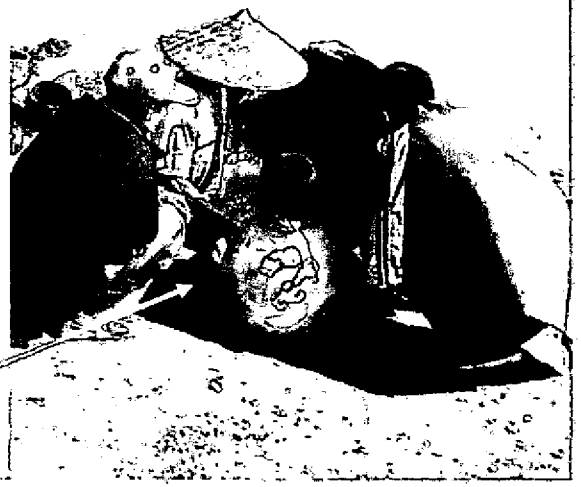
ນ້ຳເປື້ອນກໍ່ໃຫ້
ເກີດພະຍາດ ແລະ
ເປັນສາເຫດຂອງ
ການເຈັບເປັນ

ແລະ ການແກ້ໄຂ

ບໍ່ຄວນໃຊ້ ຫຼື ຈູດ
ສານບາຫຼອດ
ໃກ້ແຫ່ງນ້ຳຈັກເທື່ອ

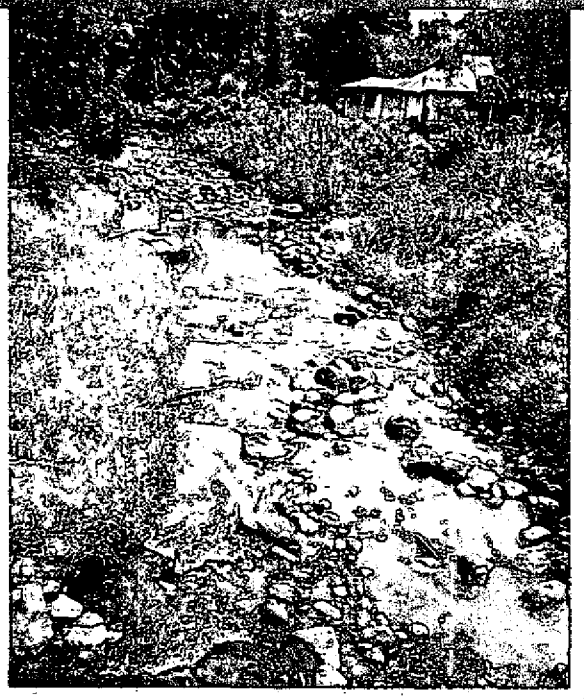
ສານບາຫຼອດຈະໄຫຼໄປຕາມ
ນ້ຳໄປສູ່ດິນທີ່ຢູ່ນ້ຳຕອນລຸ່ມ

ຢ່າໃຫ້ເດັກນ້ອຍໃກ້ສານ
ບາຫຼອດຫຼືບ່ອນຈູດ



ຢ່າຖິ້ມຂີ້ເຫຍື້ອ,
ປລາສຕິກ ຫຼື ສານ
ເຄມີລົງນ້ຳ

ຮັກສານ້ຳໃຫ້ສະອາດເພື່ອ
ຄົນ, ສັດ ແລະ ປາ

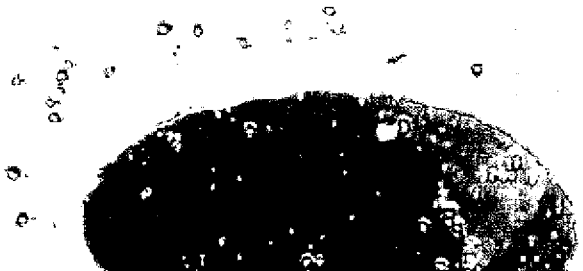


ປ້ອງກັນອະນາຄົດຂອງເດັກນ້ອຍ

ຈຸດສານບາຫູອດກາງແຈ້ງ, ຫ່າງໄກຈາກແມ່ຍິງ ແລະ
ເດັກນ້ອຍ — ໃຊ້ຫູອດແກ້ວຈູດ

ນຳໃຊ້ ແລະ ເອົາບາຫູອດກັບຄືນມາໃຊ້ ໄດ້ແນວໃດ?

ນຳໃຊ້ສານບາຫູອດ
ຢ່າງລະມັດລະວັງ



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ບາຫຼອດມີ

ອານຸພາບແຮງ

ບາຫຼອດສາມາດຈັບຄຳ

ທີ່ເປັນເມັດນ້ອຍໆໄດ້

ແຕ່

ບາຫຼອດ ສາມາດເຮັດໃຫ້

ທ່ານເຈັບເປັນໄດ້ ຖ້າບໍ່ໃຊ້ມັ

ນຢ່າງປອດໄພ

ບາຫຼອດ ແມ່ນສານອັນຕະລາຍ

ນຳໃຊ້ທີ່ຈູດເປັນປະຈຳ

ຫ້າມຈູດຄຳໃນຫ້ອງທີ່ມີ

ຝາຕັນ.

ໃຫ້ຈູດກາງແຈ້ງ ແລະ

ຫ່າງໄກຈາກຜູ້ຄົນ

ຮ່ອນຊາຍອອກເພື່ອ

ເອົາບາຫຼອດຄືນ

ບາຫຼອດນີ້ຈະເປັນ

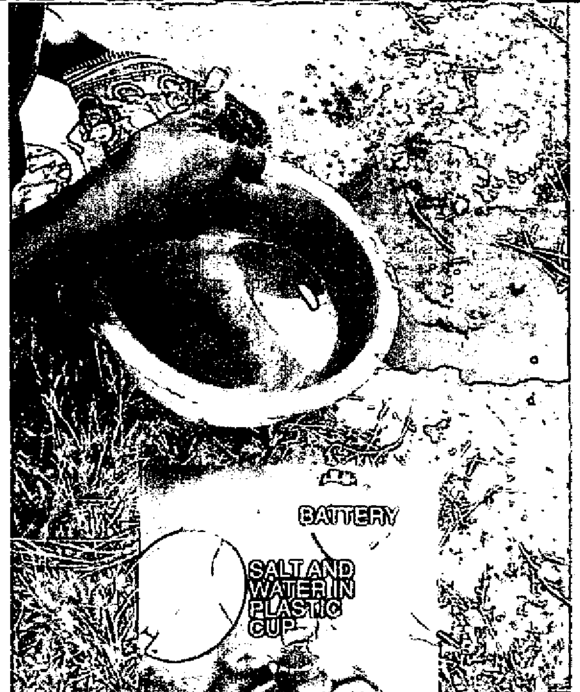
ບາຫຼອດທີ່ແຕກອອກ

ເປັນເມັດນ້ອຍໆ

ນຳໃຊ້ຖ່ານໄຟສາຍ ແລະ

ເກືອເພື່ອກະຕຸ້ນການ

ເຮັດວຽກຂອງບາຫຼອດ



ການເອົາບາຫຼອດຂອງທ່ານກັບມາໃຊ້ຄືນ

ມາຮອດນີ້ບາຫຼອດ

ສະອາດແລ້ວ ແລະ

ພ້ອມສຳລັບການນຳ

ກັບມາໃຊ້ຄືນອີກ

ບໍ່ຈຳເປັນຕ້ອງຊື້ບາຫຼອດ

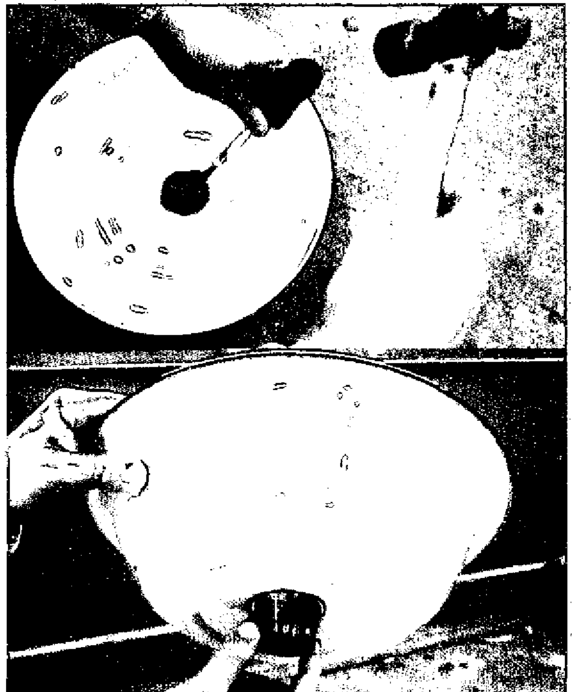
ໃໝ່

ໜໍ້ຈູດຄຳແບບມີບ່ອນກັກບາຫຼອດ

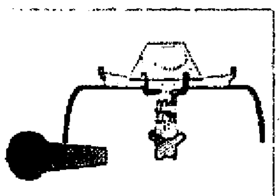
ດັດແປງຖ້ວຍແກງເປັນ ໜໍ້ຈູດຄຳແບບມີບ່ອນ ກັກບາຫຼອດ

ເອົາຖ້ວຍເຫຼັກ ຫື ພາຊະນະເຄືອບ ເຈາະຮູທີ່ມີຂະໜາດຊ່ຳຈອກເຫຼັກ

ເອົາຈອກສະແຕນເລດ ຫລື ຈອກເຄືອບສຸບເຂົ້າຮູ



ເອົາຖ້ວຍແກ້ວ ຫຼື ຖ້ວຍເຫຼັກຄອບ ແລະ ເອົາຊາຍປູກປີກ



ບາຫຼອດຖືກດັກດ້ວຍຖ້ວຍ ແລະ ຊາຍ

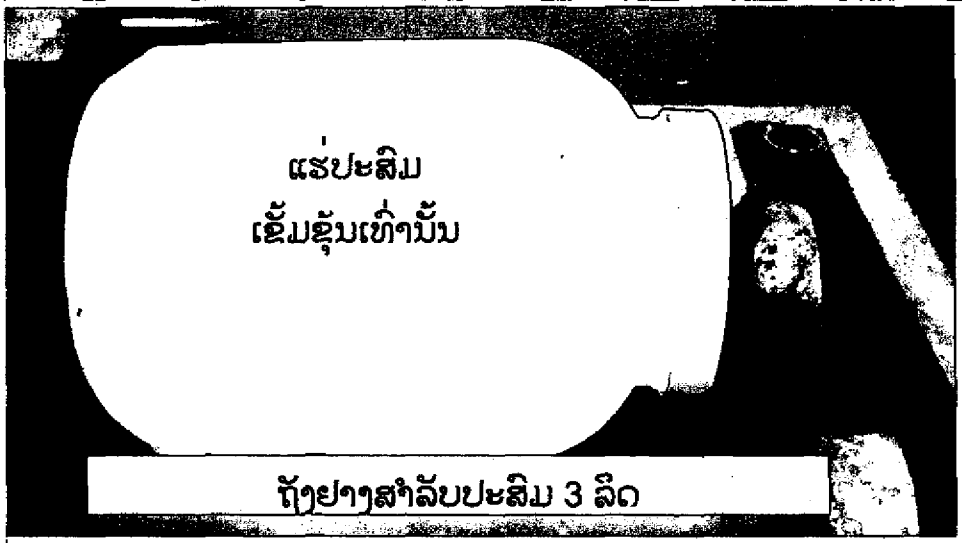
ໃຊ້ມັນຢ່າງລະມັດລະວັງ

ຢ່າປະລິມບາຫຼອດໃນແມ່ນ້ຳ

ຫຼືໃກ້ກັບແຫຼ່ງນ້ຳໃຊ້ຂອງທ້ອງຖິ່ນ

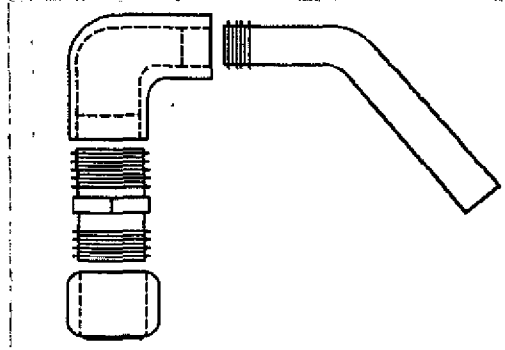
ຫຼືກລ້ຽງເຂດໃຊ້ນ້ຳທີ່ໃຊ້ຊັກເຄື່ອງ, ເຮັດກິນ ຫຼື ບ່ອນຫາປາ

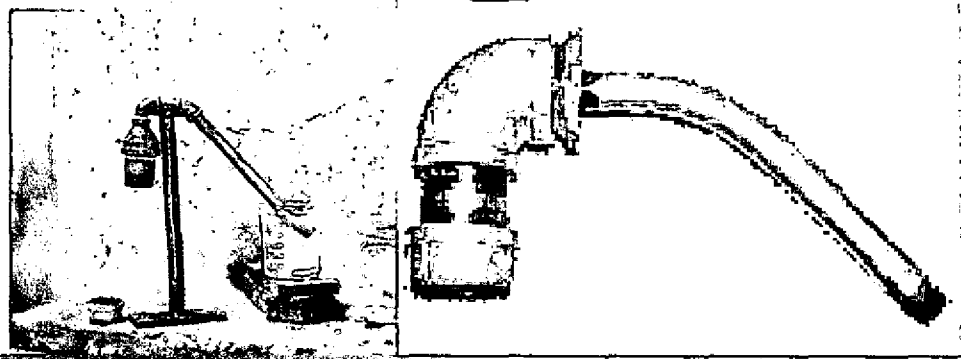
ໜອງປະລິມບາຫຼອດສະເໝີ



ໃຊ້ສານບາຫູອດພຽງແຕ່ 1 ສ່ວນ ຕໍ່ ແຮ່ເຂັ້ມຂຸ້ນ 100 ສ່ວນ

ທ່ານສາມາດ
ໃຊ້ທໍ່ນ້ຳເຮັດໜ້
ຈູດຄຳໄດ້





ອັນຕະລາຍທີ່ຮ້າຍແຮງທີ່ສຸດ

ຖ້ຽປະສົມ

ຫຼີກລ້ຽງການປະສົມ
ແຮ່ດ້ວຍມືເປົ່າ

ໃຊ້ຖ້ຽຢ່າງປະສົມເຮັດ
ໃຫ້ໃຊ້ບາຫູອດນ້ອຍລົງ
ແລະ ປະຫຍັດເງິນ

ການປະສົມທາດດ້ວຍມື
ເປົ່າ ແມ່ນ ບໍ່ມີປະສິດທິຜົນ

ໃຊ້ໄຟທີ່ຮ້ອນ
ຈູດ ແລະ ກັກ
ບາຫູອດ

ມັນໄວ ແລະ ສາມາດ
ກັກບາຫູອດໄວ້ໃຊ້
ຄືນໄດ້

ຢ່າໃຊ້ມືເປົ່າ
ບີບບາຫຼອດ

ໃຫ້ໃຊ້ຖົງມືຢາງ

ປະສົມໃນຖັງຢາງ
ໃຊ້ເວລາ 30 ຫາ
45 ນາທີ

ຖ້າໃຊ້ເວລາໜ້ອຍໂພດ
- ຈະຈັບຄໍ່ບໍ່ໄດ້ໜິດ

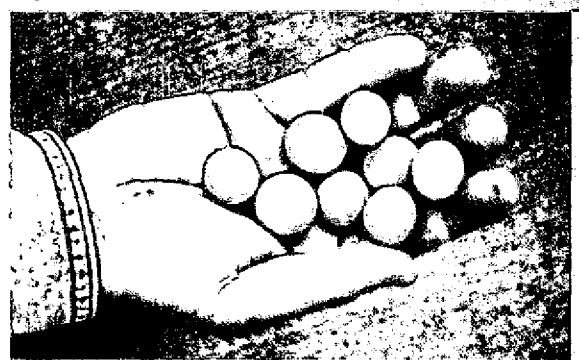
ຖ້າເວລາຫຼາຍໂພດ
- ບາຫຼອດຈະກາຍເປັນສີ
ແລະ ຄໍ່ານໍ່ຈະຫຼຸດອອກຄືນ

ອາຍບາຫຼອດແມ່ນ

ໃຊ້ບາຫຼອດໜ້ອຍກວ່າ

ຢ່າຈູດຄໍ່ປະສົມ
ບາຫຼອດ ໃນເຮືອນ
ຫຼື ໃກ້ແມ່ຍິງ ແລະ
ເດັກນ້ອຍ

ໃສ່ກ້ອນຢາງ ຫຼື
ໂສ້ເຫຼັກໃນຖັງ
ເພື່ອຊ່ວຍໃຫ້ການ
ຈັບຄໍ່ດີຂຶ້ນ

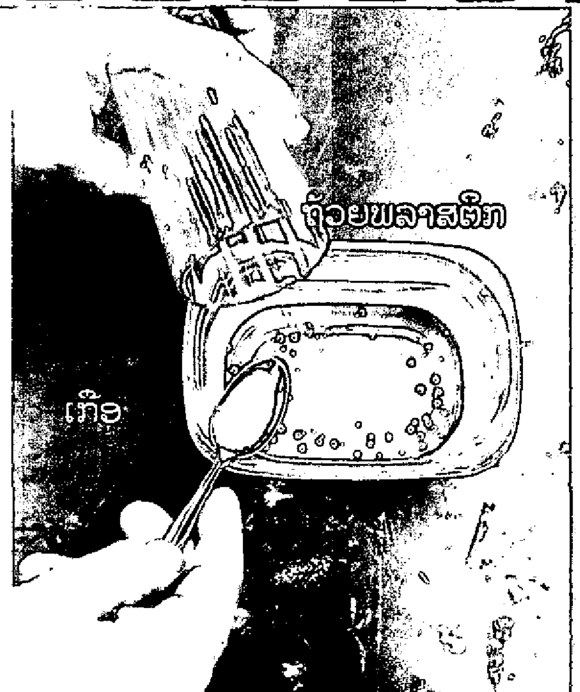


ການກະຕຸ້ນບາຫຼອດ

ບາຫຼອດທີ່ຖືກກະຕຸ້ນ
ຈະເຮັດວຽກດີຂື້ນ
ກ່ວາເກົ່າ.

ເກືອໜຶ່ງບ່ວງເຕັມ ຕໍ່ນ້ຳ
ໜຶ່ງຈອກ

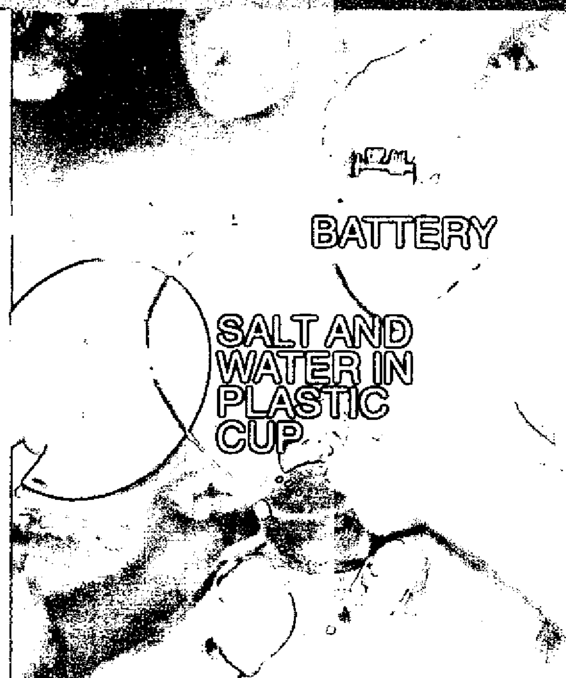
ໃຊ້ພາຊະນະທີ່ເປັນແກ້ວ
ຫຼື ຢາງ ຫ້າມໃຊ້ເຫຼັກ



ພຽງແຕ່ກະຕຸ້ນກ່ອນ
ການປະສົມ

ໃຊ້ເວລາພຽງ 10ນາທີ

ຈຸ່ມສາຍໄຟຂົ້ວບວກລົງໃນ
ບາຫຼອດ ແລະ ຂົ້ວລົບລົງ
ໃນນ້ຳເກືອ



ນຳໃຊ້ບາຫຼອດໜ້ອຍລົງ

ອັນນີ້ໃຊ້ບາຫຼອດ
ຫຼາຍໂພດ

ນຳໃຊ້ ການ
ປະສົມໃນຖັງ

ปกป้องอะนาคิด ของเด็กน้อย

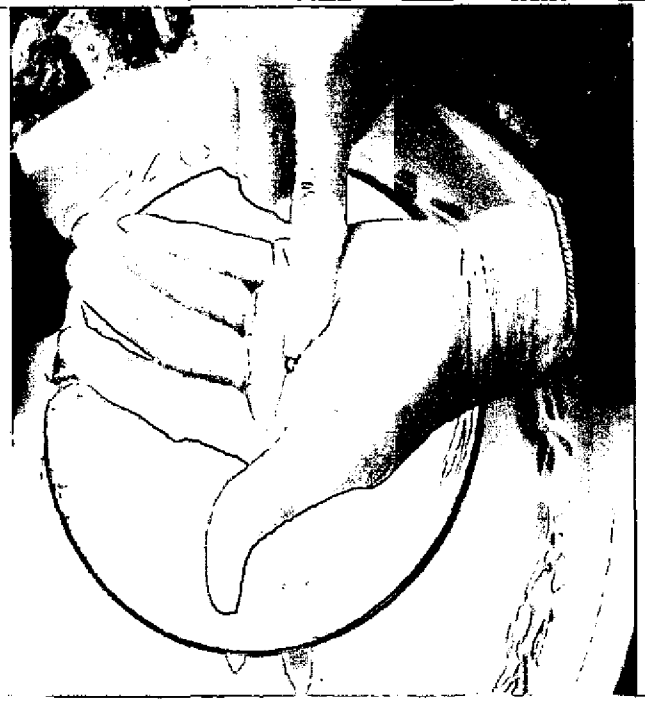
จุดปาฏอดใช้ไภจาก ผู้ยิ่ง และ เด็กน้อย

Global Mercury Project

Less Mercury, More Gold and Better Health

ການນຳໃຊ້
ບາຫຼອດ

ສາມາດຈະເຮັດໃຫ້ຄົນ
ເຈັບໜັກໄດ້



ຫຼີກລ້ຽງການ
ສຳພັດໂດຍກົງກັບ
ຜິວໜັງ

ນຳໃຊ້ຖົງມືພລາດສຕິກ

ນຳໃຊ້ຖັງຢາງໃນການ
ເຊື່ອມສານບາຫຼອດ

ອາຍຂອງສານບາຫຼອດ

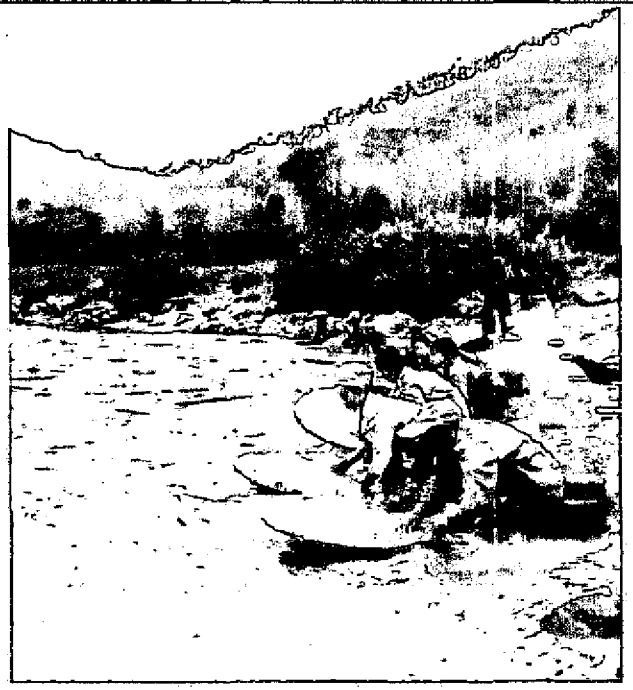
ເດັກນ້ອຍຢູ່ໃນ
ພາວະສ່ຽງ

ເຮັດວຽກຮ່ວມກັບ
ເພື່ອນບ້ານ

ສ້າງສູນລວມໃນການ
ເຊື່ອມບາຫຼອດ ແລະ
ສ້າງບ່ອນຈຳຄຳ

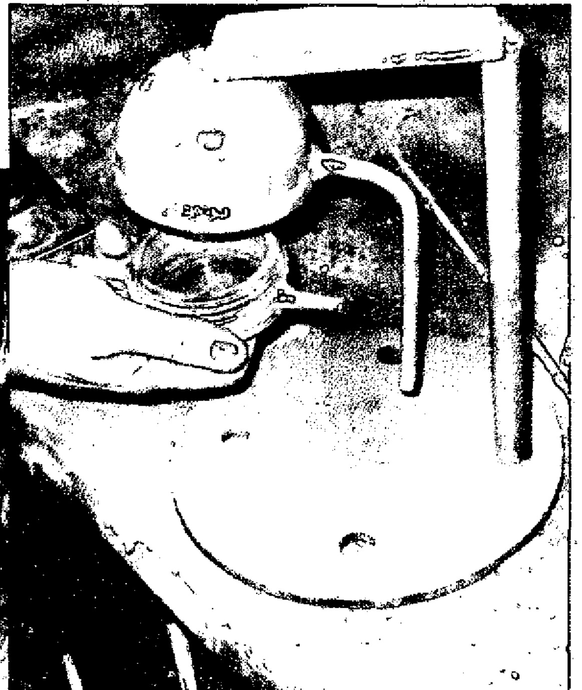
ສະຖານທີ່ຈຸດບາຫຼອດ
ຄວນໄກຈາກຄົນ, ສັດ,
ແລະ ສິ່ງປູກຝັງ

ປ່ຽນເຄື່ອງນຸ່ງຫຼັງຈາກ



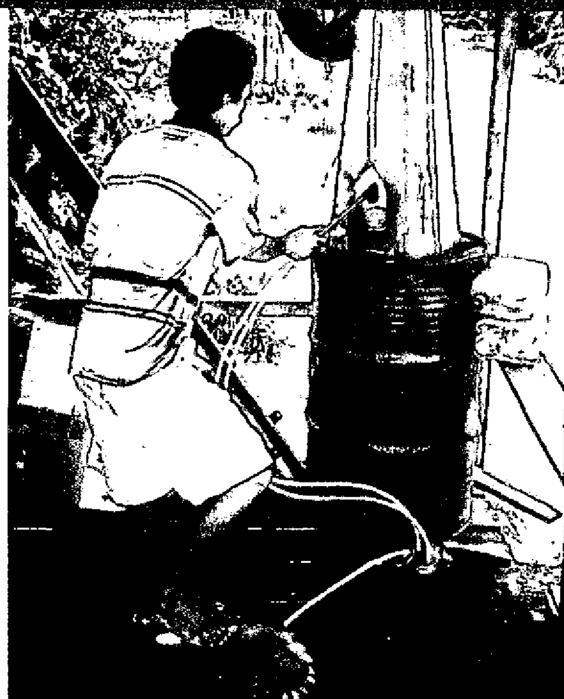
ການແກ້ໄຂບັນຫາສານບາຫຼອດ

ໃຊ້ໝໍ້ຈູດແບບມີ
ຝາຄອບ



ໃຊ້ໝໍ້ຈູດທີ່ມີທີວກັ້ນ
ອາຍຄວັນອອກ
ໂດຍທີວກອງສານ
ບາຫຼອດ

ນຳໃຊ້ເຄື່ອງເປົ່າລະບາຍ
ອາກາດທີ່ເໝາະສົມ



ມີໄພອັນຕະລາຍຮ້າຍແຮງ

ບາຫຼອດຈະ
ເຂົ້າຮ່າງກາຍ
ໂດຍທາງ
ດັງ
ປາກ
ຜິວໜັງ

ອາຍຂອງສານ
ບາຫຼອດເປັນພິດ
ທ່ານບໍ່ສາມາດເຫັນ
ຫຼື ໄດ້ກິ່ນ

ເຮັດວຽກກັບບາ
ຫຼອດອາດກໍ່ໃຫ້ເກີດ
ບັນຫາຕ່າງໆຕໍ່
ສຸຂະພາບ ລວມມີ:

- ຄວາມຈຳເສື່ອມ
- ຮ່າງກາຍສັ່ນ
- ລະບົບຫາຍໃຈຝຶດ

ບໍ່ໃຫ້ແມ່ຍິງຢູ່ໃກ້
ເຂດຈູດບາຫຼອດ

ປົກປ້ອງແອນ້ອຍ ແລະ
ເດັກອ່ອນທີ່ບໍ່ທັນເກີດ

ບໍ່ໃຫ້ຈູດບາຫຼອດ ຢູ່ໃນ ຫຼື
ໃກ້ເຮືອນ

ຈົ່ງປົກປ້ອງ

ສານບາຫຼອດສິ່ງຜົນ
ກະທົບຮ້າຍແຮງຕໍ່ເດັກ
ແລະ ແອນ້ອຍໃນທ້ອງ
ແມ່

ໃຫ້ຜູ້ຍິງ ແລະ
ເດັກນ້ອຍຢູ່ໄກຈາກ ເຂ
ດຈູດສານບາຫຼອດ

ໃຫ້ເດັກນ້ອຍຢູ່
ໄກຈາກເຂດຈູດສານ
ບາຫຼອດ

ນຳໃຊ້ຫມໍ້ຈູດ
ແບບມີຝາຄອບ

ບໍ່ໃຫ້ເດັກນ້ອຍຢູ່
ໃກ້ສານບາຫຼອດ

ພວກເຮົາສາມາດເຮັດຫຍັງໄດ້ແດ່?

ການປ້ອງກັນແມ່ນຄຳຕອບ

ເຮັດວຽກກັບເພື່ອນບ້ານເພື່ອຊອກຫາຄຳຕອບ

ການໃຊ້ສານບາຫຼອດໃນໄລຍະຍາວຈະເປັນສາຍເຫດ ຂອງບັນຫາສຸຂະພາບ ເຊັ່ນ:

- ຕາບອດ
- ເປັນລ່ອຍ
- ໄຂ່ຫູ້ງ, ຕັບຖືກທຳລາຍ, ແລະ ເສຍຊີວິດ

ສານບາຫຼອດ

ຄອບຄົວຂອງທ່ານ

ບໍ່ໃຫ້ມີການຈູດຢູ່ໃກ້ບ້ານ ຫຼື ໃນເຮືອນ

ປົກປ້ອງຄອບຄົວຂອງທ່ານ

ຈູດບາຫຼອດຢູ່ນອກບ້ານສະເໝີ

ປ້ອງກັນຕົວທ່ານເອງ ແລະ ຄອບຄົວຂອງທ່ານ

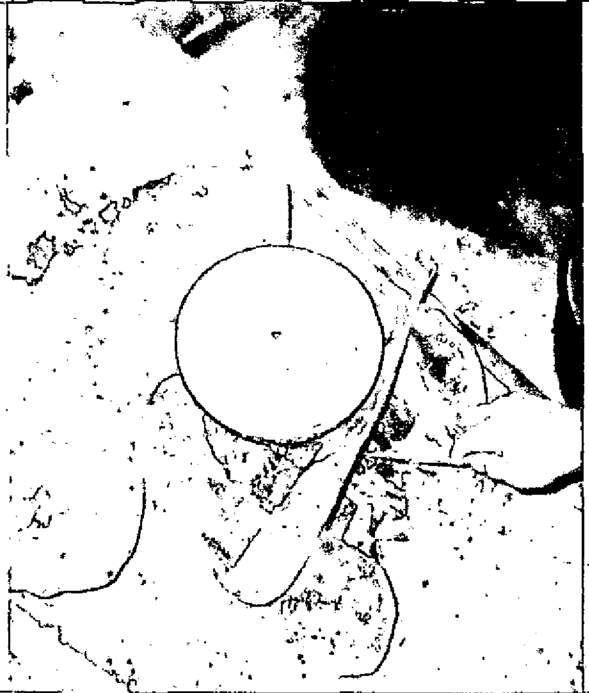
- ຈູດແຮ່ປະສົມບາຫຼອດນອກເຮືອນ ແລະ ຫ່າງໄກ ຈາກຄົນ
- ນຳໃຊ້ໝໍ້ຈູດເອົາຄຳທີ່ ມີຝາປົກ
- ຫຼີກລ້ຽງການຫາຍໃຈເອົາອາຍສານບາຫຼອດ
- ຫ້າມບໍ່ໃຫ້ກິນປາຢູ່ໃນໜອງທີ່ມີທາດປະສົມສານບາຫຼອດ

ປົກປ້ອງ

ການຈູດສານ ບາຫຼອດເປັນອັນ ຕະລາຍຫຼາຍ

ອາຍຂອງສານບາຫຼອດ ກໍ່ໃຫ້ເກີດພະຍາດປອດ ແລະ ທຳລາຍສະໝອງ

ການໃສ່ໜ້າກາກກໍ່ບໍ່ສາມາດ ປ້ອງກັນອາຍຂອງສານ ບາຫຼອດໄດ້



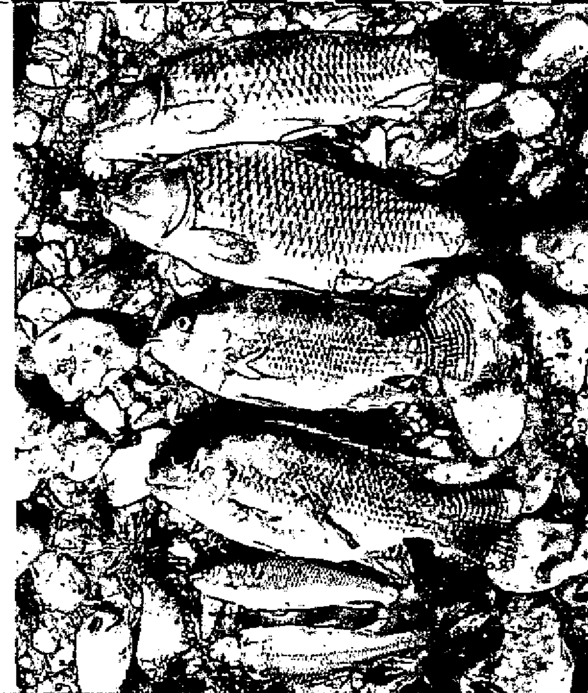
ການອາໄສ ແລະ ເຮັດວຽກຢູ່ໃກ້ບ່ອນ ຈູດສານບາຫຼອດ ແມ່ນ ເປັນອັນຕະ ລາຍຫຼາຍ

ຫ້າມບໍ່ໃຫ້ມີແມ່ຍິງ ແລະ ເດັກນ້ອຍ ຢູ່ໃກ້ບ່ອນຈູດ

ຄອບຄົວຂອງທ່ານ

ສານບາຫຼອດ ສາມາດໄຫຼລົງສູ່ ແມ່ນ້ຳ ແລະ ບຶງ

ສານບາຫຼອດເປັນພິດ ແລະ ຈະກາຍເປັນຫຼາຍກວ່າພິດ ໃນກໍລະນີມັນມີຢູ່ໃນ ປາບາງຊະນິດ



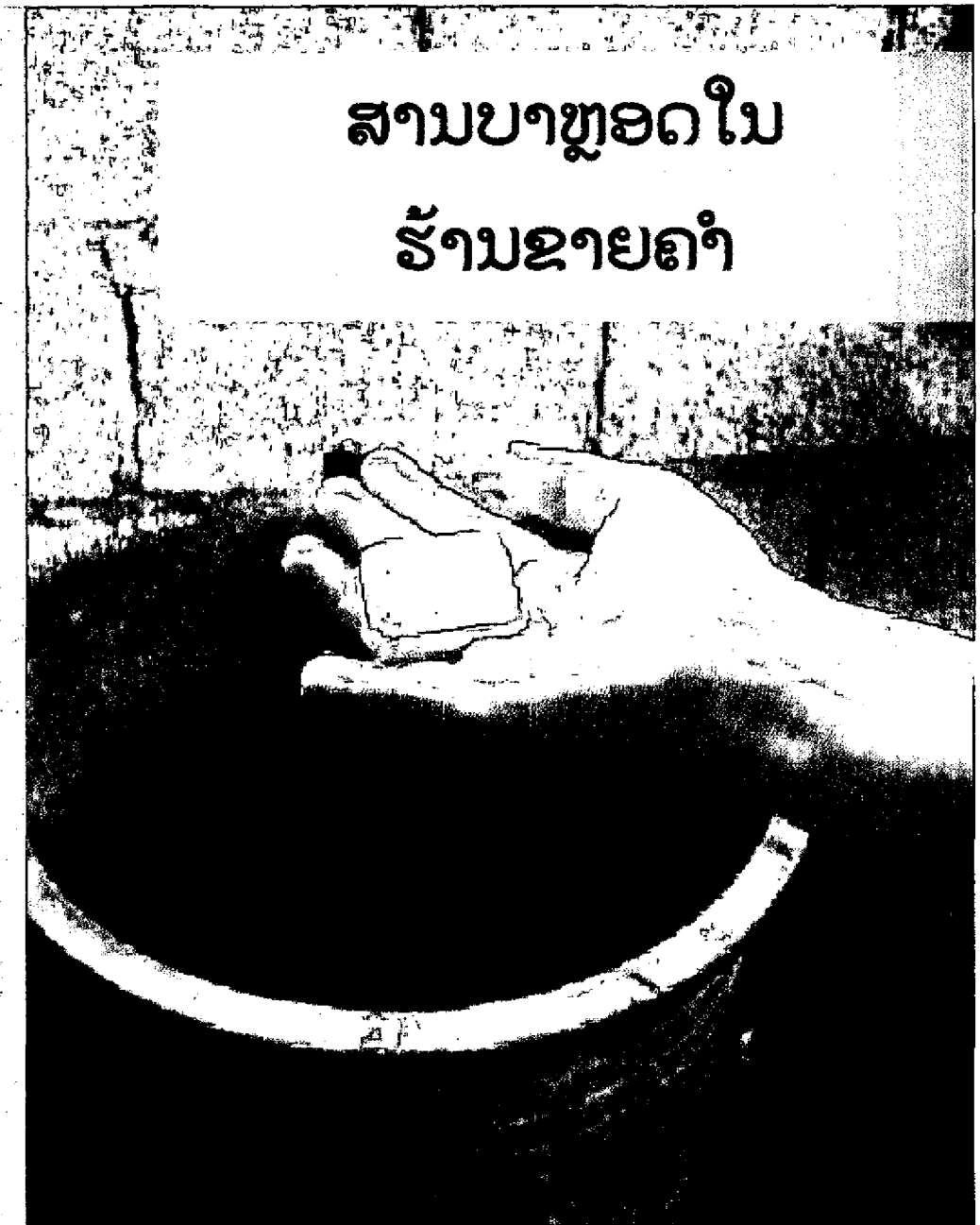
ເດັກນ້ອຍ ແລະ ເດັກອ່ອນໃນທ້ອງແມ່ ແມ່ນຢູ່ໃນ ພາວະສ່ຽງທີ່ສຸດ

ປົກປ້ອງອະນາຄົດ ຂອງເດັກ

Global Mercury Project

Less Mercury, More Gold and Better Health

ສານບາຫູອດໃນ ຮ້ານຂາຍຄຳ



Global Mercury Project

Less Mercury, More Gold and Better Health

ปฏิบัติการทดลองที่ ๑ การหาความหนาแน่นของของแข็ง

จุดประสงค์การทดลอง

๑. เพื่อหาความหนาแน่นของของแข็งที่ไม่ละลายน้ำ

๒. เพื่อหาความหนาแน่นของของแข็งที่ละลายน้ำ

อุปกรณ์

๑. ขวดแก้วปริมาตร ๑๐๐ มิลลิลิตร พร้อมจุกยาง

๒. ขวดแก้วปริมาตร ๕๐ มิลลิลิตร พร้อมจุกยาง

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วิธีการทดลอง

๑. ชั่งมวลของขวดแก้วปริมาตรพร้อมจุกยางแต่ละขนาดที่แห้งสนิทด้วยเครื่องชั่งที่มีความละเอียดสูง

๒. ใส่ของแข็งที่ไม่ละลายน้ำลงในขวดแก้วปริมาตรแต่ละขนาดที่ชั่งมวลแล้ว ปริมาณของแข็งที่ใส่ในขวดแต่ละขนาดควรมีปริมาตรประมาณ ๑/๓ ของปริมาตรขวด

๓. ชั่งมวลของขวดแก้วปริมาตรพร้อมจุกยางที่มีของแข็งอยู่ภายในแต่ละขนาด

๔. เติมน้ำกลั่นลงในขวดแก้วปริมาตรที่มีของแข็งอยู่ภายในแต่ละขนาดจนเต็มขวด ปิดจุกยางให้สนิท ระวังอย่าให้มีฟองอากาศเหลืออยู่ภายในขวด

๕. ชั่งมวลของขวดแก้วปริมาตรพร้อมจุกยางที่มีของแข็งและน้ำกลั่นอยู่ภายในแต่ละขนาด

๖. ทำการทดลองซ้ำ ๓ ครั้ง

ภาพที่ ๑ ขวดแก้วปริมาตรขนาดต่างๆ

ภาพที่ ๒ ขวดแก้วปริมาตรพร้อมจุกยาง

ภาพที่ ๓ ขวดแก้วปริมาตรที่มีของแข็งอยู่ภายในแต่ละขนาด

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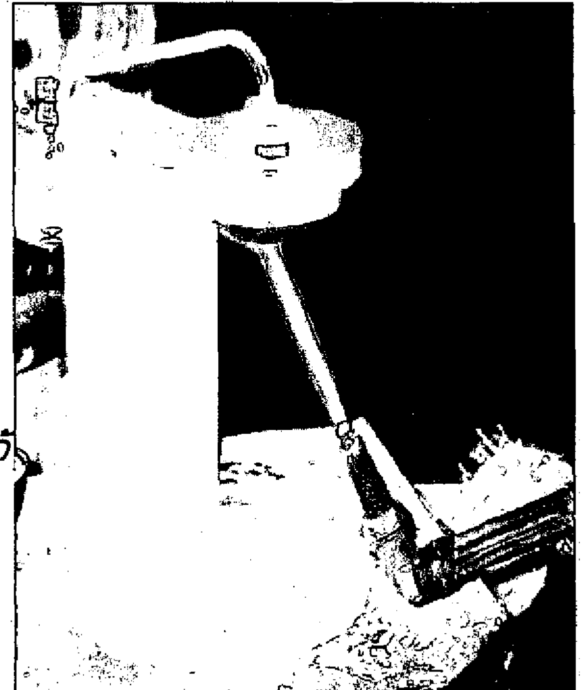
ຜ້າກັນຝຸ່ນບໍ່ສາມາດປ້ອງກັນໄດ້

ຜ້າກັນຝຸ່ນເກັບສານບາຫຼອດຈາກອາກາດ ເມື່ອຄົນເຮັດວຽກເອົາຜ້າກັນຝຸ່ນມານຳໃຊ້ອີກ ຈະເຮັດໃຫ້ເປັນພິດຫຼາຍກວ່າເກົ່າອີກ

ຄຳສາມາດຫຼອມໃນໝໍ້ຈູດທີ່ມີຕົວກັກ ສານບາຫຼອດ



ອາຍສານບາຫຼອດຈະບໍ່ກະຈາຍອອກໄປ, ແຕ່ສາມາດເກັບມາໃຊ້ຄືນໄດ້

ໃຊ້ບັງຈອດອົກຊີທີ່ມີ ອຸນນະພູມສູງເພື່ອຫຼອມຄຳ

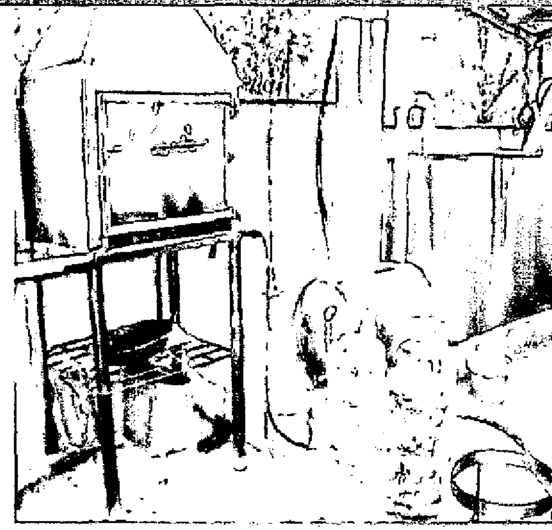
ຫຼອມຄຳໃນບ່ອນທີ່ອາກາດລະບາຍດີ

ໜ້າກາກທີ່ມີຕົວກອງສານບາຫຼອດສາມາດປ້ອງກັນຜູ້ເຮັດວຽກແຕ່ບໍ່ປ້ອງກັນຄົນທີ່ຢູ່ອ້ອມຂ້າງໄດ້

ສະນັ້ນຍັງຈຳເປັນຕ້ອງມີຕູ້ຈູດກັກຄວັນພິດທີ່ເໝາະສົມທີ່ມີຕົວປັບ ແລະ ຕົວກອງອາກາດ

ນຳໃຊ້ຕູ້ກັກຄວັນພິດທີ່ເໝາະສົມ

ເວລາຫຼອມຄຳ, ຕູ້ກັກສານພິດຕ້ອງມີຕົວປັບອາກາດ (ຖັງນ້ຳ), ຕົວກອງກາກບອນ ແລະ ແວ່ນແກ້ວ



ອາຍຈາກຕູ້ກັກສານພິດຈະຖືກອະນາໄມ ຢູ່ໃນຖັງນ້ຳ

ກ

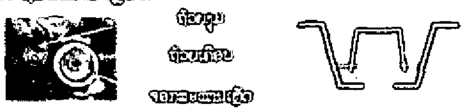
APPENDIX 5
AWARENESS MATERIALS: POSTERS

ການຈູດຄ້ານ້ຳຢາ

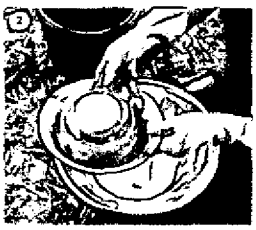
ນຳໃຊ້ຖ້ວຍດັກບາທູອດ

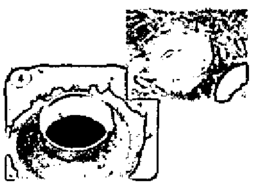
ການກະກຽມ:

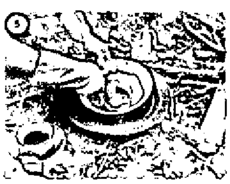
1. ຖ້ວຍດັກບາທູອດ



2. ການປະຕິບັດ :







ນຳໃຊ້ທໍ່ດັກບາທູອດ

ການກະກຽມ:

1. ທໍ່ດັກບາທູອດ

2. ການປະຕິບັດ :

ສິ່ງຄວນເອົາໃຈໃສ່:

1. ຄວນສວມຖົງມື ໃນເວລາ ທີ່ເຮັດການຈູດບາທູອດ.

2. ການເປີດຝາກອບອອກ ແລະ ນຳທໍ່ອອກ. ປິດຝາຄອບຄືນທັນທີ ແລະ ປິດຄອບໄມ້ໃຫ້ແໜ້ນ. ເກັບຮັກສາບາຈຸປະກອບຈູດບາທູອດ ໄວ້ໃນ ຖົງປລາສະຕິກ, ປິດ ແລະ ເກັບໄວ້ໃຫ້ດີ.

3. ເກັບຮັກສາບາທູອດໃສ່ໃນຂວດ ປລາສະຕິກ (ປິດໃຫ້ແໜ້ນ ແລະ ຕິດ ປ້າຍອັນຕະລາຍ).

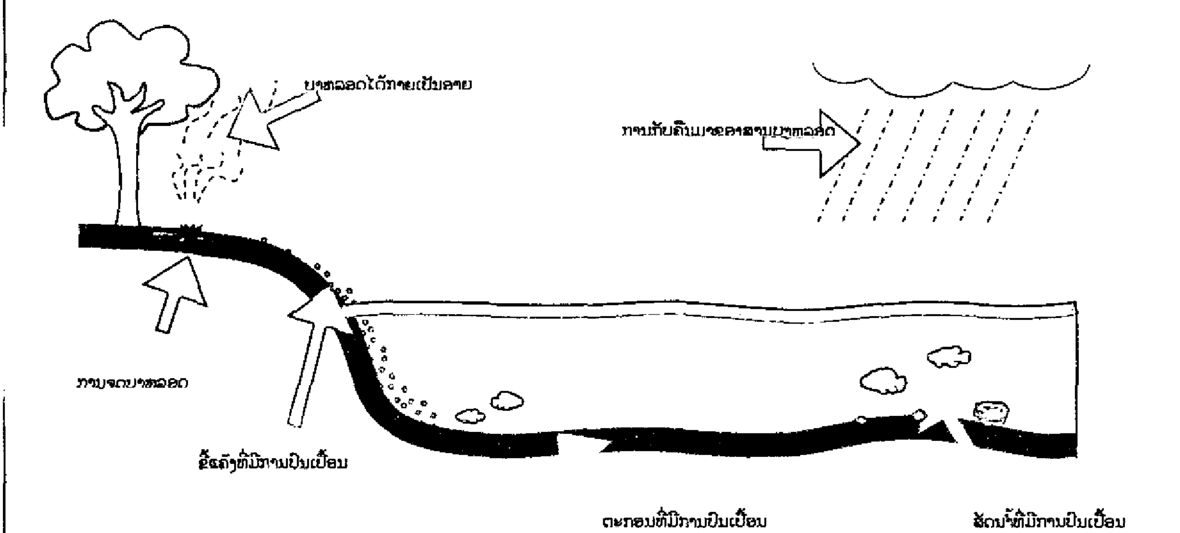
ສິ່ງຫ້າມ:

1. ເກັບຮັກສາບາທູອດ ໃຫ້ໄກຈາກແມ່ຍິງ ແລະ ເດັກນ້ອຍ.
2. ຄວາມປອດໄພຂອງຕົນເອງໃນເວລາຈູດ (ບໍ່ຄວນນັ່ງຢູ່ໃກ້ ຫຼື ລຸ່ມທິດທາງ ລົມຈາກຜູ້ທີ່ກຳລັງຈູດບາທູອດ)
3. ກຳນົດສະຖານທີ່ ໃນການຈູດບາທູອດ, ໄກຈາກຊຸມຊົນ (ຢ່າງໜ້ອຍ 100 ແມັດ).
4. ບໍ່ຄວນຖິ້ມ ບາທູອດລົງໃສ່ແມ່ນ້ຳ ຫຼື ຕາມພື້ນດິນ.

ສານບາຫລອດ ແລະ ສຸຂະພາບຂອງຄົນໃນຄອບຄົວ

ສິ່ງທີ່ຄວນເຮັດ	ສິ່ງທີ່ບໍ່ຄວນເຮັດ
ຄວນເຮັດໃຫ້ຄ... ເຜົາບາຫລອດ	
ຄວນຈູດຢູ່ບ່ອນທີ່ຫ່າງໄກຈາກເຮືອນ ແລະ ...	ບໍ່ຄວນຈູດບາຫລອດຢູ່ພາຍໃນເຮືອນ
ຄວນຈູດໄກຈາກ ແມ່ຍິງ ແລະ ເດັກນ້ອຍ	ບໍ່ຄວນຈູດບາຫລອດຢູ່ບ່ອນທີ່ໃກ້ກັບ ແມ່ຍິງ ...
ຄວນສວມໃສ່ອຸປະກອນປ້ອງກັນຕົວເອງ	ບໍ່ຄວນສວມຜ້າປົກດັງ ເພາະມັນບໍ່ສາມາດປ້ອງກັນ ...
	ບໍ່ຄວນ ... ບາຫລອດໃສ່ແມ່ນ້ຳ
	Do not use materials used for burning mercury for any other purpose - do not
	ບໍ່ຄວນນັ່ງຢູ່ໃກ້ກັບສະຖານທີ່ງເຄີຍຈູດບາຫລອດ ...

ສິ່ງທີ່ຄວນເຮັດ	ສິ່ງທີ່ບໍ່ຄວນເຮັດ
ຄວນເກັບຮັກສາສານບາຫລອດ ...	
ຄວນຖອກນ້ຳໃສ່ທີ່ຂວດທີ່ເກັບຮັກສາບາຫລອດ ...	
ຄວນຕິດປ້າຍ "ສານອັນຕະລາຍ" ໃສ່ຂວດ ...	
ຄວນເກັບຮັກສາໄວ້ບ່ອນທີ່ໄກຈາກເດັກນ້ອຍ	ບໍ່ຄວນຖິ້ມ ບາຫລອດທີ່ບໍ່ໄດ້ໃຊ້ແລ້ວ ລົງໃສ່ແມ່ນ້ຳ



APPENDIX 6
DRAFT CODES OF PRACTICE FOR ARTISANAL AND SMALL-SCALE GOLD MINING IN LAO PDR

DRAFT

Codes of Practice for Incorporation into

Regulations for Artisanal and Small Scale Mining

For implementation under the

Lao People's Democratic Republic (Lao PDR) Mining Laws

MINE SAFETY

All attempts must be taken to protect workers from harm and hazards during artisanal and small scale mining operations. To ensure mine safety, the following regulations must be followed:

1. When working below ground, all holes or pits must be reinforced to ensure that there is no risk of collapse.
2. Miners should wear protective clothing, and protect the eyes (wear goggles), feet (wear boots) and hands (wear gloves)
3. Hard hats should be worn at all times
4. When working below ground adequate lighting and ventilation (fresh air supply) must be provided
5. Explosives must not be used at any time
6. When processing ore in mills processors should protect the eyes (wear goggles) and hands (wear gloves)

ENVIRONMENTAL PROTECTION

It is very important that impacts to the local environment are minimized as much as possible. To protect the environment, the following regulations must be followed:

NO VEGETATION CLEARING

1. Clearing of vegetation will not take place within twenty-five metres (25 m) of any stream or riverbank or lake.

SETTLING PONDS

2. Washing or settling ponds must be constructed to contain processed river sediment and mine tailings.
3. Settling ponds must be located at least 100 m away from streams, rivers or ponds to ensure that fine sediment does not become washed into the stream.

ORE AND TAILINGS DISPOSAL

3. A pit to contain processed mine tailings or processed ore must be constructed. The pit must be located at least 50 m away from all streams, rivers or lakes. The pit must have sufficient space to contain all mine tailings.
4. A new pit must be constructed once mine tailings have reached to within 1 meter of the top of the pit.
5. The old pit must be covered with one meter (1 m) of clean soil to prevent overflow of tailings from the pit.

USE OF MERCURY

6. Mercury must be safely stored in unbreakable containers and away from children
7. Mercury should never be added to ore that has not first been concentrated using a pan or carpet lined sluice box
8. Copper plates lined with mercury should not be used; If copper plates are being used, there must be a transition to a sluice box by August 31, 2007. During this transition, a sluice box must be operated downstream of the copper plate
9. During burning of amalgam, a retort must be used to recover mercury. Any retort is acceptable, including a pipe retort, kitchen bowl retort or fumehood retort
10. Mercury contaminated tailings or ore must never be discharged to any stream, river, lake or pond
11. Burning of amalgam must be conducted at least 100 m away from populated areas including homes, shops, or any other building

12. Mercury and cyanide should never be mixed together. Tailings exposed to mercury must never be processed with cyanide

PROTECTION OF HUMAN HEALTH

Exposure to mercury is very harmful to human health. The most dangerous is when mercury amalgam is burned. This creates a gas of mercury vapor that when breathed is absorbed into the body. Mercury discharged to water can also eventually become accumulated by fish. Consuming *mercury contaminated fish is especially harmful to children and pregnant women.*

MERCURY EXPOSURE

1. Never burn amalgam in an enclosed space. Use a retort
2. Always keep women and children from burning areas, even if using a retort
3. Amalgam must never be burned in the home. Burn using a retort at least 100 m away from other people and buildings.
4. Store clothing used during burning of amalgam in plastic bags. Clothes used for burning should never be worn away from the burning area.
5. Items coming into contact with mercury such as bowls, utensils and clothing should never be used for any other purpose
6. Do not consume fish from ponds that have come into contact with mercury

OTHER HEALTH ISSUES

7. Children under the age of 16 are not to be employed or engaged in mechanized mining operations
8. Pit latrines should be constructed and maintained at a distance of greater than 100 m away from any water source that is also used for drinking, cooking or bathing
9. Protective gear (footwear, gloves, eye and hearing protection) should be worn
10. Ponds used for tailings disposal or amalgamation must not discharge to local waterways that contain fish or where water is used for drinking, cooking or bathing

UNIDO

March 2007

Global Mercury Project

ร่างๆ

ກິດປະຕິບັດການສຳລັບປະກອບລວມເຂົ້າໃນ

ລະບຽບກ່ຽວກັບການຂຸດຄົ້ນບໍ່ແຮ່ແບບຫັດຖະກຳຂະໜາດນ້ອຍ

ເພື່ອຈັດຕັ້ງປະຕິບັດພາຍໃຕ້

ກົດໝາຍວ່າດ້ວຍບໍ່ແຮ່ ຂອງ ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ (ສປປ ລາວ)

ຄວາມປອດໄພໃນຫຸມແຮ່

ຕ້ອງໄດ້ພະຍາຍາມດ້ວຍທຸກວິທີທາງເພື່ອປົກປ້ອງການປະກອບໃຫ້ປອດໄພຈາກຜົນຮ້າຍ ແລະ ໄພອັນຕະລາຍ ໃນຂະນະປະຕິບັດວຽກງານຂຸດຄົ້ນບໍ່ແຮ່ແບບຫັດຖະກຳຂະໜາດນ້ອຍ. ເພື່ອຮັບປະກັນຄວາມປອດໄພໃນຫຸມແຮ່, ຕ້ອງໄດ້ປະຕິບັດບັນດາລະບຽບດັ່ງລຸ່ມນີ້:

7. ໃນເວລາປະຕິບັດງານໃຕ້ດິນ, ຕ້ອງມີໂຄງສ້າງຄ້ຳຮູ ຫຼື ປ່ອງຫວ່າງໄວ້ ເພື່ອຮັບປະກັນບໍ່ໃຫ້ ຫຸມແຮ່ພັງລົງມາ.
8. ຜູ້ຂຸດຄົ້ນແຮ່ຄວນສວມເຄື່ອງນຸ່ງປ້ອງກັນຕົວ, ແລະ ປ້ອງກັນຕາ (ໂດຍໃສ່ແວ່ນຕາໜ້າກາກ), ຕີນ (ໃສ່ເກີບໂຍກ) ແລະ ມື (ໃສ່ຖົງມື)

9. ຄວນໃສ່ໝວກແຂງທຸກເວລາ
10. ໃນຂະນະທຳງານໃຕ້ດິນ ຕ້ອງມີການສະໜອງແສງສະຫວ່າງ ແລະ ລະບາຍອາກາດ (ສະໜອງອາກາດສົດ)
11. ຫ້າມໃຊ້ດິນລະເບີດເວລາໃດກໍຕາມ
12. ເວລາທຳການປຸງແຕ່ງແຮ່ໃນຈັກປິດ ຄວນປ້ອງກັນຕາໃຫ້ດີ (ໂດຍໃສ່ແວ່ນຕາໜ້າກາກ) ແລະ ມື (ໂດຍໃສ່ຖົງມື)

ການປົກປັກຮັກສາສິ່ງແວດລ້ອມ

ມັນເປັນສິ່ງສຳຄັນ ທີ່ຕ້ອງຫຼຸດຜ່ອນຜົນກະທົບຕໍ່ສິ່ງແວດລ້ອມໃນບໍລິເວນໃຫ້ໜ້ອຍລົງເທົ່າທີ່ໜ້ອຍໄດ້. ເພື່ອປົກປັກຮັກສາສິ່ງແວດລ້ອມ, ຕ້ອງໄດ້ປະຕິບັດລະບຽບການດັ່ງລຸ່ມນີ້:

ບໍ່ໃຫ້ຖາງປ່າ

1. ບໍ່ໃຫ້ຖາງປ່າໃນຂອບເຂດ ຊາວຫ້າ ແມັດ (25 ມ) ຫ່າງຈາກຫ້ວຍ ຫຼື ແຄມນ້ຳ ຫຼື ໜອງນ້ຳ.

ອ່າງດັກຕອງຕະກອນ

4. ຕ້ອງເຮັດອ່າງລ້າງ ຫຼື ດັກຕອງຕະກອນ ເພື່ອບັນຈຸຕະກອນທີ່ຜ່ານຂະບວນການຜະລິດ ແລະ ນ້ຳຂີ້ແຄ້ງຈາກບໍ່ແຮ່.
5. ອ່າງດັກຕອງຕະກອນຕ້ອງສ້າງໃຫ້ຫ່າງຈາກຫ້ວຍ, ສາຍນ້ຳ ຫຼື ໜອງ ຢ່າງໜ້ອຍ 100 ແມັດ ເພື່ອຮັບປະກັນບໍ່ໃຫ້ຝຸ່ນຝອຍຕະກອນຖືກລ້າງໄຫຼລົງສູ່ຫ້ວຍນ້ຳ.

ການຈັດມຸ້ງແຮ່ ແລະ ຂີ້ແຄ້ງ

13. ຕ້ອງຂຸດຂຸມເພື່ອບັນຈຸຂີ້ແຄ້ງທີ່ຜ່ານຂະບວນການ ຫຼື ແຮ່ທີ່ຜ່ານການປຸງແຕ່ງ. ຂຸມດັ່ງກ່າວ ຈະຕ້ອງຢູ່ຫ່າງໄກຢ່າງໜ້ອຍ 50 ມ ຈາກ ຫ້ວຍ, ສາຍນ້ຳ ຫຼື ໜອງຕ່າງໆ. ຂຸມນີ້ຕ້ອງມີຂະໜາດ ກ້ວາງພຽງພໍສຳລັບບັນຈຸນ້ຳຂີ້ແຮ້ງຂອງແຮ່ທັງໝົດ.
14. ເມື່ອຂຸມເຕັມຢູ່ລະດັບປະມານ 1 ແມັດເຖິງປາກຂຸມແລ້ວ ຕ້ອງຂຸດຂຸມໃໝ່.
15. ຂຸມເກົ່າຕ້ອງປິດຖົມດ້ວຍດິນສະອາດໃຫ້ໜາລະດັບໜຶ່ງແມັດ ເພື່ອປ້ອງກັນບໍ່ໃຫ້ຂີ້ແຄ້ງລົ້ນ ໄຫຼອອກຈາກຂຸມ.

ການນຳໃຊ້ສານບາງຊະນິດ

16. ສານບາງອດຕ້ອງໄດ້ເກັບມ້ຽນໄວ້ຢ່າງປອດໄພໃນທຸກຈຸດທີ່ບໍ່ແຕກງ່າຍ ແລະ ໃຫ້ພົ້ນ ຈາກມືເດັກ.

17. ບໍ່ຄວນນຳໃຊ້ສານບາງອດປະສົມກັບແຮ່ທີ່ຍັງບໍ່ທັນເຮັດເປັນຂີ້ຈ່ານໂດຍຜ່ານການຮ່ອນໃນ ບ້າງບາກ່ອນ ຫຼື ຜ່ານການໃຊ້ຜ້າຝ້າຍຕອງເອົາໃນຮາງຮ່ອນກ່ອນ.

18. ບໍ່ຄວນໃຊ້ຮາງແຜ່ນທອງທາບາງອດເພື່ອດັກຂີ້ຈ່ານ; ຖ້າແຜ່ນທອງທາບາງອດຍັງໃຊ້ກັນຢູ່ ໃນປະຈຸບັນ ຕ້ອງມີໄລຍະຂ້າມຜ່ານໄປສູ່ການນຳໃຊ້ຮາງຮ່ອນ ພາຍໃນ ວັນທີ 31 ສິງຫາ 2007. ຕະຫຼອດໃນໄລຍະຂ້າມຜ່ານນີ້ ຕ້ອງນຳໃຊ້ຮາງຮ່ອນຕໍ່ຢູ່ດ້ານລ່າງຂອງຮາງດັກທີ່ໃຊ້ ແຜ່ນທອງ.

19. ໃນລະຫວ່າງການຈຸດທາດປະສົມຄຳບໍ້ບາ ຕ້ອງນຳໃຊ້ທໍ່ກັກດັກສານບາງອດ ເພື່ອໃຫ້ສາ ມາດເກັບບາງອດຄືນ. ທໍ່ກັກດັກສານບາງອດຊະນິດໃດກໍ່ລ້ວນແຕ່ໃຊ້ໄດ້ທັ້ງນັ້ນ ລວມທັງທໍ່ດັກ ແບບເຫຼັກ, ແບບໃຊ້ຖ້ວຍຈວມ, ຫຼື ແບບທໍ່ຈຸດຕັ້ງຍາວ.

20. ບໍ່ໃຫ້ປ່ອຍຂີ້ແຄ້ງທີ່ມີສານບາງອດປົນເປື້ອນ ຫຼື ແຮ່ ລົງຫ້ວຍ, ສາຍນ້ຳ ຫຼື ໜອງ ໃດໆທັ້ງນັ້ນ.

21. ການຈຸດທາດປະສົມຄຳບໍ້ບາ ຕ້ອງດຳເນີນໃຫ້ຫ່າງຢ່າງໜ້ອຍ 100 ມ ຈາກສະຖານທີ່ທີ່ມີ ຜູ້ຄົນຢູ່ ລວມທັງບໍລິເວນບ້ານເຮືອນ, ຮ້ານຂາຍເຄື່ອງ, ຫຼື ອາຄານອື່ນໆ.

22. ບໍ່ຄວນເອົາສານບາງອດ ແລະໄຊຍານາຍ ມາປະສົມເຂົ້າກັນຈັກເທື່ອ. ບໍ່ໃຫ້ນຳຂີ້ແຄ້ງ ທີ່ໄດ້ສຳພັດກັບທາດບາງອດມາປຸງແຕ່ງປະສົມກັບໄຊຍານາຍ.

ການປົກປ້ອງສຸຂະພາບຂອງຄົນ

ການສຳພັດກັບສານບາງອດມີຜົນຮ້າຍຫລາຍຕໍ່ສຸຂະພາບຂອງຄົນ. ສິ່ງທີ່ອັນຕະລາຍກວ່າໝູ່ແມ່ນເວລາ ຈຸດທາດປະສົມຄຳບໍ້ບາ. ການຈຸດເຮັດໃຫ້ສານບາງອດລະເຫີຍເປັນອາຍ ຊຶ່ງເມື່ອຫາຍໃຈເອົາກໍ່ຈະຊຶມ ເຂົ້າໄປສູ່ຮ່າງກາຍ. ສານບາງອດທີ່ຖືກປ່ອຍລົງສູ່ສາຍນ້ຳ ກໍສາມາດສະສົມປົນເປື້ອນຢູ່ໃນປາ. ການບໍລິ ໂພກປາທີ່ມີສານບາງອດປົນເປື້ອນແມ່ນມີຜົນຮ້າຍ ໂດຍສະເພາະ ຕໍ່ເດັກນ້ອຍ ແລະ ແມ່ຍິງຖືພາ.

ການສຳພັດກັບທາດບາງອດ

11. ບໍ່ໃຫ້ຈຸດທາດປະສົມຄຳບໍ້ບາຢູ່ໃນສະຖານທີ່ອັດປິດ. ຈົ່ງນຳໃຊ້ທໍ່ຈຸດດັກບາງອດ.

12. ຕ້ອງໃຫ້ແມ່ຍິງ ແລະ ເດັກອອກຈາກສະຖານທີ່ຈຸດສະເໝີ, ເຖິງວ່າຈະໃຊ້ທໍ່ຈຸດດັກກໍຕາມ.

13. ບໍ່ໃຫ້ຈູດທາດປະສົມຄ້ຳບ້ຳໃນບ້ານເຮືອນ. ໃຫ້ຈູດໂດຍໃຊ້ທໍ່ດັກບາງຫຼອດ ໃນໄລຍະໄກ ຢ່າງໜ້ອຍ 100 ມ ຫ່າງຈາກຜູ້ຄົນ ແລະ ອາຄານທີ່ຢູ່ອາໃສຕ່າງໆ.
14. ມ້ຽນເຄື່ອງນຸ່ງທີ່ໃຊ້ສວມເວລາຈູດທາດປະສົມຄ້ຳບ້ຳໄວ້ໃນຖົງຢາງ. ບໍ່ຄວນໃສ່ເຄື່ອງທີ່ໃຊ້ນຸ່ງ ສຳລັບຈູດອອກໄປຈາກສະຖານທີ່ຈູດ.
15. ບໍ່ຄວນໃຊ້ວັດຖຸອຸປະກອນທີ່ໄດ້ສຳພັດກັບສານບາງຫຼອດ ເຊັ່ນ: ຖ້ວຍ, ເຄື່ອງໃຊ້ຄົວກິນ ແລະ ເຄື່ອງນຸ່ງ ເພື່ອເປົ້າໝາຍອື່ນອີກ.
16. ບໍ່ຕ້ອງບໍລິໂພກປາຈາກໜອງທີ່ຖືກສຳພັດກັບສານບາງຫຼອດ.

ບັນຫາອື່ນໆທາງດ້ານສຸຂະພາບ

17. ບໍ່ໃຫ້ຮັບເອົາເດັກໄວອາຍຸຕ່ຳກວ່າ 16 ປີ ເປັນຄົນງານ ຫຼື ເຮັດວຽກໃນກິດຈະກຳຂຸດຄົ້ນບໍ່ແຮ່ ແບບໃຊ້ເຄື່ອງມືກົນຈັກ.
18. ຄວນສ້າງຫຸ້ມວິດ ແລະ ບົວລະບັດຮັກສາ ໃຫ້ຢູ່ໃນໄລຍະກວ່າ 100 ມ ຫ່າງຈາກແຫ່ງນ້ຳ ທີ່ໃຊ້ ສຳລັບດື່ມ, ແຕ່ງຢູ່ຄົວກິນ ຫຼື ອາບ.
19. ຄວນໃສ່ເຄື່ອງອຸປະກອນປ້ອງກັນ (ເຊັ່ນ: ເກີບ, ຖົງມື, ເຄື່ອງປ້ອງກັນຕາ ແລະ ຫູຟັງ)
20. ບໍ່ຕ້ອງປ່ອຍນ້ຳເສັ່ງຈາກໜອງທີ່ໃຊ້ບັບຈຸຂີ້ແຄ້ງ ຫຼື ການປະສົມທາດບາງຫຼອດ ລົງສູ່ສາຍນ້ຳໃນ ບໍລິເວນທີ່ມີປາອາໃສຢູ່ ຫຼື ນ້ຳທີ່ນຳໃຊ້ເພື່ອດື່ມ, ແຕ່ງກິນ ຫຼື ອາບ.

ອົງການ ສ.ປ.ຊ ເພື່ອພັດທະນາອຸດສາຫະກຳ (UNIDO)

ມີນາ 2007

APPENDIX 7
TECHNICAL GUIDELINES FOR THE CONSTRUCTION AND USE OF SLUICE BOXES AND RETORTS

ການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ

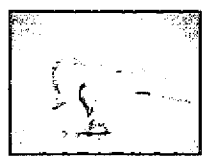
ເຮັດແນວໃດເພື່ອຈະໄດ້ຄຳຫຼາຍຂຶ້ນ ແລະ ຫຼຸດຜ່ອນການນຳໃຊ້ສານບາຫຼອດ

ທໍ່ດັກບາຫຼອດ

- ສານບາຫຼອດລະເຫີຍທີ່ອຸນນະພູມ 356 °C (ຄຳລະເຫີຍທີ່ອຸນນະພູມ 2856 °C)
- ທໍ່ດັກບາຫຼອດແມ່ນກົນໄກການດັ່ນຕອງ:
    1. ນຳສານປະສົມລົງໃສ່ພາສະນະ ທີ່ຈະຖືກເຜົາດ້ວຍອຸນະພູມສູງກ່ວາ 400 °C.
    2. ສານບາຫຼອດຖືກລະເຫີຍອາຍ ແລະ ແຍກອອກຈາກຄຳ.
    3. ອາຍບາຫຼອດທີ່ຖືກຄວາມເຢັນ ແລະ ກັບມາເປັນຂອງແຫຼວອີກ.
    4. ສານບາບຫຼອດໄດ້ຖືກເກັບຄືນ ແລະ ສາມາດນຳໃຊ້ໄດ້ອີກ.

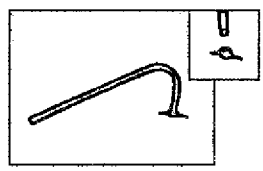
ທໍ່ດັກບາຫຼອດສາມາດເຮັດຂຶ້ນດ້ວຍຫຼາຍຂະໜາດທີ່ແຕກຕ່າງ ມັນຂຶ້ນກັບຈຳນວນຂອງ ສານປະສົມທີ່ຈະນຳມາເຜົາ. ບໍ່ຄວນເຜົາທໍ່ດັກບາຫຼອດທີ່ມີຂະໜາດໃຫ່ຍເກີນໄປກ່ວາ ຈຳນວນຂອງສານປະສົມ, ເພາະມັນຈະສິ້ນເປືອງໃນການເຜົາ (ສານບາຫຼອດໜ້ອຍ).

- ***ການອອກແບບ:***



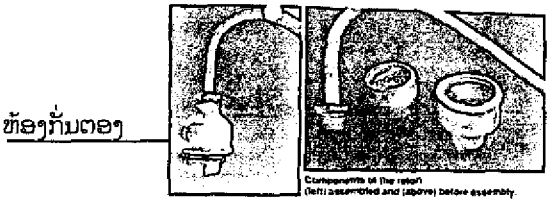
- ບາງທໍ່ດັກບາຫຼອດແບບງ່າຍດ່າຍ ທີ່ໄດ້ອອກແບບໂດຍ ນຳໃຊ້ທໍ່ ທີ່ມີຂະໜາດນ້ອຍ ແລະ ນ໋ອດງາວ ເພື່ອປິດປາກທໍ່.

- ນ໋ອດງາວທີ່ຖືກຈອດຕິດກັບທ່ອນເຫຼັກ, ເຊິ່ງງ່າຍໃນ ການຫັນປິດແຈບ ແລະ ເປີດອອກ. ຕ້ອງປິດແຈບ ເພື່ອແນ່ໃຈວ່າອາຍບາຫຼອດບໍ່ສາມາດຊຶ່ງຜ່ານອອກ ມາໄດ້ ໃນຄະນະການເຜົາ.

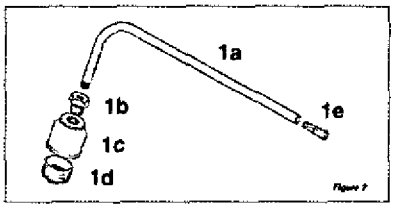


- ການອອກແບບທໍ່ດັກບາຫຼອດທີ່ນຳໃຊ້ໄດ້ດີ.

- ທໍ່ແລະສ່ວນຕ່າງໆຂອງທໍ່ດັກນ້ຳຫຼອດ ຍົກເວັ້ນດອນໄມ້ (1e, ຮູບ 2) ຄວນແມ່ນທາດຂາງ ທໍ່ທອງ ແລະ ໂລຫະອື່ນໆແມ່ນບໍ່ສາມາດນຳໃຊ້ ເພາະມັນຈະປະສົມກັບນ້ຳຫຼອດໄດ້.

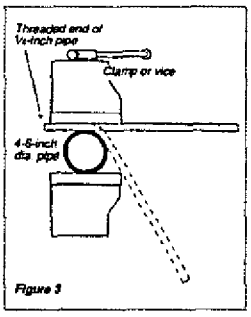


➢ *ອຸປະກອນທີ່ຈຳເປັນ:*



a. *ນ້ຳທໍ່ ¼ ນິ້ວ, ຍາວ 60cm ທີ່ມີກ່ຽວຢູ່ ສົ້ນນຶ່ງ (ທໍ່ສາມາດໃຊ້ ½ ນິ້ວ).*
b. *ນ້ຳຂໍ້ຕໍ່ລິດ ½ ນິ້ວ → ¼ ນິ້ວ (ຖ້ານຳໃຊ້ທໍ່ ¼ ນິ້ວ)*
c. *ນ້ຳຂໍ້ຕໍ່ລິດ 1½ ນິ້ວ→ ½ ນິ້ວ.*
d. *ນ້ຳຝາປິດ 1½ ນິ້ວ*
e. *ດອນໄມ້ອັດປາຍທໍ່ ¼ ນິ້ວ ນ້ຳອັນ.*

- ການເຮັດທໍ່ດັກນ້ຳຫຼອດ:



➢ ການກະກຽມ:
- ວາງທໍ່ ໃສ່ທໍ່ດັດຂະໜາດ4-6 ນິ້ວ, ໂດຍເລີ່ມຈາກສ່ວນໃກ້ແບບມີກ່ຽວ. ຄິດໃຫ້ໄດ້ມຸມ 60°-70°. ເບິ່ງຮູບ 3.
- ເຜົາທໍ່ດັກ ຈົນໃຫ້ຮ້ອນແດງ, ກ່ອນການປະກອບ ຄວນເຜົາທໍ່ ເພື່ອທຳຄວາມສະອາດ (ທາດສັງກະສີສາມາດ ປະຕິກິລິຍະກັບນ້ຳຫຼອດ).

➢ ການປະກອບເຂົ້າກັນ:
- ຫັນແໜ້ນທໍ່ເຂົ້າກັບຂໍ້ຕໍ່ລິດ ½ ນິ້ວ → ¼ ນິ້ວ (1a ໃສ່ 1b) (ຂໍ້ຕໍ່ລິດບໍ່ໄດ້ໃຊ້ ຖ້ານຳໃຊ້ທໍ່ ½ ນິ້ວ).

- ຫັນແໜ້ນຂໍ້ຕໍ່ລິດ ½ ນິ້ວ → ¼ ນິ້ວ (ຖ້າໄດ້ໃຊ້) ໃສ່ກັບຂໍ້ຕໍ່ລິດ 1½ ນິ້ວ → ½ ນິ້ວ (1b ໃສ່ 1c).
- ຫັນແໜ້ນຂໍ້ຕໍ່ລິດກັບຝາອັດ 1½ ນິ້ວ (1c ໃສ່ 1d).

ເວລານີ້ທໍ່ດັກນ້ຳໝອດສາມາດນຳໃຊ້ໄດ້.

- ***ອື່ນໆ:***

ອຸປະກອນແລະສານເຄມີອື່ນໆທີ່ຈຳເປັນ:

- ອາຊິດຈາງ (HON_3 ປະສົມ 10%), ນ້ຳລີ້ນ.
- ຈອກ/ຖ້ວຍ ເພື່ອໃວ້ໃສ່ນ້ຳ ແລະ ຈຸ່ມປາຍ ທໍ່ດັກນ້ຳໝອດ.

- ***ການນຳໃຊ້ທໍ່ດັກນ້ຳໝອດ:***

ໃຊ້ພຽງສານປະສົມທີ່ໄດ້ຈາກການຮ່ອນເທົ່ານັ້ນ. ບໍ່ແມ່ນສານປະສົມກັບແຮ່ອື່ນ!!

ກ່ອນການເຝົ້າສານປະສົມ:

ປ່ຽນຖ່າຍເຄື່ອງນຸ່ງທີ່ໃຊ້ສະເພາະການເຝົ້າສານປະສົມ.

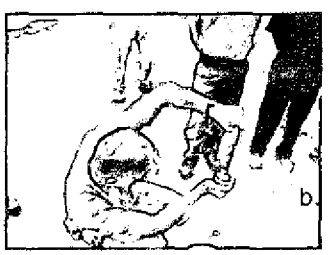
ນ້ຳໃຊ້ບ່ອນເກົ່າທີ່ເປັນບ່ອນສະເພາະການເຝົ້າ, ຄວນຫ່າງຈາກເຮືອນແລະຜູ້ຄົນ ຢ່າງໜ້ອຍ ບໍ່ໃຫ້ໜຸດ 100 ແມັດ

ບໍ່ຄວນເຝົ້າສານປະສົມທີ່ຫຸ້ມຮອມດ້ວຍແມ່ຍິງ ຫຼື ເດັກນ້ອຍ.

ຕ້ອງປ່ຽນຖ່າຍເຄື່ອງນຸ່ງແລະຊັກລ້າງທັນທີ ຫຼັງການເຝົ້າ.

ເກັບຮັກສາເຄື່ອງນຸ່ງນັ້ນແລະທໍ່ດັກນ້ຳໝອດໃຫ້ດີ; ຄວນຫ່າງຈາກທີ່ຢູ່ອາໃສ ແລະ ໄກຈາກຜູ້ຄົນ ໂດຍສະເພາະແມ່ນແມ່ຍິງ ແລະ ເດັກນ້ອຍ.

- ຂັ້ນຕອນໃນການນຳໃຊ້ທໍ່ດັກນ້ຳໝອດ:



a. ຫຸ້ມທໍ່ສານປະສົມໃຫ້ມີລັກສະນະລູກບານນ້ອຍ ດ້ວຍເຈ້ຍ. ມັນຈະຊ່ວຍໃນການປ້ອງກັນຄຳ ບໍ່ຕິດ ຄ້າງຢູ່ໃນທ້ອງກໍ່ນຕອງພາຍໃຕ້ຄວາມຮ້ອນ (ສວມ ຖົງມືຢາງຫຼືກລັ່ງການສຳພັດກັບສານນ້ຳໝອດ)

b. ວາງສານປະສົມທີ່ຫຸ້ມໄວ້ລົງຜ່ານປິດ ແລະ ຫັນໃຫ້ ແໜ້ນ.

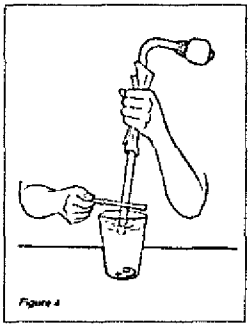
c. ໂບກປິດສ່ວນຕໍ່ຕ່າງໆດ້ວຍດິນໜຽວ ຫຼື ດິນປຸກ ເພື່ອປ້ອງກັນການຮົ່ວອອກຂອງອາຍບາຫຼອດ.

d. ກະກຽມເຕົາໄຟ, ສ່ວນໃຫ່ຍການເຜົາເສດໄມ້ (ຈຳເປັນຄວນມີປັ້ງເປົ່າໄຟ ເພື່ອເຮັດໃຫ້ມັນຮ້ອນແຮງ).

e. ຜູກມັດທໍ່ໃສ່ບ່ອນໝັ້ນຄົງ ວາງພາກສ່ວນທ່ອງກົ້ນໃສ່ເທິງແປວໄຟ. ຈຸ່ມສ່ວນປາຍທໍ່ລົງໃສ່ຖ້ວນນ້ຳ.

f. ຮັກສາແຮງໄຟຕະຫຼອດເວລາ, ຂັ້ນຕອນນີ້ອາດໃຊ້ເວລາເທິງ 10 - 15 ນາທີ.

g. ນຳທໍ່ດັ່ງອອກຈາກເຕົາໄຟ ແລະ ປ່ອຍໃຫ້ມັນເຢັນລົງ (ອາດໃຊ້ຜ້າປຸກຫຼືນ້ຳ) ຈົນກ່ວາວ່າສາມາດຈັບຕ້ອງໄດ້. ຮັກສາປາຍຂອງທໍ່ຈຸ່ມລົງນ້ຳສະເໝີ.

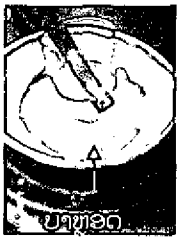


h. ຍົກທໍ່ຂຶ້ນຕັ້ງສາກ ໃນຂະນະທີ່ປາຍຂອງທໍ່ຈຸ່ມລົງນ້ຳ (ຮູບ4). ເຄາະທໍ່ ໃຫ້ບາງສ່ວນຂອງສານບາຫຼອດ ທີ່ຄ້າງຢູ່ທໍ່ນັ້ນ.

i. ນຳທໍ່ດັກບາຫຼອດອອກຈາກນ້ຳ ແລະ ປິດປາຍດ້ວຍດອນໄມ້ ທັນທີ.

j. ເຮັດຫ້ອງກົ້ນຕອງເຢັນລົງໂດຍການຈຸ່ມລົງນ້ຳເຢັນ.

k. ທັນຝາປິດອອກ ແລະ ນຳເອົາຄ້ຳອອກມາ. ທັນຝາ ປິດເຂົ້າຄືນທັນທີ ແລະ ຄວນຈື່ຈຳວ່າ ຕ້ອງທັນໃຫ້ແໜ້ນທຸກຄັ້ງຫຼັງຈາກການໃຊ້ ເພື່ອປ້ອງກັນອາຍບາຫຼອດທີ່ຍັງມີຢູ່ໃນທໍ່ດັ່ງກ່າວ.



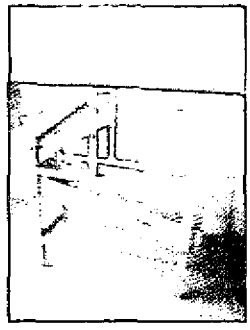
l. ຖອກສານບາຫຼອດທີ່ໄດ້ລົງໃນຂວດ (ຢາງ, ຂຸງນຊີ, ກັນຊຶມ, ບາຫຼອດຖືກຢູ່ໃນນ້ຳ).

m. ເກັບຮັກສາຂວດບາຫຼອດແລະທໍ່ດັກໃຫ້ດີ, ບ່ໃຫ້ຖືກແສງ, ໄກຈາກຄວາມຮ້ອນ ແລະ ເດັກນ້ອຍ.

ໝາຍເຫດ: ບາງຄັ້ງ ສານບາຫຼອດທີ່ໄດ້ນັ້ນບ່ສະອາດ ຈຳເປັນໄດ້ຢອດອາຊິດຈາງ (HON_3 for 10%) ລົງ 2-3 ຢອດ ແລະ ສັ່ນໃຫ້ປະສົມກັນດີ.

ການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ

ຮາງຮ່ອນແຮ່ຄຳ



ການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ

ເຮັດແນວໃດເພື່ອຈະໄດ້ຄຳຫຼາຍຂຶ້ນ ແລະ ຫຼຸດຜ່ອນການນຳໃຊ້ສານບາຫຼອດ

ຮາງຮ່ອນແຮ່ຄຳ

ຮາງຮ່ອນແມ່ນໄດ້ຖືກນຳໃຊ້ເຂົ້າໃນການແຍກຄຳກັບຊາຍ. ແຮ່ທີ່ປົນຢູ່ກັບດິນ ແລະ ນຳ້ໄດ້ໄຫຼຜ່ານຮາງຮ່ອນ ໄປຕາມຜ້າພົມທີ່ປູຢູ່ພື້ນຂອງຮາງຮ່ອນນັ້ນ , ຊຶ່ງຄຳຈະໜັກ ກ່ວາວັດຖຸອື່ນ ມັນຈະຕົກລົງພື້ນ ແລະ ຈັບຢູ່ຜ້າພົມ. ໃນນີ້ຈະເຫັນໄດ້ວ່າ ຮາງຮ່ອນ ອາໃສແຮງໂນມຖ່ວງເພື່ອໃຫ້ໄດ້ມາ ແຮ່ປະສົມຂີ້ປຶກ, ທີ່ຈະໄດ້ນຳໄປຮ່ອນຂັ້ນຕໍ່ໄປ. ຄຳໄດ້ຖືກແຍກອອກຈາກຂີ້ປຶກ ໂດຍໃຊ້ມື ຫຼື ບາຫຼອດ ຊຶ່ງຂຶ້ນກັບຂະໜາດຂອງຄຳນັ້ນ.

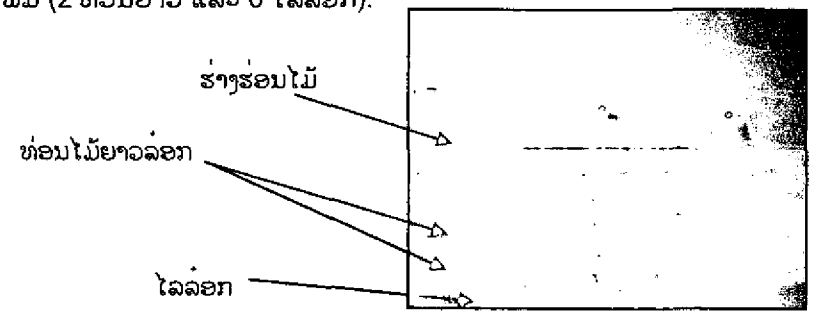
ຂໍ້ສະດວກຂອງຮາງຮ່ອນແຮ່ຄຳ:

- *ການອອກແບບທີ່ງ່າຍດາຍ.*
- *ສາມາດເຮັດໄດ້ໃນລະດັບໝູ່ບ້ານ.*
- *ລາຄາຕ່ຳ.*
- *ໃຊ້ໄດ້ສຳລັບແຮ່ຫຍາບ (ໃຫ່ຍ) ແລະ ແຮ່ຄຳປົວ.*
- *ສາມາດຮ່ອນແຮ່ຈຳນວນຫາຍທີ່ໃຊ້ເວລາພຽງໜ້ອຍ.*

ແບບທີ່ງ່າຍຂອງອຸປະກອນຮ່ອນແມ່ນ ຮາງຮ່ອນທີ່ໄດ້ອະທິບາຍຂ້າງລຸ່ມ. ມັນທຳງານ ໄດ້ດີກັບການຮ່ອນຢູ່ນຳ້.

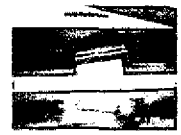
○ ***<u>ການອອກແບບ:</u>***

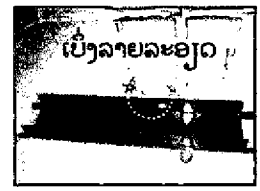
ມັນໄດ້ຖືກອອກແບບໆງ່າຍດາຍ ໂດຍປະກອບມີ ຮ່າງໄມ້ ແລະ ອຸປະກອນລ໋ອກຜ້າ ພົມ (2 ທ່ອນຍາວ ແລະ 6 ໄລລ໋ອກ).



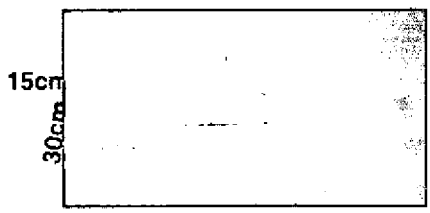
ຮ່າງຮ່ອນສາມາດເຮັດດ້ວຍໄມ້ຫຼືເຫຼັກ ດັ່ງລຸ່ມນີ້:

ລາຍລະອຽດໄລລ່ອກ





➢ <u>ຮ່າງຮ່ອນໄມ້</u>



ສິ່ງທີ່ຈຳເປັນ:

- *2 ແຜ່ນໄມ້: ຍາວ 1.5m, ກ້ວາງ 15cm (1)*
- *1 ແຜ່ນໄມ້: ຍາວ 1.5m, ກວ້າງ 30cm (2)*
- *6 ໂຕລ່ອກໄມ້: ໜ້າຕັດ 2cm x 2cm, ຍາວ 10cm (3)*

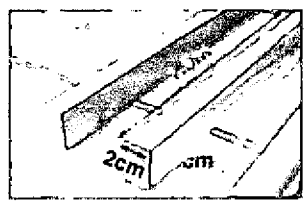
ຄວາມໜາຂອງແຜ່ນໄມ້ປະມານ 1-2cm.

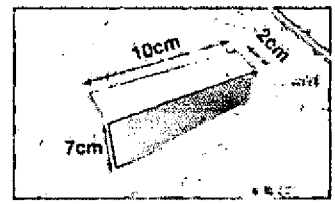
➢ <u>ອຸປະກອນລ່ອກ</u>

ອຸປະກອນລ່ອກແມ່ນເພື່ອລ່ອກຜ້າພົມໃຫ້ຢູ່ກັບທີ່. ທ່ອນໄມ້ຍາວ ລ່ອກຜ້າພົມຕາມລວງຍາວ ແລະ ຕິດຕາມແຄມຝາຂອງຮ່າງຮ່ອນ. ໄລລ່ອກເປັນໂຕສອດເຂົ້າລ່ອກ (ຕີເຂົ້າໃຫ້ແໜ້ນ) ລະຫ່ວາງທ່ອນໄມ້ຍາວ ແລະ ໂຕ່ລ່ອກໄມ້.

ສິ່ງທີ່ຈຳເປັນ:

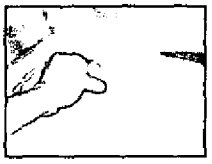
- *2 ທ່ອນໄມ້: ຂະໜາດ 1.5m x 3cm x 2cm (4)*
- *6 ໄລລ່ອກ: ຍາວ 10cm; ໜ້າຕັດ 7cm x 2cm(ເບື້ອງນຶ່ງ) ແລະ 3cm x 2cm(ອີກເບື້ອງນຶ່ງ) (5)*





ການປະກອບຮາງຮ່ອນແຮ່ຄຳ:

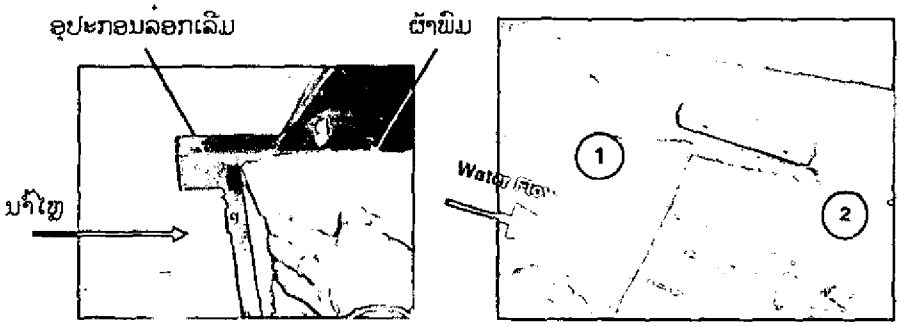
- ການປະກອບຮາງຮ່ອນແມ່ນປະຕິບັດດັ່ງຕໍ່ໄປນີ້ (ລວມທັງໂຕລ໋ອກໄມ້):
  - ປະກອບຕີແໜ້ນແຜ່ນໄມ້ (1) ແລະ (2) ດ້ວຍຕະປູ, ເຮັດໃຫ້ຄີຮາງທີ່ເປີດສອງເບື້ອງ, ຈາກນັ້ນ
  - ຕອກໂຕລ໋ອກໄມ້ (3) ໃສ່ແຜ່ນໄມ້ (2) ໂດຍແບ່ງເປັນສາມສ່ວນຕາມໜ້າໄມ້ນັ້ນ (ເຮັດຄືກັນກັບອີກເບື້ອງນຶ່ງ).



  - ວາງຜ້າພົມລົງເທິງຮາງໄມ້, ຂະໜາດຂອງຜ້າພົມຕ້ອງໃຫ້ແຈບດີ (ຖ້າບໍ່ແຈບ ຕ້ອງໄດ້ຕັດອອກ) ຫຼັງຈາກນັ້ນ ວາງທ່ອນໄມ້ຍາວ *(4) ລົງ ແລະ* ສອດໄລລ໋ອກໄມ້ໃສ່ ເພື່ອລ໋ອກທ່ອນໄມ້. (ສອດທັງ 6 ໄລລ໋ອກໄມ້ໃສ່ບ່ອນຂອງມັນ ໃຫ້ຖືກຕ້ອງ)

ໝາຍເຫດ:

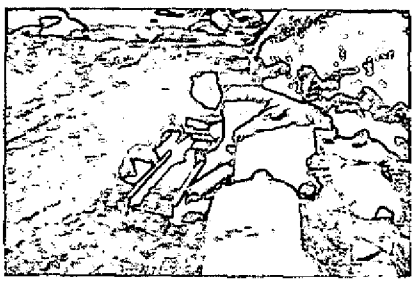
- ຂະໜາດຂອງໄລລ໋ອກສາມາດປັບປ່ຽນໃຫ້ສອດຄ່ອງກັບຂະໜາດທີ່ແຕກຕ່າງຂອງພື້ນຮາງຮ່ອນ.
- ຜ້າພົມຕ້ອງແຈບດີ ແລະບໍ່ເຄື່ອນເໜັງ ທີ່ສົ້ນເລີ້ມຕົ້ນຂອງຮາງຮ່ອນ ເພື່ອປ້ອງກັນບໍ່ໃຫ້ແຮ່ປົກໄຫຼລອດພື້ນໄດ້. ລ໋ອກຜ້າພົມດ້ວຍອຸປະກອນລ໋ອກເລີ່ມ.
- ມັນເປັນການດີໃນການໃຊ້ຜ້າພົມສອງຜືນທີ່ວາງເທິງຮາງຮ່ອນ, ງ່າຍໃນການລ້າງ. ວາງຜ້າພົມລົງໃຫ້ຖືກວິທີ ຄືວາງໂຕເບື້ອງໜ້າໃຫ້ປົກເທິງເບື້ອງຫຼັງ (ຕາມສາຍນ້ຳ, ເບິ່ງຮູບລຸ່ມ)



- ***<u>ການທຳງານຂອງຣາງຮ່ອນ:</u>***

ຣາງຮ່ອນຖືກເຮັດຂຶ້ນຕາມຂະໜາດທີ່ແຕກຕ່າງກັນຂອງຄຳ, ແຮ່ທີ່ໜັກ ແລະ ແຮ່ແກ້ວ.

ການນຳໃຊ້:



- ຕາມສາຍນ້ຳ.
- ກະກຽມພື້ນທີ່ແລະກ້ອນຫີນເພື່ອຢຶດ ຣາງຮ່ອນໃຫ້ຄົງທີ່ ຕາມບ່ອນທີ່ສາຍນ້ຳ ໄຫຼຜ່ານໄດ້ ດ້ວຍຄວາມໄວທີ່ເໝາະສົມ.
- ປ້ອນແຮ່ທີ່ຕ້ອງການຮ່ອນລົງໃສ່ຣາງນັ້ນ.
- ຂີ້ຊາຍທີ່ເບົາຈະຖືກຊະລ້າງອອກໄປດ້ວຍນ້ຳ.
- ແຮ່ຄຳ ແລະ ແຮ່ທີ່ໜັກນັ້ນຈະຈົມລົງພື້ນພົມຂອງຣາງຮ່ອນ. ໝາຍຄວາມວ່າ ຂີ້ປົກຈະຖືກຜ້າພົມຈັບເອົາໄວ້.
- ຫຼັງຈາກໄລຍະເວລານຶ່ງ (ປະມານ 2 ຊົ່ວໂມງ) ແມ່ນນຳເອົາຜ້າພົມອອກມາລ້າງ ໃນຖຸ ເພື່ອໄດ້ແຮ່ຂີ້ປົກ (ແຮ່ຄຳ ແລະ ແຮ່ທີ່ໜັກ).
- *ແຮ່ຂີ້ປົກນີ້ ຈະຖືກຮ່ອນເພື່ອໄດ້ຂີ້ປົກ ຊຶ່ງແຮ່ຄຳຈະຖືກແຍກອອກດ້ວຍມື ຫຼື* ບາງຄັ້ງ ຈະຂຶ້ນກັບຂະໜາດຂອງເມັດແຮ່ຄຳ.

ຣາງຮ່ອນທຳງານໄດ້ດີກັບແຮ່ປະສົມກັບນ້ຳໃນຂະໜາດທີ່ເທົ່າກັນ ດັ່ງນັ້ນເມື່ອຊາຍທີ່ເບົາ ກ່ວາຈະຖືກໄຫຼໄປຕາມນ້ຳ ແລະ ສ່ວນທີ່ໜັກ (ແຮ່ຄຳ) ຈະຍັງຈັບຕິດຢູ່ພົມ. ເມື່ອແຮ່ທີ່ ຂ້ອນຂ້າງໃຫ່ຍທີ່ປະສົມຢູ່ນັ້ນ ມັນສາມາດເກາະຕິດ ແລະ ຈົມລົງຜ້າພົມນັ້ນໄດ້ເໝືອນກັນ ດັ່ງນັ້ນຄວນຮ່ອນ-ຕອງ ແຮ່ທີ່ໃຫ່ຍອອກ ເພື່ອໃຫ້ຄຳ ແລະ ແຮ່ໜັກນັ້ນຖືກຈັບຢູ່ພົມ. *ໂດຍທົ່ວໄປນ້ຳປະສົມຢູ່ກັບຫາດແຂ້ງປະມານ 5% - 15%.*

ສິ່ງຄວນເອົາໃຈໃສ່ເພື່ອການທຳງານທີ່ໄດ້ຮັບຜົນດີ:

ແຮ່ປະສົມກັບນ້ຳທີ່ໄຫຼໄວເກີນໄປ:

- ບໍ່ມີຫັຍໆຈັບຢູ່ກັບຜ້າພົມ
- ແຮ່ຄຳເກືອບທັງໝົດຖືກຈັບຢູ່ສ່ວນປາຍ (ສຸດທ້າຍ) ຂອງພົມ. (ແທ້ທີ່ຈິງຄວນຈະຖືກຈັບຕິດຢູ່ສ່ວນເທິງທຳອິກຂອງຜ້າພົມ)

ແຮ່ປະສົມກັບນ້ຳທີ່ໄຫຼຊ້າເກີນໄປ:

- ຜ້າພົມຈະເຕັມໄປດ້ວຍຂີ້ຊາຍ
- ມີແຕ່ສ່ວນນ້ອຍກ່ວາ 1" ແຮ່ປະສົມກັບນ້ຳ ທີ່ໄຫຼຜ່ານຜ້າພົມ

ການເພີ້ມຄວາມໄວຂຶ້ນ:

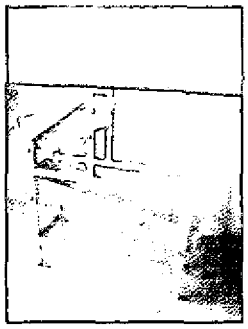
- ເພີ້ມມູມຂອງຮາງຮ່ອນນັ້ນຂຶ້ນ (ເຮັດໃຫ້ມັນຊັນລົງ)
- ເພີ້ມປະລິມານນ້ຳໄຫຼ ແລະ ແຮ່ປະສົມຂຶ້ນ
- ຂະຫຍາຍຄວາມກ້ວາງຂອງຮາງຮ່ອນ (ເພີ້ມຄວາມໜາແໜ້ນຂອງແຮ່ປະສົມກັບນ້ຳ)
- ເພີ້ມຄວາມຍາວຂອງຮາງຮ່ອນ (ຂອງແຫຼວຖືກລຸດຜ່ອນຄວາມໄວດ້ວຍໄລຍະທາງ)

ການລຸດຄວາມໄວລົງ:

- ລຸດມູມຂອງຮາງຮ່ອນນັ້ນລົງ (ເຮັດໃຫ້ມັນລຽບຂຶ້ນ)
- ລຸດປະລິມານນ້ຳໄຫຼ ແລະ ແຮ່ປະສົມລົງ
- ເພີ້ມຄວາມກ້ວາງຂອງຮາງຮ່ອນຂຶ້ນ (ລຸດຄວາມໜາແໜ້ນຂອງແຮ່ປະສົມກັບນ້ຳ)
- ລຸດຄວາມຍາວຂອງຮາງຮ່ອນ (ດັ່ງນັ້ນມັນບໍ່ພັດເອົາແຮ່ທີ່ກຳລົງເຄື່ອນເໜັງຢູ່)

ການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ

ຮາງຮ່ອນແຮ່ຄຳ “ຊິກແຊັກ”



ການຂຸດຄົ້ນບໍ່ແຮ່ຂະໜາດນ້ອຍ

ເຮັດແນວໃດເພື່ອຈະໄດ້ຄຳຫຼາຍຂຶ້ນ ແລະ ຫຼຸດຜ່ອນການນຳໃຊ້ສານບາຫຼອດ

ຮາງຮ່ອນແຮ່ຄຳ "ຊີກແຊັກ"

ຮາງຮ່ອນແມ່ນໄດ້ຖືກນຳໃຊ້ເຂົ້າໃນການແຍກຄຳກັບຊາຍ. ແຮ່ທີ່ປົນຢູ່ກັບດິນ ແລະ ນຳ້ໄດ້ໄຫຼຜ່ານຮາງຮ່ອນ ໄປຕາມຜ້າພົມທີ່ປູຢູ່ພື້ນຂອງຮາງຮ່ອນນັ້ນ , ຊຶ່ງຄຳຈະຕົກ ກ່ວາວັດຖຸອື່ນ ມັນຈະຕົກລົງພື້ນ ແລະ ຈັບຢູ່ຜ້າພົມ. ໃນນີ້ຈະເຫັນໄດ້ວ່າ ຮາງຮ່ອນ ອາໃສແຮງໂນມຖ່ວງເພື່ອໃຫ້ໄດ້ມາ ແຮ່ປະສົມຂີ້ປຶກ, ທີ່ຈະໄດ້ນຳໄປຮ່ອນບັ້ງຂັ້ນຕໍ່ໄປ. ຄຳໄດ້ຖືກແຍກອອກຈາກຂີ້ປຶກ ໂດຍໃຊ້ມື ຫຼື ບາຫຼອດ ຊຶ່ງຂຶ້ນກັບຂະໜາດຂອງຄຳນັ້ນ.

ຂໍ້ສະດວກຂອງຮາງຮ່ອນແຮ່ຄຳ:

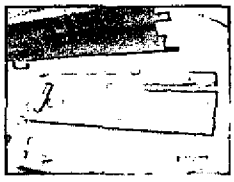
- *ການອອກແບບທີ່ງ່າຍດ່າຍ.*
- *ສາມາດເຮັດໄດ້ໃນລະດັບໝູ່ບ້ານ.*
- *ລາຄາຕ່ຳ.*
- *ໃຊ້ໄດ້ສຳລັບແຮ່ຫຍາບ (ໃຫ່ຍ) ແລະ ແຮ່ຄຳປົວ.*
- *ສາມາດຮ່ອນແຮ່ຈຳນວນຫາຍທີ່ໃຊ້ເວລາພຽງໜ້ອຍ.*

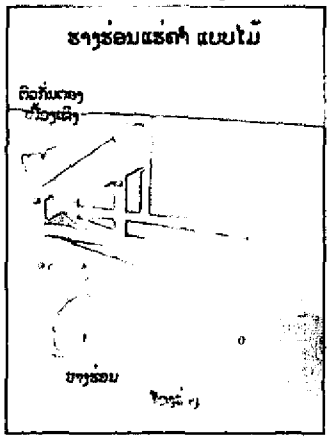
○ ***<u>ການອອກແບບ :</u>***

ມັນປະກອບມີ 2 ສ່ວນໃຫ່ຍຄື: ຕິວຮ່ອນເບື້ອງຕົ້ນ ແລະ ຮາງຮ່ອນ. ທັງສອງສ່ວນ ແມ່ນຍຶດຕິດກັບໂຄງຮ່າງດ້ວຍສານເຫຼັກກົນ (ມີກຽວທັງສອງດ້ານ).

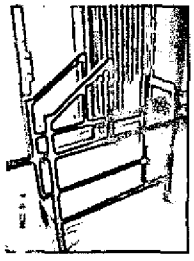
ຕິວຮ່ອນເບື້ອງຕົ້ນ

ຮາງຮ່ອນ

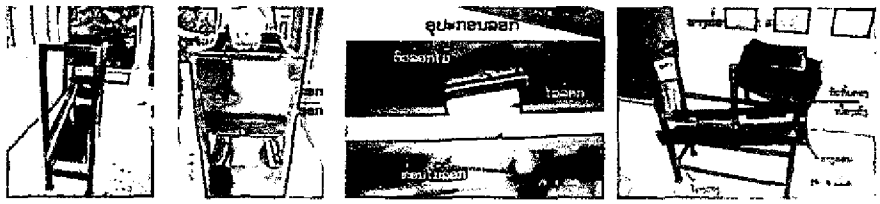




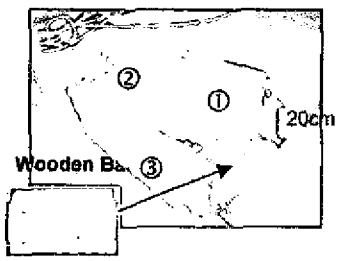
ໂຄງຮ່າງ



ຮ່າງຮ່ອນສາມາດເຮັດດ້ວຍໄມ້ຫຼືເຫຼັກ ດັ່ງລຸ່ມນີ້:



➢ <u>ຕິວຮ່ອນເບື້ອງຕົ້ນ</u>



ຕິວຮ່ອນເບື້ອງຕົ້ນ ເຮັດຄືກັນກັບຕິວຕອງເສດຫີນ ອອກຈາກແຮ່.

ອຸປະກອນສິ່ງທີ່ຈຳເປັນ:

- *2 ແຜ່ນໄມ້: ຂະໜາດ 50cm x 20cm (1)*
- *1 ແຜ່ນໄມ້: ຂະໜາດ 30cm x 20cm (2)*
- *1 ແຜ່ນໄມ້:ຂະໜາດ 50cm x 30cm (3)*

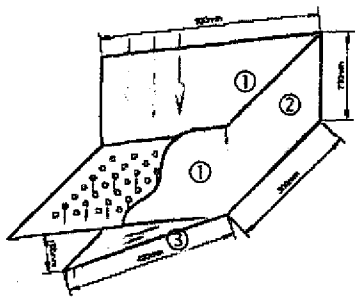
(ຄວາມໜາປະມານ 1-2cm)

ຈາກນັ້ນ ຈັດຫາທ່ອນຕາມໄມ້ອ້ຽງຂວາງ ເພື່ອວາງ ຮາວໄມ້ໃສ່.

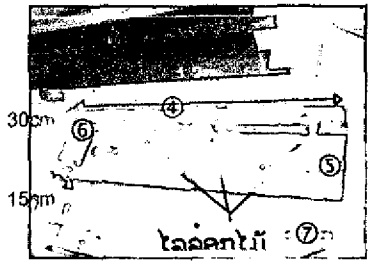
Metal Screen

ເພື່ອປ້ອງກັນແຮ່ປະສົມຖືກສະລ້ຽງອອກຈາກຕິ່ງກອງດ້ວຍນ້ຳ ແຜ່ນຝາປິດດ້ານໜ້າ ມີຄວາມຈຳເປັນ.

ຕະແກງ (ເຫຼັກ) ກໍ່ຈຳເປັນເໜືອນກັນວາງຢູ່ເທິງ. ຂະໜາດຂອງຮູ ຈະຂຶ້ນກັບຂະໜາດຂອງແຮ່ຄຳທີ່ຈະຮ່ອນນັ້ນ. ສຳລັບຄຳທີ່ມີຂະໜາດນ້ອຍ.



➢ ຮ່າງຮ່ອນ

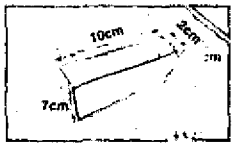


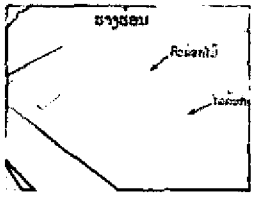
ອຸປະກອນທີ່ຈຳເປັນ:

- *2 ແຜ່ນໄມ້: ຂະໜາດ 1.2m x 15cm (4)*
- *1 ແຜ່ນໄມ້: ຂະໜາດ 1.2m x 30cm (5)*
- *1 ແຜ່ນໄມ້: ຂະໜາດ 30cm x 15cm (6)*
- *6 ໄລ່ລ໋ອກໄມ້: ຂະໜາດ 2cm x 2cm , ຍາວ 10cm (7)*

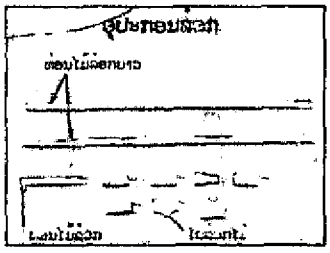
ຄວາມໜາຂອງແຜ່ນໄມ້ປະມານ 1-2cm.

ໄລ່ລ໋ອກ





➢ ອຸປະກອນລ໋ອກ



ອຸປະກອນລ໋ອກແມ່ນເພື່ອລ໋ອກຜ້າພິມໃຫ້ຢູ່ກັບທີ່. ທ່ອນໄມ້ຍາວ ລ໋ອກຜ້າພິມ ຕາມລວງຍາວ ແລະ ຕິດຕາມແຄມຝາຂອງຮ່າງຮ່ອນ.
ໄລ່ລ໋ອກເປັນໂຕສອດ ເຂົ້າລ໋ອກ (ຕີເຂົ້າໃຫ້ແໜ້ນ) ລະຫ່ວ່າງທ່ອນໄມ້ຍາວ ແລະ ໂຕ່ລ໋ອກໄມ້.

ອຸປະກອນທີ່ຈຳເປັນ:

- *2 ທ່ອນໄມ້: ຂະໜາດ 1.5m x 3cm x 2cm (8)*
- *1 ທ່ອນໄມ້: 25cm x 3cm x 2cm (9)*
- *6 ໄລ໋ໄມ້ລ໋ອກ: ຂະໜາດຍາວ 10cm ; 7cm x 2cm (ເບື້ອງນຶ່ງ) ແລະ 3cm x 2cm (ອີກ ເບື້ອງນຶ່ງ) (10)*

ການປະກອບຮາງຮ່ອນຄຳ:

- ❑ ການປະກອບຕິວກັ່ນຕ່ອງເບື້ອງຕົ້ນແມ່ນປະຕິບັດຄືດັ່ງຮູບ, ຕໍ່ໄປນີ້:
  - ປະກອບຕີແໜ້ນແຜ່ນໄມ້ (1) ແລະ (2) ດ້ວຍຕະປູ, ຈາກນັ້ນ
  - ປະກອບຮາວຢຶດງ້ວໄມ້ໃສ່ ແລະຕອກຕະປູຈັບແໜ້ນ,
  - ປະກອບຕີແໜ້ນແຜ່ນໄມ້ (3) ດ້ວຍມຸມທີ່ເໝາະສົມ ແລະ ຕ້ອງໜັ້ນຄົງດີ.

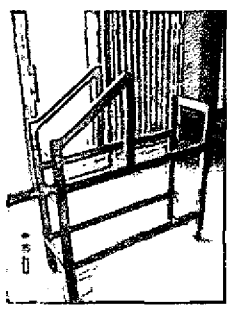
- ❑ ການປະກອບຮາງຮ່ອນແມ່ນປະຕິບັດດັ່ງຕໍ່ໄປນີ້ (ລວມທັ້ງໂຕລ໋ອກໄມ້):
  - ປະກອບຕີແໜ້ນແຜ່ນໄມ້ (4) ແລະ (5) ດ້ວຍຕະປູ, ເຮັດໃຫ້ຄີຮາງທີ່ເປີດ ສອງເບື້ອງ, ຈາກນັ້ນ
  - ຕອກໂຕລ໋ອກໄມ້ (7) ໃສ່ແຜ່ນໄມ້ (4) ໂດຍແບ່ງເປັນສີ່ສ່ວນຕາມໜ້າ ໄມ້ນັ້ນ (ເຮັດຄືກັນກັບອີກເບື້ອງນຶ່ງ).

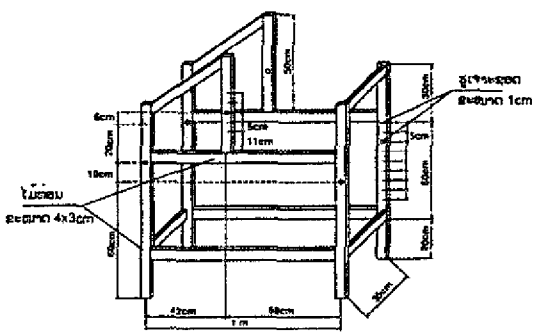
  - ວາງຜ້າພົມລົງເທິງຮາງໄມ້, ຂະໜາດຂອງຜ້າພົມ ຕ້ອງໃຫ້ແຈບດີ (ຖ້າບໍ່ແຈບ ຕ້ອງໄດ້ຕັດອອກ) ຫຼັງຈາກນັ້ນ ວາງທ່ອນໄມ້ຍາວ *(8) ລົງ ແລະ* ສອດໄລລ໋ອກໄມ້ໃສ່ ເພື່ອລ໋ອກທ່ອນໄມ້. (ສອດ ທັງ 7 ໄລລ໋ອກໄມ້ໃສ່ບ່ອນຂອງມັນ ໃຫ້ຖືກຕ້ອງ)

- ❑ ການປະກອບຮາງຮ່ອນແມ່ນປະຕິບັດດັ່ງນີ້:

ເບິ່ງຮູບການປະກອບສ້າງຂອງໂຄງຮ່າງ ແລະ ເຮັດໃຫ້ຄືຮູບຂ້າງລຸ່ມນີ້

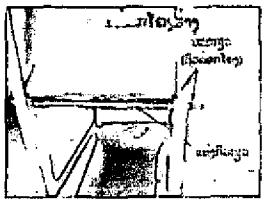
ແຜນວາດໂຄງຮ່າງ

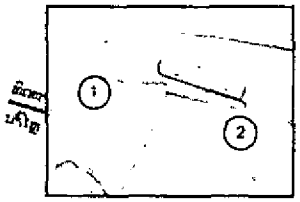




ໝາຍເຫດ:

- ຂະໜາດຂອງໄລລ໋ອກສາມາດປັບປ່ຽນໃຫ້ສອດຄ່ອງກັບຂະໜາດທີ່ແຕກຕ່າງຂອງ ພື້ນຮາງຮ່ອມ.
- ແທ່ງກົມກຽວມີຄວາມຈຳເປັນຕໍ່ການຢຶດໂຄງຮ່າງນັ້ນໃຫ້ໝັ້ນຄົງ.
- ນ໋ອດກຽວແມ່ນມີຄວາມຈຳເປັນທັງສອງເບື້ອງຂອງແທ່ງກົມກຽວ.
- ມັນເປັນການດີໃນການໃຊ້ຜ້າພົມສອງຜືນທີ່ວາງເທິງຮາງຮ່ອມ, ງ່າຍໃນການລ້າງ. ວາງຜ້າພົມລົງໃຫ້ຖືກວິທີ ຄືວາງໂຕເບື້ອງໜ້າໃຫ້ປົກເທິງເບື້ອງຫຼັງ (ຕາມສາຍນ້ຳ, ເບິ່ງຮູບລຸ່ມ)





○ ***<u>ການທຳງານຂອງຮາງຮ່ອມ :</u>***

ຮາງຮ່ອມຖືກເຮັດຂຶ້ນຕາມຂະໜາດທີ່ແຕກຕ່າງກັນຂອງຄຳ, ແຮ່ທີ່ໜັກ ແລະ ແຮ່ແກ້ວ.

- ລຳລຽງແຮ່ປະສົມລົງໃສ່ຕິວຕອງພ້ອມກັບນ້ຳ.
- ຊາຍທີ່ເບົາຖືກຂະລ້າງອອກໄປດ້ວຍນ້ຳ.
- ແຮ່ຄຳ ແລະ ແຮ່ທີ່ໜັກນັ້ນຈະຈົມລົງພື້ນພົມຂອງ ຮາງຮ່ອມ. ໝາຍຄວາມວ່າ ຂີ້ປົກຈະຖືກຜ້າພົມ ຈັບເອົາໄວ້.
- ຫຼັງຈາກໄລຍະເວລານຶ່ງ (ປະມານ 2 ຊົ່ວໂມງ) ແມ່ນນຳເອົາຜ້າພົມອອກມາລ້າງ ໃນຖຸ ເພື່ອໄດ້ແຮ່ຂີ້ປົກ (ແຮ່ຄຳ ແລະ ແຮ່ທີ່ໜັກ).

ຮາງຮ່ອນທຳງານໄດ້ດີກັບແຮ່ປະສົມກັບນ້ຳໃນຂະໜາດທີ່ເທົ່າກັນ ດັ່ງນັ້ນເມື່ອຊາຍທີ່ເບົາກ່ວາຈະຖືກໄຫຼ່ໄປຕາມນ້ຳ ແລະ ສ່ວນທີ່ໜັກ (ແຮ່ຄຳ) ຈະຍັງຈັບຕິດຢູ່ພົມ. ເມື່ອແຮ່ທີ່ຂ້ອນຂ້າງໃຫ່ຍທີ່ປະສົມຢູ່ນັ້ນ ມັນສາມາດເກາະຕິດ ແລະ ຈົມລົງຜ້າພົມນັ້ນໄດ້ເໝືອນກັນ ດັ່ງນັ້ນຄວນຮ່ອນ-ຕອງ ແຮ່ທີ່ໃຫ່ຍອອກ ເພື່ອໃຫ້ຄຳ ແລະ ແຮ່ໜັກນັ້ນຖືກຈັບຢູ່ພົມ.
ໂດຍທົ່ວໄປນ້ຳປະສົມຢູ່ກັບທາດແຂງປະມານ 5% -15%.

<u>ສິ່ງຄວນເອົາໃຈໃສ່ເພື່ອການທຳງານທີ່ໄດ້ຮັບຜົນດີ:</u>

ແຮ່ປະສົມກັບນ້ຳທີ່ໄຫຼໄວເກີນໄປ:

- ບໍ່ມີທັຍໆຈັບຢູ່ກັບຜ້າພົມ
- ແຮ່ຄຳເກືອບທັ້ງໝົດຖືກຈັບຢູ່ສ່ວນປາຍ (ສຸດທ້າຍ) ຂອງພົມ. (ແທ້ທີ່ຈິງຄວນຈະຖືກຈັບຕິດຢູ່ສ່ວນເທິງທຳອິກຂອງຜ້າພົມ)

ແຮ່ປະສົມກັບນ້ຳທີ່ໄຫຼຊ້າເກີນໄປ:

- ຜ້າພົມຈະເຕັ້ມໄປດ້ວຍຂີ້ຊາຍ
- ມີແຕ່ສ່ວນນ້ອຍກ່ວາ 1" ແຮ່ປະສົມກັບນ້ຳ ທີ່ໄຫຼ່ຜ່ານຜ້າພົມ

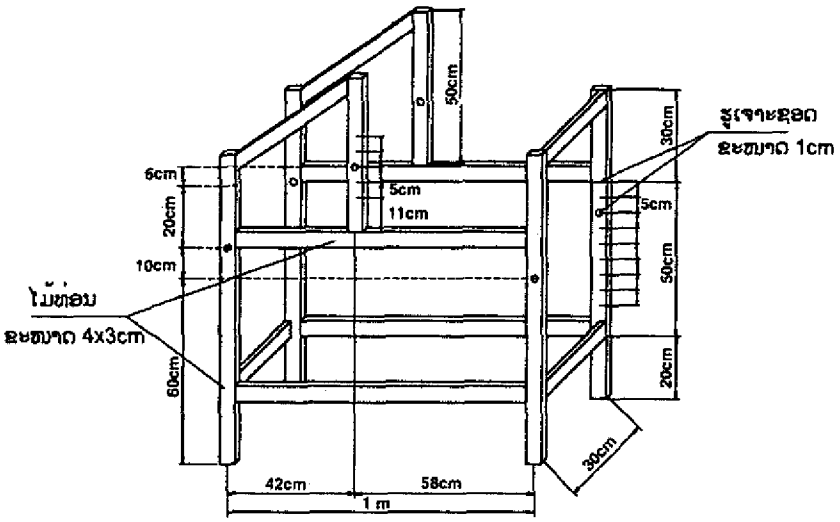
ການເພີ້ມຄວາມໄວຂຶ້ນ:

- ເພີ້ມມູມຂອງຮາງຮ່ອນນັ້ນຂຶ້ນ (ເຮັດໃຫ້ມັນຊັນລົງ)
- ເພີ້ມປະລິມານນ້ຳໄຫຼ ແລະ ແຮ່ປະສົມຂຶ້ນ
- ຂະຫຍາຍຄວາມກ້ວາງຂອງຮາງຮ່ອນ (ເພີ້ມຄວາມໜາແໜ້ນຂອງແຮ່ປະສົມກັບນ້ຳ)
- ເພີ້ມຄວາມຍາວຂອງຮາງຮ່ອນ (ຂອງແຫຼວຖືກລຸດຜ່ອນຄວາມໄວດ້ວຍໄລຍະທາງ)

ການລຸດຄວາມໄວລົງ:

- ລຸດມຸມຂອງຮາງຮ່ອນນັ້ນລົງ (ເຮັດໃຫ້ມັນລຽບຂຶ້ນ)
- ລຸດປະລິມານນ້ຳໄຫຼ ແລະ ແຮ່ປະສົມລົງ
- ເພີ້ມຄວາມກ້ວ້າງຂອງຮາງຮ່ອນຂຶ້ນ (ລຸດຄວາມໜາແໜ້ນຂອງແຮ່ປະສົມກັບນ້ຳ)
- ລຸດຄວາມຍາວຂອງຮາງຮ່ອນ (ດັ່ງນັ້ນມັນບໍ່ພັດເອົາແຮ່ທີ່ກຳລົງເຄື່ອນໜ້ຽງຢູ່)

ແຜນວາດໂຄງຮ່າງ



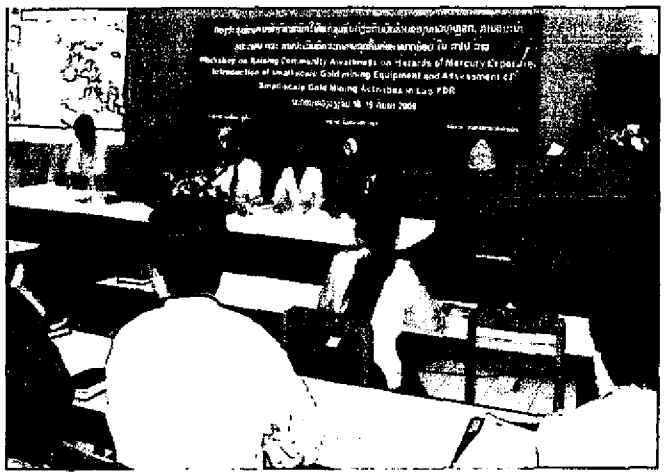
APPENDIX 8
PHOTOGRAPHIC RECORD

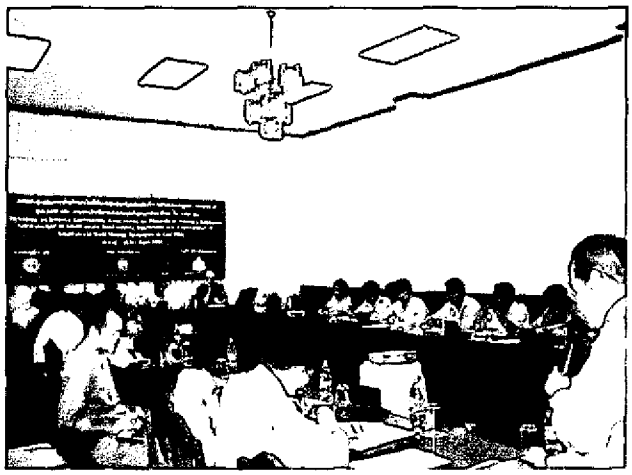
UNIDO Global Mercury Project Lao PDR

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

PHOTOGRAPHIC REPORT (June 2006 – April 2007)

REGIONAL WORKSHOPS





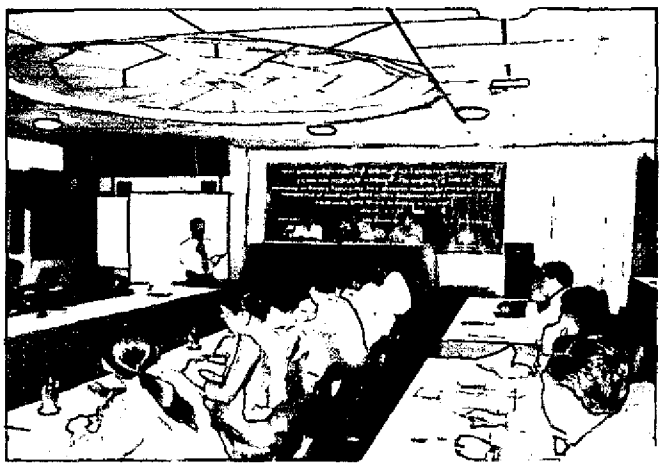
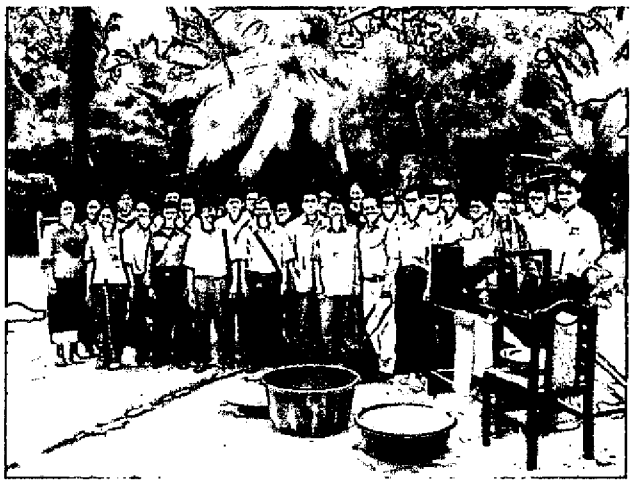


Plate 1 - 3. Workshops in Vientiane, Pakse and Luang Prabang (anticlockwise from top)

Regional Workshops - Equipment Demonstrations

Plates 4 – 7: Equipment demonstration in Pakse

Plates 8 and 9: Equipment demonstration in Luang Prabang


Plates 10 and 11: Equipment demonstrations in Pakse (top) and Vientiane (bottom)

FIELD VISITS

Field Visit 1 – Bolikhamxay

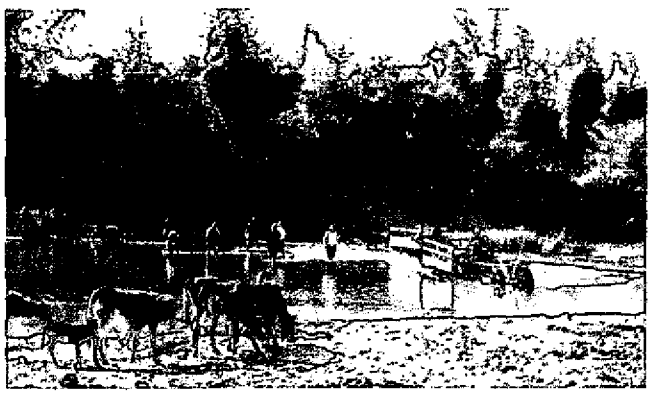
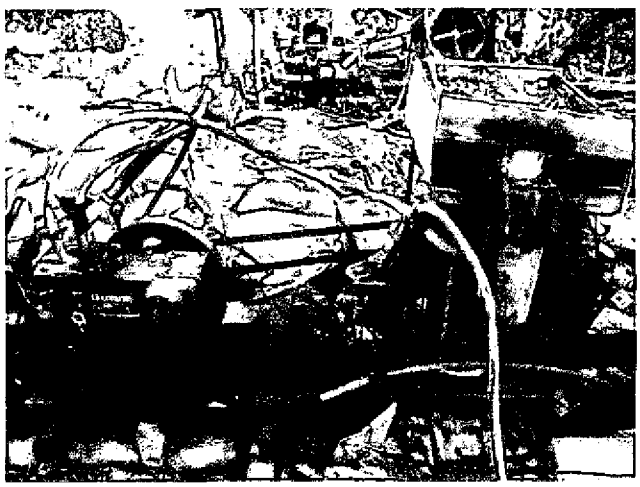
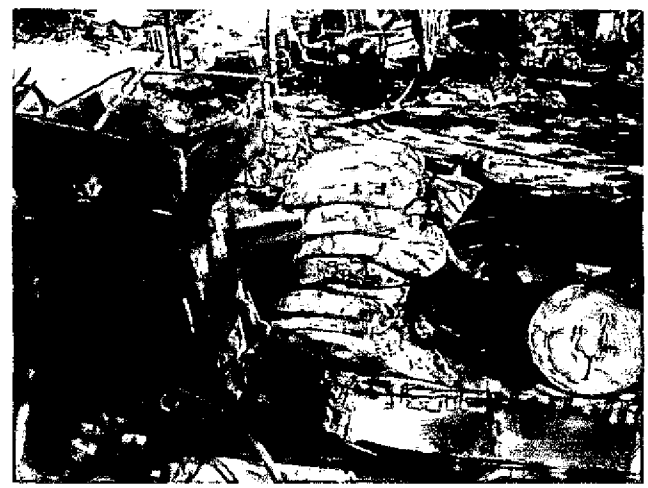
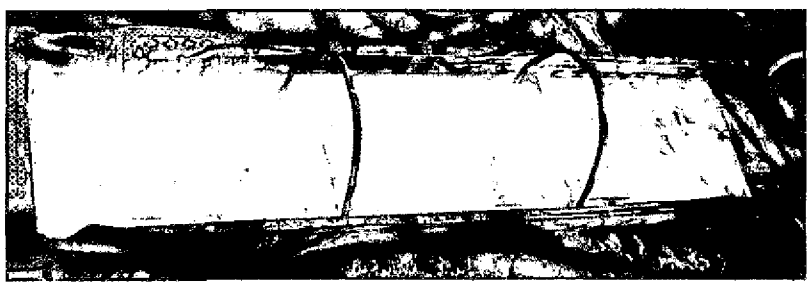


Plate 12 River crossing

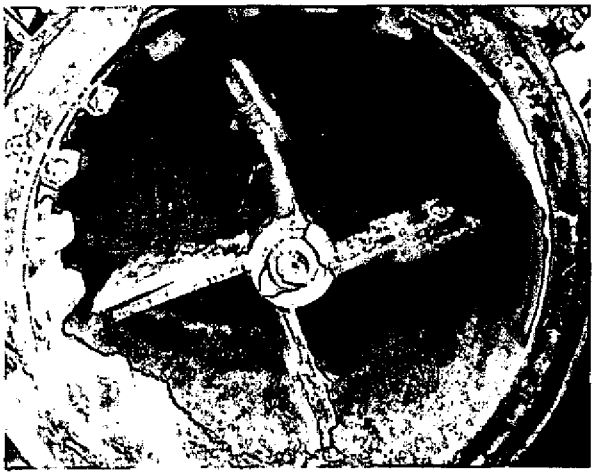
Plate 13 Local children and water buffalo

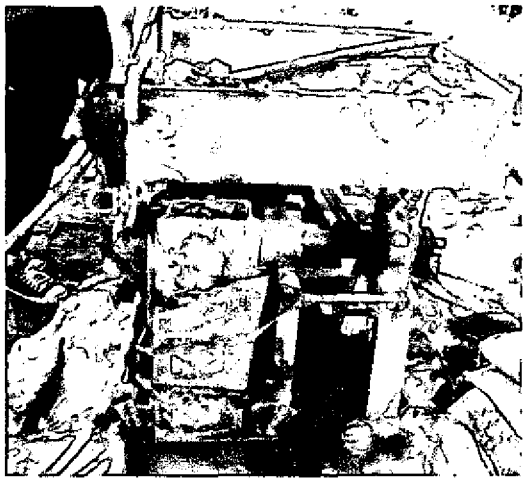






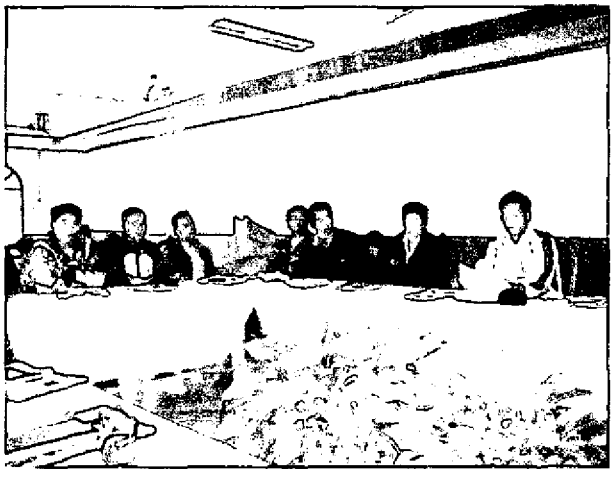
Plates 14 – 16: Vietnamese technology – combination mill and mercury covered copper plate sluice





Plates 17 and 18: Vietnamese technology – combination mill and mercury covered copper plate sluice

Plate 19: Mercury in 1 kg bottles for sale in a Lak Sao gold shop



Plates 20 and 21: Meeting in Lak Sao

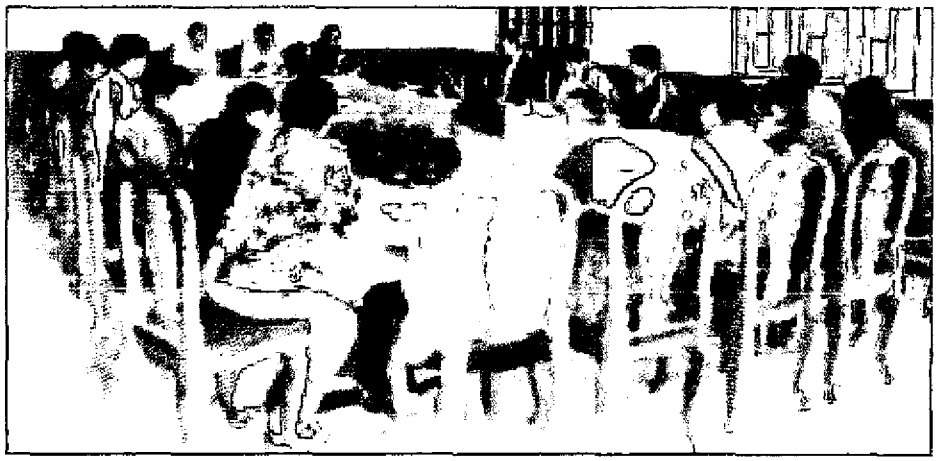
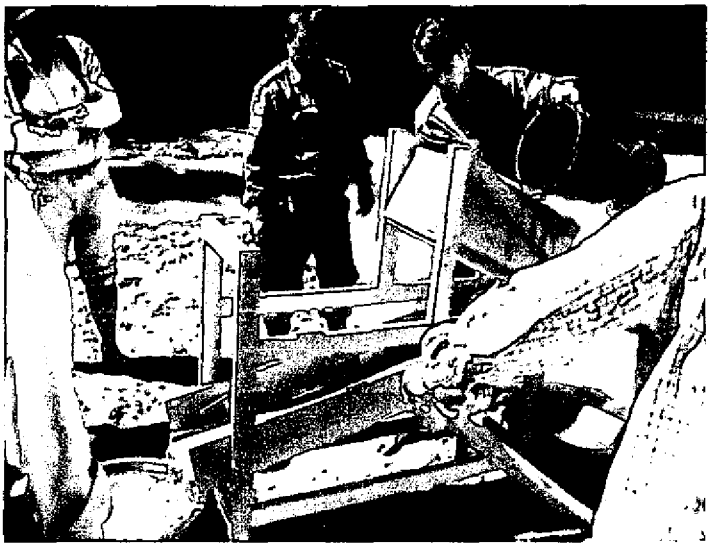


Plate 22: Meeting in Lak Sao

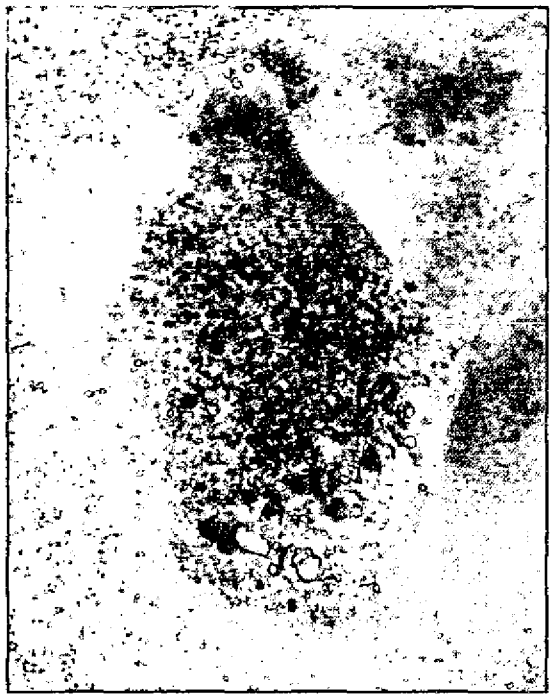
Plate 23: Demonstration site 1 day 1

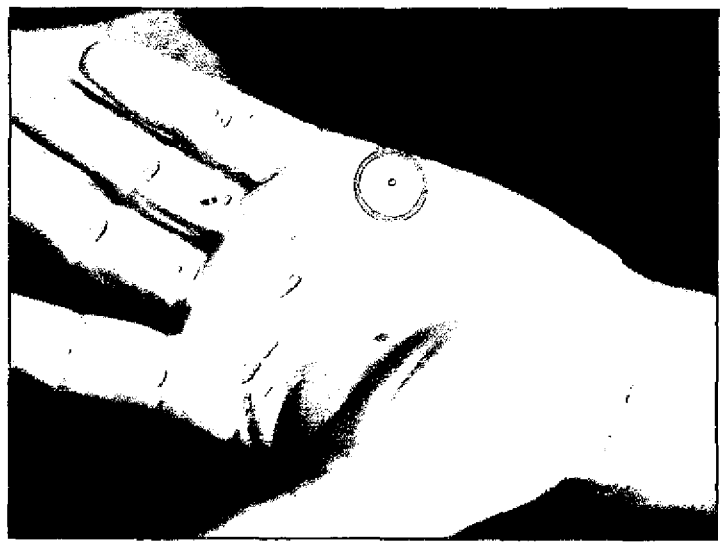
Plate 24: Demonstration site 3 day 2



Plates 25 and 26: Demonstration of zig zag sluice

Plates 27 and 28: Demonstration of tray sluice





Plates 29 and 30: Drop of mercury and resulting small piece of amalgam

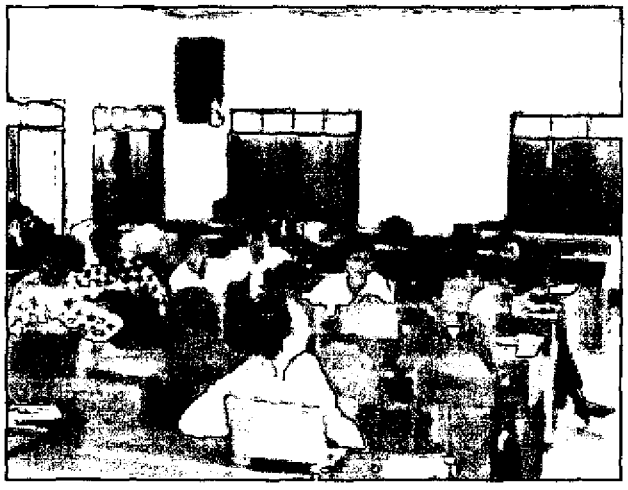
Plate 31: Kitchen bowl retort

Plate 32: Plumbing pipe retort and fire blower

Field Visit 1 – Attapeu

Plate 33: Local children

Plate 34: Sluice box demonstration



Plates 35 and 36: Meeting in Sanamxay

Plate 37 and 38: Sluice demonstration site 1 day 1

Plate 39: Sluice demonstration site 3 day 2

Plate 40: Retort demonstration site 4 day 2

Plate 41 Sluice demonstration site 1 day 1

Plate 42 Sluice demonstration site 3 day 2

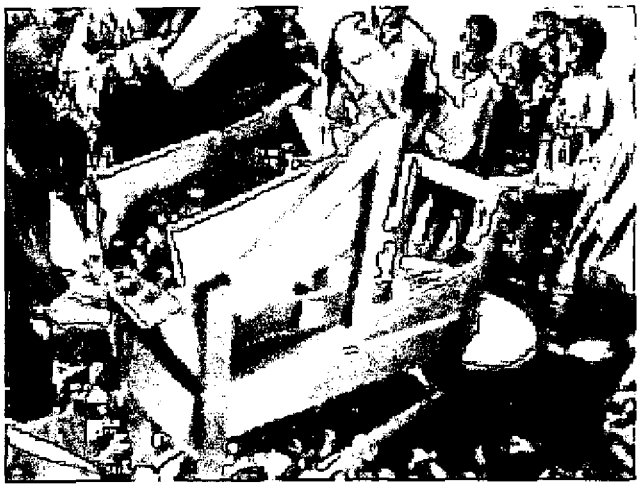


Plate 43 Zig zag sluice demonstration

Plate 44 Tray sluice demonstration

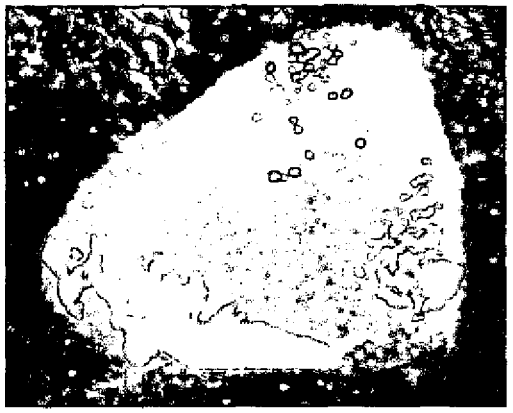


Plate 45 Gold particles

Plate 46 Kitchen bowl retort demonstration

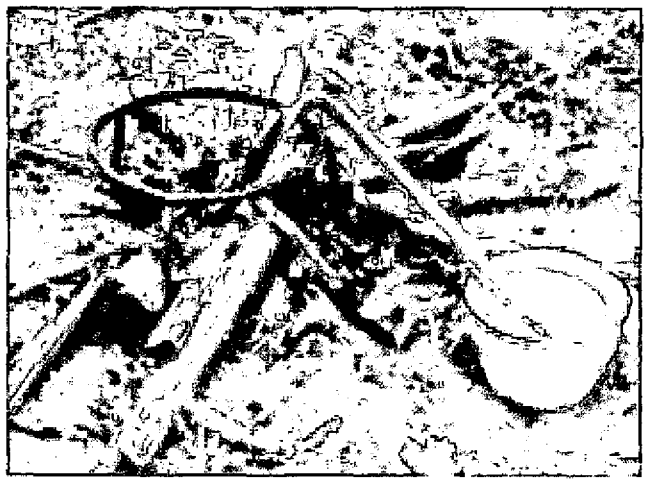
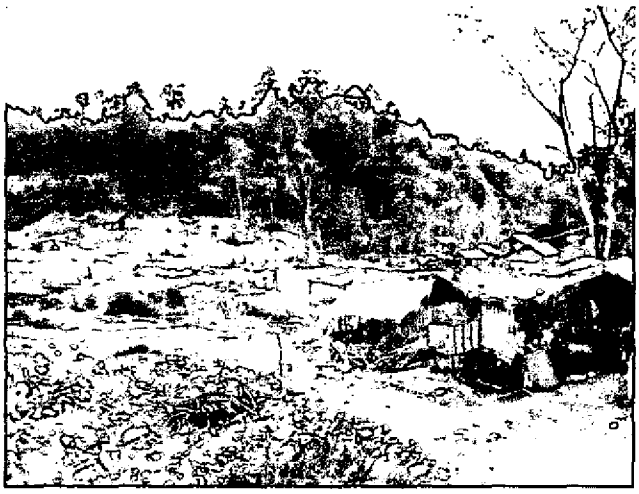


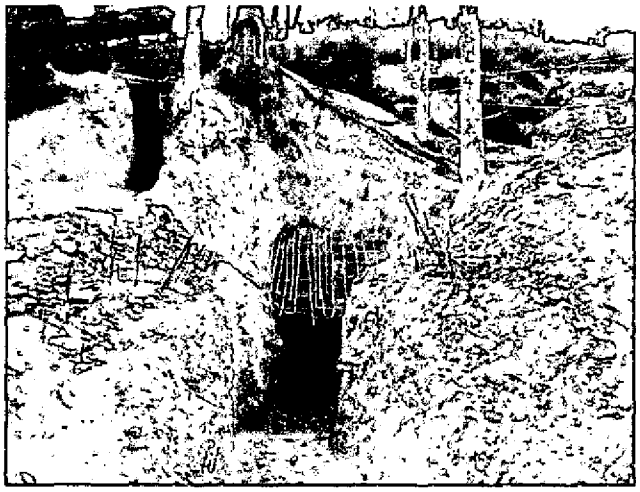
Plate 47 Plumbing pipe retort demonstration

Field Visit 2 – Bolikhamxay

Plates 48 and 49: Artisanal mining near Nakadok Village, Bolikhamxay Province



Plates 50 and 51: Newly formed village near primary ore mining area, near Nakadok Village, Bolikhamxay



Plates 52 and 53: Primary ore mining area, near Nakadok Village, Bolikhamxay

Plates 54 and 55: Opening to mine tunnel, inside mine tunnel

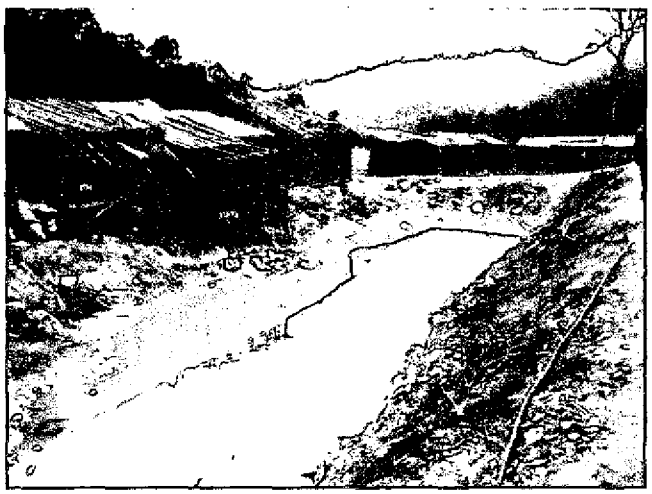


Plate 56: Shelters built around tailings collection pond

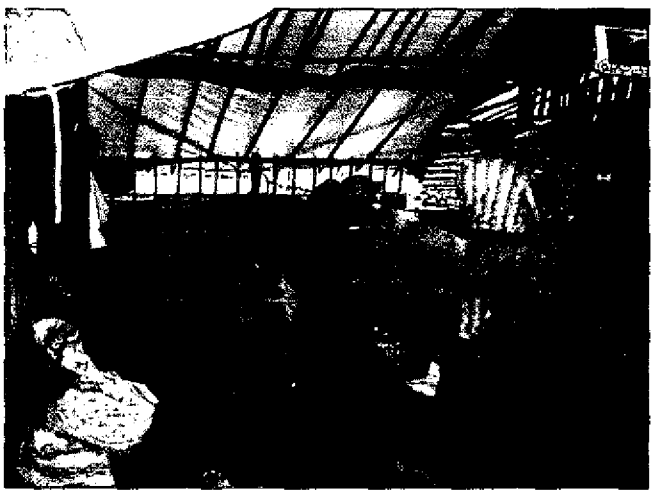


Plate 57: Miner burning large piece of amalgam (approx. 300g) in enclosed area with person sleeping beside him

Plate 58: Mercury amalgamation plate sluice box, draining out of shelter into pond and

Plate 59: Shelter with mill and sleeping area

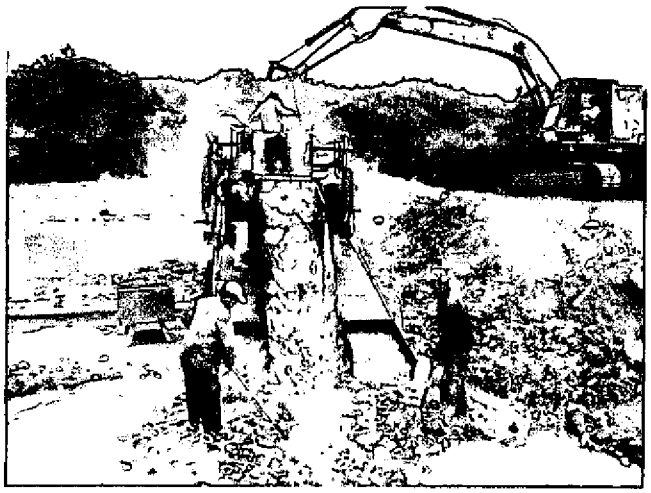


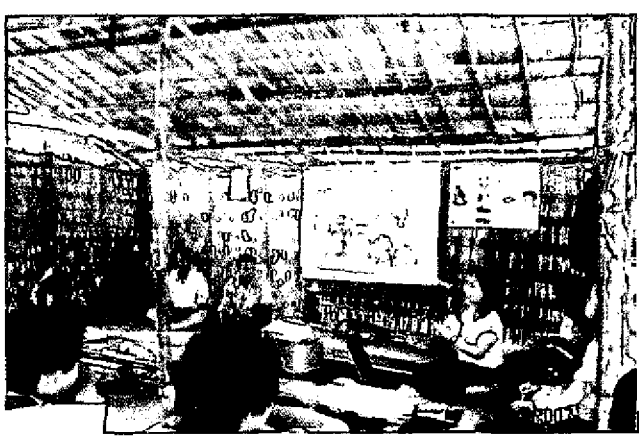
Plate 60: Alluvial mining by Chinese company presentation

Plate 61: Mercury Health Awareness

Plate 62: Retort Kitchen Bowl Retort Demonstration

Plate 63: Plumbing Pipe Retort Demonstration

Field Visit 3 – Health Awareness Training, Bolikhamsay



Plates 64 – 66: Health awareness training.

Field Visit 3 – Stationary Retort and Draft "Codes of Practice" Introduction, Bolikhamxay

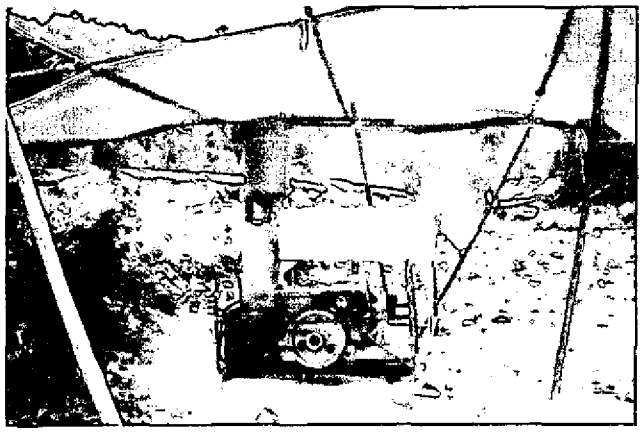


Plate 67: Temporary shelter for stationary retort.

Plate 68: Panning activity

Plate 69: Using a mercury-coated copper plate sluice to recover gold.

Plate 70: instructing miners in retort use using a demonstration retort.

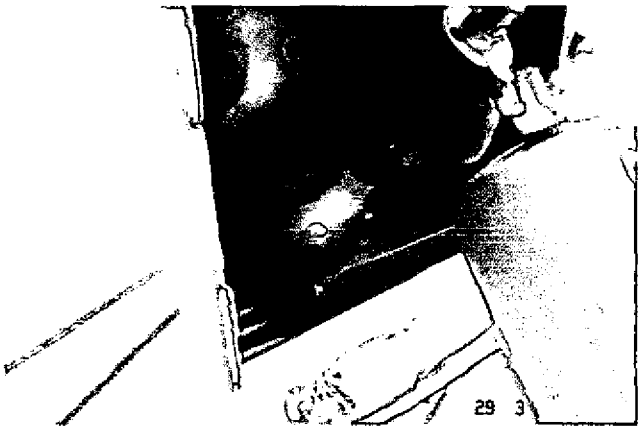


Plate 71: Burning amalgam in the stationary retort.

Plate 72: The resulting gold.

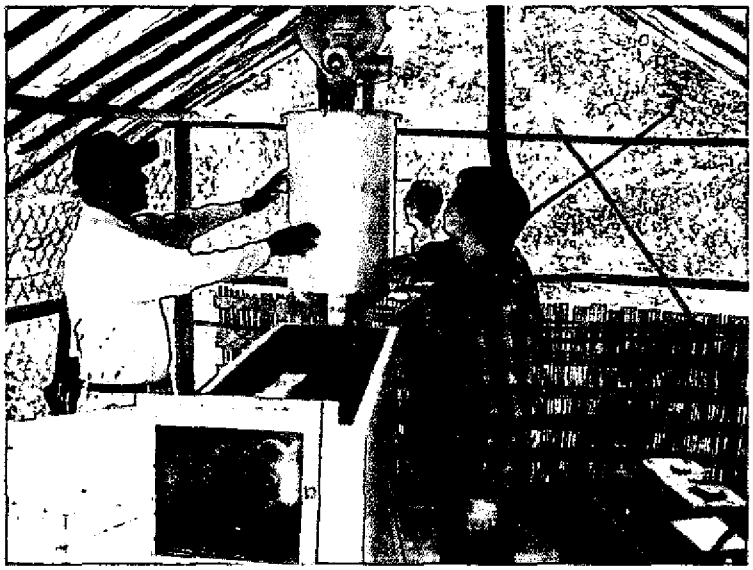
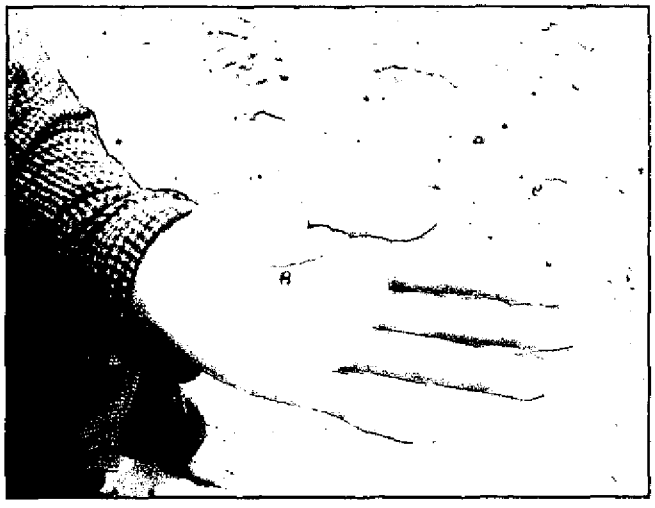


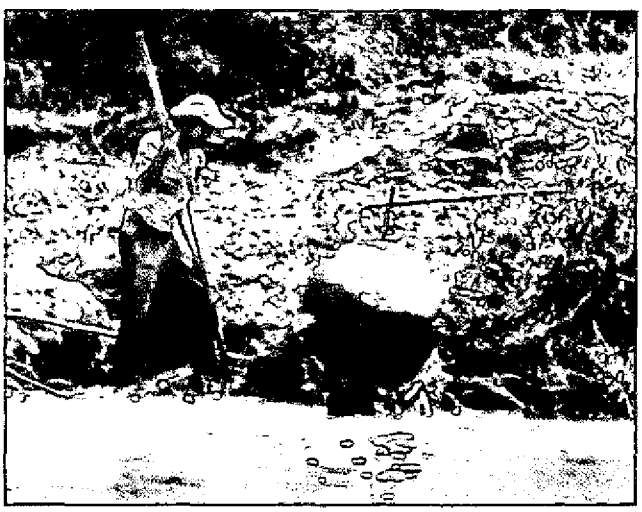
Plate 73: The stationary retort in its newly constructed shed.

Field Visit 4 – Investigating ASM Reported by NGO's, Aid Agencies and Private Companies

Plates 74 and 75: Panning for gold in the Mekong River north of Luang Prabang.



Plates 76 and 77 Mercury-gold amalgam resulting from panning in the Mekong River.



Plates 78 – 80 Panning for gold in the Nam Tha River.