# Supporting Pollution Controls and Sustainable Environmental Monitoring

The Philippines

Environmental Impact Assessment for

Project Ex-Post Evaluation

Environmental Equipment for Power Plants Project

February 27, 2004

Graduate School of Environmental Management, Hosei University

Ryo Fujikura (Professor, Graduate School of Environmental Management, Hosei University)
Mikiyasu Nakayama (Professor, Graduate School of Tokyo University of Agriculture and Technology)

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## Summary

The following is the conclusion and lessons learned from the survey.

1. As data collection on concentration of pollutants is required for issuance of the operating license for power plants by DENR and also for joint monitoring, most of the monitoring equipment provided under the Project has been used continuously, although there are some problems including the problem in calibration.

2. NPC has no motivation to collect meteorological data that are not required to obtain the license. As a result, meteorological instruments and equipment are left broken.

In order to confirm whether the executing agency intends to continue environmental monitoring, we need to see if there is any motivation to do so (obtaining licenses, information disclosure, etc). It is desirable for us to know what inconvenience would be caused to the executing agency as a consequence of non-performance of monitoring. We need to know if it is a common practice for the executing agency to measure the meteorological elements as in Japan.

3. Joint monitoring is playing a certain role in gaining the understanding of local organizations concerned. However, the local residents are little aware of monitoring activities and the existence of the monitoring equipment. The residents recognize the environmental impact to the extent they perceive with their senses such as dust, foul odors, water contamination and the impact on the ecosystem, which give them a negative impression of power plants. It is expected that their viewing of the actual data would raise their awareness and understanding of power plants.

When implementing an environmental monitoring project, it is recommended to confirm how to make the obtained data public and give advice if necessary.

4. In order for NPC to improve the contents of environmental monitoring at power plants and ensure continuous implementation of monitoring, NPC needs to further realize the importance of disclosure of environmental information to local residents. To this end, proper issuance (renewal) of the operating license by DENR is important.

In the case where the executing agency itself carries out environmental monitoring, it is necessary for the purpose of assessing the sustainability of the monitoring to have a third party organization (public authorities in charge of environmental management, local government, etc.) evaluate the validity of the monitoring results and confirm if the executing agency is capable of monitoring. If possible it would be desirable to develop a mechanism to enhance the ability of the third party organization as necessary as part of the project (it would not be easy because complicated coordination efforts would be required). One example is to train not only the personnel of the executing agency but also other organizations concerned in the consulting service of the ODA loan.

5. The problems pointed out in the ex-post evaluation such as insufficient support for the equipment and training of the staff remain unsolved. Collaboration with JICA and GAP has not been promoted as initially planned.

Even if the executing agency were willing to perform monitoring, it would be impossible for them to continue monitoring in the absence of a sufficient support system and personnel training. These points should be examined at the appraisal stage and necessary measures should be taken to secure such a system. For example, it may be possible to stipulate in the original contract that the supplier of equipment should

provide services including training for a certain period.

I It would be effective to provide training of the staff members in conjunction with other schemes than ODA loans such as technical cooperation programs. However, it will require a lot of coordination efforts not only with Japanese organizations but also with the liaison organizations of the recipient countries.

Please see the result of the feedback Seminor in August 2004 regarding meteorological instruments and equipment (2), joint monitoring (3) and operating licence (4).

## 1. Introduction

For the Environmental Equipment Project for Power Plants in the Philippines ("Project"), exchange of notes took place in November 1994 and the loan agreement was signed in December of the same year. The ODA loan covered the entire project cost of 457.1 million yen.

Ex-post evaluation of the Project ("ex-post evaluation") was carried out in September 2002. In this survey, we evaluated the sustainability of environmental monitoring using the equipment provided to the National Power Corporation (NPC) under the Project.

NPC, which is responsible for the operation and management of power plants, does not recognize environmental monitoring as part of its original responsibility. They find no reason to perform monitoring as long as no problem affecting power generation occurs. In order to have them conduct proper monitoring, a situation needs to be created in which non-performance of monitoring inconvenience to NPC, e.g. suspension of the operating license issued by the Department of Energy and Natural Resources (DENR) or increased pressure from local governments, NGOs or the mass media.

In this survey, we examined the operational status of the monitoring equipment provided under the Project as well as the existence of "pressure" on NPC for the purpose of evaluating NPC's motivation level for environmental monitoring and sustainability.

## 2. Method

The following surveys were conducted.

### (1) Literature research

1) We collected, reviewed and sorted the material related to the Project (appraisal materials, PCR and the ex-post evaluation report).
2) We looked at back numbers of Philippine newspapers in English, "Business World" and "Inquirer", stored at the Institute of Developing Economies to collect articles on the electric utility sector of the country.

### (2) Survey of the residents

We surveyed 100 households in the vicinity of coal-fired thermal power plants in Masinloc and Calaca on their awareness of the environmental monitoring by NPC. The interview with the residents was conducted by the Small Economic Enterprises Development, Inc. (SEED), an NGO in the Philippines.

### (3) Field survey and interview

The field survey and interview were carried out as follows:

1) November 20-25, 2003

Location: Manila; Target of the interview: NPC, DENR, JICA Manila Office and Asian Development Bank (ADB)

2) February 8-15, 2004

Location: Masinloc Coal-Fired Thermal Power Plant and Bac-man Gerothermal Power Plant

Target of the interview: persons in charge at the power plants, local residents and others involved

(4) Interview survey in Japan

We interviewed those in charge at JBIC, International Center for Environmental Technology Transfer (ICETT) and Center for Coal Utilization, Japan (CCUJ) either in person, by telephone, or via e-mail.

(5) Survey by Internet searching

We searched NGO web sites to collect and sort out information on power plants in the Philippines.

3. Formation of the Project

A loan agreement for 457 million yen for the Project was signed in December 1994. The disbursed amount was 214 million yen. The disbursement ratio of 47% is quite small for an ODA loan.

The Project was formed based on the suggestion from the Japanese side that one of the components of the package of sector loans for the Philippines which was initially planned around 1993 should be implemented as a separate environmental project in consideration of the importance of environmental protection. This is one of the reasons for the small size of the project in terms of loan amount.

4. Present Status of the Project

(1) Operational status

Table 1 below shows the state of the equipment introduced under the Project as of January 31, 2004.

Table 1: Current State of Equipment (as of January 31, 2004)

| Equipment | Installation Site | Current State |
|---|---|---|
| Stack Sampling Equipment | Environmental Management Division at Headquarters (EMD) | Gas analyzer: in operation<br>Dust analyzer: in operation<br>Data processing software: not in operation<br>It is difficult to obtain standard samples of gas at the site.<br>Training on handling problems is necessary. |

| | | |
|---|---|---|
| | Visayas Regional Center | The equipments were used for trial operation of Bohol Diesel Power Plant in 2002. But the equipments are not fully utilized, as: □there are no vehicles to transfer the equipments to another power plants □environmental division which were responsible for the equipments were transferred to another power plant*. |
| Continuous General Environmental Monitoring System | Battan Thermal Power Plant | Transferred to Calaca Coal-Fired Thermal Power Plant<br>Scheduled to start operations at Calaca by March 2004 |
| | Bohol Diesel Power Plant | EMD's inspection revealed incorrect calibration in some parts of the system. As monitoring has not been performed since November 2003, EMD is planning to offer training.<br>There is a Y2K problem. |
| | Panaly Diesel Power Plant | As proper management and calibration have not been conducted since 1998, reliability of the measurement results since 1999 is questionable. Training on handling problems is necessary. |
| Hydrogen Sulfide Meter (automatic measurement) | Bac-man Geothermal Power Plant | Meteorological instrument: unusable because of corrosion of the sensor<br>Data acquisition system: not in working order<br>Hydrogen sulfide meter: under repair and calibration<br>Notebook PCs: one is out of order and the other is unreliable |
| | Leyte Geothermal Power Plant | Waiting for response |
| | Palinpinon Geothermal Power Plant | Only one Hydrogen sulfide meter is operating. Another one as well as the data acquisition system, notebook PC, printer, meteorological data acquisition system and air conditioner are all out of order. |
| Monitoring Vehicle | EMD | In operation |
| | Battan Thermal Power Plant | In operation |
| | Masinloc Coal-Fired Thermal Power Plant | In operation |
| Water Quality Analyzer | Northern Luzon Regional Center | Transferred to Masinloc Coal-Fired Thermal Power Plant in April 2003. Currently in operation. |
| | Southern Luzon Regional Center | No information |

| | | |
|---|---|---|
| | Metro Manila Regional Center | Transferred to Calaca Coal-Fired Thermal Power Plant |
| | Visayas Regional Center | The equipments were transferred to another power plant in accordance with the transfer of Environmental division* |
| | Mindanao Regional Center | In operation |
| Hydrological Equipment | Hydrology Service Division at Headquarters | Waiting for response |
| Noise Meter | Northern Luzon Regional Center | Waiting for response |
| | Southern Luzon Regional Center | Waiting for response |
| | Metro Manila Regional Center | Transferred to EMD |
| | Visayas Regional Center | The equipments were transferred to another power plant in accordance with the transfer of Environmental division* |
| | Mindanao Regional Center | In operation |
| Meteorological Instrument | Masinloc Coal-Fired Thermal Power Plant | Data acquisition is impossible due to failure in the computer's download program |

* based on the information which were offered by NPC at the time of the feedback in August 2004.

As of the completion of the survey, some organizations had not responded to the inquiries we made through NPC.

Not all the equipment is in good condition. Particularly, meteorological instruments and related equipment have problems. The gas sampler and the general environmental monitoring system also have some problems. Maintenance activities including calibration are not being performed properly. In addition to the difficulty in procuring standard materials, lack of sufficient maintenance measures at each power plant is a factor in this situation. Failure of measurement equipment is also found at geothermal power plants, indicating the possibility that volcanic gas may have caused corrosion of equipment.

At the time of installation, training for the staff was provided by the suppliers of the measurement equipment. However, no training has been given since then. The ex-post evaluation report pointed out that the trained staff members have retired or transferred to other sections without transferring their knowledge to their successors and that sufficient maintenance has not been provided for mechanical problems. These problems have become more apparent now two and a half years after the ex-post evaluation's field survey in June 2001. This situation is common to not only regional power plants but also to the headquarters in Manila.

The meteorological monitoring equipment has been broken and left unrepaired for a long time at all 3 power plants in Bac-man, Palinpinon and Masinloc that responded to the inquiries. In Japan, it is common practice to collect meteorological data when monitoring air quality and to measure water temperature and

pH when monitoring water quality. However, NPC has no reason to record meteorological conditions on a continuous basis. The public authority in charge of regulating environmental pollution has a reason, i.e. it can use the accumulated meteorological data to predict air pollution levels in residential areas and introduce new regulations. On the other hand, those who are regulated are interested only in the data necessary to obtain an operating license such as data on the concentration of pollutants. Meteorological data have no meaning to them, so therefore, meteorological monitoring equipment is left unrepaired. (Please see the result of the feedback seminar in August 2004 for the reference.)

(2) Collaboration with technical cooperation programs

When the Project was designed, the OECF Manila Office contacted the JICA Manila Office and the JETRO Manila Office, which served as a liaison for the Green Aid Plan (GAP), to seek their technical cooperation under the Project. The plan of supplying monitoring equipment with the ODA loan and providing operational techniques through JICA or GAP to NPC was carried out.

Table 2 shows the number of NPC employees who visited Japan as trainees of JICA and GAP programs since the late 1990s.

Table 2: Trainees from NPC who were trained under technical cooperation programs in Japan

1) JICA (one trainee for each)

| FY | Training Course |
|---|---|
| 98 | Mechanical Spare Parts for Plant Maintenance |
| | Urgent Disaster Restoration System |
| | Legal Metrology |
| | **Techno for Industrial Exhaust Gas Treatment and Energy Saving** |
| 99 | Electric Power System Management |
| | Thermal-electric Power Engineering |
| 00 | Improvement of Operation of Electric Power Facilities |
| 01 | Thermal-electric Power Engineering |
| 02 | Industrial Pollution Control Engineering |
| 03 | Small-scale Hydropower Engineering |
| | Thermal Power Engineering |
| | Plant Engineering and Technical Standard for Energy Related Facilities |
| | **Comprehensive Waste Management Technique** |

2) Number of GAP trainees (Training for Clean Coal Technology)

| FY | Number of Trainees |
|---|---|
| 96 | 2 |
| 97 | 1 |

| | |
|---|---|
| 98 | 1 |
| 99 | 1 |
| 00 | 1 |
| 01 | 0 |
| 02 | 1 |
| 03 | 0 |

3) ICETT Training

One trainee during the 9-year period from FY1995 to FY2003 (Training for Industrial Exhaust Gas Treatment Technology in FY1998)

From FY1998 to FY2003, 13 trainees from NPC participated in JICA's training courses. Although the courses "Techno for Industrial Exhaust Gas Treatment and Energy Saving" in FY1998 and "Comprehensive Waste Management Technique" in FY2003 were related to environmental control, no training course has been provided on environmental monitoring.

In the training course on Clean Coal Technology held under GAP, a total of 7 staff members participated from FY1996 to FY2003. However, environmental monitoring is not the main subject of this course either. As 4-7 trainees from the Philippines take part in this course every year, the only 1 or 2 trainees from NPC do not make up the majority of the trainees.

Also, the training provided by ICETT is not about environmental monitoring.

As far as the data provided by the Japanese side is concerned, there is no record that any staff member of NPC has received training on environmental monitoring techniques at JICA or GAP. Considering that there is more than one organization that receives applications for training under GAP, Table 2 may not show the complete data. However, it is unlikely that a large number of trainees from NPC participated in any other training course.

According to ICETT (Yokkaichi, Mie Prefecture), even if a certain organization in the Philippines wants to send many trainees, it would be rare for all the applications to be accepted because NEDA adjusts the number of trainees. Collaboration between the ODA loan and technical cooperation programs was expected to create good results. However, it was not realized in the Project. Although it is unclear to what extent such collaboration was planned by the Japanese side, coordination with the Philippine side (NEDA, in particular) should have been considered.

5. Field Survey of Masinloc Power Plant

At the Masinloc Power Plant, a water quality analyzer (transferred from the Northern Luzon Regional Center), meteorological monitoring equipment and a monitoring vehicle were provided under the Project.

Pursuant to the memorandum executed at the construction stage, general environmental monitoring is

performed on a regular basis by the joint monitoring team of NPC, DENR, the City of Masinloc and NGOs. The results of environmental monitoring have been satisfactory according to the submitted report. With regard to the data on pollutants, power plants are required to submit the monitoring results regularly to obtain the operating license. Implementation of joint monitoring and submission of the data on pollutants in order to obtain an operating license are requirements for power plants to continue operating. Therefore, joint monitoring is likely to continue in the future.

However, as already stated, the Masinloc Power Plant has no motivation to monitor meteorological data. In fact, meteorological data have not been collected due to the failure in the download program.

The problem seems to be with DENR, not the power plant. In the field survey (February 9, 2004), we found that the operating license posted at the entrance of the administration building of the power plant had expired on November 3, 2003. The power plant staff explained that they applied for renewal of the license well before the expiration date, but DENR is slow in processing the application. .(PO was issued in Jaunuary 2004. Please see the result of the feedback seminar in August 2004 for the reference.)

As far as the interview with the local residents is concerned, their perception of the power plant is not so negative in terms of environmental issues. Although a fierce protest campaign was organized at the time of construction, there has been no major trouble after the start of operations. However, the survey of the residents of the barangay where the power plant is situated shows that 90% of the residents think that the environment has deteriorated since the power plant started operations. Many believe that the fish catch has declined because of the decrease of seaweed and coral bleaching around the outfall of the plant. (Please see the result of the feedback seminar in August 2004 for the reference.)

Air pollution is not considered a serious problem, though it is recognized by the residents in the vicinity. When Semirara coal, which caused environmental pollution around the Calaca Power Plant, was used once at the Masinloc Power Plant, the residents noted a foul odor and dust. This event gave them a more negative impression of Masinloc Power Plant than its actual circumstances today warrant. The power plant is planning to mix the fuel coal with 20% of Semiara coal in order to make up for a short supply of Chinese coal caused by a coal mine accident in China. Any mishandling might cause the residents' opinion to fall again.

Captains of barangays in the neighborhood of the power plant reportedly inform the residents of the results of monitoring at barangay meetings, etc. However, most of the residents are not aware of the periodic joint monitoring or the existence of the environmental monitoring equipment installed around the power plant.

According to the questionnaire results, only a few residents (3 persons) have seen the monitoring results. They said they realized that the power plant has not polluted the surrounding environment as much as they thought. They think the monitoring results are highly reliable. Probably they think the results are reliable because the data was obtained through instrumental measurement. If there was a mechanism to make the residents fully aware of the joint monitoring taking place and the results, their impression of the power plant would improve. If this happens, the power plant would be encouraged to continue environmental monitoring. It would be effective to provide written information, by putting up a notice in each Barangay Hall for example, rather than conveying information orally.

The Mayor of Masinloc has been in office almost continuously since the 1980s. Initially, he opposed the construction of the power plant. Later, he consented to the construction in response to the direct request of then President Ramos. He still expresses concern over the environmental impact of the power plant and does not trust the results of the joint monitoring led by NPC. On the other hand, the Mayor trusts DENR. He says that he would trust the monitoring results if DENR or city officials performed the monitoring or, at the least, if he himself could scrutinize the results.

It is desirable from the viewpoint of ensuring objectivity to have local governments conduct environmental monitoring, as in Japan. However, neither DENR nor the municipal government is capable of doing so. One possible solution is for DENR or city officials to acquire skills to evaluate the monitoring activities of NPC and assess the monitoring results. If city officials were able to determine the validity of the methods and result of the monitoring, the Mayor and those who are skeptical of the reliability of the monitoring would be satisfied. The quickest way is to have NPC provide training to DENR and municipal officials.

## 6. Results of Survey of Residents in the Vicinity of Masinloc and Calaca Power Plants

### (1) Target residents

We surveyed by questionnaire 100 households in the vicinity of the Masinloc Power Plant.

For comparison purposes, a similar survey was conducted on 100 households in the vicinity of the Calaca Coal-Fired Thermal Power Plant, to where some equipment installed at other power plants were transferred from the end of 2003 to 2004. The problem of environmental pollution at the Calaca Coal-Fired Thermal Power Plant arose in the late 1980s and was a social issue until countermeasures were taken in the 1990s under the ODA loan project; this affected the construction plans of the Masinloc Power Plant. The idea of joint monitoring in Masinloc was developed based on the experience in Calaca. Therefore, it is meaningful to compare the Masinloc results with that of the Calaca Power Plant as a pioneer case of environmental monitoring.

At first, we planned to use the same format at both sites. However, we had to use slightly different formats taking into account the wishes of NPC, which cooperated in the survey. These differences are not so significant as to disturb the comparison of the general trends of the two sites.

The target residents are as follows:

1) Masinloc: a total of 100 households consisting of the residents of Barangay Bani, Masinloc City where the power plant is situated and the residents relocated for the construction of the power plant (they are treated as residents of Barangay Bani although they live outside the administrative boundary of Barangay Bani).
2) Calaca: a total of 100 households consisting of the residents of three barangays in Calaca City (Baclaran, Dacanlao, and San Rafael) whose houses are within 1.5 kilometers from the power plant or who have been relocated for the construction of the power plant.

(2) Survey method

In person interview by visit

(3) Survey period

January 26-January 31, 2004 (Masinloc)

(4) Summary

The survey results in Masinloc and Calaca were almost the same with no notable difference between the two sites. The results are summarized in the Attached Table. It indicates that the residents' perception of the Project in Masinloc is not unique. The results seem to reflect the fact that they have a common system developed on similar backgrounds and similar measures such as the protest campaign and joint monitoring as a countermeasure.

In both surveys, more than 90% of neighborhood residents answered that they think the environmental situation has deteriorated as a result of the construction and operation of the power plant. The most common reason in Masinloc is the decline in the fish catch, which is suspected to be caused by warm wastewater. As for air pollution, many respondents mentioned air pollution caused by the use of Semirara coal. However, only a small number of households strongly believe it is a cause of "environmental deterioration." In Calaca, many households pointed out problems related to air pollution such as a foul odor and blackish smoke. This is because they had a strongly negative impression of the power plant when it started operations and because Semirara coal is still used. Even today, many residents point out the problem of a foul odor.

Few residents are aware of the joint monitoring. In Masinloc, the awareness level of the existence of the monitoring equipment was also surveyed. The result shows only 6% of the respondents knew of the existence of the monitoring equipment. The awareness level is low even in the barangay where Barangay Hall is situated behind the monitoring station, which naturally is visible to the residents. In Calaca, only a few residents are aware of the joint monitoring in spite of the fact that it was initiated as part of countermeasures against environmental pollution, an issue that has come to the fore.

In Masinloc, only 3 households answered that they have been provided with information on the environment. In Calaca, 11 households answered yes. Two out of these 3 households in Masinloc and 8 out of 11 households in Malaca say the information was provided by word of mouth. However, 9 out of 11 households in Calaca requested information and inspected the data, indicating that the residents' awareness level is a little higher in Calaca than in Masinloc.

At both sites, the residents recognize changes in the environmental situation in the elements that are perceived by the five senses such as dust, foul odors or the change in fish catch. On the other hand, almost all households that saw the environmental data say that air quality and water quality were less polluted than they had thought. This may be partly because the substances causing the foul-odor have not been measured and therefore the measurement items are not consistent with the residents' impressions. Still, the residents came to think that the environmental situation had not deteriorated as much as they thought after they saw the data. Interestingly, almost all the households that obtained information say that the information they

received is reliable.

Regarding environmental management by NPC, nearly 80% and 70% of the respondents in Masinloc and Calaca, respectively, said it is insufficient. Most residents think NPC should be able to take more measures. If NPC makes more efforts to disseminate the joint monitoring results by word of mouth (probably by oral report at barangay meetings) or by disclosing the report for public inspection, it would deepen the residents' understanding of the environmental measures taken by the power plant.

If the existence of NGOs was widely known, they could help increase the residents' awareness and put pressure on NPC's activity. However, the awareness level of NGOs is so low that more than 90% of the residents in Masinloc do not know what NGOs are doing.

7. Field Survey of Bac-man Geothermal Power Plant

Bac-man Geothermal Power Plant was provided with meteorological monitoring equipment, a hydrogen sulfide meter and notebook computers for data processing under the Project. The power plant is built in a mountainous area surrounded by a forest reserve with no residence in the vicinity. It is unthinkable that citizens are directly affected by air pollution.

The residents are concerned about possible health damage caused by wastewater alleged to be discharged from the power plant. When a skin disease spread in some villages, wastewater from the power plant was suspected to be the culprit. The power plant adopts the system of reinjecting the hot water generated when extracting geothermal energy back into the aquifer and therefore, according to NPC, wastewater never flows out of the plant site. In the periodic monitoring of the water quality of rivers in the vicinity conduced by NPC, no particular problems have been found. The investigation concluded that the skin disease was caused by the unsanitary condition of the villages where it occurred. However, as not all the residents are satisfied with this conclusion, they still suspect wastewater from the power plant.

The meteorological monitoring equipment procured under the Project has been causing data errors (relative humidity of over 100% or outside temperature below freezing) since 1998. It has been left unrepaired for years since it became unusable several years after it was installed. Around the equipment, we smelled volcanic gas (hydrogen sulfide odor). Corrosion induced by volcanic gas and infiltration of rain water are thought to have caused the malfunction of the equipment. In spite of NPC's request for maintenance to the supplier in Singapore, nothing has been done to date. Probably because measurement of meteorological data is not required to obtain a license from DENR and is not included in the items of joint monitoring, the power plant does not seem to take this problem seriously.

The hydrogen sulfide meter works properly according to the operation report, although it was temporarily removed for calibration when we conducted the field survey.

At the Bac-man Power Plant site, no interview survey of the residents was conducted. We happened to stay in the same hotel as the former mayor of Bac-man and his wife (the owner of the hotel and president of the local tourism association). Judging from what they and local newspaper reporters told us, there is a perception gap regarding environmental monitoring between the power plant and the local residents, just like in Masinloc. The power plant carries out environmental monitoring jointly with local organizations.

However, it does not seem to us that the results are revealed to the interested residents.

8. Remarks

In this survey, both power plants in Masinloc and Bac-man were cooperative, whereas the headquarters of NPC (Environmental Division) was not. The headquarters of NPC thought only the survey on the operational status of the equipment and materials provided under the Project was necessary. We repeatedly explained to them by e-mail that a survey on the surrounding circumstances, including the residents' awareness, is indispensable to assess the sustainability of environmental monitoring. However, we were not able to obtain their understandings on this issue.

Given a series of protest campaigns against the construction of power plants, starting with the Calaca Coal-Fired Thermal Power Station, as well as the difficulty handling complaints associated with the operation of power plants and criticism against NPC by NGOs and the mass media, it is understandable that NPC is worried about conducting a survey on residents' perceptions. However, the unwillingness of NPC headquarters to disclose information and its lack of effort to gain public understanding prevent the residents in the vicinity of power plants from improving their impression of power plants.

In fact, the residents in Masinloc and Calaca who read the monitoring report, though the number is small, trusted the contents and gained a more favorable impression towards environmental management by power plants. Although we cannot deny the disadvantage to NPC and power plants in the short term of disclosing information, information disclosure will help deepen the residents' understanding in the long term. Also, if power plants and NPC come to know that the residents are interested in environmental monitoring, they would perform monitoring more actively. Then a situation like leaving broken equipment unrepaired for a long time could be prevented. Eventually, it would be more beneficial than costly. Regretfully, power plants and NPC do not seem to take a long-term perspective on monitoring.

External factors that encourage proper environmental monitoring include:

1. Statutory regulations
2. Protest by victims of environmental pollution
3. Pressure from the mass media and NGOs
4. Orders and pressure from local governments
5. Judicial solutions

Internal factors include:

6. Awareness of the head of the monitoring entity
7. Awareness of the technical staff
8. Support by equipment suppliers

In this Project, the most important factor for NPC is the operating license issued by DENR (1). NPC has been conducting measurement of pollutants on its own in spite of some problems such as the delay in calibration. It seems that the problem lies with DENR rather than NPC. Because of the delay in issuing the operating license, they have to tacitly permit unlicensed operation. As DENR itself is not capable of monitoring the environmental situation around power plants, there is no choice but to use the measurement

results provided by NPC. NPC says that examination by DENR is strict. However, it is unclear if the examination is conducted properly in terms of technical relevancy.

Protest by neighborhood residents (2) is weak. When the power plants were constructed, active protest campaigns were organized to prevent environmental pollution by power plants. However, there has been no major dispute over environmental pollution since the start of operations and the residents have not staged protests frequently. In addition to the absence of serious pollution, low media coverage is one reason for this situation. As far as our review of newspaper articles (3) is concerned, while protest campaigns against the construction of power plants received much initial coverage, there were only a few follow-up reports.

As an advocacy NGO (3), Greenpeace organized a campaign targeting coal-fired thermal power stations and staged protests while posting a statement on its web site . However, according to the survey results, NGO activities are not recognized by the local residents.

In the cases of Masinloc and Bac-man, local governments (4) seem to exert some pressure by making complaints about environmental pollution by power plants and participating in joint monitoring. In Masinloc, however, the focus of the local government's interest is employment rather than the environment. Also, the local governments seem to feel constraints because NPC is an agency of the national government. The judicial system (5), which is an important factor in environmental management in India, is not powerful enough in the Philippines.

It appears that the awareness of environmental management of the head of the monitoring entity (6) is not very high, as indicated by the attitude of NPC headquarters towards this survey. Rather, NPC may have a sense of being victimized by unreasonable criticism by the mass media and NGOs that give NPC no credit for its hard work. The technical staff perform monitoring (7) seem to fulfill their duties sincerely. Still, there remain some problems including insufficient support for the equipment (8) and the failure to pass on maintenance techniques as pointed out in the ex-post evaluation.

NPC is proceeding with the privatization of power plants. The privatization plan of Masinloc Power Plant has already been decided. Bac-man Power Plant is also planned to be privatized in the near future. The privatization of Masinloc, Bac-man and Calaca Power Plants would have no substantial negative impact on the implementation of environmental monitoring. At these power plants, it is stipulated in the memorandum that environmental monitoring be performed jointly by DENR, local governments and NGOs. Therefore, it is unthinkable that such monitoring would be suspended after privatization. The current system under which DENR has the authority to rescind the operating license of power plants, although its practical effect is questionable, will remain unchanged after the privatization of power plants. In Masinloc, we felt that the mayor held back from making strong statements about the power plant operated by NPC, a national agency. After power plants are privatized and the situation described above changes, power plants are expected to face increased pressure from local governments. All things considered, the privatization of power plants would not result in an immediate decline in the sustainability of environmental monitoring. On the contrary, if power plants are purchased by environmentally-conscious companies (e.g. companies from industrialized nations), performance of the monitoring system might be improved. The important question is whether provisions requiring continued environmental management including environmental monitoring will be contained in each power plant sales contract between NPC and private purchasers.

9. Conclusion and Lessons Learned

The following is the conclusion and lessons learned from the survey.

1) As data collection on concentration of pollutants is required for issuance of the operating license for power plants by DENR and also for joint monitoring, most of the monitoring equipment provided under the Project has been used continuously, although there are some problems including the problem in calibration.

2) NPC has no motivation to collect meteorological data that are not required to obtain the license. As a result, meteorological instruments and equipment are left broken.

In order to confirm whether the executing agency intends to continue environmental monitoring, we need to see if there is any motivation to do so (obtaining licenses, information disclosure, etc). It is desirable for us to know what inconvenience would be caused to the executing agency as a consequence of non-performance of monitoring. We need to know if it is a common practice for the executing agency to measure the meteorological elements as in Japan. (According to NPC, meteorological data are needed at the geothermal power plants. Please see the result of the feedback sekinar in August 2004.)

3) Joint monitoring is playing a certain role in gaining the understanding of local organizations concerned. However, the local residents are little aware of monitoring activities and the existence of the monitoring equipment. The residents recognize the environmental impact to the extent they perceive with their senses such as dust, foul odors, water contamination and the impact on the ecosystem, which give them a negative impression of power plants. It is expected that their viewing of the actual data would raise their awareness and understanding of power plants.

When implementing an environmental monitoring project, it is recommended to confirm how to make the obtained data public and give advice if necessary.

4) In order for NPC to improve the contents of environmental monitoring at power plants and ensure continuous implementation of monitoring, NPC needs to further realize the importance of disclosure of environmental information to local residents. To this end, improvement of DENR's ability to issue a license is important .(Please see the result of the feedback sekinar in August 2004.)

In the case where the executing agency itself carries out environmental monitoring, it is necessary for the purpose of assessing the sustainability of the monitoring to have a third party organization (public authorities in charge of environmental management, local government, etc.) evaluate the validity of the monitoring results and confirm if the executing agency is capable of monitoring. If possible it would be desirable to develop a mechanism to enhance the ability of the third party organization as necessary as part of the project (it would not be easy because complicated coordination efforts would be required). One example is to train not only the personnel of the executing agency but also other organizations concerned in the consulting service of the ODA loan.

5) The problems pointed out in the ex-post evaluation such as insufficient support for the equipment and training of the staff remain unsolved. Collaboration with JICA and GAP has not been promoted as

initially planned.

Even if the executing agency were willing to perform monitoring, it would be impossible for them to continue monitoring in the absence of a sufficient support system and personnel training. These points should be examined at the appraisal stage and necessary measures should be taken to secure such a system. For example, it may be possible to stipulate in the original contract that the supplier of equipment should provide services including training for a certain period.

It would be effective to provide training of the staff members in conjunction with other schemes than ODA loans such as technical cooperation programs. However, it will require a lot of coordination efforts not only with Japanese organizations but also with the liaison organizations of the recipient countries.

Attached Table

Results of Survey of Residents in the Vicinity of Masinloc and Calaca Power Stations

1) Description of the Present Environmental Situation (open ended)

a) Air quality

| Problem | Masinloc | | Calaca |
|---|---|---|---|
| | No. of answers | % | No. of answers (multiple answers) |
| - Foul odor when Semirara coal is used | 41 | 32.28 | |
| - Falling dust | 37 | 29.13 | |
| - Skin disease, itchiness, soreness, etc. | 19 | 14.96 | |
| - Smell like burning tires | 8 | 6.30 | |
| - Foul-smelling blackish smoke when the wind is strong | | | 52 |
| - Foul odor causing lung or stomach pain | | | 20 |
| - (Occasional) foul-smelling dust fall | | | 36 |
| - Nothing particular | 7 | 5.51 | |
| - Others<br>Blackish smoke<br>Hot air<br>Humidity<br>Dust irritating to the nose<br>Smell of coal at night | 15 | 11.81 | |
| Total | 127 | 100 | 108 |

b) Water quality

| Problem | Masinloc | | Calaca |
|---|---|---|---|
| | No. of answers | % | No. of answers (multiple answers) |
| - Low water level | 18 | 18 | 6 |
| - Short water supply during summer | 3 | 3 | 5 |
| -Occasional brown water | 1 | 1 | |
| - Occasional appearance of oil slicks or charcoal on the surface of water | | | 8 |
| - Nothing particular | 54 | 54 | 85 |
| No answer | 24 | 24 | |
| Total | 100 | 100 | 104 |

c) Noise

| | Masinloc | | Calaca |
|---|---|---|---|
| Problem | No. of answers | % | No. of answers (multiple answers) |
| - Loud noise at the start and end of operation | 73 | 69.52 | 15 |
| - Have got used to the noise | 17 | 16.19 | 73 |
| - Mechanical sound during operations | 7 | 6.67 | |
| - Not affected because of the distance | 7 | 6.67 | |
| - Sometimes hear noise early in the morning | 1 | 0.95 | |
| - Loud noise at night | | | 6 |
| - Loud noise whenever the pressure goes down | | | 5 |
| Total | 105 | 100.00 | 99 |

d) Others

| | Masinloc | Calaca |
|---|---|---|
| Problem | No. of answers (multiple answers) | No. of answers (multiple answers) |
| - Seawater gets muddy near the power plant | 56 | |
| - Sometimes it becomes very dusty at night | 23 | |
| - We have to go several kilometers offshore to catch fish because of the decline in the fish catch | 19 | |
| - The fence of the power plant blocked running water when a typhoon came and as a result a flood occurred | 7 | |
| - Children have recurring cough and colds | 6 | |
| - Marine resources have declined (decrease in growth of seaweed, death of coral reefs, and destruction of fish habitats near the power plant) | 13 | |
| - Dustiness when strong wind blows | | 51 |
| - Dirty seashore | | 18 |
| - Growth retardation of crops | | 7 |
| - Others | 7 | |
| Blackish smoke emitted at night<br>Dust sticks to clothes and plants<br>Seawater is hot in some spots<br>Shellfish have disappeared from the seashore | | |
| Total | 131 | |

2)-1 Has the environment deteriorated after the construction of the power plant? (Masinloc)

| | No. of answers | % |
|---|---|---|
| Yes | 90 | 90.00 |
| No | 8 | 8.00 |
| No answer | 2 | 2.00 |
| Total | 100 | 100.00 |

2)-2 Has the environment changed after the construction of the power plant (Calaca)

| | No. of answers | % |
|---|---|---|
| Yes | 94 | 94.00 |
| No | 6 | 6.00 |
| Total | 100 | 100.00 |

3)-1 Reason for thinking that the environment has deteriorated (Masinloc, open-ended)

| | No. of answers |
|---|---|
| - Fish catch decreased (mentioned by fishermen in particular) | 28 |
| - Pollution has worsened around the power plant | 17 |
| - Ash disposal site has adverse impacts on marine creatures and their habitats | 8 |
| - Floods occurred | 6 |
| - Seawater is polluted | 5 |
| - Water level has dropped | 7 |
| - Mango production has declined | 2 |
| - Others<br>This area used to be rich in marine products<br>Children became susceptible to illness | 6 |
| - There are other factors than the power plant that affect the environment | 4 |
| - Don't know | 2 |
| Total | 85 |

3)-2 Reason for thinking the environment has changed (Calaca, open-ended)

| | No. of answers |
|---|---|
| Positive | 33 |
| - Increase in employment | 15 |

| | |
|---|---|
| - Development funds granted to the region | 9 |
| - Embankment | 1 |
| - No change | 5 |
| - Improvement of living conditions | 3 |
| Negative | 96 |
| - Foul-smelling blackish smoke | 36 |
| - Diseases caused by dust | 11 |
| - Intensified environmental pollution | 23 |
| - Impact on marine products and decrease of fish catch | 17 |
| - Occasional oil scattering on the sea surface | 2 |
| - Forced contribution of farmland to NPC as the source of the development funds (?) | 7 |
| Total | 129 |

4) Have you ever received information on the environment?

| | Masinloc | | Calaca | |
|---|---|---|---|---|
| | No. of answers | % | No. of answers | % |
| Yes | 3 | 3.00 | 11 | 15.71 |
| No | 97 | 97.00 | 59 | 84.29 |
| Total | 100 | 100.00 | 70 | 100.00 |

5) Awareness of joint environmental monitoring

| | Masinloc | | Calaca | |
|---|---|---|---|---|
| | No. of answers | % | No. of answers | % |
| Yes | 6 | 6.00 | 4 | 4.00 |
| No | 94 | 94.00 | 96 | 96.00 |
| Total | 100 | 100.00 | 100 | 100.00 |

6) Awareness of the existence of environmental monitoring equipment (Masinloc)

| | No. of answers | % |
|---|---|---|
| Yes | 6 | 6.00 |
| No | 94 | 94.00 |
| Total | 100 | 100.00 |

7) Do you think the environmental management by NPC is sufficient?

| | Masinloc | Calaca |
|---|---|---|

| | No. of answers | % | No. of answers | % |
|---|---|---|---|---|
| Yes | 3 | 3.00 | 12 | 12.00 |
| No | 77 | 77.00 | 66 | 66.00 |
| Don’t know | 20 | 20.00 | 22 | 22.00 |
| Total | 100 | 100.00 | 100 | 100.00 |

8) Awareness of activities of environmental NGOs (Masinloc)

| | No. of households | % |
|---|---|---|
| Yes | 8 | 8.00 |
| No | 51 | 51.00 |
| Don’t know | 41 | 41.00 |
| Total | 100 | 100.00 |

Environmental Equipment Project for Power Plants
[Outline of Feedback Seminar]

I. Date: August 9, 2004 (Monday)
Participants: DENR (Department of Environment & Natural Resources) and NPC (National Power Corporation)

II. Summary of the Meeting

1. Operational Certificates (PO)
(←In the report it is stated that DENR's tardiness in issuing the PO means that the power plant is operating under tacit approval and the authorization accorded under the PO is not functioning.)

(1) During the discussions, it was concluded that the PO for Masinloc (renewable annually) had already been issued on January 22, 2004 (approx. 2 months late). (Mr. Sador confirmed this during the meeting via a telephone call to the DENR regional office.)
(2) DENR stated that if DENR encounters no problem with the documents submitted by the power plant then the regional office is authorized to issue a PO immediately; however, NPC stated that there are sometimes slight delays (of a few months) in the issue of this document (there are also cases when the document is issued on time). Both organizations need to establish better communication on this issue.

2. Collaborative Monitoring
(←In the report it is stated that there is no awareness of collaborative monitoring on the ground.)

(1) The Masinloc power plant has had numerous discussions with local community representatives and NGOs as requested in the EIA. The reports on the results of quarterly collaborative monitoring are distributed to the relevant organizations and community representatives one month after the monitoring takes place.
(2) However, since the reports are technical, lengthy and limited in number, it is believed that the information is only reaching those individuals actually involved in the monitoring. This is believed to be the reason why ordinary residents are unaware of the collaborative monitoring activities.
(3) During the meeting we suggested that the creation of report summaries (e.g. a single-sheet document in Tagalog) as a means of advising residents would be a good idea. NPC approved of the idea (similar efforts have already been initiated at the Calaca power plant).

3. Other Matters
(1) Meteorological Observation Data
(←In the report it is stated that: "NPC has no incentive to measure meteorological observation data that is

unrelated to certificate acquisition.)

According to NPC, there are several polluters in the area and it needs to measure meteorological data at the geothermal power plant to identify where responsibility for the pollution lies, and at the geothermal power plant where expansion is on the drawing board and a decision needs to be made on the location of the new well.

(2) Heated Effluent

(←In the report it is stated that: "The volume of seaweed is decreasing and there is bleaching of coral around the drain outlet" at the Masinloc power plant.)

According to NPC, privatized bleaching of coral and falling catches can be attributed to numerous causes aside from heated effluent and it is difficult to specify the primary cause. Dynamite fishing, which is prohibited, is regularly undertaken in the Masinloc area, and NPC is of the opinion that this is having a major impact.

(3) Privatization of NPC

The Masinloc power plant is to be sold off to the private sector this year, with the Calaca power plant to go next year. Bidding procedures have already commenced for both plants. As to environmental monitoring, the ECC clearly specifies that the obligation lies with the owner of the power plant thus it will pass to the buyers.