

# Environment Preservation and Mineral Pollution Prevention Technology



Project Sites Tegucigalpa

## 1. Background of Project

In Honduras, where the level of economic development is lagging even compared to other Central American countries, the mining industry was attracting attention as a promising source for inviting foreign capital. Large mines, mainly of zinc and lead, and small and medium-sized mines, mainly of gold and silver, were in operation. However, the wastewater and material management were poorly carried out in these mines. For example, in Lake Yojoa, which is located in about 150km north of the capital Tegucigalpa, a deformed fish appeared due to the mineral waste water from the El Mochito mine near the lake. As described, the environmental pollution was in progress.

From such reasons, the Government of Honduras was concerned about this deterioration of the environment that was accompanying mining. They requested cooperation from Japan with the aim of introducing the proper technology for curbing the environmental pollution in the mining industry, and establishing proper mining management techniques.

## 2. Project Overview

### (1) Period of Cooperation

16 June 1997 – 15 June 2000

### (2) Type of Cooperation

Research Cooperation

### (3) Partner Country's Implementing Organization

Mines and Hydrocarbon General Directorate (DEFOMIN)

### (4) Narrative Summary

#### 1) Overall Goal

The mining industry development is promoted without causing contamination.

#### 2) Project Purpose

Joint study is conducted on the appropriate technology and on improving the skills and knowledge on environmental conservation, specifically on mining industry contaminant control.

#### 3) Outputs

- a) Research on present conditions of mining contamination.

- b) Improved technology on hazardous substances treatment by DEFOMIN.
- c) Environmental monitoring methods are established.

## 4) Inputs

### Japanese Side

Long-term experts	2
Short-term experts	8
Trainees received	2
Equipment	24 million yen
Local facilities	

### Honduran Side

Counterpart	16
Local cost	
Land and facilities	

## 3. Members of Evaluation Team

JICA Honduras Office

(Commissioned to a local consultant: ESA Consultores)

## 4. Period of Evaluation

9 February 2001 – 16 March 2001

## 5. Results of Evaluation

### (1) Relevance

Today, it is commonly recognized worldwide that it is necessary to give careful and full consideration to the preservation of the environment on the occasion of development. On one hand, the Government of Honduras holds expectations for the development of the mining industry as the core of national development. On the other, it is seriously considering how to curb the environmental pollution brought about by the development of the mining industry. This proves the fact that the Government of Honduras has a high level of awareness regarding sustainable development and the preservation of the environment. The project carries out direct cooperation for such points; therefore, it can be said that the relevance of the cooperation is high.

## (2) Effectiveness

In this project, a section that deals only with environmental preservation in the mining field, the "Environment Unit", was established inside DEFOMIN with cooperation of the Japanese experts. In the Environment Unit, Japanese experts carried out training and instructions, and cooperated in the making of two kinds of textbooks about chemical analysis techniques. According to interviews with the persons concerned in this project (13 people including two from the Japanese side), almost all the expected outputs are evaluated as having been achieved. For example, in the investigation related to "the actual condition of environmental pollution that originated in the mining industry," through techniques such as collection of information, field investigations, environmental specimen analysis, 245 specimens of water and soil were collected and analyzed in the total 78 mines. Hazardous substances such as heavy metals and zinc were detected.

## (3) Efficiency

According to the interviews on both sides of the project, more than 80% of the responses indicated that the setting of the purpose for this project and the scale of cooperation were appropriate. On one hand, as for the Japanese side experts, they were dispatched when necessary throughout the cooperation period. On the other hand, as for the first half of the year when the cooperation started, delays occurred in the arrival of the equipment and in the appointment of the Honduran counterparts. Also in Honduras, when the Government changes as a result of the Presidential election every four years, it is characteristic that official personnel and public servants will also be replaced. Sometimes the change of personnel, including the Director of DEFOMIN, had a negative impact on the efficient management of the project. Some had the opinion that although Japanese experts transferred the technology in Spanish, and an anticipated level of results was achieved, if their language skills were higher, it would have been more efficient.

## (4) Impact

In the mine areas, due to the activities of the Environmental Unit, raising of awareness about the environment was recognized in the community and in the local governments. Furthermore, because of the clear existence of environmental pollution in the mine areas, concern about the health of mine workers and local people has been rising. However, the Environment Unit does not have the authority to make any regulations against the mining industry. Therefore, for the purpose of controlling the environmental pollution, it could only have limited impact.

Information such as the actual conditions, the results of the investigation of the Environment Unit and the actual mining activities were provided for the community. This seems to be raising the level of environmental awareness of the local people.

## (5) Sustainability

It was decided to permanently establish the environment section within DEFOMIN as the environment preservation organization for the mining field in July 2000, when this project was to be finished. This decision was made



River water examination

based on the recognition that the research analysis section in this unit has the extremely eminent research analysis ability in the mining field in the country.

In DEFOMIN, the maintenance of the facilities and the equipment has been good. However, the management cost was attained with some difficulties. DEFOMIN is also considering the means of gaining self-income by providing services. However, it is still to reach the stage of self-sustenance. Moreover, reflecting the personnel affairs of Honduras, human resources who have accumulated training or experience tend to move. Therefore, on the point of the effective utilization of human resources, it can be said that there is a side that lacks sustainability.

## 6. Lessons Learned and Recommendations

### (1) Lessons Learned

By trying to dispatch experts who can carry out instructions using the language of the dispatched area, efficiency can become even higher.

### (2) Recommendations

In order for the project to have sustainability, it is necessary to bring about a situation in which human resources accumulate knowledge and the training experience from the project. Furthermore, in order to minimize the potential of the environmental pollution in the mining industry, the Environment Unit should be given legal authority to set up regulations.

## 7. Follow-up Situation

From 2000, one long-term expert is dispatched as "a mine development adviser," and two short-term experts in "rules for pollution prevention" and one expert in "monitoring and waste water management technology" have been dispatched. Also from 2001, in-country training in "environment preservation technology" is being carried out with a schedule of five years.

# San Pedro Sula Water Treatment Plants Improvement Project in Honduras



Project Sites San Pedro Sula

## 1. Background of Project

The City of San Pedro Sula, located in the northwestern part of Honduras, is the second largest city with a population of 51,000 people (in 2001), and population increase is drastic due to the population inflow from the surrounding areas. Regarding the drinking water supply of the city, there was a serious problem originating in the decaying of facilities with a leak rate equivalent to 60% of the potential ability of water supply. The lack of sanitary water management capability, where surface water is only treated with chlorine sterilization, was also a problem. Especially in western areas, Santa Ana and Rio Piedras, the time when water was supplied was limited. According to a water survey including the remaining impurities value, the standards for water quality established by the World Health Organization (WHO) and others were not being satisfied. Thus, the Government of Honduras and the city of San Pedro Sula decided upon the "basic plan" for realizing a stable supply of safe drinking water in the city. A Grant Aid was requested to Japan in order to construct a water purification plant equipped with purification plants of slow-filtering method in both Santa Ana and Rio Piedras,.

## 2. Project Overview

### (1) Period of Cooperation

FY1994 – FY1996

### (2) Type of Cooperation

Grant Aid

### (3) Partner Country's Implementing Organization

San Pedro Sula Municipal Division of Water (DIMA)

### (4) Narrative Summary

#### 1) Overall Goal

The sanitary situation of the people of San Pedro Sula is improved.

### 2) Project Purpose

The capacity of DIMA to steadily supply safe drinking water is improved.

### 3) Outputs

- Water treatment plants in Santa Ana and Rio Piedras are constructed.
- Knowledge and skills of water supply among DIMA staff are improved.

### 4) Inputs

#### Japanese Side

Grant	2,121 million yen (E/N amount)
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#### Honduran Side

Land and electricity supply

## 3. Members of Evaluation Team

JICA Honduras Office

(Commissioned to a local consulting firm, ESA Consultores)

## 4. Period of Evaluation

1 March 2001 – 14 March 2001

## 5. Results of Evaluation

### (1) Relevance

The drinking water supply of the city of San Pedro Sula had problems in terms of water supply range, quality and stable supply capability. The capability to purify water directly relates to the sanitary conditions of the people, thus this project aiming for the improvement of the City's water purification plant is evaluated as responding to the concerns of the municipal authority and citizens of San Pedro Sula.

The relevance of this project was unexpectedly proven after the cooperation period when Hurricane Mitch hit San Pedro Sula in November 1998. The Hurricane was a

disaster that affected the lives of 2.2 million people, or one third of the country's population. However the processing ability of the two water purification plants fully recovered and water supply resumed within two days. There is a report that states that, without these water purification plants, the sanitary conditions of the people might have been much worse if the water supply had been cut for more than a month.

## (2) Effectiveness

The water purification plants improved the City's drinking water supply capability in fields of water supply range, stability of the water supply, and water quality. According to the statistics for 1995, only 61% of the inhabitants in Santa Ana and Rio Piedras were able to obtain safe drinking water throughout the day. After this project in 1999, this was improved to 96%, and in 2000 it became 89%. The amount of water purification was expected to be 25,000m<sup>3</sup> per day in the initial plan, but it reached an average of 27,600m<sup>3</sup>. Correspondingly, the amount of water supply per person was expected to be 210 liters, became 241 liters on average.

Before this project, because the medicine precipitation in the water purification process was not sufficient, residual coagulant, sulfuric acid aluminum was observed in the drinking water. However the water quality steadily came to satisfy the water quality standards of the WHO and others by the improvement of water purification plants.

## (3) Efficiency

The equipment introduced by this project can be evaluated appropriate in terms of quality and quantity. Although there were several pieces of equipment that had initial troubles, these were repaired by the Japanese constructor. All the equipment was installed and the construction finished as initially planned. During the construction period, DIMA had a meeting every week with the Japanese constructor. These meetings functioned well as the locus for the Project's decision making.

## (4) Impact

Socio-economic impacts from this project such as the decrease in the waterborne diseases to local residents are observed, due to the realization of a stable wide-range supply of safe drinking water. The completion of the water purification plant also made the full utilization of surface water possible so that the people do not have to depend on the high cost subterranean water.

In addition, the equipment specification was changed from a slow-paced filtration system to a rapid filtration system, accepting the proposal of the Japanese constructor. The latter has high processing ability in comparison to the original specification of DIMA, and fully demonstrates its functions when the original water is highly turbid. The arguments, skills, and methods of the Japanese construc-



Water treatment plant of Santa Ana

tors that were demonstrated at this proposal also became lessons to the DIMA staff, promoting technology transfer for the improvement of knowledge and technology of DIMA.

## (5) Sustainability

The management of the water purification plant by DIMA is recognized to be sustainable from the improved capabilities of the DIMA staff after the technology transfer by the Japanese constructors. However, since DIMA had not considered preventive maintenance method important, a sufficient system for maintaining the facilities has not been established.

## 6. Lessons Learned and Recommendations

### (1) Lessons Learned

The equipment manual should be translated into the language of the counterpart country in order to increase the efficiency and the durability of the project.

### (2) Recommendations

For the maintenance and strengthening of the water purification capability, a technical evaluation system should be established by academic experts or engineers. Furthermore, in order to secure independent development, DIMA needs to establish a maintenance framework of the facilities.

## 7. Follow-up Situation

Based on the above recommendations, a total of 14 DIMA staff members have participated with the Group Training in the related fields in Japan.