Supporting Pollution Controls and Sustainable Environmental Monitoring

Indonesia
The BAPEDAL Regional Monitoring Capacity Development Project

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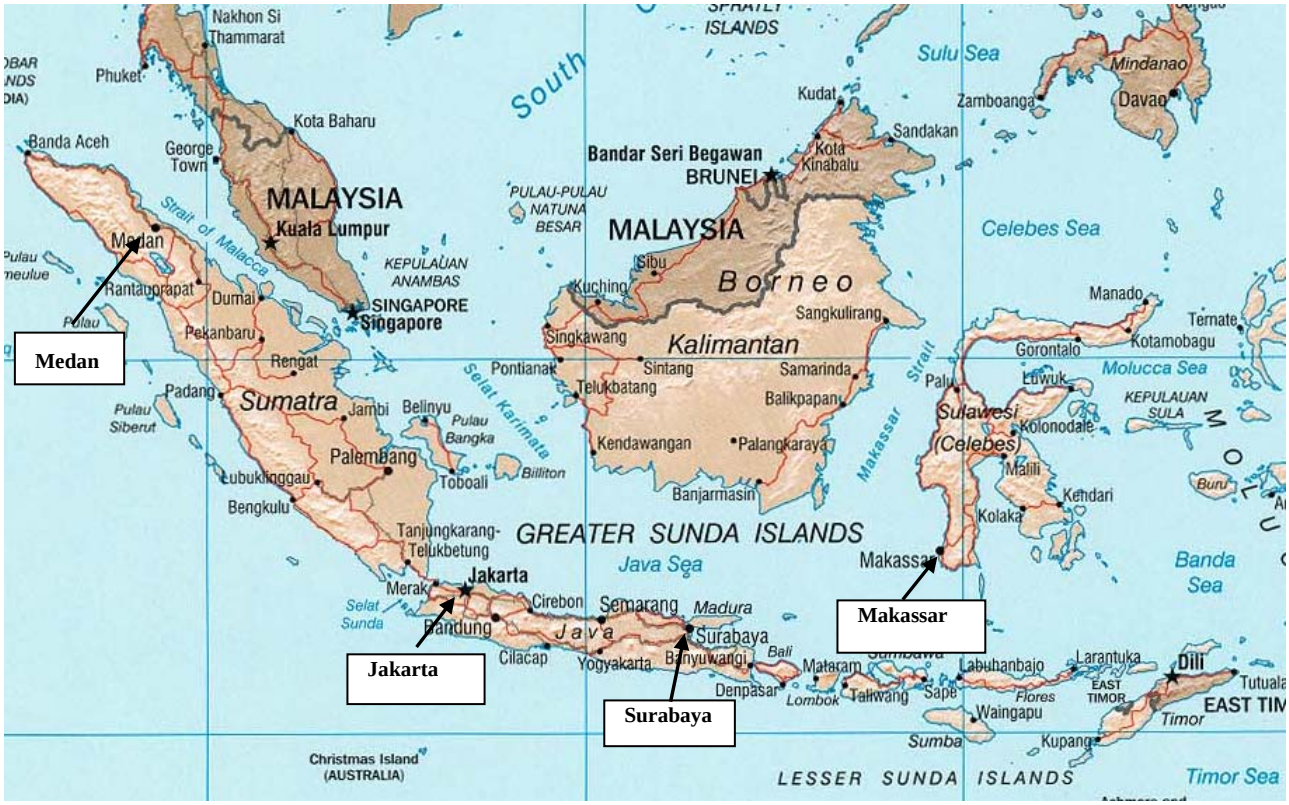
1. Summary

[Project Outline & Field Survey Dates]

In 1994, the Japanese government extended a loan of 2,935 million yen to Indonesia to fund an environmental monitoring improvement project that was designed to support environmental monitoring capacity development within BAPEDAL, Indonesia's Environmental Impact Management Agency, at the local level. In specific terms, the loan was used to fund the supply of equipment for monitoring environmental pollutants such as water, air and ambient noise, to 39 regional laboratories in 14 provinces owned by the ministries of health, industry and public works, as well as training in the operation of these equipment. Under commission from the Japan Bank for International Cooperation (JBIC), in August 2003 an independent evaluation team traveled to Indonesia to conduct field surveys in Jakarta, North Sumatra (Medan), South Sulawesi (Makassar) and East Java (Surabaya).



[Environmental Changes Affecting the Project]

The project got underway in 1994, all equipment had been procured and installed by October 2000, and the training component was completed in April 2001. However, major changes subsequently took place in the environment surrounding the project: (1) decentralization laws were enforced in 2001, and in December of that year the Ministry of Environment issued a notification stating that: "The ownership and use rights of equipment introduced through this project are to be transferred to the provincial governments"; (2) in January 2002 BAPEDAL was incorporated into the new environment ministry; and (3) the Public Works Ministry underwent radical restructuring into Ministry of Resettlement and Regional Infrastructure.

[Conditions for Assessing the Onset Status of Project Impacts]

Environmental monitoring needs to be implemented within a cycle that comprises the development of environmental policies (including environmental standards and penal regulations) → the development of plans to monitor these policies → the implementation of

the policies → ongoing and accurate measurement of environmental data → analysis of these data and identification of areas requiring further improvement → the development of new environmental policies. Accordingly, the objective of this project was set as environmental monitoring capacity development at the local level; however, in order to determine whether project impacts are being sustainably achieved answers are required to the following questions. (1) Are Indonesia's environmental policies and monitoring plans being developed and implemented appropriately at both the central and regional government level? (2) Do the laboratories that were supplied with equipment through this project carry out accurate data measurements under systems that are both technically and financially sustainable? (3) Are data measurements and analysis results being reflected in environmental policy, and are they contributing to improvements in the efficiency of environmental administration and to protection of the environment?

[Indonesia's Environmental Policy & Monitoring Plans]

Based on the National Development Program (PROPENAS) for 2000 through 2004 that was established in November 2000, the Ministry of Environment has established and is working on a major program to reduce pollution loads from stationary and non-stationary sources; however, with the exception of the Clean River Program (PROKASIH) described later, it would be fair to say that Indonesia has, to all intents and purposes, undertaken no environmental monitoring plans involving nationwide participation to date. The ministry is currently in the process of formulating guidelines that cover air pollution and domestic waste in addition to water pollution. The concept for these guidelines, which stipulate the minimum administrative service standards (in Indonesian SPM: Standar Pelayanan Minimal) to be maintained by regional governments, was announced in 2002, and the guidelines are forecast to be issued under a Minister of Environment decree that is based on the presidential decree that is expected[1] to be issued in 2003. These guidelines essentially set forth minimum standards, and the extent to which standards surpassing the SPM are established will be left to the provincial governments to decide. The plan is to implement the guidelines using a feedback cycle in which, after the standards have been established, the level to which they are being achieved is to be reported to local assemblies and to the Ministry of Environment, and the SPM then reviewed on the basis of these reports. Full-scale environmental monitoring will start with the SPM and the environmental standards established at the regional level in consideration of same. How local governments respond to central government moves to establish SPM, how far the environmental standards are beefed up, how to ensure their implementation, and how to enforce the application of punitive action against violating companies are all likely to have a major impact on the activities and financial status of the laboratories that were supplied with equipment through this project.

Among earlier efforts to protect the environment, measures to counter water pollution were assigned maximum priority among the environmental problems facing Indonesia. The 1995 revisions to water discharge standards concerning industrial effluent included many values for ordinary factories that were even more rigorous than the discharge standards (national) in Japan. Although limited to specific rivers, in 1989 the government began implementing its Clean River Program, dubbed PROKASIH, which was designed to improve water quality in the country's rivers. The program was devised in response to growing pollution in the nation's rivers, which are an important source of water, and through agreements concluded between factories / businesses and the provincial governments concerning regulatory compliance, targeted reductions in pollution loads and improvements in the water quality of rivers. In 2000,

[1] As of the hearing held at the Ministry of Environment in August 2003 during the field survey; the same applies hereunder.

the program was implemented for 77 rivers in 17 provinces, with agreements put in place for approximately 600 factories / businesses nationwide. Requests for analyses springing from PROKASIH account for a significant volume of the sample analyses performed using equipment procured through this project.
If the aforementioned Ministry of Environment guidelines (SPM) are applied at the regional level, this is expected to increase analysis needs and to further raise the level of equipment usage.

[Current Status of Laboratories Supplied with Measuring Apparatus via this Project]
Survey results from the three regional laboratories (referred to as labs hereunder) visited by this survey team are as follows.
(1) Laboratory Affiliation
The basic policy of the Ministry of Environment is to transfer the ownership of the equipment to the Regional Environmental Management Agency (BAPDALDA) and to establish environmental laboratories with exclusive use rights over same, but our findings reveal that this policy is being implemented differently in different provinces. In North Sumatra, an environmental laboratory has already been set up under BAPEDALDA jurisdiction, equipment supplied to other laboratories through this project has been transferred to the BAPEDALDA lab and analysis work is in progress. Although the centralization of equipment at the BAPEDALDA lab is producing some results, the lab is facing a number of problems, including in securing and training analysts, acquiring certification for the lab, and the emergence of a major gap between its earnings from lab fees and its business expenses. The South Sulawesi BAPEDALDA is in the process of establishing its own environmental lab. With the three labs in Makassar, South Sulawesi (the Ministry of Trade and Industry Research Lab [BPPI], the now-defunct Ministry of Public Works Laboratory [PU], and the Ministry of Health Health Laboratory [BLK]), and the three labs in East Java (BPPI, Ministry of Health Environmental Health Laboratory [BTKL], and PU), the BPPI labs belong to the Ministry of Industry, BLK and BTKL to the Ministry of Health, and PU to the provincial governments. At all the labs it is understood that project equipment belongs to the province's BAPDALDA. By contrast, at East Java's BAPEDALDA, the establishment of an environmental laboratory is still at the feasibility study stage.

(2) Financial Status
This project was completed in 2000 and was actually up and running in 2001, and revenues from environmental monitoring contracts have grown considerably at all labs during this time. However, the Makassar PU was shut down before the environmental lab became functional. Personnel expenses at all labs are procured from the administrative organization (national ministries or provincial governments), while the costs for reagents and consumables, utilities, equipment operation and maintenance, parts purchases and so forth are covered by the lab fees obtained from commissions for monitoring work. However, all labs have pointed to difficulties in covering all costs, including those for O&M and training, with the revenues from lab fees alone. The challenge for the future will be to establish self-supporting systems to ensure the financial sustainability of the labs, including personnel expenses.

(3) Lessons Learned
Basic training was undertaken as part of this project, but all labs have requested additional training as a means of developing the skills of their staff. Training courses that are much in demand include (1) troubleshooting for analytical equipment and repair techniques for minor breakdowns; (2) operation and maintenance of analytical equipment; (3) analysis of PCBs, agrichemicals and other toxic substances; (4) calibration of analytical instruments and

equipment; (5) handling techniques for heavy metals and toxic substances; (6) cleaner production; (7) analysis accuracy management; (8) laboratory management (including ISO17025); and (9) training in basic analytical techniques for junior analysts.

(4) Data measurements enabled by project implementation
It has now become possible to measure environmental data in new fields such as industrial emissions, air movement, agrichemicals and oil content, but due to a lack of regulation there are no clients for the TOC (Total Organic Carbon) meters, which measure pollution levels in rivers, and it is hoped that regulations will be introduced at the earliest time so that this equipment can be put to effective use.[2]

(5) Clients
The client breakdown varies across the labs, but the Ministry of Industry and former Ministry of Public Works labs (BPPI and PU) receive many requests for analysis from private-sector businesses, including mining companies, electricity producers, food companies and hotels. At Ministry of Health labs (BLK and BTKL), the majority of analysis commissions come from governmental organizations. The Clean River Program (PROKASIH) has had a major impact on the volume of requests received by the labs.
The North Sumatra lab receives virtually no orders from privately-owned factories because it has not been accredited. Accordingly, as of February 2004 the lab was in the process of putting its documentation in order in preparation for accreditation. The lab is also looking into requesting the province's BAPEDALDA to issue a notice encouraging businesses to use the lab, in the event that it is accredited. As this suggests, environmental policies, including accreditation, have a major impact on lab activities (= project impacts).
The integration of Ministry of Health labs (BPPI and BLK) into BAPEDALDA labs is causing anxiety due to a sharp drop in the volume of analysis commissions.

(6) Equipment Use & Laboratory Management
With the exclusion of the Makassar PU, which has been shut down, all procured equipment is being put to adequate or basic use. (The equipment could be used more, however, given that the performance of other labs pales in comparison with the number of samples being measured annually at the Surabaya Ministry of Health Environmental Health Lab [BTKL].)
Equipment maintenance is basically favorable, although the situation varies across the labs. There have, however, been difficulties operating some of the equipment, which cannot be activated due to problems with computer programs. In addition, many labs have pointed to difficulties in covering high consumable and repairs costs with existing budgets. In developing countries there are few equipment suppliers, to say nothing of manufacturers, in provincial towns, and lab personnel require greater skills than their Japanese counterparts in order to find and repair equipment defects. Moreover, in many instances the only suppliers capable of handling repairs that require parts replacement are located in Jakarta, and there are also cases where parts have to be ordered from Japanese or other foreign manufacturers. The labs are operating under limited budgets and this issue will have a major effect on their sustainability.

(7) Problems at the Makassar PU Laboratory
The Makassar PU environmental lab was shut down virtually unused; added to which, the equipment became unready to use because it was insufficiently maintained. The lab was closed and power supplies shut down in August 2000, just five months after project

[2] However, there are no regulations on TOC even in Japan and the quality of river water is measured in terms of chemical oxygen demand (COD) and biochemical oxygen demand (BOD).

completion; in January 2001, the power was switched back on and attempts made to reopen the lab, but it was shut down again in May of the same year and the power has remained off ever since. It was not possible to ascertain the reasons why the Makassar PU lab was shut down while the Surabaya PU lab remains functional because the staff had already been transferred by the time this survey was undertaken. The equipment procured through this project will require complete overhaul if it is to become reusable because essential measures for long-term operational suspension were not properly executed when the lab was shut down. With current management conditions there is a risk that even if the equipment is overhauled it will only be usable for around a year, thus measures need to be taken urgently.

(8) Environment Monitoring Execution Status
None of the labs formulate their own monitoring plans; instead they are performing sampling and analysis work in response to requests from government or industry that derive from policies such as PROKASIH. It will likely be some time before the labs start to develop their own monitoring plans and present them to the government.

[Measurement Data & Utilization of Analysis Results: Project Impacts]
(1) Improvements in the monitoring capabilities of regional laboratories
The primary impact of this project lies in the fact that the equipment introduced has enabled environmental data measurements to be performed in new fields such as industrial emissions, air movement, agrichemicals and oil content. These expansions in measurement scope are significant for being accredited by the Accreditation Body of Indonesia (KAN) and receiving commissions for analysis from businesses. Not only has this contributed to improvements in the finances of the labs, it has also increased the accuracy of environmental monitoring in Indonesia's regions, strengthened the implementation of environmental policy and is leading to the creation of new policy.

(2) System for sharing monitoring data among related personnel/organizations
One problem is that the labs are "not currently coordinating with BAPEDALDA or the Ministry of Environment concerning measurement analysis results." During the current survey it became clear that although labs are reporting measurement results to BAPEDALDA when the requests come from this agency, they are not reporting the results of measurements undertaken for other clients (businesses, etc.) because of the legal requirement to maintain the confidentiality of this information. The Makassar BLK and the Surabaya PU submit data measurement results to BAPEDALDA every three months but no discussions are taking place with BAPEDALDA officials on these data. Meanwhile, the BAPEDALDA are focused on setting up independent laboratories and do not appear to realize the necessity of coordinating with several labs in connection with measurement data. Evidently no progress has been made on the sharing of measurement data between the Ministry of Environment, BAPEDALDA and the labs.
Data sharing is essential for resolving problems and in policy discussions among related parties, and it is thus hoped that further improvements will be made in this area. In this sense, it is hoped that complementary relationships can be established between the system for pooling data collected from automatic air quality measurement centers in 42 cities in 10 provinces nationwide at the Ministry of Environment, which was introduced in 2002 with funding from the Australian government, the JICA regional environment management capacity building project that includes the creation of a system for transmitting data from Environmental Management Centers (EMC) in 33 provinces, and the environmental impact data management system (scheduled for completion in February 2004) being established with the support of the Asian Development Bank (ADB) that will consolidate environmental

databases (inter-regional satellite transmissions of data) throughout the nation.

(3) Impact of measurement results on environmental policy
From hearings conducted at the labs it was learned that, at the micro level, the use of measurement data in environmental policy and administration has contributed to a more direct, site-oriented resolution of pollution problems by: (1) identifying the causes of pollution being generated by power producers and steel corporations, and contributing to improvements in the local environment; (2) ascertaining the causes of pollution from effluent being discharged by industrial estates, which led to companies receiving administrative guidance; (3) enabling analysis and appraisal to be performed rapidly in the event of an abnormality or emergency through the accumulation of environmental monitoring data; and (4) resolving individual environmental problems in response to complaints from local communities.

At the macro level, measurement results have been used at seminars given by BAPEDALDA and the Ministry of Environment designed to increase the environmental awareness of local governments, etc., in presidential addresses on water conservation in reservoir areas, in reports to parliament, and in the creation of Indonesia's first environmental white paper (State of Environment Report, the draft of which had been completed, in Indonesian, in August 2003), and the project is evaluated as having been of some effect in increasing public awareness of environmental issues.

That stated, however, just two years have elapsed since the project was completed and environmental data began to be measured in earnest, added to which, Indonesia's environmental monitoring plans are only expected to achieve critical mass hereafter, thus a complete assessment of the project's impact on environmental policy may be premature at this time point.

(4) Monitoring plans
Under the terms of their contracts, in 1999, the consultants employed on this project compiled a country-level environmental monitoring plan, which was presented to the environmental management agency (BAPEDAL) at that time; however, no further progress has been made due to BAPEDAL's incorporation into the Ministry of Environment and the effects of the decentralization policies. If the aforementioned guidelines (SPM) that are now being developed by the ministry are implemented (the concept of which was announced in 2002), however, then monitoring involving both regional and central governments will become a reality. The implementation of these guidelines is being closely monitored. If they can be implemented without hitch, then demand for analysis at environmental laboratories should increase and it should become possible for the impacts of this project to be produced more consistently.

[Conclusions, Lessons Learned, Recommendations]
(1) Project positioning & the key to heightening its impact
After this project got underway there were major changes in the surrounding environment: BAPEDAL was incorporated into the Ministry of Environment, the Ministry of Public Works was reorganized, and the decentralization policies introduced; however, capacity development of regional labs was in line with the new trend towards decentralization, and this project, which introduced environmental monitoring equipment at regional labs, can, in one sense, be said to have preempted and prepared the ground to support the tide of decentralization in the field of environmental conservation.

In order to heighten the impact of this project: (1) central and regional governments must establish appropriate environmental policy (quality standards, penal regulations) and implement them (… both central and regional governments responding on the basis of the guidelines, etc., currently being developed by the Ministry of Environment); (2) there must be a constant flow of requests for analysis from government and the private sector in line with these environmental policies; (3) the labs must be able to secure personnel and provide them with training; and (4) it must be possible for the labs to obtain smooth supplies of reagents and spare parts. With regard to (1), the development and implementation of appropriate environmental policy, particularly at the provincial level (the introduction of additional environmental standards and penal regulations at the provincial level), is the most pressing task for the future. The strengthening of this system will lead to (2) ongoing increases in analysis requests from the private sector, that strengthen lab finances (3) the securing and training lab staff, and (4) ensuring a smooth supply of reagents and spare parts. This will also contribute to sustainable environmental monitoring and to greater efficiency in environmental administration.

(2) Lessons learned

[Lessons learned in connection with Japan's efforts]

1) During the current survey it became clear that it is sometimes difficult to obtain continuous / smooth supplies of reagents and spare parts in the regions. When taking on similar projects in the future, it is hoped that surveys exploring the feasibility of procuring reagents / spare parts in the recipient country will be undertaken with a view to ensuring the sustainability of project effects. Should this prove problematic, it would be worth investigating including the provision of a post-completion support system in the terms of bid contracts at the equipment bidding stage.

2) When state-of-the-art equipment breaks down it is difficult to procure the necessary parts locally. The recipient country should be presented with the option of introducing equipment that is based on local operation and maintenance capabilities step-by-step and, if state-of-the-art equipment is to be introduced, made sufficiently aware of the potential difficulties in conducting maintenance, before the equipment to be funded using a Japanese ODA loan is selected.

[Lessons learned in connection with Indonesia's efforts]

1) Efforts, such as the guidelines currently being developed by the Ministry of Environment, are being made, but enforcing environmental standards and the use of penalties is essential to improving environmental monitoring. This can be expected to increase private-sector commissions for analysis and to improve lab finances, which will in turn contribute to sustainable environmental monitoring and to greater efficiency in environmental administration.

2) In order to avoid the emergence of cases like that of the Makassar lab, which was closed as the result of ministerial reform at the central government level, adequate communication and coordination among the various central and regional government agencies must be affected.

(3) Recommendations

[Recommendations relating to Japan's efforts]

1) Financing recurrent costs and policy on ODA funding to Indonesia

Supporting recurrent costs is recommended as a method of accomplishing both an emphasis on independent efforts and the smooth operation of the project after its completion. In short, we recommend the introduction of a system under which the funding provided to cover recurrent costs serves to reduce the amount of new aid granted to Indonesia. Under this type

of system, the funding of recurrent costs will strengthen the smooth operation of completed projects, and since the more Indonesia receives such aid the less new funding it will require, the system has the potential to strengthen efforts to ensure sustainability, including cost recovery policies, throughout Indonesia.

2) Supporting operational management post-completion using JICA experts and senior volunteers

Managing operations at the labs after their completion requires specialist knowledge of various types of equipment, thus it would be worth exploring the establishment of a system that involves positioning several experts in Jakarta who could then tour the regional laboratories. It is also necessary to develop training courses that focus on troubleshooting and maintenance.

3) Promoting tie-ups between assistance schemes and donors

This project and the JICA regional environment management building project are interrelated, thus further increasing the exchange of information and links between the two projects beyond current levels has the potential to improve environmental monitoring in Indonesia. In addition, the environmental monitoring data collection work that is being undertaken using satellites via ADB's BAPEDAL Regional Network Project, has a potentially beneficial role to play in facilitating Japan's efforts to improve environmental monitoring through loans and technical assistance. Henceforth, it is hoped that efforts will be made to promote information-sharing between ADB and Japan, while respecting initiatives made in Indonesia, so as to facilitate the synergies between the two projects.

[Recommendations relating to Indonesia's efforts]

1) The fact that no national environmental monitoring plans have been developed to date represents a major problem. Monitoring plans based on the guidelines that are currently being drawn up by the Ministry of Environment need to be developed at the national and regional level. It is also important that environmental monitoring data be shared by the ministry, BAPEDALDA, and the labs, and that a system be established to facilitate increased use of the information for environmental policy development, implementation and evaluation processes by both central and regional governments.

2) Having labs under the direct control of the Regional Environmental Management Agency (BAPEDALDA) is a good thing, but since it takes time to train personnel, it would be worth investigating ways of making cooperative and effective use of the personnel at existing labs, such as environmental health laboratories, which Japan has rudimentary experience in overcoming pollution.

3) There are many varieties of environmental analysis equipment parts, but since individual labs require such parts in relatively small quantities, labs, particularly those located in remote areas, experience difficulties obtaining a continuous supply when the parts have to be procured from separate companies. In order to remove bottlenecks of this nature, it is necessary to nurture local distributors capable of operating in a small radius, and in this sense, the thorough application of environmental standards and penalties at both central and regional levels is also important to fostering related industries.

4) With regard to the equipment that has been left in poor condition at the Makassar PU lab, the South Sulawesi BAPEDALDA must negotiate with related organizations and institute the necessary measures, including overhauls, at the earliest possible time.

[Abbreviations]

ADB:	Asian Development Bank
AIDAB:	Australian International Development Assistance Bureau (the predecessor to AusAid)
AMDAL:	Analisis Mengenai Dampak Lingkungan (Environmental Impact Assessment; English abbreviation: EIA)
ANDAL:	Analisis Dampak Lingkungan (EIA report)
AusAid:	Australian Agency for International Development
BAPEDAL:	Badan Pengendalian Dampak Lingkungan (Environmental Impact Management Agency; has now been absorbed by the Ministry of Environment)
BAPEDAL Wilayah:	Badan Pengendalian Dampak Lingkungan Wilayah (formerly regional BAPEDAL offices at the provincial / district-level, but were absorbed into the new Ministry of Environment as Deputy 2 in 2002)
BAPEDALDA:	Badan Pengendalian Dampak Lingkungan Daerah (provincial and district / municipal environment management agencies)
BAPPENAS:	Badan Perencanaan Pembangunan Nasional (National Development Planning Board)
BDTAP:	BAPEDAL Development Technical Assistance Project
BLH:	Biro Lingkungan Hidup (Board of Environment Management)
BLK:	Balai Laboratorium Kesehatan (Ministry of Health laboratory)
BMG:	Bureau of Meteorology and Geophysics
BPLHD:	Badan Pengendalian Lingkungan Hidup Daerah (local government environmental management organization created by the renaming / reorganization of the Ministry of Environment, BAPEDALDA)
BPP PU:	Balai Pengujian dan Peralatan - Pekerjaan Umum (regional laboratory of the Ministry of Public Works)
BPPI:	Balai Penelitian dan Pengembangan Industri (industrial research laboratory of the Ministry of Industry)
BTKL:	Balai Teknik Kesehatan Lingkungan (environmental health laboratory of the Ministry of Health)
CAQMS:	Continuous Air Quality Monitoring System
CDM:	Clean Development Mechanism
DEMS:	Project for Strengthening Decentralized Environmental Management System in Indonesia (A JICA project aimed at strengthening Indonesia's regional environmental management system)
EFIC:	Export Finance and Insurance Corporation
EIA:	Environmental Impact Assessment
EIMIS:	Environment Impact Management Information System
EMC:	Environmental Management Center
F/S:	Feasibility Study
GAP:	Green Aid Plan
GIS:	Geographical Information System
ISO:	International Organization for Standardization
JBIC:	Japan Bank for International Cooperation
JICA:	Japan International Cooperation Agency
KAN:	Komite Akreditasi Nasional (Accreditation Body of Indonesia)

KLH:	Kementrian Lingkungan Hidup (Ministry of Environment)
MAQME:	Manual Continuous Air Quality Monitoring System Equipment
NGO:	Non Governmental Organization
O&M:	Operation and Maintenance
ODA:	Official Development Assistance
ODS:	Ozone Depleting Substances
OECF:	Overseas Economic Cooperation Fund
PCR:	Project Completion Report
PEDACS:	Post Evaluation Data Collection Survey
PROKASIH:	Program Kali Bersih (Clean River Program)
PROPENAS:	Program Pembagunan Nasional (National Development Plan)
PROPER:	Program Peringkat (Program for Pollution Control, Evaluation and Rating)
PSI:	Pollution Standard Index
PU:	Pekerjaan Umum (regional laboratory of the Ministry of Public Works)
PUSARPEDAL:	Pusat Sarana Pengendalian Dampak Lingkungan (Environmental Management Center: the former Indonesian abbreviation for EMC)
RELD:	Regional Environmental Laboratory Development Project (an AusAID project)
RKL:	Rencana Pengelolaan Lingkungan (Environmental Management / Mediation Plan)
RMCD:	Regional Monitoring Capacity Development Project
RPL:	Rencana Pemantauan Lingkungan (Environment Monitoring Plan)
SAPROF:	Special Assistance for Project Formation
SARPEDAL:	Sarana Pengendalian Dampak Lingkungan (Environmental Impact Management Center: the former Indonesian abbreviation for EMC (the name was changed in 2002))
SOP:	Standard Operating Procedure
SPM:	Standar Pelayanan Minimal (minimum administrative service standards)
TA:	Technical Assistance
TOC:	Total Organic Carbon
TOR:	Terms of Reference
TSP:	Total Suspended Solid

[Introduction]

[Project Outline & Survey Objectives / System]
This survey constitutes an independent analysis of the improvements in the efficiency of environmental administration and the impact on environmental conservation in Indonesia of the BAPEDAL Regional Monitoring Capacity Development Project, which was selected for Japanese ODA funding in 1994. The project was designed to strengthen environmental monitoring capacity in regional Indonesia and involved the introduction of various measurement equipment for verifying the extent of water, air and noise pollution to 39 laboratories (abbreviated as labs hereinafter) in 14 provinces; the Japanese government extended a loan totaling 2,935 million yen in 1994 and the project was completed in May 2001. (For an outline of the project, refer to the reference materials.) In implementing this survey, Mr. Yasutaka Watanabe, principal visiting engineer at the Overseas Environmental Cooperation Center, was responsible for investigating current conditions at the labs, including the use status of environmental monitoring equipment; Professor Hidetoshi Kitawaki of the Department of Regional Development Studies, Toyo University, was responsible for investigating measurement data and the ways in which results from their analysis are being utilized (= project impact); and Professor Yoshitaro Fuwa of the Environmental Management Research Department, Hosei University Graduate School, had overall control of the survey. Graduate students from the same department provided help in the collection and analysis of data.

[Survey Methods]
A questionnaire was compiled on the basis of materials collected and analyzed in Japan and a field survey undertaken in August 2003[3]. During the field survey, visits were made to Jakarta and three cities in North Sumatra (Medan), Makassar (Ujung Pandang) and Surabaya; which had been selected based on information gathered ahead of time from among the 14 provinces covered by the project as the location of labs where equipment use is favorable and of labs experiencing problems, i.e. cases at both extremes of the scale, and also of standard labs; discussions were also held with provincial environmental management agencies (BAPEDALDA), related labs, etc., and materials gathered. In this sense, it should be noted that this report does not necessarily represent an exhaustive evaluation of the project in its entirety.

[Environmental changes affecting the project]
There were major changes in the surrounding environment after this project was selected for funding; specifically: (1) in December 2001, after the enforcement of the decentralization laws that year, the Ministry of Environment issued a notification stating that: “The ownership and use rights of equipment introduced through this project are to be transferred to the provincial governments.” (2) In January 2002, BAPEDAL was incorporated into the new Ministry of Environment, and (3) the Ministry of Public Work underwent radical restructuring to the Ministry of Resettlement and Regional Infrastructure. These environmental changes require consideration when examining the impacts of this project.

[Conditions for Assessing the Onset Status of Project Impacts & Composition of this Report]
Environmental monitoring needs to be implemented within a cycle that comprises the

[3] We would like to take this opportunity to extend our gratitude to JICA experts Mr. Tetsuro Fujitsuka, Mr. Kazuhiro Kuwata and Mr. Ishihara, senior JICA volunteers Mr. Norichika Yatsugi and Mr. Hitoshi Watanabe, and Mr. Tomoyuki Naito, assistant chief at the JICA Jakarta office for their assistance in undertaking this field survey.

development of environmental policies (including environmental standards and penal regulations) → the development of plans to monitor these policies → the implementation of the policies → ongoing and accurate measurement of environmental data → analysis of these data and identification of areas requiring further improvement → the development of new environmental policies. Accordingly, the objective of this project was set as environmental monitoring capacity development at the local level; however, in order to determine whether project impacts are being sustainably achieved answers are required to the following questions. (1) Are Indonesia's environmental policies and monitoring plans being developed and implemented appropriately at both the central and regional government level? (2) Do the laboratories that were supplied with equipment through this project carry out accurate data measurements under systems that are both technically and financially sustainable? (3) Are data measurements and analysis results being reflected in environmental policy, and are they contributing to improvements in the efficiency of environmental administration and to protection of the environment? From these perspectives, Chapter 1 examines "Indonesia's Current Environmental Policy and Monitoring Plans", Chapter 2 analyzes the "Current Status of Laboratories supplied with Measuring Equipment via this Project" with a focus on the labs visited during the field survey, Chapter 3 deals with "Monitoring Data and Utilization of Analysis Results" (= project impact), and finally, in Chapter 4, we arrive at conclusions and lessons learned and offer a few recommendations.

Chapter 1: Indonesia's Environmental Policy & Monitoring Plans

The following chapter presents an overview of Indonesia's environmental policy and monitoring plans as the background to this project, with a view to providing an overall framework for its assessment.

1-1 Environmental Problems as Policy Issues

(1) Environmental Protection in National Development Plans

Chapter 10 of the National Development Program (PROPENAS) for 2000 through 2004, which was formulated in November 2000, describes Indonesia's future policy objectives and guidelines in relation to the sustainable management of natural resources and the environment, which are as outlined hereunder.

1) Policy Objectives

The economic crisis enlarged the poor population and undermined the judiciary, but attention must also focus on preventing any further degradation of natural resources, such as illegal logging. Further, the centralization of population and industrial activity must be curtailed so as to reduce the environmental problems that are occurring in many areas, for example, damage arising from business activities, from the treatment of unsanitary waste, the use of unecological fuel, and agriculture, forestry and fishery activities that exceed the absorptive capacity of the environment.

Taking these circumstances into account, the government of Indonesia's policy objectives for the natural resources and environmental management sector are as follows.

1. To introduce environmentally friendly technologies for sustainable natural resource management.
2. To enforce equitable and coherent laws to prevent the destruction of natural resources and environmental pollution.
3. To delegate the authority and responsibility for natural resource and environmental management step-by-step to the regional governments.
4. To strengthen community participation in the management of natural resources and the environment so as to improve the welfare of people living in the regions.
5. To introduce effective indicators for the management of natural resources and the environment.
6. To attempt to preserve existing protected natural habitats and designate new protected areas in specific regions.
7. To promote community participation in the resolution of global environmental issues.

2) Policy Guidelines

In order to achieve these objectives the government has set forth the following policy guidelines.

1. To ensure the sustainability of natural resource management with the aim of increasing the welfare of the people from generation to generation.
2. To introduce environmentally friendly technologies for the conservation, rehabilitation and economic consumption of natural resources and the environment in order to control the utilization of natural resources and the environment).
3. To introduce indicators regarding the extent to which natural regeneration is sustainable so as to prevent irreversible destruction.
4. To establish the transfer of authority and responsibility from the central government to the regional governments under law in an attempt to protect the ecosystem.
5. To regulate the balance of environmental conservation, sustainable development, and the economic interests, living habits of regional society, and national land development plans under law, with the aim of maximizing the utilization of natural resources for the prosperity of the people.

3) Development Programs

The government also designated specific development programs that are to be planned and implemented within the five-year period as follows.

1. The program of information development and increased access to natural resources and the environment.
2. The program of effective management, conservation and rehabilitation of natural resources and the environment.
3. The program to prevent and manage environmental destruction and pollution.
4. The program to establish institutions and laws relating to natural resource management and environmental conservation.
5. The program to increase society's role in natural resource management and environmental conservation.

(2) Key Ministry of Environment Programs

Since its merger with BAPEDAL, the new Ministry of Environment (KLH) has set forth and is promoting seven major programs based on the objectives and guidelines outlined in PROPENAS above (the following is extracted from the "Strategic Plan and Work Program of the Ministry of Environment 2001-2004" that was published in April 2002).

1. Capacity building of regional governments targeting good environmental governance

Building on the enforcement of the decentralization laws in January 2001, KLH is attempting to strengthen the environmental management capacity of regional governments, with the specific goal of promoting environmental conservation administration that reflects the needs of the citizenry. It has established the "Good Environmental Governance Award" (ADIPRAJA) as an incentive to stimulate competition among the regional governments.

2. Capacity building and education of the citizenry (Warga Madani)

KLH is promoting capacity building and educational activities in the community with the aim of ensuring a clean environment and the health of the people and of encouraging citizens to take the initiative in resolving economic problems.

3. Reducing pollution loads from stationary sources

Pollution loads from stationary sources are to be reduced by strengthening law enforcement or employing other means that are not grounded in the law.

4. Reducing pollution loads from non-stationary sources

KLH will reduce pollution loads from non-stationary sources using vehicle exhaust gas regulations, preventing the illegal mining of mineral resources, preventing illegal logging, and through the appropriate treatment of household and other forms of waste.

5. Conservation of the natural environment

KLH will conserve the natural environment in areas under its jurisdiction by preventing forest fires, conserving tropical rain forests, preserving lake water quality, preserving coral reefs, and protecting the environment in coastal regions.

6. Institution building

KLH will train human resources, develop a regulatory system, develop standard reference / regulatory values and establish sustainable development committees as a means of strengthening the institutional capacity of environmental administration.

7. Strengthen information systems

KLH will strengthen information systems with the aim of acquiring data on environmental conditions, identifying the scope of problems from causal analysis, and of providing and disseminating information among the people.

1-2 Environmental Pollution & Countermeasures[4]

1-2-1 Environmental Management Law

The Environmental Management Law was instituted in 1997 (and the old Basic Environmental Management Law abolished). This law is a basic environmental law and comprises eleven chapters and 52 articles covering general rules, the principles and puposes, the objectives, rights and obligations, and the role of society in environmental management, the administrative authority for environmental management, the conditions that must be observed to protect the environment, the conservation of environmental function, the handling of environmental disputes, investigations, penalties, and interim measures.

The new environmental management law is characterized by: (1) stronger environmental regulation of business activity, (2) stronger penalties, (3) improved provision covering the handling of environmental disputes, and (4) the introduction of regulations covering public rights to environmental information.

1-2-2 Water Pollution

(1) Current Status

Measures to control water pollution have been assigned maximum priority among the environmental problems facing Indonesia. This is because industrialization has led to increases in the volume and diversity of effluent being discharged by factories and businesses, urbanization has increased the volume of wastewater from households, which has been accompanied by deterioration in the quality of water in rivers, etc., and this is having a direct impact on the health and living environments of the people. In addition, the mercury used in the illegal mining of gold is running off into rivers, affecting the health of the people and giving rise to concern throughout the nation.

(2) Water Quality Standards

Water quality standards have been established for inland waters (excluding ground water) and marine waters.

Under the Regulation regarding Water Pollution Prevention and Water Quality Management (Government Regulation No. 82 of 2001) inland waters are classified into four categories, which relate to their use / functions.

1. Type I: Raw water that may be use for drinking
2. Type II: Water that may be used for recreation facilities
3. Type III: Water that may be used for the cultivation of freshwater fish
4. Type IV: Water that may be used for agriculture and watering animals

Water quality standards have been established for 45 criteria:

1. Physical criteria (water temperature, turbidity)
2. Inorganic criteria (pH, mercury, arsenic, cadmium)
3. Organic chemical criteria (biochemical oxygen demand [BOD], chemical oxygen demand [COD], dichloro-diphenyl-trichloroethane [DDT], benzene hexachloride [BHC], etc.)
4. Microorganism criteria (coliform bacteria count)
5. Radioactivity criteria (total alpha radiation, total beta radiation)

The environmental quality standards for marine waters are stipulated under Minister of Environment Decree No. 2 of 1988 which classifies marine waters into six categories relating to their use / function: conservation, tourist (bathing), tourist (scenic attraction), fishery, mining and manufacture (processing), and mining and manufacture (cooling), and the provincial governors have the authority to set standard reference values for all classifications.

[4] Global Environmental Forum (1998), Environmental Measures for Japanese Companies Operating Overseas (Indonesia edition).

There are physical criteria (water temperature, transparency, etc.) and chemical criteria (pH, COD, etc.).

(3) Water Emissions Standards

The 1995 revisions to Minister of Environment Decree No. 51 regarding Liquid Waste Quality Standards for Industrial Effluent increased specified industry classifications to 21. The industries covered by the standards are caustic soda, metallic paint, palm oil, pulp and paper, rubber, sugar, tapioca, textiles, chemical fertilizers, ethanol, monosodium glutamate, plywood, milk and milk beverages, soft drinks, soap, synthetic detergents and vegetable oil, beer, dry-cell batteries, paint, pharmaceuticals and insecticides. Between 4 to 12 discharge standards and reference values have been stipulated for each industry. Thirty more general water emission standards have been established for other industry groups and the standard reference values classified under two categories corresponding to the level of effluent treatment facility. The stricter category applies to general factories, with the majority of standards being tougher than the water emissions (national) in Japan[5].

Besides factory emissions, discharge standards have been established by Minster of Environment Decree for hotels, hospitals, the oil industry, the gas industry and industrial parks.

Under Government Regulation No.82/2001 and Government Regulation No.20/1990, provincial governors and the mayors of special regions, such as Jakarta, have been granted the authority to use gubernatorial statutes to set independent water quality and discharge standards (top-up standards). DKI Jakarta (Daerah Khusus Ibukota: Special Capital District), West Java, Yogyakarta Special Region, East Java, South Kalimantan and East Kalimantan have all established independent discharge standards[6].

(4) Clean River Program (PROKASIH)

The Clean River Program or PROKASIH (Program Kali Bersih) was inaugurated in 1989 with the aim of improving water quality in rivers. The program was devised in response to growing pollution in the nation's rivers, which are an important source of water, and through monitoring water quality in rivers, agreements concluded between factories / businesses and the provincial governments concerning regulatory compliance, targeted reductions in pollution loads and improvements in the water quality of rivers; it is one of the focal environment improving programs being promoted by BAPEDAL (as was) in cooperation with the regional governments.

Five concentrations are measured in the rivers targeted under PROKASIH, namely: DO, pH, BOD, COD, and total suspended solids (SS). In 2000, the program was implemented for 77 rivers in 17 provinces, and for approximately 600 factories and businesses nationwide.

Because PROKASIH has only targeted reductions in the pollution loads of medium and large-scale factories and businesses, the program has not been effective in reducing pollution caused by other types of discharge, for example, wastewater from households, general waste and pesticides. In consequence, in fiscal 2000, BAPEDAL (as was) inaugurated a new program: "PROKASIH 2005", adding the coliform bacteria count and total nitrogen to the measurement criteria and covering other polluters in addition to factories and businesses, thereby reinforcing its efforts to reduce the pollution loads in rivers.

Furthermore, a new program dubbed "PROPER PROKASIH" was launched in fiscal 2002. This program involves the assessment and public disclosure of the efforts being taken by participatory companies to comply with regulations. Under the system a five-color rating

[5] Global Environmental Forum (1998), Environmental Measures for Japanese Companies Operating Overseas (Indonesia edition).

[6] JBIC Environment Assessment Unit (2003), Indonesia Environment Profile, pp. 3-17

scheme is used to grade performance from best to worst, with companies being assigned a color rating: gold, green, blue (compliance), red and black (non-compliance) that is subject to disclosure in the media (newspapers, etc.).

(5) Administrator Institutions / Systems[7]

Since decentralization, responsibility for environmental management, including water pollution control, has passed to district and municipal governments. Government Regulation No.82/2001 concerning Water Quality Management and Water Pollution Control lays down the following framework for water pollution control.

- Responsibility for water pollution control is to be transferred from the central government to provincial or district / municipal governments.
- KLH is responsible for developing basic national guidelines on water pollution control.
- The central government will handle any transboundary (provincial or national) water problems.

However, on the basis of other legislature, an exceptionally large number of central government ministries and agencies have authority over water resources and water emission control.

1-2-3 Air Pollution

(1) Current Status

Rapid economic growth and increasing vehicle use has resulted in conspicuous air pollution, particularly in large urban centers. Nevertheless, the air pollution caused by factories and businesses has yet to be recognized as a national issue. Exclude localized pollution in the vicinity of factories employing manufacturing processes with large air pollution loads, and air pollution from vehicles, which is increasing at an exponential rate in urban areas, is the more serious issue, an issue that the government is seeking urgently to address. Added to which, the effects of forest fires are being felt in some years.

In Jakarta, atmospheric lead pollution from gasoline increased from 0.42μg/m^3 in 1998 to 1.3μg/m^3 in 2000, exceeding the environmental quality standard by 1μg/m^3. Meanwhile, airborne concentrations of particulate matter (PM_{10}) reached high levels in 1997, predominantly as the result of forest fires, and in Jakarta maximum concentrations exceeded the recommended standard between June through September 2001. It is estimated that air pollution imposes costs of at least USD 400 million every year[8].

(2) Air Quality Standards

The first air quality control standards were devised in 1988; these are reviewed every five years in line with developments in pollution control measures. In recent years, Government Regulation No.41/1999 has set standards for thirteen pollutants, including sulfur dioxide, carbon monoxide, nitrogen dioxide, hydrocarbon, and suspended particulate matter (PM_{10} and $PM_{2.5}$).

In addition, the Pollution Standard Index (PSI or Indeks Standar Pencemar Udara: ISPU) has been developed as an indicator of air pollution. The index converts monitoring data on individual pollutants into a single number that indicates the level of atmospheric pollution, and is used to monitor concentrations of suspended particulate matter (PM_{10}), carbon monoxide, sulfur dioxide, nitrogen dioxide and ozone.

Minister of Environment Decrees No. 48-50 of 1996 set the respective standards for noise, vibration and effluvium.

[7] JBIC Environment Assessment Unit (2003), Indonesia Environment Profile, pp. 3-19

[8] World Bank (2003), Indonesia Environment Monitor 2003, p9

(3) Emissions Standards

Emissions standards for stationary sources were established in 1995 under Minister of Environment Decree No.13, which sets standards for five industries: steel, the paper and pulp industry, cement plants, coal-fired power stations and all remaining factories and businesses. The same Minister of Environment Decree set forth even tougher standards for the year 2000 onwards; these standards have been in force since 2000.

Minister of Environment Decree No.35 of 1993 establishes limits on the carbon monoxide and hydrocarbon content of exhaust gas emissions from motor vehicles.

(4) Clean Air Program

In 1992, the Environment Impact Management Agency (as was) launched a program, which it dubbed the Blue Sky Program (Langit Bilu), with the aim of reducing emissions from stationary and moving sources. The program establishes targets and the scope of stationary source controls, moving source controls, and pollution controls for noise and vibration, but incorporates no specific action guidelines aimed at improving atmospheric pollution and is thus failing to produce tangible results.

Businesses from four provinces – West, East and Central Java, and DKI Jakarta – are participating in the Stationary Sources Program, which aims to reduce industrial air pollution, and are working with government agencies to monitor air pollution and train specialists in air pollution control.

Meanwhile, the Moving Source Program targeting reductions in pollution from vehicle exhaust gas, which has become a particularly severe problem in large urban centers, is promoting the use of low-sulfur fuels and unleaded gasoline, the establishment of vehicle exhaust gas treatment facilities and the mounting of catalytic converters, and the development of vehicle exhaust gas monitoring centers. In connection with leaded gasoline, which has long been identified as a problem, unleaded gasoline was introduced in the Greater Jakarta Region in July 2001, and on Bali, the lead phase-out date was enforced in February 2003. Adjustments are also underway to phase in lead-free gasoline in other areas.

(5) Developing an Air Monitoring System

Between 2000-2002, KLH developed ambient air quality monitoring stations in 42 locations (33 fixed and 9 mobile) in 10 cities nationwide with funding from the Government of Australia. The main network center is KLH; air quality monitoring stations and regional centers have been established in 10 cities, all of which are connected online. Through this network data on SO_2, PM_{10}, CO, NO_2 and O_3 concentrations are automatically transmitted to the KLH office every hour.

The 10 cities are DKI Jakarta, Bandung, Semarang, Surabaya, Denpasar, Medan, Pekanbaru, Palangkarya, Jambi, and Pontianak.

Added to which, BMG (Bureau of Meteorology and Geophysics) has been monitoring air quality since the 1970s; however, the bureau only measures TSP (Total Suspended Solid) concentrations[9].

(6) Administrator Institutions / Systems[10]

Government Regulation No.41/1999 regarding air pollution control lays down the following framework for air pollution control for Indonesia.

- KLH is under mandate to set and enforce national air quality control standards, standards for emissions from stationary and mobile sources, and technical guidelines relating to air

[9] ADB (2002), Integrated Vehicle Emission Reduction Strategy for Greater Jakarta, Indonesia, p8

[10] JBIC Environment Assessment Unit (2003), Indonesia Environment Review, pp 3-5

pollution control. KLH is also responsible for developing policy / measures for dealing with Ozone Depleting Substances (ODS) and the issue of global warming.

- The provincial governors are entitled to use gubernatorial statutes to establish air quality control standards taking into account national air quality control standards and air pollution within the province (these require review on a five-yearly basis). DKI Jakarta, East Java and East Kalimantan, for example, have laid down independent air quality control standards.
- District governors and municipal mayors are responsible for regional environmental management under provincial governor supervision.
- Vehicle exhaust gas testing is performed by the Ministry of Communications' Traffic and Road Transportation Agency and other agencies with jurisdiction over road transportation.

1-2-4 Waste

(1) Current Status[11]

Municipal waste generation has increased in line with urbanization and in 1998 per capita generation of solid waste in major cities ranged between 0.66 and 0.90kg per day, with Jakarta producing 24,025m^3 of waste daily. Open dumping is the most prevalent form of waste disposal in the country.

It is estimated that Indonesia produced 1 million tons of hazardous waste in 2000. The main producers are the textile, metal finishing, chemical, automotive, electronics, and oil and gas industries. The only treatment facility is the Cileugsi Hazardous Waste Treatment Center, which is located near Jakarta, but it is estimated that significant quantities of hazardous waste are being disposed of in uncontrolled landfills and dumped in rivers with other solid waste.

(2) Legislation

Solid waste that is subject to legislation is commonly referred to as B3 waste; this appellation refers to the three initial letters of the words hazardous, toxic and dangerous in Indonesian.

The "Government Regulation regarding the Management of Hazardous and Toxic Waste" (GR No. 19 of 1994) was established in 1994 after the 1993 ratification of the Basel Convention; in line with this, Head of BAPEDAL decrees (No.s 1-5) were enacted providing detailed regulation on the storage, collection and procedures for handling hazardous waste. This was followed in 1999 by the enactment and promulgation of Government Regulation No.18 (1999) regarding the Management of Hazardous and Toxic Waste, at which time all earlier regulation was abolished.

This regulation states that hazardous waste producers are required to process their hazardous waste, defines collection, storage, transportation and treatment, and sets sanctions against violators; the appendix also contains details on specific substances that fall under the category of hazardous waste.

However, the actual conditions of hazardous waste discharge have been inadequately apprehended and Indonesia lacks treatment and disposal contractors with sufficient competence to deal with the problem. There are also few institutions capable of appropriately analyzing hazardous waste.

BAPEDAL (as was) launched the Toxic and Hazardous Waste Control Program (Program KENADLI B3). Under this program, the government acted as a consultant working in partnership with hazardous waste producers to hammer out measures for managing toxic and hazardous waste.

No regulatory system has been set up specifically for the management of municipal solid waste.

[11] World Bank (2003), Indonesia Environment Monitor 2003, pp33-39

(3) Institutions / Systems

The establishment of Government Regulation No.85 of 1999 makes the producers responsible for the management and treatment of hazardous waste and assigns supervisory authority to KLH. Since the enforcement of the decentralization framework in 2001, KLH has been undertaking supervision in cooperation with the provincial and/or district and municipal governments[12].

Regarding municipal solid waste, decentralization has entitled municipalities and rural kabupaten (districts) to plan and manage environmental services, including solid waste treatment[13].

1-2-5 Environmental Impact Assessments

The environmental impact assessment system known as AMDAL (the abbreviation of Analisis Mengenai Dampak Lingkungan, which means environmental impact assessment; the English acronym is EIA), was inaugurated in 1986, established under Government Regulation No.51 (1993) regarding Environmental Impact Assessments, and amended under Government Regulation No.27 of 1999.

An Environmental Impact Assessment (EIA) must be carried out for any large-scale projects, any complex projects, any projects likely to have significant environmental effects, and any activities that are to be executed in protected or environmentally sensitive areas. The details are stipulated in the Minister of Environment Decree regarding the Criteria for Projects / Activities requiring an EIA.

Businesses must first submit a Terms of Reference (TOR) document defining the scope of the EIA survey and the methods for collecting and analyzing data to the Regional AMDAL Commission. Once the TOR has been evaluated by the commission and approved, either by the Minster of Environment or the provincial governor, the next step is for the company to compile an EIA Report (abbreviated as ANDAL in Indonesian). The EIA Report is a detailed and comprehensive study of the significant effects that the submitted project plan is likely to have on the environment. Simultaneously, the company is also required to draw up an "Environmental Management and Mediation Plan" (RKL: Rencana Pengelolaan Lingkungan) and an "Environmental Monitoring Plan" (RPL: Rencana Pemantauan Lingkungan). The former should contain details of the measures to be taken to manage and/or mitigate predicted significant environmental effects; the latter details of the measures to be taken to monitor the environmental factors associated with predicted significant environmental effects.

Moreover, the public disclosure of these evaluation and approval procedures is mandatory. There are three types of AMDAL commission corresponding to the scale and type of project: the Central AMDAL Commission, the Regional AMDAL Commission, and the District / Municipal AMDAL Commission.

The ANDAL Report should include details on data collection and analysis and environmental baseline data. The RPL should include details on impact sources, the environmental parameters that are to be monitored, monitoring sites, and the duration and frequency of monitoring.

1-2-6 Collecting Environment Monitoring Data

The Regional Monitoring Capacity Development (RMCD) Project was devised to support the design of the National Environmental Monitoring Plan; however, the documents that were prepared in 1999 were frozen as the result of decentralization and no plans have been developed since then.

In November last year (or November 2003), the Ministry of Environment (KLH) called up

[12] JBIC Environment Assessment Unit (2003), Indonesia Environment Profile, pp. 3-24

[13] World Bank (2003), Indonesia Environment Monitor 2003, p40

officials from the Regional Environmental Impact Assessment Agencies (BAPEDALDA) in 30 provinces nationwide (the provinces were subsequently subdivided; there are now 33) and requested them to undertake at least biannual monitoring of one river in their province with the results to be submitted to KLH. Agreement was reached between KLH and the BAPEDALDA to this effect. Since fiscal 2003, KLH has been allocating funds to cover the costs of this undertaking to the BAPEDALDA. The river monitoring data is to be submitted to KLH from fiscal 2004 onwards and will be consolidated at the Environmental Management Center (EMC).
Under the Project for Strengthening Decentralized Environmental Management in Indonesia (the DEMS Project), the EMC is working to build a data collection system that is designed to facilitate the prompt and accurate collection and consolidation of river monitoring data from 33 provinces.
To date, KLH has not published any periodicals corresponding to an environmental white paper, however, this year it will compile a "State of Environment Report", which it intends to make a periodical publication. KLH intends to print 3,000 copies, which are to be distributed to local governments at the provincial, kota (municipal) and rural kabupaten (district) level, to the mass media, and to multi-bilateral aid organizations.
Some BAPEDALDA have issued annual reports containing monitoring data internally.
As this demonstrates, the system for accumulating monitoring data in Indonesia is still in its embryonic stages and will require further strengthening in the future.

1-2-7 Problems with Environmental Pollution Controls

- Continuous monitoring of air pollution is only being undertaken in Jakarta and other major cities, and the government has not accurately diagnosed air quality status. A monitoring network needs to be developed and expanded at the earliest possible time. Air pollution monitoring equipment is extremely expensive. Studies also need to be undertaken regarding technical and funding assistance (subsidies, low-interest loans, etc.) with a view to encouraging factories to install air pollution control equipment. There is also a need to develop plans that will strengthen the capacity of local governments and enable greater all-round participation in air pollution control among the public[14].
- The enforcement of penalties is being hampered by numerous administrative problems. For example, Indonesia had no recognized system of environmental monitoring (for officially verifying the accuracy of measured figures). As a result, even if local environment agencies identified violators and instituted law suits, because there was no means of verifying that a factory, etc. was discharging pollutants in excess of the recommended standard (the accuracy of the measurements taken by the environmental agency), it was only possible to issue a warning to the violator. Budgetary shortfalls since the economic crisis of 1997 have meant that the government has undertaken virtually no monitoring of industrial effluent[15]. That stated, in recent years the data from accredited laboratories by KAN (the Accreditation Body of Indonesia) has begun used as an effective weapon against companies.
- A regulation concerning public participation in and the disclosure of information on the AMDAL process was established in 2000 (Head of BAPEDAL Decree No.08.2000), but with the exclusion of projects being bankrolled by foreign corporations and those being funded by foreign financial institutions, there is still insufficient public participation in or information disclosure on the AMDAL process. One of the reasons for this is that the government agencies with jurisdiction over environmental management and businesses have insufficient understanding of the importance of public participation and information

[14] JBIC Environment Assessment Unit (2003), Indonesia Environment Profile, pp 3-8
[15] ibid., pp3-17

disclosure. Also, environmental administrative agencies at the district and municipal levels have insufficient capacity; another problem are the frequent institutional reforms.
Added to which, under Head of BAPEDAL Decree No. KEP-105/1997, the district governors / municipal mayors, provincial governors, supervisory government agencies and/or the environmental management agency at the appropriate level, have been made responsible for monitoring the ongoing compatibility and implementation status of the approved AMDAL document, the RKL and the RPL. However, since the above-cited government agencies are performing virtually no monitoring (analysis of effluent, exhaust gas, etc.) it is rare for them to discover when a business is failing to comply with the figures stated in the plans or to the recommended standards.
When a second infringement is discovered the company is considered to be in violation of the law; however, it is only issued with one of three types of warnings (from the Minister of Environment, the provincial governor, or the district governor / municipal mayor), within a year and punitive action is almost never taken. This is believed to be because the statutory penalties are extremely heavy, which forces the agencies to hesitate in applying the letter of the law. Under the Environmental Management Law, a deliberate violation carries a 10-year prison sentence or a fine of up to Rp 500 million; violations resulting in a fatal accident carry a prison sentence of 15 years or of fine of up to Rp 750 million[16].

- One of the biggest problems lies in the fact that no national environmental monitoring plans have been developed. National or provincial level monitoring plans are necessary for the undertaking of systematic monitoring. Accurate management of monitoring data using the proficiency tests conducted by the EMC is also necessary.
  Simultaneously, to enable monitoring data to be reflected in administrative policy, plans covering data analysis and processing methodology need to be drawn up within KLH or between the regional BAPEDALDA and the environmental laboratories.

1-3 Regulatory Organizations

(1) Ministry of Environment

1) Institution / Jurisdiction

The Ministry of Environment and the Environment Impact Management Agency (BAPEDAL) were established as national institutions with responsibility for dealing with environmental issues; however, BAPEDAL was incorporated into the Ministry of Environment through a Presidential Decree (No.2/2002) dated January 1, 2002, which revised the Presidential Decree (No.101/2001) stipulating the mandates of the various agencies. This resulted in the establishment of the new Ministry of Environment (Kementrian Lingkungan Hidup in Indonesian, abbreviated as "KLH") and its assumption of the duties and functions of both the old ministry, which drafted policy on environmental issues and was responsible for dealing with global environmental issues, and BAPEDAL, which carried out environmental preservation measures and was responsible for monitoring the environment. The organizational chart of KLH is presented in the Appendix to this report.

According to Presidential Decree No. 2 of 2002, the primary duty of KLH is "to draft and regulate policy on environmental management and the prevention of environmental effects" and these functions and authorities are exemplified hereunder.

1. To draw up government policy on environmental management and the prevention of environmental effects.
2. To develop comprehensive plans for environmental management and the prevention of

[16] Ibid. pp4-20, 4-22. We were unable to interview any KLH officials responsible for penalizing violators of environmental quality standards during this field survey and it was thus not possible to check up on the institution of punitive action.

environmental effects, and undertake the monitoring, analysis and assessment of same.
3. To formulate guidelines setting forth the minimum standards necessary for local governments at the municipal and district (kota/kabupaten) level.
4. To provide guidelines, guidance, training and supervision for local governments at the municipal and district (kota/kabupaten) levels.
5. To formulate guidelines for the conservation and management of the natural environment.
6. To apply international agreements in related sectors

The organizational chart shows there to be seven Deputies, however, these are better termed agencies.

- Reorganization appears to have resulted in significant scattering and loss of the data owned by BAPEDAL.
- The institutions that were separately responsible for air pollution, water pollution and waste have been disbanded and reorganized as source-based institutions. There are no agencies or departments directly responsible for environmental monitoring.
- BAPEDAL's environmental laboratory development department has been transferred to the EMC.
- The authority for the EMC has been transferred from the Deputy Vice-Minister to the Sub-Deputy of Deputy VII.
- The Inspector under Deputy I jurisdiction is responsible for evaluating the regional laboratories.
- In 1996, BAPEDAL had three regional offices in Pekanbaru, Bali and Makassar (another office was also set up in Jakarta), but these offices have now been transferred to KLH. These offices function as KLH outposts in Sumatra, Bali, Nusa Tenggara, Sulawesi, Maluku, and Irian Jaya and are involved in the capacity development of local governments. Responsibility for the remaining regions is shared by KLH.

2) Budget / Personnel

BAPEDAL's budget for fiscal 1999 (April 1999 – March 2000) and for fiscal 2000 (April 2000 – December 2000) (the budget for FY00 was an abnormal 9-month budget) were as follows.

(Unit: million Rp)

Year	Regular Budget	Foreign Aid
1999	27,620	25,000
2000	31,500	34,283

As of November 2000, BAPEDAL had a workforce of 727, including those employed at its regional offices. As of June 2002, KLH employed 924 personnel.

(2) Environment Management Center (EMC)

The Environment Management Center (EMC otherwise known by its Indonesian abbreviation: SARPEDAL [Environment Impact Control facility], is under KLH Deputy VII supervision, and is managed by the Assistant Deputy for Environment Impact Control. The name was changed from PUSARPEDAL (Center for Environmental Control Facility) to SARPEDAL in April 2002.

The EMC received grant-in-aid from the Government of Japan, which was used to fund buildings, facilities and equipment; the work was completed in August 1993 (Japan invested 2,687 million yen in the project). This was accompanied by a JICA technical assistance project: the Indonesia Environmental Management Center Project, followed by the Project for

Strengthening Decentralized Environmental Management System in Indonesia, which was launched in July 2002 and is scheduled for completion in June 2006.

SARPEDAL's mandate is as follows[17].
SARPEDAL's mandate:

- To act as the national environmental reference laboratory
- To implement environmental monitoring and provide scientifically based environmental data
- To manage the network of environmental laboratories
- To provide professional services in the environmental laboratory sector

Its roles in the environmental laboratory network system are as follows[18]:

- To provide technical assistance and enforce the SNI quality assurance system
- To make recommendations on the technical competence of the environmental laboratories
- To conduct proficiency tests on the environmental laboratories
- To provide technical assistance aimed at strengthening the staff of BAPEDALDA and the environmental laboratories

SARPEDAL Facilities

- Air Quality Testing Laboratory
- Water Quality Laboratory
- Biology Laboratory
- Soil and Solid waste Laboratory
- Noise and vibration Laboratory
- Calibration Laboratory
- Training block including laboratory
- Auditorium
- Dormitory
- Library
- Information System Unit

Activities / Services

- Measurement of environmental parameters
- Equipment calibration, accuracy tests, provision of standard reference materials / test materials, resin recycling
- Provision of guidelines and reference methods for laboratory tests, maintenance, calibration, data management systems
- Provision of technical recommendations / assistance, execution of the SNI19-17025-2000 quality assurance system
- Monitoring, research, and surveys relating to environmental issues
- Library / information services

Organization

SARPEDAL has the following divisions. The training division is located in the same building but is a separate organization.

[17] SARPEDAL leaflet
[18] Muns Hilman (2003), "The Role of SARPEDAL in Developing Social Capacity for Environmental Management", paper presented at the "Symposium on Japan's Environmental Center Approach to Social Capacity Development for Environmental Management in Indonesia", July 22, 2003, Jakarta

・Environmental Testing Laboratory Division
・Environmental Laboratory Network Division
・Environment Monitoring Division
・Facilities and Support Services Division

(3) BAPEDALDA
The agencies responsible for the environment at the provincial, district and municipal level are the BAPEDALDA (the Indonesian abbreviation). Since decentralization, some of these agencies have been renamed BPLHD (the Indonesian abbreviation; in English: the Regional Body for Environment Monitoring and Control). With the exclusion of some provinces and municipalities, most of the agencies have little experience of environmental administration and building their competence in this field is now a major issue in strengthening Indonesia's environmental management capacity for the future.
The provincial BAPEDALDA (BAPEDAL Daerah) are supervised by the governors, but do not necessarily have a direct hierarchical relationship with KLH or the Environmental Impact Assessment Agency. The Department of Environment (Biro Lingkungan Hidup: BLH) was established in the 1980s; it was strengthened during 1997-98 and the BAPEDALDA formed. District-level BAPEDALDA are supervised by the mayors (bupati) and BLH was set up during the 1990s; these agencies have become progressively more competent. Besides these agencies, the regional BAPEDALDA (formerly known as BAPEDAL Wilayah) are positioned as regional offices of BAPEDAL (now KLH); they supervise and give technical guidance to the provincial governments[19].

(4) Issues
The data on previous documents, etc. has been scattered as the result of reorganization and KLH has acknowledged that it is not cognizant of the location of this information.
It is not clear which departments within KLH are responsible for collecting and analyzing environmental monitoring data. Monitoring data is currently being collected at the EMC and much is expected of the future activities of this organization.

1-4 Decentralization of Environmental Administration & Monitoring Plans
(1) Current Status
In order to respond to the greater demands being placed on the local governments of Indonesia and an emerging need to expand the scope of local authority, Law No. 22/1999 on Regional Governance and Law No. 25/1999 on the Fiscal Balance Between the Center and the Regions were enacted and sweeping decentralization undertaken; these laws came into effect in January 2001.
Responsibility for almost all governmental matters, with the exclusion of those functions for which the central government should obviously assume responsibility of the nation for at the national level, passed to the local governments. Moreover, the main constituents of local government were not the so-called primary local governments, i.e. the provincial governments, but the more than 270 district governments (known as kabupaten or kota). The decentralization framework came into effect in fiscal 2001, and in line with the transfer of governmental authorities and functions to the local level, central government personnel and fiscal resources are gradually being transferred to the local governments. However, it is difficult to escape the feeling that the basic design of this policy is somewhat rough and ready. In consequence, much confusion and a plethora of problems have emerged in the process of

[19] World Bank (2001), INDONESIA Environment and Natural Resource Management in a Time of Transition, p103

transforming the concept into reality[20].
In the environmental administration sector too, many authorities and duties have passed to the local governments (essentially to the district / municipal level), and the Ministry of Environment is also attempting to ease the passage of decentralization by presenting the local governments with various guidelines. Nevertheless, the local governments lack human resources, funds and facilities, and have limited experience in this field, which means that the capacity to provide environmental administration services is failing to keep pace with the sudden transition to regional autonomy. The big challenge for the future will be to develop the capacity of the local governments, which have a crucial role to play in providing environmental administration services.
Neither the provincial BAPEDALDA nor the district (kabupaten/kota) BAPEDALDA are under the direct supervision of KLH; instead they are respectively regulated by the provincial governors and the kabupaten/kota mayors. With decentralization, the role of the governor has become less the supervisor of the Bupati and Walikota and more coordinator[21].

(2) Ministry of Environment Guidelines on Environment Monitoring by Central / Regional Governments
According to KLH Deputy I, the ministry has completed the work of formulating draft guidelines on the Minimum Standard of Services (in Indonesian: Standar Pelayanan Minimal [SPM]) to be observed by the local governments in respect to water, air quality and household waste. These guidelines define (1) the Basic Concept on Regional Environmental Institutional Formation, (2) the Duty, Function & Authorization of Provincial Environmental Institutions, (3) the Duty, Function & Authorization of District/Municipal Environmental Institutions, (4) the Form of Regional Environmental Institutions, and (5) the Technical Qualifications of the Head of Regional Institutions. The guidelines stipulate the principles and standards that must be observed by the local governments and set forth indices for monitoring the same. The concept for the guidelines was announced in 2002, and the aim is to issue them under a Minister of Environment Decree after the Presidential Decree (currently being prepared by the Ministry of Home Affairs) is delivered. The provincial governments will apply the guidelines having adjusted them to actual conditions in the province. (The guidelines set forth the minimum standards and it will be left up to the provincial governments to decide the extent to which top-up standards are established.) The extent to which standards are being met will then be reported to KLH. KLH also plans to employ a feedback cycle under which the regional councils and heads of local government will be required to submit annual reports on the implementation of the guidelines and the SPM then reviewed on the basis of these reports. It is possible that KLH could decide to reduce its budget allocations to those provinces, etc., that fail to take a proactive approach to the SPM.
How local governments respond to these trends within central government[22], how far the environmental standards are beefed up, how to ensure their implementation, and how to enforce the application of punitive measures against violating companies are all likely to have a significant impact on the activities and financial status of the laboratories that were supplied with equipment through the RMCD project and will thus require careful monitoring in the future.

[20] Asanuma S., (2003), Indonesia's Decentralization Policies – the Big Bang Policy Demanding Transformation"
[21] Setyo S. Moersidik (2003), "Development of Social Environmental Management System in Indonesia"
[22] North Sumatra, one of the provinces visited by the survey team, is in the process of developing environmental regulations that reflect actual conditions in the province. Five experts from the University of North Sumatra who have studied in the Netherlands, Germany, etc., are involved in this task, and the plan is to submit the regulations to the DPR (North Sumatra Provincial Council) during 2003. Considered in the light of this example, it is believed that the bid to start implementing the aforementioned KLH guidelines in 2004 has taken on reality.

(3) RMCD Project Resources

In 2001 and 2002, KLH sent letters to all the provincial governors advising them of its intention to transfer the ownership of laboratory equipment supplied with funding from the RMCD project and AusAid funding from KLH to the provinces.

KLH is undertaking a study on the use status of equipment at laboratories throughout Indonesia.

In addition, KLH has allocated a budget of Rp 70 million to each of the provinces, with this money to be used to monitor at least one river per province.

According to KLH, the provincial governments can receive a budget to cover the operation and maintenance (O&M) expenses of the environmental laboratories upon application to the Ministry of Finance. However, according to reports from the North Sumatra BAPEDALDA, the operating budgets for the labs have to be allocated on a province base, which entails submitting a budget request to the governor that has to be approved by the provincial council; the provincial council is reluctant to approve budget requests and this is creating a bottleneck. This anecdote would suggest that there are some gaps in the perceptions of the central and regional governments.

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Chapter 2: Current Status of Laboratories supplied with Measuring Apparatus via this Project

2-1 Laboratory Management (affiliation, training, finances, fees, clients, etc.)
The following is compiled from the results of the survey undertaken at the regional laboratories visited by this survey team.
(1) Laboratory Organization / Personnel Assignment
Total staff numbers and the numbers employed in environment-related tasks[23] are as shown in Table 2-1 below.

Table 2-1 Personnel Numbers at Individual Labs

	Lab Total	Environmental Staff	Remarks
Makassar BPPI	Researchers: 16 Analysts: 19	Researchers: 9 Analysts: 4	There are plenty of researchers available for analyzing monitoring results. Management levels are high.
Makassar BLK	Analysts: 70	Analysts: 7	
Makassar PU	—	(5 personnel including admin staff)	The lab is being shut down in line with reforms at the Ministry of Public Works
Surabaya BPPI	Total: 110	Environmental staff: 12 Water quality analysts: 7 Air quality analysts: 3 Researchers: 1 Admin staff: 1	
Surabaya BTKL	Total: 65 Management: 15 Analysts: 33 Equipment calibration: 7 Technical development: 4	As left	The lab has both equipment calibration and training sections and management levels are high.
Surabaya PU	—	Analysts: 7	
Medan BAPEDALDA lab	Full-time staff: 3 Commissioned staff: more than 10 (of which, 11 analysts)	As left	General affairs, training and research positions have been set up, but all are vacant.

(2) Affiliations
With the three labs in Makassar, South Sulawesi (the Ministry of Trade and Industry Research Lab [BPPI], the now-defunct Ministry of Public Works Laboratory [PU], and the Ministry of Health Health Laboratory [BLK]), and the three labs in East Java (BPPI, Ministry of Health Environmental Health Laboratory [BTKL], and PU), the BPPI labs belong to the Ministry of Industry, BLK and BTKL to the Ministry of Health, and PU to the provincial governments. At all the labs it is understood that RMCD equipment belongs to the province's BAPDALDA.
The South Sulawesi BAPEDALDA is in the process of setting up its own environmental lab, and there are labels attached to RMCD equipment at the three labs in the province indicating

[23] Compiled from hearings and supporting material obtained from the regional laboratories.

that it is to be removed. By contrast, at East Java's BAPEDALDA, the establishment of an environmental lab is still at the feasibility study stage, thus with the exception of the equipment at the PU lab, the removal of RMCD equipment by the province's BAPEDALDA has yet to take on reality.
In North Sumatra, an environmental laboratory has already been set up under BAPEDALDA jurisdiction, equipment supplied to other laboratories through RMCD has been transferred (to the BAPEDALDA lab) and analysis work is in progress. Although the centralization of equipment at the BAPEDALDA lab is producing some results, the lab is facing a number of problems, including in securing and training analysts, acquiring certification for the lab, and the emergence of a major gap between its earnings from lab fees and its business expenses.

(3) Financial Status
Personnel expenses at all labs, including those for personnel involved in environmental monitoring, are procured from the administrative organization to which each lab is affiliated (one of the national ministries or the provincial government). The expenses for general consumables – building maintenance, stationery, etc. – are obtained from the same source.
Also, at all labs reagents and consumables, utilities costs, equipment maintenance, parts purchases and all remaining expenses relating to environmental monitoring are covered using the fees obtained from monitoring commissions.
As to training costs, the fees for training undertaken at the EMC are defrayed by the labs, while the costs for in-house training and training participation are, in principle, covered using lab revenues. The administrative organizations to which each lab is affiliated (e.g. the Ministry of Health for the Makassar BLK) will cover training coststhat are done upon the administrative organization's request.
Lab earnings[24] are as shown in Table 2-12; however, there are some labs that can post all fees as earnings, some that are required to hand over their earnings to their parent organization before receiving between 85-95 percent back, and some that are required to surrender some 30-50 percent of their earnings to the provincial government as taxes.
The RMCD project was completed in 2000 and was actually up and running in 2001, and revenues from environmental monitoring commissions have grown significantly at all labs during this time. However, due to the fact that it was shut down before it got up and running as an environmental lab, the Makassar PU has made no money from using the equipment provided through the RMCD.
According to the results of a KLH assessment of regional laboratories[25], analysis costs at all labs are comparatively high; however, as is detailed in section (5), the basic fees at all labs (excluding the Surabaya BTKL) are significantly higher than those at the Surabaya BTKL. The same report also points to instances in which the budget for environmental monitoring operations is not being listed in the budget for the lab as a whole. It was not possible to obtain data on the cost-income ratios, but despite the fact that personnel expenses are being covered by the parent organization, the environmental labs are experiencing difficulties meeting the costs for O&M and training, etc. with their income from lab fees.

Table 2-2 Laboratory Earnings (*)

(Unit: Rp)

	2000	2001	2002	2003 (Jan. – Jul.)
Makassar BPPI	25,835,000	75,110,000	181,060,000	42,116,000
Makassar BLK		95,570,000	135,304,000	44,380,000

[24] Compiled from questionnaire responses and hearings held at each of the labs.
[25] Report on Monitoring and Evaluation of Foreign Aid in Environment Laboratory utilization in the Provinces, (submitted to the State Minister of Environment, Indonesia)

Makassar PU	—	—	—	—
Surabaya BPPI	69,000,000	90,250,000	46,200,000	
Surabaya BTKL		242,256,000	389,586,000	450,000,000(**)
Surabaya PU	20,295,000	35,195,000	43,072,000	30,314,000
North Sumatra BAPEDALDA		0	Details unknown (approx. 5% of expenses)	(as left)

(*) This refers to income from lab fees and does not include income for personnel expenses, etc. received from the parent organization.
(**) The 2003 figure for the Surabaya BTKL is the target for the year.

(4) Training
Basic training was undertaken as part of the RMCD project. Besides this, KLH provides training at the EMC, donors from other industrialized nations offer training (AusAid training courses, etc.), and the labs plan and implement their own training programs. It was not possible to get an accurate overview of the training situation at the labs visited by the survey team, but Table 2-3 provides a summary of the information[26] acquired on training recipient numbers.
All the labs have requested additional training as a means of developing the skills of their staff, but this is being hampered by shortages of funds to cover participation in / implementation of training. Lab personnel have expressed a desire to enroll in the following training courses:

- Troubleshooting for analytical equipment and repair techniques for minor breakdowns
- Operation and maintenance of analytical equipment (GC, AAS, TOC, etc.) (gas chromatographs, atomic absorption spectrophotometers, total organic carbon meters)
- Analysis of PCBs, PAHs, agrichemicals and other toxic substances
- Calibration of analytical instruments and equipment
- Handling techniques for heavy metals and toxic substances
- Cleaner production
- Analysis accuracy management
- Laboratory management (including ISO17025)
- Training in basic analytical techniques for junior analysts

Table 2-3 Numbers of Training Recipients & Training Content

	RMCD Training	EMC Training	Other
Makassar BPPI	6 personnel (all on the payroll)	20 staff took the Exhaust Gas Sampling Course in 2003	2 in-house training sessions have been planned / implemented Is applying for places on the JICA Group Training Course
Makassar BLK	N.A.	N.A.	Staff participated in training for KAN ISO17025 certification last year and this year Staff have taken the

[26] Compiled from questionnaire responses received from the labs, responses to the PEDACS questionnaire and hearings held at each of the labs.

			AusAid training course (numbers unknown)
Makassar PU	4 personnel (2 on the payroll)	—	(2) staff have taken the AusAid training course
Surabaya BPPI	8 personnel (1 on the payroll)	N.A.	(2) staff have taken the JICA Group Training course
Surabaya BTKL	4 personnel (all on the payroll)	N.A.	4 staff have taken the Berca GC operation and maintenance course
Surabaya PU	N.A.	N.A.	Staff have taken the AusAID lab management course and training under the Mermaid Program
North Sumatra BAPEDALDA	(None of the staff that received training through the RMCD have been transferred)	Training assistance is being provided through the JICA, SARPEDAL and DEMS projects	

Looking at the list of desired training courses above, it becomes clear that there are powerful needs to improve skills in (1) routine maintenance and calibration skills to enable analytical equipment to be used safely. There are also needs for training in (2) techniques for analyzing toxic substances, such as heavy metals and organochlorine chemicals, (3) laboratory management and analysis accuracy management, and (4) in the field of pollution prevention techniques.

(5) Laboratory Fees[27]

Lab fees are set either for individual parameters or for individual samples, with the fee covering a number of specific types of analysis. Table 2-4 and Table 2-5 compare the fees for representative parameters at each of the labs.

Although the fees charged by all the labs are not shown in the two tables, the figures given reveal manifest variability across the labs. A comparison of the fees for water quality analysis shows that the Surabaya BTKL charges the lowest prices, the fees at the Surabaya BPPI and the Surabaya PU are 2-3 times higher, those at the Makassar BLK 3-4 times higher, and those at the North Sumatra BAPEDALDA lab 5-10 times. According to the results of the KLH assessment of regional labs, testing and analysis costs are fairly high, which means that if the Surabaya BTKL lab can remain solvent at these prices, then the fees at the other labs are clearly exorbitant. The same report also states that KLH is considering standardizing lab fees while making the necessary adjustments.

Table 2-4 Unit Cost of Water Quality Measurement Analysis

Paramater	Makassar			Surabaya			North Sumatra
	BPPI	BLK	PU	BPPI	BTKL	PU	Bapedalda
pH	N.A.	6,300	N.A.	—	1,000	3,500	9,500
DO	"	14,400	"	—	2,000	12,500	—
SS	"	6,750	"	—	2,000	—	—
COD	"	14,400	"	50,000	5,000	38,000	31,500

[27] Compiled from questionnaire responses received from the labs.

BOD	"	14,400	"	30,000	9,000	24,500	28,500
Zn	"	40,050	"	21,000	12,000	20,000	110,000
As	"	37,800	"	30,000	20,000	45,000	110,000
Cd	"	40,500	"	21,000	12,000	20,000	110,000
Cr(VI)	"	40,050	"	21,000	2,000	20,000	110,000
Hg	"	40,050	"	75,000	20,000	45,000	110,000
Pb	"	40,050	"	21,000	12,000	20,000	110,000
Mn	"	40,050	"	21,000	6,000	20,000	110,000
Mineral oil	"	24,400	"	56,400	7,500	40,000	—
CN	"	24,300	"	50,400	—	19,500	110,000
Detergent	"	24,300	"	30,000	16,000	55,000	13,500
Pesticide	"	119,700	"	—	75,000	—	120,000
PCB	"	119,700	"	—	—	—	120,000
Coli bacteria	"	—	"	—	20,000	—	120,000

Table 2-5 Unit Cost of Air Quality Measurement Analysis

(Unit: Rp)

	Makassar		Surabaya		North Sumatra
	BPPI (flue gas)	BLK (ambient air) Accurate / Simple	BPPI (source gas)	BTKL (ambient air)	Bapedalda
O3	N.A.	90,000 / 28,800	N.A.	8,000	—
SO2	"	90,000 / 28,800	"	10,500	110,000
NO/NO2	"	90,000 / 28,800	"	10,500	110,000
NH3	"	45,000 / 28,800	"	10,000	110,000
H2S	"	90,000 / 28,800	"	10,500	110,000
CO2	"	90,000 / 28,800	"	8,000	110,000
CO	"	90,000 / 28,800	"	8,000	120,000
HC	"	90,000 / —	"	13,000	110,000
PM10	"	90,000 / —	"	—	—
Temperature / humidity	"	45,000 / 24,800	"	—	—
Graphite	"	90,000 / —	"	—	—
TPM	"	126,000 / —	"	—	120,000(TSP)
Ambient noise	"	90,000 / 24,800	"	—	—

In compiling the above tables representative measurement parameters were selected, but there are considerable differences among the labs in the measurable parameters available, with the Surabaya BTKL offering an exceptionally wide range of services that includes the bio field. The columns that have been left blank could not be checked and it is not known whether or not prices have been set for these parameters.

The parameters that have become measurable since the RMCD project was completed are as shown in Table 2-6.

Table 2-6 Measurement Parameters/ Fields Measurable as Result of RMCD Project

	Measurable Parameters / Fields	Remarks
Makassar BPPI	TOC, ambient air, industrial effluent	There are no clients for

		TOC
Makassar BLK	Air movement, TOC	"
Surabaya BPPI	Some metals, agrichemicals, TOC, industrial effluent	"
Surabaya BTKL	Agrichemicals, TOC, air movement	"
Surabaya PU	Some metals, TOC, oil content	"
North Sumatra Bapedalda	(all)	"

Few parameters have become measurable at the Makassar BPPI and BLK labs, and the Surabaya BTKL as the result of the RMCD. Since neither the Surabaya BPPI nor the Surabaya PU had AAS prior to the RMCD, they are now able to measure many new parameters.

(6) Clients and Measurement Result Report Destinations

1) Breakdown of Clients[28]

Major clients commissioning analyses using RMCD equipment are given for each of the laboratories below.

Makassar BPPI: Most of the lab's clients are from the private sector, including mining companies, electricity producers, food companies and hotels. The BAPEDALDA coordinates monitoring plans, such as PROKASIH, but companies are responsible for submitting data for analysis and BPPI does not report directly to BAPEDALDA.

Makassar BLK: 70 percent of the lab's clients are government agencies, 20 percent are from the private sector, and approximately 10 percent are NGOs, etc. The lab's government clients include the Ministry of Health, the regional health laboratory, the Makassar BAPEDALDA and the South Sulawesi BAPEDALDA. The BPPI and BLK labs have been incorporated into the BAPEDALDA lab resulting in a sharp drop in commissions for analysis, which is giving rise to concern.

Surabaya BPPI: Most of the lab's clients are privately-owned factories and the majority of analysis samples received are factory effluent. Plans to incorporate the lab into the province's BAPEDALDA are still nascent, but the lab does not believe that this will have any effect on its clientele.

Surabaya BTKL: The lab's clients are factories and environmental government agencies; the ratio of government to private-sector commissions is unknown, but it is believed that orders from the private-sector account for a large percentage. Looking at chemical analyses of water, at approximately 5,000 samples per year the total number is exceptionally high, and of these, approximately 50 percent are industrial effluent (factories, hospitals, hotels, etc.), approximately 20 percent are river water samples, and approximately 20 percent are potable/mains water samples.

Surabaya PU: 60 percent of the lab's clients are government agencies; 40 percent are from the private sector. PROKASIH has led to commissions for river water analysis from the provincial government and to commissions for factory effluent analysis from businesses; the provincial government also requests analysis of leachate from waste treatment plants.

[28] Compiled from questionnaire responses and hearings held at each of the labs.

North Sumatra: The province's BAPEDALDA is central. The lab receives few commissions from the private sector because it has not been accredited. Accordingly, as of February 2004 the lab was in the process of putting its documentation in order in preparation for accreditation. It is also looking into requesting the province's BAPEDALDA to issue a notice encouraging businesses to use the lab in the event that it is accredited.

In terms of the government / private-sector ratio of fees earnings, a significant proportion is from the "private sector" at BPPI labs, particularly at the Makassar BPPI, which earns most of its income from private-sector commissions. The government / private-sector ratio at the Makassar BLK is 70/30, with a slightly higher percentage of earnings coming from government agencies, while it is estimated that the Surabaya BTKL receives a fairly high proportion of commissions from the private sector. The government / private-sector ratio at the Surabaya PU is 60 / 40.

2) Reporting Monitoring Data to BAPEDALDA
Almost all the laboratories covered in the KLH regional laboratory assessment report have pointed to the fact that "there is no coordination with the BAPEDALDA regarding analysis results". This issue will be dealt with in the section on project impacts in Chapter 3.

2-2 Equipment Utilization
(1) Questionnaire Results
Questionnaires relating to the utilization of equipment provided through the RMCD were sent to all the laboratories. The questions were narrowed down to two issues: (1) Is the equipment fit for continuous operation and if not, why not? (2) Are there adequate supplies of spare parts and consumables for the RMCD equipment?
Details of the equipment that is currently unusable are given for each of the laboratories in Table 2-7.

Table 2-7 Operational Status of RMCD Equipment & Spare Parts / Consumables Supplies

	Unusable equipment, defective equipment, etc.	**Spare parts/consumables in short supply**
Makassar BPPI	Noise meter, precision recording meter (out of order) All other equipment is fit for use	None in particular
Makassar PU	All equipment is unusable because inadequate measures were taken for long-term shut down	Reagents deteriorated before they could be used due to poor storage
Makassar BLK	Notebook PC (out of order) Anemometer, anemoscope, barometer (out of order) Some mobile lab equipment (the hydrogen generator for the fully-automated continuous hydrocarbon analyzer and the GCD computer are out of order) There are sometimes problems with th AAS and pH meter	None in particular
Surabaya BPPI	Oil analyzer (unavailable for	Consumables for the GC, oil

	Unusable equipment, defective equipment, etc.	**Spare parts/consumables in short supply**
	standard samples) Water purifying apparatus (water quality defective) Furnace (program defective) CN-ion distiller (difficult to operate) F-ion distiller (difficult to operate)	analyzer, water purifying apparatus, hot plate, furnace, OA equipment, and vehicles; electrical parts, parts for the diesel generator
Surabaya BTKL	Dissolved oxygen analyzer (out of order) Water purifying apparatus (water quality defective) Water quality monitoring apparatus (out of order) Some mobile lab equipment (the hydrogen generator for the fully-automated continuous hydrocarbon analyzer is out of order)	Virtually all parts and consumables needed for water and air quality analysis are in short supply There are adequate supplies of parts and consumables for noise meters, OA equipment, the mobile lab
Surabaya PU	Water purifying apparatus (water quality defective) Ultrasonic pipette washer (out of order) PC (out of order)	Rubber tubes for the AAS have a short life
North Sumatra BAPEDAL	No staff capable of operating the GC No staff capable of using ambient air quality monitoring equipment AAS detector is unstable Exhaust gas sampling equipment is not in use because no-one knows how to use it	UV absorption cells are in short supply Standard gas for the portable gas analyzer is old Inability to replace small parts/consumables means that it is sometimes not possible to conduct sampling/analysis

The Makassar BPPI has the lowest number of analytical instruments (for lab use) that are currently unusable or in an unstable condition, followed by the Surabaya BTKL and the Surabaya PU labs. The Makassar BLK and the Surabaya BPPI are experiencing problems with a number of instruments. All of the instruments at the Makassar PU lab are inoperable. In many instances, instruments that have broken down or are defective lie neglected. This is because, where the problems cannot be dealt with by the labs, although contact has been made with local suppliers, knowledge and skill shortfalls mean that staff are unable to find the precise means of recovering the instruments, or because there are no funds available for commissioning the manufacturers (predominantly foreign) to undertake the repairs.

Water purifying apparatus was found to be inoperable in all three of the Surabaya labs. This is because raw water in the province is extremely hard, which causes the ion-exchange resin to deteriorate in a short period of time. All the labs have given up trying to use the apparatus and are using high quality water purchased from external sources.

Ambient air quality monitoring equipment, which was supplied to the Makassar BLK and the Surabaya BTKL, is in constant use, but ancillaries for the hydrocarbon monitoring apparatus is broken down and no measurements have been taken for the last two years. Furthermore, the Makassar BLK lab's GCD computer is inoperable.

(2) Operational Status of RMCD Equipment

1) Level of Equipment Utilization

With the exclusion of the Makassar PU, RMCD equipment is being put to adequate or basic use. That stated, the lack of environmental regulation on TOC concentrations means that no commissions are being received for TOC analysis and the equipment is never put into operation. Based on observations made at the six laboratories visited by our laboratory evaluation team, equipment utilization appears to be extremely high at the Surabaya BTKL, followed by the Surabaya BPPI, while the use rates at the Makassar BPPI, the Makassar BLK and the Surabaya PU labs fail to reach the same level. These observations are broadly consistent with the numbers of samples being analyzed at the labs (see table). A look at the number of water samples analyzed at the North Sumatra BAPEDALDA lab in 2002 reveals it to be second only in scale to the Surabaya BTKL, and given the rapid growth in water, air and gas samples performed in 2003 (twice as in 2002), it is predicted that the operating rates of analytical equipment at this lab will increase gradually.

Table 2-8 Number of Samples Analyzed in 2002

Bracketed figures indicate the number of parameters

	Makassar		Surabaya			North Sumatra Bapedalda
	BPPI	BLK	BPPI	BTKL (*)	PU	
Water	117	101 (2,054)	. 141	2,434+1,600	(1,031)	1,638
Effluent	26	54 (676)	908	2,478+95	(included in the above)	(included in the above)
Ambient air	13	50 (192)	—	2,043+238	—	98
Gas emissions	44	—	n.a.	0	—	(included in the above)
Ambient noise	43	3 (3)	"	236	—	—
Food, etc.	—	—	—	889+326	—	—

(*) The figures on the left indicate the number of physiochemical analyses performed at the BTKL lab; those on the right refer to the number of biochemical analysis samples (outside number).

The mobile lab vehicles are being put to effective use for sampling work in Makassar and Surabaya; they are also proving invaluable for water quality sampling operations by providing an alternative to the existing, decrepit vehicles. The Makassar BPPI appears to be exercising painstaking control of its equipment and has installed shelving inside its vehicle in order to mount delicate sampling equipment for factory gas emissions; it also stores equipment in an air-conditioned warehouse after sampling work is completed. At the North Sumatra BAPEDALDA lab, because none of the staff that had received training in the operation of equipment mounted in the mobile lab were transferred when the equipment initially supplied to existing labs was centralized at the BAPEDALDA lab, the equipment has not been

operated and measures need to be taken to rectify this situation.
As to the operating status of the ambient air quality monitoring vehicles, at the two Ministry of Health labs that were visited, although some of the equipment was found to be defective, monitoring work was being performed routinely and, notably, the Surabaya BTKL was taking measurements six times a day. The defects are primarily attributable to the hydrogen generators needed for the hydrocarbon analyzers, which have been out of order at both BTKL labs for the past two years; however, although the faulty generators have been sent to the French manufacturer for repair they have yet to be returned.
No data are available on the capacity operating rates of equipment, but UV, AAS, GC and TOC apparatus are all core analytical equipment that was supplied through the RMCD, thus the findings from the current survey for these apparatus are outlined hereunder. UV, AAS and GC apparatus are being used at all labs, with the exclusion of the Makassar PU. However, many of the BPPI, BLK and BTKL labs owned these instruments before the RMCD project was undertaken and are either using them in plural or gradually withdrawing older equipment that has become superannuated. The Surabaya BTKL lab has four GC and three AAS in operation and since it handles a much larger number of samples than any of the other labs, this equipment is being put to effective use. By contrast, sample numbers at the other labs are infinitely lower, meaning that one of each device is more than sufficient.

2) Laboratory Management

Although the following remarks on the standard of equipment utilization will overlap with the section on maintenance hereunder, the fact that virtually all the equipment at the Surabaya BTKL and the Makassar BPPI is in working order suggests that staff at both labs are attempting to undertake small-scale repairs on their own. While not on the same level as the two labs aforementioned, management practices at the Surabaya PU lab are appropriate and their equipment is being maintained in good working order. Sophisticated equipment is being properly managed at the Makassar BLK and Surabaya BPPI labs, but it would appear that ancillary equipment is not being managed to the same extent. The Makassar PU has been shut down as an environmental laboratory and can not therefore be compared.
Regarding spare parts and consumables, the Surabaya BTKL stated that it had “shortages” of numerous items, while the other labs indicated that they had “sufficient supplies” of most things. Given that the Surabaya BTKL receives far more commissions for analysis than any of the other labs it is likely to have expended its initial supplies of consumables very quickly. By contrast, the short shelf life of consumables was pointed to by some laboratories. Specifically, there were large quantities of reagents that had already passed their expiry date in storage at those labs that received initial supplies in excess of their needs.
At the North Sumatra BAPEDALDA lab it is highly probably that smaller consumables and spare parts were lost in the move and the lab is encountering problems in that analyses are being delayed due to the impossibility of procuring these items locally. There is a strong possibility that a similar problem could also arise at any of the other labs.
Water purifying apparatus presents a problem of a slightly different nature. The water purifying equipment supplied was of the ion-exchange resin type, but the quality of mains water in the cities visited and particularly that in Surabaya is poor, and the apparatus cannot be used because the ion-exchange resin deteriorates almost instantaneously. The labs are therefore forced to purchase high-quality bottled water.

3) Problems at the Makassar PU Laboratory

One extremely regrettable issue is that, as was stated earlier in this report, the Makassar PU environmental laboratory was shut down virtually unused, added to which, its equipment quickly became unusable because it was inadequately maintained. The lab was closed and the

power supplies switched off in August 2000, just five months after project completion; in January 2001, the power was switched back on, but despite attempts to reopen the lab, it was shut down again in May of the same year and the power has remained off ever since. It is almost inconceivable that PU employees performed routine analyses during the periods in which power supplies were available. However, according to reports, the lab was used sporadically by BPPI, universities and businesses, among others.
This situation came about in consequence of two problems. The first problem lies in the question: why was it necessary to shut down the PU environmental lab? The staff that were assigned to the environmental laboratory have been transferred to positions within provincial government and it is not clear why BAPEDALDA did not request the PU lab to loan its site and continue to operate the environmental laboratory. The other problem is that essential measures for long-term operational suspension were not properly executed for the equipment supplied through the RMCD. It is possible that since the environmental lab organization per se was eradicated, although its personnel remained behind they may not have felt duty-bound to check the manuals for details on what measures should be taken for long-term operational suspension or to carry out the necessary steps.

2-3 Maintenance Systems
An evaluation of the maintenance of RMCD equipment should not be limited to the upkeep of the equipment alone but must also incorporate an extremely wide range of management parameters, including lab cleaning, the cleaning and storage of glass containers, the management and storage of reagents (including labeling, classification, etc.), storage and management of spare parts / consumables, management of samples (labeling, classification, storage, etc.), use of procedures and standards (for labeling and storage), calibration, troubleshooting, response to breakdowns (outsourcing repairs, in-house repairs, other response), analysis accuracy management (including ISO17025 certification, etc.), training (course participation, provision of in-house training programs), and the handling of liquid waste. This is because only once these practices can be maintained above a certain level will people begin to trust in the accuracy of analyses.

(1) Management Levels at Each Laboratory
A comparison of impressions on these managerial issues is given for each of the laboratories (with the exclusion of the Makassar PU) in Table 2-9 below.

Table 2-9 Management Levels for Specific Tasks

	Makassar		Surabaya			North Sumatra (*)
	BPPI	BLK	BPPI	BTKL	PU	BAPEDALDA
Lab cleaning	○	△	△	◎	○	◎
Cleaning / storage of glass containers	◎	△	△	◎	○	◎
Control / storage of reagents	◎	△	△	◎	◎	○
Storage of spare parts / consumables	○	△	△	◎	○	○
Sample management	○	△	△	◎	○	○
Procedure / standard (SOP) usage	◎	△	△	◎	○	○
Equipment calibration	◎	△	△	◎	○	△
Troubleshooting	○	△	△	○	△	△

Failure response	○	△	△	○	△	△
Analysis accuracy control	◎	△	△	○	△	△
Training	◎	△	△	◎	○	△

(*) Improvements have been made in many areas at the North Sumatra laboratory under the guidance of the senior JICA volunteer.

Lab cleaning and the cleaning and storage of glass containers are the most fundamental aspects of lab management. If these are being properly executed then the management of other areas will also be generally favorable. Reagent management falls into two types: the stock for day-to-day use and that which is being warehoused, but at the Surabaya BTKL lab all aspects requiring attention, including labeling, separate alignment, and safe storage, are being properly taken care of. The Surabaya BTKL deserves high praise for its exemplary sample labeling practices. The labs are proving resourceful in performing equipment calibration work, some of which needs to be undertaken within the lab, some of which must be outsourced to specialized organizations.

The Makassar BPPI has been certified with the ISO17025 equivalent by the domestic accreditation body, KAN; the other labs are pushing ahead with preparations for accreditation, either in the current year or the following one, but there is little doubting that the Surabaya BTKL can be accredited this year. Training was dealt with in Section 1 (3) of this chapter thus it will not be discussed in detail here; nonetheless, it is the most important strategy for improving the ability of lab staff to respond to breakdowns, a topic that is examined hereunder. However, despite the many costs involved in training the labs face difficulties in that the parent organizations have long proved reluctant to provide these funds.

(2) Handling of Equipment Failures

Maintenance is the key means of handling equipment breakdowns. It involves the following steps. First, analysts must know and be sure to perform the checks and procedures that need to be undertaken when starting up and shutting down analytical equipment. Second, when a problem occurs, the cause must be identified and analysts must be able to make sense of the things prepared for the equipment by the respective manufacturers. If the cause of a breakdown is positively identified then, should the necessary repairs be minor, for example, in cases where function can be recovered by dismantling and cleaning the equipment, then the problem can be dealt with by the analysts or by technicians from the maintenance department. In the event that it is not possible to pinpoint the cause, or for breakdowns that the technicians are unable to handle requiring the replacement of parts, the equipment will have to be sent to a specialist contractor for repair. In short, it is necessary to foster the ability to positively identify the step at which the problem is at, and practice, training and instruction must be provided.

Regrettably, none of the labs visited by the survey team were found to be fully capable of handling breakdowns in the manner described above, but efforts of one kind or another were being made to address failures at some of the facilities. At the Makassar BPPI lab, for example, when the GC gas regulator stopped working the chief technician rang the supplier to request repairs but, in the event, was able to fix the problem by dismantling the regulator and cleaning it, evidencing great enterprise on his (her) part. At the Surabaya BPPI, however, problems with computer programs mean that several pieces of equipment were found to be either not operational or difficult to operate. Meanwhile, consumables and repairs are costly, and many of the labs pointed out that they have difficulty dealing with breakdowns because of budgetary constraints.

In developing countries there are few equipment suppliers, to say nothing of manufacturers, in provincial towns, and they tend to be unreliable where they exist, which means that lab

personnel require greater skills than their Japanese counterparts in order to find and repair equipment defects. Moreover, in many instances the only suppliers capable of handling repairs that require parts replacement are located in Jakarta, or parts have to be ordered from Japanese or other foreign manufacturers. During this survey it was learnt that more than two years had elapsed since hydrogen generators used for the hydrocarbon analyzers in mobile labs had been sent to their French manufacturer for repair.
It is extremely difficult to take the measures outlined above in developing countries and it is therefore vital that lab personnel be given the instruction and OJT needed to master the skills necessary for performing minor repairs in-house. This example is taken from a geological research institute in Pakistan (a JICA project), but the evaluators have been impressed with the response of analysts to a host of breakdowns. The responses include exchanging information by phoning or mailing the Japanese equipment manufacturers directly, and the prompt institution of causal investigations and arrangements for replacement parts, among others. It might be meaningful for the labs in Indonesia to prepare lists of the mail addresses of contacts at the respective manufacturers. The project's equipment suppliers should also give appropriate consideration to the provision of (necessary) information.

2-4 Implementation of Environment Monitoring
The equipment supplied through the RMCD project was designed to correspond to the environmental monitoring work being undertaken by each of the labs, which is as outlined in Table 2-10.

Table 2-10 Types of Monitoring undertaken at each laboratory, details of monitoring plans

	Water Quality		Air / Ambient Noise	
	Samples	Monitoring programs	Samples	Monitoring programs
Makassar BPPI	Industrial effluent Potable water sources Potable water River water Seawater	1. PROKASHI-based monitoring program 2. Regular factory monitoring program	Industrial emissions Ambient air Ambient noise	1. Factory gas emissions, ambient air and noise monitoring program
Makassar BLK	Potable water Mains water Groundwater River / lake water Seawater Industrial effluent	1. Monitoring programs under direct request from Ministry of health, provincial government 2. Monitoring commissions stemming from PROKASIH 3. Regular factory monitoring program	Ambient air Ambient noise	1. Regular monitoring programs under direct request from the ministry of health, provincial government
Makassar PU	—	—	—	—
Surabaya BPPI	Industrial effluent River water Other water	1. PROKASHI-based monitoring program 2. Regular factory monitoring program	Industrial emissions	1. Factory gas emissions monitoring program
Surabaya BTKL	Potable water Mains water	1. Original ministry of health river	Ambient air Ambient noise	1. Regular monitoring on commission from the

	Water Quality		Air / Ambient Noise	
	Samples	Monitoring programs	Samples	Monitoring programs
	Ground water River / lake water Seawater Industrial effluent	monitoring program 2. PROKASIH-based monitoring program 3. Regular mineral water plant monitoring program 4. Regular factory effluent monitoring program		central and regional governments 2. Factory gas emissions monitoring program
Surabaya PU	River / lake water Industrial effluent Solid waste Leachate from waste treatment facilities	1. Regular provincial government monitoring program 2. PROKASIH-based monitoring program	—	—
North Sumatra BAPEDALDA	River water Industrial effluent	1. Monitoring of Deli River based on PROKASHI (measurements taken at 21 sites twice a year) 2. Factory effluent is measured under the regular monitoring plans of the factories and the BAPEDALDA monitoring plan	Ambient air Industrial emissions (no sampling)	Unscheduled

As the above table demonstrates, none of the labs have developed their own monitoring plans[29]. All perform sampling and analysis work in line with the monitoring programs formulated by government agencies, or are analyzing samples that have been taken by factories bound by PROKASIH agreements. It will likely be some time before the labs start to develop their own monitoring plans and present them to the government. In other words, the first step will be for the labs to develop as parent organizations, evaluating monitoring data and conducting research that leads to the creation of countermeasures, as opposed to merely performing monitoring work under commission. In this sense, a considerable number of researchers have been assigned to the Makassar BPPI lab and they are believed to have the potential to undertake original research. If possible, analysts at other laboratories should be given training to give them the perceptiveness of researchers and the skills to evaluate data that they have analyzed themselves.

The Surabaya BTKL is one lab that is performing relatively systematic measurements on the basis of a monitoring plan. According to its annual report, seven parameters, including SO_2, NOx, and O_3, are being analyzed at ten sites in Surabaya and compared against environmental

[29] Compiled from questionnaire responses and hearings held at each of the laboratories.

standards. The lab also took monthly measurements at seven sites on the Surabaya River between April and September 2002, comparing pH, BOD, COD and DO concentrations against the recommended standards. It performed similar monitoring on the Bengawan Solo River the same year. The Surabaya BTKL is also studying atmospheric pathogens at hospitals, the environmental health of vegetable patches, and heavy metal contamination in marine products as original monitoring activities.

The following environment improvement projects are either under investigation or have been newly launched by the South Sulawesi BAPEDALDA. The BAPEDALDA reports that it is measuring pollution in two rivers under PROKASIH, air pollution in three districts, and seawater pollution in two cities and two districts; specifically, studies into an environmental management plan for the Gulf of Bone (Teluk Bone) are about to begin in earnest. The East Java BAPEDALDA mentioned its environmental improvement project involving monitoring of the Brantas River, which is based on PROKASIH, and Super Kasih – an upgraded version of the PROKASIH program.
However, at the root of BAPEDALDA thinking lies the fact that it needs its own labs because it is not possible to adopt a consolidated approach that is directly linked to environmental administration if monitoring commissions are going to the labs owned by other ministries, and that it is impossible for the labs to fulfill their function if they remain decentralized. Although this thinking is correct in some respects, for the BAPEDALDA to rush headlong into owning its own labs carries some risks. These will be dealt with later.

2-5 Problems & Points to Consider
The following section classifies the problems facing the labs that were visited by this survey team and points requiring consideration when planning similar projects in the future.

(1) RMCD Project Equipment

1) When state-of-the-art equipment breaks down it is difficult to procure the necessary parts locally. The recipient country should be presented with the option of introducing equipment that is based on local O&M capabilities step-by-step and, if state-of-the-art equipment is to be introduced, made sufficiently aware of the potential difficulties in conducting maintenance, before the equipment to be covered by a Japanese ODA loan is selected.
2) Since highly-competent labs were handled the same way as labs with lower capabilities, the equipment at the latter is not being fully utilized. Equipment commensurate with capacity levels must be supplied, and the level and duration of training provided should also correspond to lab capabilities. To put it the other way round, rather than providing the same equipment across the board, it might be better to supply highly-competent labs with more sophisticated equipment, the GM-MS, for example.
3) In developing countries, reagents and consumables are comparatively expensive and difficult to get hold of. Added to which, the labs sometimes lack the necessary know-how to be self-supporting. Accordingly, recurrent costs, including those for ancillary equipment, need to be covered using project funds and JICA experts and senior volunteers deployed so as to facilitate smooth operations after the project is completed.
4) Cases like the Makassar PU must not be allowed to reoccur. The problems experienced this time were compounded by various background factors. In the first instance, ownership of the RMCD equipment was subject to highly complex arrangements: the now-defunct BAPEDAL had proprietary rights, which it awarded to three regional laboratories owned by government ministries. BAPEDAL was subsequently incorporated into the Ministry of Environment and with decentralization, equipment ownership was

transferred from the central government to the provincial governments; the situation was further complicated by another big change occurring at much the same time, i.e. the reorganization of the Ministry of Public Works, which was accompanied by the transfer of environmental labs to the provincial governments. But these changes would presumably have placed the PU labs in all provinces in the same position and Indonesia must conduct a thorough investigation to ascertain why only the Makassar PU lab had to be shut down. The survey team was unable to understand the fact that why even the KLH report on its assessment of regional laboratories makes no mention of the circumstances affecting the Makassar PU. With current management conditions, there is a risk that even if the equipment is overhauled it will only be usable for approximately one year, thus measures to address this situation need to be taken urgently.

(2) Equipment Maintenance

1) Analysts need to have a comprehensive understanding of analytical equipment for it to operate smoothly. If they don't then the equipment will become inoperable when minor problems occur. Analysts should be able to start with the basics, i.e. the routine checks that need to be performed before equipment is switched on and the procedures required after it is shut down, and as the next step, be able to pinpoint causes by troubleshooting. It is essential that the training for this be practical.
2) Minor repairs can be performed by analysts and this (skill) is particularly crucial in developing countries. For example, analysts need to master the techniques needed to dismantle, clean and reassemble parts, but the way forward will likely be found when they can tackle this task with devotion (or develop an attachment to the equipment). It would be beneficial if this type of training were to be included in projects. In this process, there are times when the replacement of parts becomes unavoidable. On earlier projects spare parts were not normally supplied in the early stages, but in consideration of the fact that it is extremely difficult for suppliers to deliver spare parts in developing countries, it may be necessary to expand the scope of initial supply components or to extend warranty periods (to around two years).
3) The causes of many problems are relatively easy to identify, but some breakdowns are extremely complex. There are occasions when such breakdowns are beyond the capabilities of local suppliers. By making direct contact with a service engineer at the manufacturers when such breakdowns occur it may be possible to pinpoint the cause or arrange for replacement parts to be sent rapidly. Analysts and service engineers need to make every effort possible to exchange information during the process of project implementation and contact should be maintained even after the engineers leave the country. If possible, lists of mail addresses for the service engineers should be posted in the laboratories. At the same time, the manufacturers should consider providing this sort of information.

(3) Training Approaches

1) The regional labs must progress from the start-up phase of RMCD equipment use to the growth phase. To get there, the labs have indicated that they wish to take various types of training; the fields mentioned by lab personnel are listed hereunder.
   - Routine maintenance, troubleshooting and calibration skills to enable the safe operation of analytical equipment
   - Operational techniques for mobile lab equipment and GC (agrichemicals, effluvium testing equipment)
   - Analysis techniques and specific sampling techniques for measuring air pollution
   - Analysis techniques for toxic substances, including heavy metals and PCBs

- Laboratory management and analysis accuracy management
- Developing analysis plans for the next 3-4 years
- Building internal data systems and data systems linking the labs with provincial and central government
- Pollution prevention techniques and cleaning technologies

2) The problem is that participating in this type of training involves considerable funds and the labs find it difficult to subsidize training costs within the framework of their own budgets. It goes without saying that efforts must be made by the Indonesian side, but the donor countries must also do everything in their power to help solve this problem. For example, where possible, the training programs provided using project funds should not just be started up but should incorporate up-grade training spanning a period of 2-3 years. Another option is to use ODA funds to invite competent instructors from Japan, etc., and provide special training courses using the EMC.
3) The major differences in the capabilities of regional laboratories must also be factored into training (programs). Where possible, the content and duration of training provided to low-level labs should be planned and implemented to correspond to the reality. Also, supplementary OJT would be beneficial at labs where training alone has its limitations, and one option could be for highly-experienced JICA experts or senior volunteers to travel round the regional labs spending a certain amount of time at each (to provide guidance). Where possible, plans incorporating such measures should be laid during the project implementation phase. To put it the other way round, highly-competent labs should be advised to dispatch personnel on training courses being held in Japan. JICA is currently setting up an analysis course; however, since the biggest problem in developing countries is tackling equipment breakdowns, it might also be necessary for them to develop training courses that focus on troubleshooting and maintenance.

(4) Accuracy Management

1) There are major differences in the capabilities of laboratories in developing countries and this links directly with the accuracy, or lack thereof, of lab operations. For the past two years the EMC has been taking a leading role in performing annual lab proficiency tests and these have been highly beneficial. Using the results of these tests, the labs that perform badly should be advised to conduct their own investigations into the causes and to draw up plans for improvement. Moreover, since this type of comparative testing can be performed internally, the lab managers should take the initiative in planning and implementing this type of activity, and use the plan-do-check-action cycle to improve management and accuracy at the labs.
2) Among the labs visited this time, the Makassar BPPI has already acquired KAN ISO17025 certification. Most of the other labs are involved in efforts to improve management practices and other activities geared towards being accredited this year or the year after. The companies that commission analysis tend to select accredited laboratories and this trend is likely to become more pronounced in the future; a highly desirable development in that it will help to bring about improvements in accuracy management at the labs. Management practices at the already accredited Makassar BPPI and the Surabaya BTKL, which is expected to be accredited this year, have reached a considerably high level, and should thus be exceptionally good models for the many labs attempting to acquire certification. In this sense, the authorities in Indonesia should recommend that labs share information as a means of improving lab management and analysis techniques.

(5) Labs are Research Oriented: Increase Information Exchange

Prefectural laboratories in Japan conduct research into the state of the environment, the causes of environmental problems and other matters in parallel with their routine monitoring operations. The results of this research are conveyed to government agencies and are frequently put to use in environmental administration. Indonesia's EMC is moving slowly in this direction but the regional labs still have a long way to go in this respect and have not yet reached the level at which they can present research results to the government and have them reflected in policy.

Among the labs visited by our survey team, the Makassar BPPI has employed researchers in addition to analysts and these employees are in a position to analyze monitoring data. There was not enough time to ask about the specific content of their research, but since the lab appears to have around ten environmental researchers on its payroll it should be capable of undertaking some significant research. The Surabaya BTKL has set up a Research and Training section. The lab has yet to recruit any researchers, but if analysts are given training to guide them towards using research-based approache, even if the process is gradual, it will create promising conditions for the production of some form of research results. A look at the monitoring data contained in the BTKL annual report demonstrates that the groundwork for this has already begun to take shape. Incidentally, to boost the level of the labs it would be well for analyst training to include a range of topics, such as environmental management and monitoring planning techniques, as opposed to focusing exclusively on analysis techniques.

In Japan, researchers from around the country meet at periodic intervals to report on the results of their research, exchanging information and learning at the same time. Researchers from the prefectural laboratories also participate as key members in these gatherings. Similar meetings are being held in Indonesia, but the participation of analysts from the regional labs does not appear to have gained currency at the present time. Even if this state of affairs cannot be achieved, the inter-lab exchanges of information that we heard are being practiced in South Sulawesi should be encouraged in other provinces as well.

In addition, information must also be shared between the labs and government agencies. According to the results of the KLH assessment of regional laboratories, no discussions are taking place between the labs and BAPEDALDA concerning monitoring data. At the labs visited by our team there appeared to be an atmosphere of mutual standoff between the two parties stemming in part from the vertical administrative structure and in part from the removal of RMCD equipment, which is occurring with the establishment of BAPEDALDA labs.

(6) Setting up BAPEDALDA Laboratories

Throughout the 60s and 70s, the prefectural governments were at the forefront of action to tackle the serious pollution problems confronting Japan at the time. For citizens, the victims, and companies, the perpetrators, to be able to deal with the problems dispassionately it is necessary to procure accurate scientific data. Initially, the health departments handled environmental administration, but there were already environmental health laboratories with sufficient technologies and experience to undertake environmental monitoring. Even after the environmental health departments became independent they did not immediately set about establishing laboratories, but in many prefectures operated as environment and health labs, spanning both departments, for a considerable length of time. Many prefectural governments made environmental research departments independent after they had developed to a sufficient extent within the environment and health labs, at which point they established environmental laboratories.

The fact that the prefectural governments did not initially establish independent environmental labs but started out as environment and health laboratories may well have been dictated by circumstances at the time, but it was ultimately the best way forward. This is

because much of the knowledge, technology and analytical methodology is common to both fields and accordingly existing personnel could be used to perform the environmental analysis. If independent environmental laboratories had been set up it would have been necessary to divide health technicians between the two laboratories, there would have been problems in that developing human resources takes time, and it might not have been possible for the governments to respond swiftly to the pollution problems.

It was fortuitous for Japan not to have labs combined from the departments of environment and health but to have been able to operate the institutions and functions of the labs involved in environmental monitoring under circumstances that were little different than if they had been under the direct jurisdiction of the department of the environment.

Indonesia is moving towards setting up labs under direct BAPEDALDA authority and among the labs visited during this survey, the North Sumatra BAPEDALDA lab has already been established, the South Sulawesi BAPEDALDA lab is under construction and scheduled for completion in November this year, and in East Java, although the lab is only at the F/S stage, the project is being advanced with great enthusiasm. Having labs under direct BAPEDALDA control is critical to promoting scientific and rational environmental administration and the direction of current trends is considered to be appropriate.

That stated, the problem lies in the methodology. It is easy to remove the equipment provided through the RMCD from the three provincial laboratories and transfer it to the new BAPEDALDA labs, but the operating systems cannot be built overnight. For this, personnel are the decisive factor, thus if the analysts, who are at the core of operations at the existing labs, can be recruited to work at the BAPEDALDA labs then it should be possible to establish operating systems within a relatively short timeframe. However, existing labs have their rutine works and recruiting the human resources with high capacity may be difficult. North Sumatra is facing major personnel problems, and it will likely take considerable time for the BAPEDALDA lab to develop into a reliable facility (in the class of the Surabaya BTKL or the Makassar BPPI).

Conditions differ in Indonesia and Japan and it is probably not possible to transfer Japan's experiences unabridged, but it might be helpful to reference Japan's experiences and operate the environmental labs collectively, placing one of the existing labs at the center. The Surabaya BTKL equates to an environmental health lab in Japan and is a top-class facility both in terms of competence and scale; it would thus be the ideal counterpart (candidate) for the collective operation of the environmental labs. The East Java BAPEDALDA is currently fixated on establishing its own laboratory, but it might do well to investigate setting up an environment and health laboratory to be operated in conjunction with the BTKL. The problem is that the BTKL lab is still owned by the Ministry of Health, thus the East Java BAPEDALDA would do well to consider making aggressive overtures to the ministry regarding the transfer of the BTKL to the provincial government.

Chapter 3: Monitoring Data & Utilization of Analysis Results (= Project Impacts)

3-1 Improvements in Monitoring Capabilities of Regional Laboratories and Contributions to Accreditation

The most significant impact of this project lies in the fact that the equipment that was introduced has enabled regional laboratories to measure environmental data in various new fields, including factory gas emissions, air movement, agrichemicals, oil content and so on. The various testing equipment that was supplied through the RMCD project represent pivotal resources in promoting lab efforts to acquire certification from KAN – the Accreditation Body of Indonesia. Not being accredited constrains the labs' potential to obtain commissions for analysis from companies, which means that if provincial governments establish independent environmental regulations based on the KLH guidelines that were discussed in 1-(4)-2, then the volume of analysis commissions will increase and the labs can become financially independent organizations. The North Sumatra lab, for example, is in the process of compiling the necessary documentation in preparation for accreditation, which it intends to submit to KAN by February 2004[30]. As this demonstrates, the monitoring equipment that was supplied using Japan's ODA loan is proving crucial to the accreditation process. Added to which, not only is it contributing to improvements in lab finances, but the increased scope of environmental data measurements and improvements in accuracy affected by this project have the potential to improve the accuracy of environmental monitoring in regional Indonesia, facilitate the implementation of environmental policy, and even lead to the development of new environmental policies. However, if these goals are to be achieved the following improvements must be made to the system for sharing data.

3-2 Monitoring Data Sharing System & Public Disclosure

(1) One of the points that emerged from the hearings that were held at the various labs is that: "The measurement data and the results from its analysis are not currently being shared to a sufficient extent with BAPEDALDA and KLH." During the current survey it became clear that although labs are reporting measurement results to BAPEDALDA when the requests come from this agency, they are not reporting the results of measurements undertaken for other clients (businesses, etc.) because of the legal requirement to maintain the confidentiality of this information. The Makassar BLK and the Surabaya PU submit data measurement results to BAPEDALDA every three months but no discussions are taking place with BAPEDALDA officials on these data. Meanwhile, the BAPEDALDA are focused on setting up independent laboratories and do not appear to realize the necessity of coordinating with several labs in connection with measurement data. Evidently no progress has been made on the sharing of measurement data between the Ministry of Environment, BAPEDALDA and the labs.

(2) Data sharing is essential for resolving problems and in policy discussions among related parties, and it is thus hoped that further improvements will be made in this area. In this sense, it is hoped that complementary relationships can be established between the system for

[30] In North Sumatra, if the lab is accredited then the governor intends to designate the BAPEDALDA lab and advise factories, etc., in the province to use the lab for sample analysis. At this time, BAPEDALDA has identified and is monitoring 40 specific factories; it sends questionnaires, and undertakes sampling if it receives no response, but if the BAPEDALDA environmental lab is accredited, it can then request the more than 1,000 companies (small and medium-sized steel manufacturers, cooking oil, hospitals, hotels, etc.) that it has already listed up to use the lab for their sampling analysis needs. If the BAPEDALDA lab receives analysis commissions from one third of these companies the revenue therefrom will be no more than around 5 percent of current lab expenses, but if that figure climbs to around 50 percent it will strengthen the lab's fiscal base and is expected to enable the lab to conduct independent research.

pooling data collected from automatic air quality measurement centers in 42 cities in 10 provinces nationwide at the Ministry of Environment, which was introduced in 2002 with funding from the Australian government, the JICA regional environment management building project that includes the creation of a system for transmitting data from Environmental Management Centers (EMC) in 33 provinces, and the environmental impact data management system (scheduled for completion in February 2004) being established with the support of the Asian Development Bank (ADB) that will consolidate environmental databases (inter-regional satellite transmissions of data) throughout the nation.

(3) The potential for utilizing a database of environmental monitoring data will depend on the extent to which the data are disclosed to and disseminated among the public. According to our hearing with the KLH Deputy VII, KLH is compiling its first "State of Environment Report", and plans to distribute 3,000 copies to district governors (kabupaten) and municipal mayors (bupati), provincial governors, the mass media, and multi-bilateral aid organizations; the draft report is complete. This information is available to the public in Indonesian via the KLH website (www.menlh.go.id). Meanwhile, in North Sumatra monitoring data was presented at a meeting held to discuss measures in the fight against air pollution with NGOs, district governors and universities in August 2003. Again, provincial data was also presented at a JICA seminar held in the summer of 2003 to evaluate the environmental center. If, in addition to the data sharing outlined in (2) above, further progress can be made on the disclosure and sharing of data in the public arena, it can be expected to further enhance the effects of this project.

3-3 Impact on Environmental Policy & Case Examples of Monitoring

The labs were asked to produce specific examples of how monitoring results are being utilized and reflected in the development of environmental policy. However, from the labs' perspective, there were no examples of monitoring results being used in this way. (That stated, in North Sumatra a new environmental lab has been set up at the province's BAPEDALDA and the equipment supplied through this project centralized there, which means that test results from the labs are being shared with BAPEDALDA and are even being reflected in the work of preparing the draft of independent environmental regulations that is currently under development in the province.)

By way of example, the only case of coordination between a lab and BAPEDALDA concerning monitoring data (among the labs covered by our survey) reported in the KLH assessment of regional laboratories, involved the data requested by the East Java BAPEDALDA from the Surabaya PU lab. Nevertheless, the chief of the Surabaya PU lab said that he considers it unlikely that the results of measurements of river water, solid waste and leachate will be reflected in environmental policy.

The Surabaya BTKL is one lab that is performing relatively systematic measurements on the basis of a monitoring plan. According to its annual report, seven parameters, including SO_2, NOx, and O_3, are being analyzed at ten sites in Surabaya and compared against environmental standards. The lab also took monthly measurements at seven sites on the Surabaya River between April and September 2002, comparing pH, BOD, COD and DO concentrations against the recommended standards. It performed similar monitoring on the Bengawan Solo River the same year. The Surabaya BTKL is also studying atmospheric pathogens at hospitals, the environmental health of vegetable patches, and heavy metal contamination in marine products as original monitoring activities.

3-4 Micro & Macro Effects of the Project

(1) From hearings conducted at the labs it was learned that, at the micro level, the use of

measurement data in environmental policy and administration has contributed to a more direct, site-oriented resolution of pollution problems by: (1) identifying the causes of pollution being generated by power producers and steel corporations, and contributing to improvements in the local environment; (2) ascertaining the causes of pollution from effluent being discharged by industrial estates, which led to companies receiving administrative guidance; (3) enabling analysis and appraisal to be performed rapidly in the event of an abnormality or emergency through the accumulation of environmental monitoring data; and (4) resolving individual environmental problems in response to complaints from local communities.

(2) At the macro level, measurement results have been used at seminars given by BAPEDALDA and the Ministry of Environment designed to increase the environmental awareness of local governments, etc., in presidential addresses on water conservation in reservoir areas, in reports to parliament, and in the creation of Indonesia's first environmental white paper (State of Environment Report, the draft of which had been completed, in Indonesia, in August 2003), and the project is evaluated as having been of some effect in increasing public awareness of environmental issues.

That stated, however, just two years have elapsed since the project was completed and environmental data began to be measured in earnest, added to which, Indonesia's environmental monitoring plans are only expected to achieve critical mass hereafter, thus a complete assessment of the project's impact on environmental policy may be premature at this time point.

(3) During hearings conducted locally, the labs cited the following as being promising fields for future activity. How the labs and BAPEDALDA handle these fields will be the challenge for the future, but those with the potential to promote the effects of the RMCD project are given as examples hereunder.

1. The municipal government is to cooperate in an epidemiologic study that is to be conducted in North Sumatra due to a suspicion of cadmium and mercury poisoning on the west side of Lake Toba (Danau Toba) where residents have complained of being unable to move their arms, as it is necessary to survey conditions, such as where the patients live, what water they are drinking and so forth. The province's environmental laboratory is expected to contribute to this study.
2. Capacity development for the testing and analysis of pesticides used in vegetables, etc., which are increasingly being exported to Japan, and of food inspection laboratories.
3. Human resource development (Training for municipal government staff. Results are already being produced at the North Sumatra environmental lab.)
4. Development of effluent and air pollution prevention processes, etc.
5. Initiatives on new issues, such as how best to handle the forthcoming issue of sales of emissions quotas to industrialized nations.

3-5 Monitoring Plans

Under the terms of their contracts, in 1999, the consultants employed on this project compiled a country-level environmental monitoring plan, which was presented to the environmental management agency (BAPEDAL) at that time; however, no further progress has been made due to BAPEDAL's incorporation into the Ministry of Environment and the effects of the decentralization policies. By rights, KLH is in a position to reflect environmental monitoring data in policy and to petition the regions for the data necessary to its formulation. In 2003, for example, KLH allocated funds to the provincial BAPEDALDA to cover the expenses of

monitoring and reporting on 1-2 rivers. However, at the hearing held at the EMC it was pointed out that environmental management goals have not been clarified at many regional environmental impact assessment agencies (BAPEDALDA) and KLH has in fact also yet to ascertain what additions have been made to regulatory standards in the regions. Such problems are considered to represent one of the negative effects of growing regional autonomy, and the belief that decentralization has made it more difficult for KLH to collect data and that, as stated in 3-2 above, communications between the regions and the ministry are not necessarily satisfactory, were underscored by this survey.

However, as was discussed in 1-(4)-2, if the guidelines on minimum standards (SPM) for water, air and household waste to be maintained by the provincial governments, currently being developed by KLH, are implemented then monitoring involving both regional and central governments will become a reality. The implementation status of these guidelines is being closely monitored. If they can be implemented without hitch, then demand for analysis at environmental laboratories should increase and it should become possible for the impacts of this project to be produced more consistently.

Chapter 4: Conclusions, Lessons Learned, Recommendations

(1) Project positioning and the key to heightening its impact

After this project got underway there were major changes in the surrounding environment: BAPEDAL was incorporated into the Ministry of Environment, the Ministry of Public Works was reorganized, and the decentralization policies introduced; however, capacity development of regional labs was in line with the new trend towards decentralization, and this project, which introduced environmental monitoring equipment at regional labs, can, in one sense, be said to have preempted and prepared the ground to support the tide of decentralization in the field of environmental conservation.

The primary impact of this project on environmental administration in Indonesia lies in the fact that the equipment procured has enabled environmental data to be measured in a number of new fields, including factory gas emissions, air movement and pesticides. With the exclusion of the Makassar PU lab, which was shut down, all procured equipment is being put to adequate or basic use. However, other labs (besides the Makassar PU) are calling for additional training and parts supplies for some of their equipment, and there is room for improvement in terms of the long-term sustainability of the laboratories that were covered by the RMCD project.

The impacts of the project on environmental policy and administration are already being generated at the micro level through contributions to the resolution of individual pollution problems in the regions and so forth; some effects are also being recognized at the macro level in that environmental data are being incorporated into the work of developing Indonesia's first environmental white paper; and it is likely that promoting the sharing of measurement results between central / regional governments and the labs and the public disclosure of this information will further enhance the effects of the RMCD project. That stated, however, just two years have elapsed since environmental data began to be measured in earnest; added to which, Indonesia's environmental monitoring plans are only expected to achieve critical mass hereafter; thus a complete assessment of the project's impact on environmental policy may be premature at this time point.

In order for project impacts to continue to be generated and for the environmental laboratories to be able to operate sustainably, both in technical and financial terms: (1) central and regional governments must establish appropriate environmental policy (quality standards, penal regulations) and implement them (… both central and regional governments responding on the basis of the guidelines, etc., currently being developed by the Ministry of Environment); (2) there must be a constant flow of requests for analysis from government and the private sector in line with these environmental policies; (3) the labs must be able to secure personnel and provide them with training; and (4) it must be possible for the labs to obtain smooth supplies of reagents and spare parts. With regard to (1), the development and implementation of appropriate environmental policy, particularly at the provincial level (the introduction of additional environmental standards and penal regulations at the provincial level), is the most pressing task for the future. The strengthening of this system will lead to (2) ongoing increases in analysis requests from the private sector, (3) the securing and training lab staff, and (4) ensuring a smooth supply of reagents and spare parts. This will also contribute to sustainable environmental monitoring and to greater efficiency in environmental administration.

(2) Lessons Learned

[Lessons learned in connection with Japan's efforts]
1) During the current survey it became clear that it is sometimes difficult to obtain continuous / smooth supplies of reagents and spare parts in the regions. When taking on similar projects in the future, it is hoped that surveys exploring the feasibility of procuring reagents / spare parts in the recipient country will be undertaken with a view to ensuring the sustainability of project effects. Should this prove problematic, it would be worth investigating including the provision of a post-completion support system in the terms of bid contracts at the equipment bidding stage.
2) When state-of-the-art equipment breaks down it is difficult to procure the necessary parts locally. The recipient country should be presented with the option of introducing equipment that is based on local O&M capabilities step-by-step and, if state-of-the-art equipment is to be introduced, made sufficiently aware of the potential difficulties in conducting maintenance, before the equipment to be funded using a Japanese ODA loan is selected.

[Lessons learned in connection with Indonesia's efforts]
1) Efforts, such as the guidelines currently being developed by the Ministry of Environment, are being made, but enforcing environmental standards and the use of penalties is essential to improving environmental monitoring. This can be expected to increase private-sector commissions for analysis and to improve lab finances, which will in turn contribute to sustainable environmental monitoring and to greater efficiency in environmental administration.
2) In order to avoid the emergence of cases like that of the Makassar (PU) lab, which was closed as the result of ministerial reform at the central government level, adequate communication and coordination among the various central and regional government agencies must be affected.

(3) Recommendations
[Recommendations relating to Japan's efforts]
1) Financing recurrent costs and policy on ODA funding to Indonesia
Supporting recurrent costs is recommended as a method of accomplishing both an emphasis on independent efforts and the smooth operation of the project after its completion. In short, we recommend the introduction of a system under which the funding provided to cover recurrent costs serves to reduce the amount of new aid granted to Indonesia. Under this type of system, the funding of recurrent costs will strengthen the smooth operation of completed projects, and since the more Indonesia receives such aid the less new funding it will require, the system has the potential to strengthen efforts to ensure sustainability, including cost recovery policies, throughout Indonesia.
2) Supporting operational management post-completion using JICA experts and senior volunteers
Managing operations at the labs after their completion requires specialist knowledge of various types of equipment, thus it would be worth exploring the establishment of a system that involves positioning several experts in Jakarta who could then tour the regional laboratories. It is also necessary to develop training courses that focus on troubleshooting and maintenance.
3) Promoting tie-ups between assistance schemes and donors
This project and the JICA regional environment management building project are interrelated, thus further increasing the exchange of information and links between the two projects beyond current levels has the potential to improve environmental monitoring in Indonesia. In addition, the environmental monitoring data collection work that is being undertaken using satellites via ADB's BAPEDAL Regional Network Project, has a potentially beneficial role to

play in facilitating Japan's efforts to improve environmental monitoring through loans and technical assistance. Henceforth, it is hoped that efforts will be made to promote information-sharing between ADB and Japan, while respecting initiatives made in Indonesia, so as to facilitate the synergies between the two projects.

[Recommendations relating to Indonesia's efforts]
1) The fact that no national environmental monitoring plans have been developed to date represents a major problem. Monitoring plans based on the guidelines that are currently being drawn up by the Ministry of Environment need to be developed at the national and regional level. It is also important that environmental monitoring data be shared by the ministry, BAPEDALDA, and the labs, and that a system be established to facilitate increased use of the environmental policy development, implementation and evaluation processes by both central and regional governments.
2) Having labs under the direct control of the Regional Environmental Management Agency (BAPEDALDA) is a good thing, but since it takes time to train personnel, it would be worth investigating ways of making cooperative and effective use of the personnel at existing labs, such as Japan's environmental health laboratories, which have rudimentary experience in overcoming pollution.
3) There are many varieties of environmental analysis equipment parts, but since individual labs require such parts in relatively small quantities, labs, particularly those located in remote areas, experience difficulties obtaining a continuous supply when the parts have to be procured from separate companies. In order to remove bottlenecks of this nature, it is necessary to nurture local distributors capable of operating in a small radius, and in this sense, the thorough application of environmental standards and penalties at both central and regional levels is also important to fostering related industries.
4) With regard to the equipment that has been left in poor condition at the Makassar PU lab, the South Sulawesi BAPEDALDA must negotiate with related organizations and institute the necessary measures, including overhauls, at the earliest possible time.

[Outline of Feedback Seminar]

Date: March 15-19, 2004
Participants: Representatives from BAPPENAS, South Kalimantan Environment Agency, North Sumatra Environment Agency

In March 2004 the survey team held discussions with (representatives from) the National Development Planning Agency (BAPPENAS), the Ministry of Environment (KLH), South Sulawesi BAPEDALDA and North Sumatra BAPEDALDA regarding the results of this survey and confirmed the following.

1. The analytical equipment belonging to the Makassar PU, which was unused, and some of the analytical equipment belonging to the BPPI lab had been transferred to the BAPEDALDA laboratory as of August 2003. Further, in line with the recommendations made in this report, some of the staff from the PU lab has been employed by the BAPEDALDA laboratory, employees from the BPPI and BLK labs have been disptached on temporary contracts, and various efforts are being made to resolve the staff shortages at BAPEDALDA using the staff from existing labs and their know-how. (However, the decision to assign staff from the BPPI and BLK labs on fixed-term contracts was made on the basis of an annual government announcement and it has yet to be confirmed whether the assignments will continue in the current fiscal year).

2. Regarding the SPM guidelines that were expected to be implemented in 2003, neither the Presidential Decree nor the Minster of Environment Decree have been issued due to holdups in coordination between KLH and the Ministry of Home Affairs at the central government level. The Medan and Makassar BAPEDALDA, and staff at the labs were completely unaware of the SPM guidelines, and the opinion is that more time will be needed before for the SPM guidelines can be developed at the central government level and for additional standards to be formulated / implemented at the regional level.