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**DESIGN OF A POPULATION AND ENVIRONMENT
INFORMATION MANAGEMENT SYSTEM
FOR INDONESIA**

**A Study of Information Needs and a
Proposed System for Meeting Them**

**James J. Tarrant
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September, 1983**

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DESIGN OF A POPULATION AND ENVIRONMENT INFORMATION
MANAGEMENT SYSTEM FOR INDONESIA

A Study of the Information Needs and a Proposed
System for Meeting Those Needs for the Government
of Indonesia

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Preliminary Report of the Study Mission to Indonesia

Prepared for:

GOVERNMENT OF INDONESIA, MINISTRY OF POPULATION AND THE
ENVIRONMENT
AND
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

Preface

The task of helping the Ministry of Population and the Environment of the Government of Indonesia design a practical information management system has been a challenging and fascinating task. Given the size of the task and limited amount of time available, we hope that we have at least made a contribution to what must be a gradual and evolving effort.

We would like to thank those individuals in the various agencies and institutions with whom we visited for their ideas and comments, as well as the members of the Environmental Sector Review Team who also made a number of useful suggestions. We would especially like to thank the following people for their large contribution to this effort: Dr. Alwi Dahlan, Assistant Minister III at the Ministry for his direction and insights, Dr. Harry Harsono Amir for his long hours, hard work and valuable insights and suggestions as the key member of the design team, and also to the other members of the design team for their help. To Mr. Will Knowland, USAID Regional Environmental Advisor for Asia, who organized the whole effort, worked closely with the team throughout the study and provided many ideas and comments, a special thanks is given.

James J. Tarrant
Dr Kenneth L. Reed

Jakarta
21 September 1983

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Glossary of Abbreviations and Acronyms

Organizations

MKLH	Menteri Kependudukan dan Lingkungan Hidup/ Ministry of Population and the Environment, Jakarta
IIED	International Institute for Environment and Development
IUCN	International Union for the Conservation of Nature and Natural Resources
LIPI	Lembaga Ilmu Pengetahuan Indonesia/Indonesian Institute of Sciences, Jakarta
PDIN	Pusat Dokumentasi Ilmiah Nasional/National Scientific Documentation Center, Jakarta
DPMA	Direktorat Penyelidikan Masalah Air/Directorate of Water Issues Research, Bandung
LON	Lembaga Oceanografi Nasional/National Oceanographic Institute
BKKBN	Badan Kordinasi Keluarga Berencana Nasional/National Family Planning Coordinating Board, Jakarta
LP3ES	Lembaga Penelitian, Penedidikan dan Pengetahuan Ekonomi Sosial/Institute of Research Education and Social Economic Sciences, Jakarta
CSIS	Center for Strategic and International Studies, Jakarta
LPPM	Lembaga Pembinaan Pendidikan Managemen/Institute for Management Education Development, Jakarta
LAN	Lembaga Administrasi Nasional/National Administration Institute, Jakarta
ADB	Asian Development Bank, Manila
PSL	Pusat Studi Lingkungan/Environmental Study Center
USAID	U.S. Agency for International Development
BAKOSURTANAL	Badan Kordinasi Survai dan Pemetaan Nasional/ National Survey and Mapping Coordinating Board, Cibinong
BPS	Biro Pusat Statistik/Central Bureau of Statistics, Jakarta
AARD	Agricultural Research and Development Agency (Ministry of Agriculture)
LPT	Lembaga Penelitian Tanah/Soils Research Institute, Bogor
BKLN	Biro Bina Kependudukan dan Lingshungan Hidup/Bureau for Supervision of Population and the Environment
PEMDA	Pemerintah Daerah/Regional Government (Province and Regency)
BAPPEDA	Badan Perencanaan Pembangunan Daerah/Regional Development Planning Board (Provincial and Regency)

Others

ORNOP	Organisasi Non Pemerintah/Non-Governmental Organization
ANDAL	Analisa Dampak Lingkungan/Environmental Impact Analysis

REPELITA	Rencana Pembangunan Lima Tahun/Five Year Development Plan
GBHN	Garis Besar Haluan Negara/Basic Guidelines of State Policy
Kepres dinas	Keputusan Presiden/Presidential Decision Regional government office of a line agency; responsible to governor
kanwil	kantor wilayah/regional line agency office; reports to Jarkarta
litbang	balai penelitian dan pembangunan/R&D Center of line agency in a region (especially Industry, Public Works, Agriculture, etc.)
Asmen	Asisten Menteri/Assistant Minister
Drs./Dra.	Doktorandus (a). Academic titles (male/female respectively) conferred upon university first degree graduates in Arts and Sciences, but not Applied Sciences and Engineering

1. Introduction

1.1 Background and Terms of Reference

Since its establishment in 1978, the State Ministry of Population and the Environment (MKLH) has been concerned with the need to develop an adequate environmental information management system. Owing to the nature of the Ministry, which is essentially that of a coordinating and oversight body, with few, formal, line agency powers, MKLH has had to rely primarily on persuasion as well as policy and program evaluations provided to the Cabinet and other decision-making fora in its task of environmental management [1]. For this reason, a properly functioning information management system is clearly essential if the Ministry is to become an effective and credible body.

With the re-orientation of the mandate of MKLH in 1983, in order to include oversight and management of population activities along with the task of defining and assessing the impact of the interactions between population, natural resources and the environment, the Ministry's information needs have expanded greatly. Finally, the Ministry is playing an increasingly large role in helping to shape a national strategy for long-term, sustainable development. This is specifically aimed at the quality of life and the nature of society in the year 2000 as well as the requirements for reaching the "take-off" stage of growth and development, beginning during the Sixth Five-Year Plan (REPELITA VI, [1994-1999]).

For a country as large and as varied as Indonesia, such a mandate constitutes a very difficult policy management task. In fact, MKLH has neither the staff nor the budgetary resources to tackle, by itself, all the issues related to its mandate, even if it were permitted to do so. Realistically, it has set its sights on monitoring and evaluating the activities of other institutions, public and private. It has already shown that it can play an effective coordinating role in crisis management, at times, though it has not been able to do so, systematically. Thus, the Ministry is concerned with enhancing the effectiveness of this coordination and policy management role, during the next five years, including enhancing the ability of its information management.

Shortly after the inauguration of the new Cabinet in April 1983, MKLH and USAID officials began discussions on an assessment of the environmental situation in Indonesia as an input to planning for the Fourth Five Year Plan (REPELITA IV, 1984-89). The

[1] See references 13, 20, 24. From 1978 until 1983, MKLH was known as the State Ministry for Development Supervision and the Environment, or PPLH. The role of the Ministry was formally set out in "Basic Legislation on Environmental Management", Act No. 4 (1982), especially in Article 18 and Elucidations.

Ministry requested the assistance of a few foreign consultants to review the Ministry's plans for such an assessment and help design an environmental profile format [2]. Hence, the Terms of Reference for the AID-funded assistance on an Indonesian country environmental profile were aimed at the design of a "Phase II" profile such as have been done for several other USAID-assisted countries (e.g. Bolivia, Dominican Republic and the Philippines).

Under the aegis of the Joint Environmental Service, a cooperative effort of the International Institute for Environment and Development (IIED) and the International Union for the Conservation of Nature and Natural Resources (IUCN), a two-man team was assembled to work with MKLH during August and early September on the design of a Phase II profile, with USAID funding.

When the team began its work with MKLH, it became apparent that what the Ministry wanted and needed, actually, was the design for an environment and population information management system, one of the outputs of which could include an environmental profile. After an initial review of the information situation at MKLH, the team concurred with the changed emphasis of the assignment. Nevertheless, this report will also include some recommendations on the design of an environmental profile as well as other possible products of the proposed environment and population information management system (EPIMS).

The Terms of Reference for the IIED team's assignment, including objectives, tasks and team members as well as the counterpart team, are attached to this Report as Appendix 1.1.

1.2 Execution of the Study

The first two weeks of the study were spent in reviewing the Ministry's information sources and output, including a detailed review of the "Draft 1983 Environmental Quality Report" (in Bahasa Indonesia). At the same time, a series of discussions were held with various members of the section of MKLH dealing with environmental information and liaison, i.e., Assistant Minister III and staff (ASMEN III). This division has been the principal MKLH counterpart for the IIED team. Discussions were also held with members of the Environmental Sector Review Team, which is carrying out a study of selected environmental issue areas for MKLH over a six-month period (May-November 1983), as well as discussions with the USAID Regional Environmental Advisor for Asia [3].

[2] Until now, neither a Phase I nor a Phase II environmental profile has been carried out for Indonesia. Robert Goodland's paper on environmental management and nature conservation in Indonesia has been available and been considered adequate as a Phase I profile. See reference 7.

[3] Current review and analysis studies on population and the environment are briefly described in Appendix 1.2.

The second two weeks of the Mission were divided between working with ASMEN III staff and visits to government and non-government institutions working in the environmental field. The purpose of these visits was to assess the information resources available to the Ministry and the relationship of these institutions to MKLH. The list of organizations visited was determined jointly by the ASMEN III team and the IIED team. The list of organizations and individuals visited can be found in Appendix 1.3.

Owing to the brevity of the assignment and the very large number of organizations working in different aspects of population and the environment, it was not possible to undertake a comprehensive review of the agencies and institutions connected with population and environment matters. At best, a sample of the various kinds of institutions was drawn up and visited.

The IIED team, itself, had complementary tasks for this assignment. Dr Kenneth L. Reed, working from 18 August to 4 September, concentrated his efforts on the design of a computer-based, information management system design. Mr James J. Tarrant, working from 10 August to 20 September, investigated sources of information, institutional relationships and potential products of the information system. Both team members' reports have been combined in an analysis of information needs and a design for meeting those needs.

2. Present Capabilities and Needs for Population and Environmental Information in Indonesia

2.1 The Current Level of Effort in Population and Environmental Information Management

Presently, a large amount of data and information relating to population and environment issues are being generated in Indonesia. Governmental agencies are the largest aggregate source of such information followed by public and private universities along with special research and public education groups. A modest amount of information is available from the domestic private sector. Finally, there is a substantial amount of information generated by foreign consultants, usually working within Government agencies, state enterprises and projects; international organization and bilateral donor-sponsored surveys and assessments and information from foreign, private enterprise feasibility and operating studies.

The Ministry of Population and Environment is responsible for identifying and coordinating the management of these sources of information. However, the requirements for fulfilling this mandate are far too great compared with the resources which MKLH currently possesses or to which it has ready access. This is particularly the case given the nature of the de facto information management system operating at the Ministry.

When MKLH was established in 1978 as part of the Development Cabinet of the third Five Year Plan, it had almost no staff and a tiny budget. The State Minister immediately set about developing a network of university experts, public education and community activists, along with liaisons with line departments at the national level. Later, regional supervisory offices for population and environment were created for every province (most but not all are actually functioning). Finally, the Ministry has developed various ad hoc relationships with a number of domestic agencies and foreign organizations whenever these have proved useful.

It is important to stress the "network" character of these relationships, since MKLH's only directly-controlled staff is its own small group within the Ministry itself, although it has an indirect level of control over staff in other organizations, notably the environmental study centers through its limited project budget (4). The extent and quality of information flow from these various agencies and institutions to MKLH and back again varies quite significantly, but is generally at least potentially important for all of the institutions concerned.

This is because the inter-related issues of population and resource management are central to Indonesia's development effort, a fact which the Government realizes and which is

(4) See Appendix 2 for details of MKLH's staff, and support network.

reflected in the State Guidelines on National Development, (GBHN). Figure 1 provides an illustration of the extent of the Ministry's information network, the nature of the institutional links and the kinds of information which the Ministry receives.

The point to be stressed is that the effectiveness of these relationships - even where formalized by surat keputusan (formal decision letters) are largely dependent upon the initiative and cooperation of the information providers and users and the budgetary and expertise resources available to both. For a number of reasons, the extent, regularity and quality of the information flow varies widely at the present time. Since the Ministry is in a state of transition, especially in the development of its population management capability, a complete assessment of its situation and progress is difficult to make at this time. Finally, it should be noted that MKLH is not a line agency with extensive program and regulatory powers of its own. "State ministries" must work through cooperation with line agencies and regional government. MKLH is primarily entrusted with the coordination and management of the population and environment activities of other government agencies and the supervision of private and community-based activities. In other words, it can only be as effective as its cooperating institutions enable it to be. This structural arrangement is an important inherent limitation on its capability to design its own monitoring and evaluation programs or to directly intervene "in the field".

With the above in mind, it is worth summarizing the main issues relating to the management of environmental and population information in the Indonesian context. It should be noted that these problems are by no means unique to the MKLH. Virtually every agency experiences some of these problems (5). In the case of MKLH, the impact may be more critical because of the wide subject matter scope of its mandate and the limited resources which it can bring to bear on the problem.

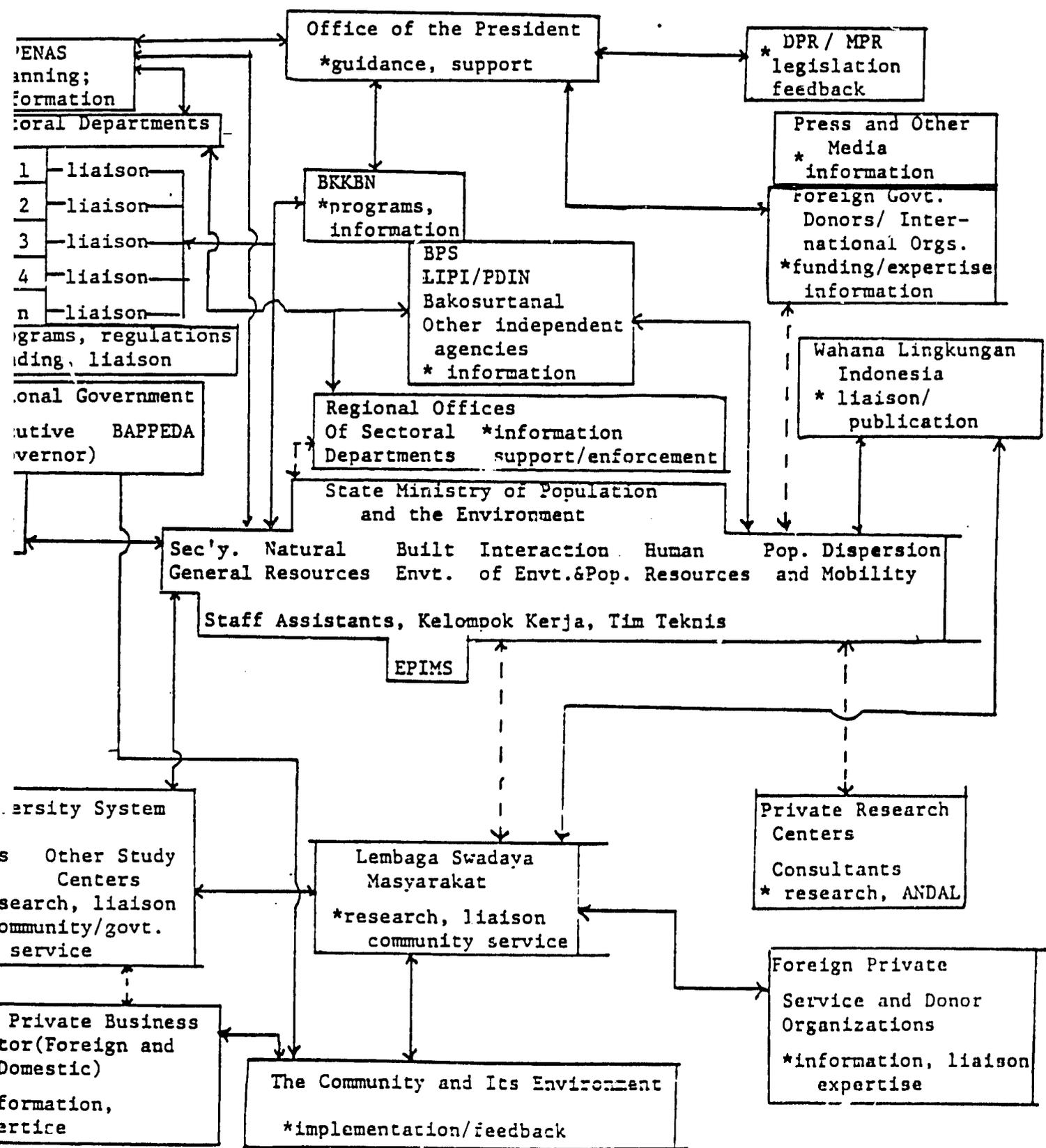
2.2 Problems Relating to Population and Environmental Information Management

A number of problems in information management can be identified which adversely affect MKLH's environment and population management responsibilities. These problems include:

- a) inadequacies in the data base on population and the environment;
- b) lack of management and coordination in the direction and design of information and research activities;
- c) problems with the integration of data and information with policy-making, planning and evaluation.

(5) See references 1, 2, 8, 13 for further discussion of these issues.

FIGURE: 1 The Network of MKLH, including Sources and Kinds of Information



Notes: Not all possible relationships amongst different agencies are shown.
 —————> : indicates a direct or important relationship;
 - - - - -> : indicates a more indirect or infrequent relationship

Each of the problems is discussed, in brief, below. It should be noted that these problem areas are closely connected with each other, in practice and may be symptomatic of a wider problem of how to encourage the systematic and purposeful collection and use of information by all institutions (6).

Inadequacies in the data base on population and the environment. A major problem for both the providers of information (e.g. agencies, universities, regional government) and users of information at MKLH is the current lack of a detailed framework setting forth the scope of the Ministry's policy-making and regulatory authority for specific environment and population issues. This vagueness can only limit its ability to influence the activities of other ministries, especially in obtaining certain kinds of information critical to its supervisory role including:

- program and activity performance criteria (measures of impact, progress, costs versus benefits, etc);
- basic data parameters for the subject matter: what should be included and what not, as well as information criteria by type, form, analytical methodology, data quality and information and end-user needs by type. A particularly urgent problem is how to define the socio-economic parameters for both subject areas;
- a set of basic indicators and trend criteria which could be used for planning, policy-making and evaluation as well as prediction.

Currently comprehensive data for environment and population are not available for the same year both between policy sectors and within sectors (e.g. agriculture, water resources, population movement, etc.). Much of the progress report data available to MKLH at this time is derived from program plans and implementation (operational) reports from line agencies. This becomes a particular problem with sensitive sectors such as forestry, where data on success rates in reforestation and actual versus reported activities is often difficult to verify. Few independent, evaluative reports on sectoral programs are available to the Ministry and, in any event, these are far from comprehensive even for critical sectors. Evaluative data and analyses are mostly the result of one-time, small-scale research surveys and observations in addition to the occasional environmental impact assessment.

For those areas in which an attempt has been made at identifying environmental and population criteria, few complete data

(6) Exactly three years ago (August-September 1980), MKLH sponsored a review mission to examine natural resource information capabilities in Indonesia. Many of the issues raised in that report still exist today, see PPIH (1980) (13)

series are available. Even for particular topics, in a defined locality, e.g. erosion rates for certain watersheds or water pollution levels from a particular industrial zone in a particular waterway, longitudinal surveys are often incomplete. This latter problem may be due partly to the "project" nature of many activities which mitigates against regular evaluations, aside from periodic progress reports (quarterly, annual). These, in turn, are usually the product of general "desk studies", owing to the lack of funds allocated for monitoring and evaluation, along with staff, equipment, etc., outside the bounds of a specific project (7).

A consequence of the absence of a criteria "checklist" and suggested methodologies for gathering the information on that list is that much quantitative and qualitative data for important topic areas are completely lacking or not available to MKLH at this time (Compare the kinds of topical coverage for an environment and population profile in Appendices 5.1 and 5.2 of this report).

As an aside, it is worth noting that, while the Minister of MKLH has done an exemplary job of encouraging the active role of non-government, public service and community development and education groups under its "umbrella", it has not been able to use them to their fullest extent as sources of information (especially qualitative feedback) particularly in the critical subject area of locality-specific interactions of population and the environment. This may be due to the lack of an assessment of these organizations' abilities and comparative advantage in information flows vis-a-vis those of government agencies (8).

A concerted effort to upgrade information collection, analysis and dissemination and exchange for MKLH's needs from the line ministries and other agencies should be paramount. Ministry

(7) Normally a government agency's budget is divided between DIP (daftar isian proyek), the list of project activities and DIK (daftar isian kerja), the routine, basic operating budget. The latter is limited to salaries and overhead; all other activities are "projectized" and thus dependent upon agreement from BAPPENAS annually. This lends a degree of uncertainty to an agency's program and the "soft" areas of information and publication may be the first to suffer in any cutback. Another common problem with the "project" framework is that design, implementation and evaluation are frequently carried out by separate agencies which limit the "institutional memory and learning of an agency, both critical elements to the quality of information for policy evaluation.

(8) Such a role for non-governmental organizations is mandated in the Basic Law on the Environment (reference 24). Despite the wide range of activities of these organizations, few of their reports are used by the Ministry, possibly because their support role (dissemination, evaluation, education) has not been fully defined in relation to the Ministry's needs.

officials have acknowledged this and have tried to utilize the PSL system for this purpose. However, few funds and little guidance have been brought to bear to this task so far. Although MKLH has made specific requests for information and made entreaties for better information collection and provision to it from other agencies on particular topics, there has not yet been a consistent effort aimed at evolving an effective information management system. One result of this situation has been a state of confusion and delay in dealing with crises that arise without warning (e.g. volcanic eruptions, transmigration project problems, sudden industry-community conflicts over, e.g. polluted waterways). More importantly, the Ministry has not developed a mechanism enabling it foresee and prepare for the occurrence of such crises, or at least be able to use the "early warning" mechanisms in other agencies, where these exist.

Lack of management and coordination in the direction and design of information and research activities. A consistent theme in the comments of various agencies, universities and other institutions interviewed by the team for the purposes of this study was the lack of direction and feedback from MKLH regarding information collection, analysis, dissemination and use. Many of these institutions are working with too little information regarding the kinds of specific data and analyses needed by the Ministry to help them in their tasks. .

While MKLH has a program of policy research which is coordinated primarily through the environmental study center system (PSLs), it lacks a comprehensive effort in the broader field of environmental and population activity monitoring, assessment and baseline data gathering, utilizing line agencies and regional government. Admittedly, a major problem in trying to manage and coordinate the flow of information on environment and population is the nature of the subject matter and the large number of institutions, programs and activities actually or potentially involved in the two fields.

Almost every government department program and many of the activities of other agencies and institutions have environment and population impacts, depending upon how broadly the two fields are defined and to what extent MKLH, deliberately or by default, decides to involve itself in the possible range of topics. Looking at the proposed program of the MKLH for REPELITA IV (1984-9), it is clear that the Ministry's purview is quite broad (see Appendix 3.2). For this reason, it will require accurate and comprehensive information from a wide range of institutions.

At this time there are a very large number of government agencies which would need to be consulted by MKLH in its REPELITA IV program. Moreover, many of these agencies have mandates that overlap with other institutions; it is common for new agencies to be created without a reorganization of the previous structure, giving a "layered look" to the governmental structure.

There are several consequences for information-gathering and use

arising from this proliferation of institutions, including:

- a) a dissipation of scarce expertise and research and data-gathering budgets to a point well below the "critical mass" level necessary for generating comprehensive and in-depth research and information activities;
- b) an increasing duplication of effort in the collection of data and in research and field studies. In the absence of an effective research and data-gathering coordinating mechanism, this situation may result in some topics being covered extensively with others being dealt with very little if at all. The redundancy problem is compounded by an apparent reluctance or unconcern on the part of professionals to share research results and information and/or the erection of elaborate, bureaucratic procedures for obtaining information. This problem in the publication of data bases and research results in a lack of knowledge of what kinds of information exist out "in the field", especially so-called "grey literature" (unpublished reports, data sets, research papers, etc.) which may well constitute the bulk of the useful information of many agencies (9).

Integration of data and information with policy-making, planning and evaluation. This problem is particularly relevant to issues relating to population and the environment. For many individuals and institutions, there is still a tendency to regard data and information collection as an exercise in itself rather than explicitly tied to defining, analyzing and resolving problems.

The need to link data and information use with analysis and evaluation is essential to a systematic approach to planning and decision-making as well as carrying out a credible research design. Many of the aforementioned problems of data management are rooted in inadequate planning to determine information needs and how such information should be used. The issues of determining appropriate indicators of progress and problem areas of allocating tasks to appropriate agencies and of exchanging and reviewing the quality of data and information purposefully is partly due to the perception that information and problem-solving and analysis are separate fields and possibly also due to a "top-down" approach to development planning.

A number of critical areas may be identified in which there appear to be particular problems of information management affecting environment and population.

(9) This problem is particularly notable in the field of research. There is frequent overlap in research done by university departments and institutes with that done by LIPI and by specialized government department agencies (balai litbang and others). This issue and the problem of information coordination and agenda setting is noted in references 2, 6, 13 and 14 and in interviews of the study team with the Director of PDIN and several environmental study centers.

Maps. For a country as large and diverse as Indonesia, a comprehensive and accurate set of base maps on soils, water, geology, vegetation and human settlements is essential to rational planning. The main governmental agency concerned with the preparation of maps, BAKOSURTANAL, (National Survey and Mapping Coordinating Board) has a modern, well-equipped facility capable of photo-interpretation of aerial and Landsat imagery and they have produced a wide range of such maps of different types. Unfortunately, many of their most useful maps are under national security classification and cannot be copied (10). Requests for other maps are supposed to be processed within three months, but some agencies have waited years without results. Consequently, BAKOSURTANAL has been of such limited use to other departments that these agencies have had to set up their own mapping units, usually with far fewer resources upon which to draw.

Moreover, these mapping units often do not use an agreed-upon common set of protocols and methods for coordinates and scaling, identification of land-type classes and topographical information. One consequence of this has been a lack of coordination in the implementation of multi-sectoral programs. Each of the agencies involved in such programs creates its plans based on its own maps which sometimes conflict with other map sets. This has been a particular problem for transmigration programs in the recent past.

National and Regional Statistics. Basic, demographic data for the national census are regularly collected from the village level and above, especially for the purposes of the decennial census and the preparation of the five year plan. In addition, a variety of special surveys are regularly carried out by the Central Bureau of Statistics (BPS) on a broad range of social, economic and resource-related matters. BPS data are widely and regularly used by many sectoral departments as well as research institutes, foreign government donor agencies and international organizations.

While the BPS has an impressive statistical ability, they do not regularly receive input on specific topics nor critiques of their methods. Much of the data on environmental and population interactions can be found in their special surveys on expenditure patterns, environmental statistics and regional studies. Research designs and survey methodologies for the collection and analysis of this data do not appear to be regularly reviewed by panels of independent experts. Individuals from BPS readily admit this and appear to be eager for input regarding specific indicators, topics and methods in the resource and environmental fields as well as on matters relating to the

(10) The irony of this situation is that because Landsat data are not the property of the Indonesian Government, maps prohibited for general distribution in Indonesia are freely available outside the country from, for example, the U.S. Defense Mapping Agency.

interaction of environment and resources with population behaviour patterns.

Given the wide circulation afforded to BPS data and studies and its apparent ready acceptability by national and international bodies, as well as the prestige and access accorded BPS which enables it to ferret out information from other sources, it is urgent that there be closer cooperation between research institutes and the BPS. This should include a regular review of statistical and survey methods in the fields of population and the environment.

Research. A number of the problems relating to research on environmental and population-related matters have been discussed above, but it may be useful to discuss a few of the structural problems of research further. Research can be divided into basic and applied research fields. Applied research, in particular, seems relevant to the fields of population and the environment.

Applied research itself may be further sub-divided into the following fields, i.e. research for:

- a) inventorying, classification and description;
- b) hypothesis and/or technology-testing (field or laboratory);
- c) monitoring, evaluation and assessment.

It is difficult to find anyone or set of research institutes conducting research in all three areas in Indonesia at this time including LIPI. Instead there is a growing fragmentation of research efforts due in part to the causes noted above. At this time research is conducted in:

- a) line departments (ministries), by specialized, applied research bodies (e.g. AARD, LPT, DPMA and others);
- b) LIPI, and its constituent institutes (both basic and applied research);
- c) universities and university research institutes (basic and applied research);
- d) state and private enterprises (mostly applied research);
- e) private research and training institutes (mostly applied research).

A particular individual may be doing research in several different venues at the same time. He may well also have a position of administrative responsibility in a government department. While this situation is hardly unique to Indonesia and, in theory, could contribute to the convergence of research with policy priorities, in fact, it has also lead to certain undesirable trends, including the following:

- a) the dissipation of expertise and resources into institutions with redundant or overlapping research mandates;
- b) a lack of clear direction in the determination of research agendas among institutions, with the consequence of considerable duplication of effort, often using different methods

for the generation of research and information for different sponsoring agencies. Also the lack of direction has led to increasingly narrowly-directed research efforts, according to the preferences of individual researchers or the availability of grants and project funds;

- c) a lack of coordination and exchange of research results and peer review among both research institutions and sponsoring agencies. Likewise, the lack of peer review of published results. This latter problem is exacerbated because much research never gets published, a situation largely due to the absence of a national copyright law and the protection it might afford a researcher.

Given the over-extension of the limited available expertise and institutional resources, especially those specifically devoted to environmental subjects and the interactions of resources, development and population, the research situation described above raises a number of issues for MKLH, including:

- a) how can MKLH try to influence research priorities and the requisite allocation of budgets and expertise to priority areas?
- b) how can the Ministry identify areas of past, existing or planned research and the published results of that research?
- c) what is the appropriate vehicle for reviewing research methods, results and the applicability and relevance of research products?
- d) what scope is there for encouraging research, government and private and state enterprise to pool their resources for the development of environmentally appropriate technologies and products and those aimed at productive labor use (11).

(11) We are aware of only a few successful ventures of this type in Indonesia at this time, and they appear to be concentrated at the relatively high technology end of the spectrum, e.g. P. T. Nurtanio Aircraft Co of Bandung.

3. Proposed Design for an Environment and Population Information Management System (EPIMS)

3.1 Purpose of the EPIMS

In this section we propose an environmental and population information management system for MKLH aimed at enabling the Ministry to support its program of environmental and population supervision and coordination among the range of line agencies of government, private and state sector enterprises and community institutions. The EPIMS is designed to be an evolving mechanism for a Ministry that is, itself, still growing and evolving. Hence, the proposed system should not be viewed as the final information system for MKLH. The following design is intended to show the basic components of the EPIMS and their relationship with each other and with the other elements of the Ministry.

Defining Information Management. A few words about what we mean by information and management might be useful for understanding the purpose and functioning of the EPIMS.

Data (the plural form of datum), are observations and measurements, usually quantitative in form either in their original, collected form or in sets of arranged or tabulated formats. Data are not random bits of fact; they are purposive in nature. An individual collects data for the purpose of describing and analyzing some situation or problem (e.g. in addressing an hypothesis or null hypothesis).

Information is the content of any communication. Communication aims at conveying some understanding, signal or feeling. Communication consists of the means of communication (speech, written material, electronic signals, etc.) and its content or information. Because information consists of messages, it is more than just data, per se. Information consists of data that have been digested and filtered or interpreted, for a purpose. Information is never neutral, as a result, though of course information need not be misleading because of that fact. Because both data and information are purposive, an individual may not be conveying information if he, e.g. writes a paper and appends to it a set of unanalyzed data that may or may not be related to his argument. He must choose and manipulate data sets in such a way as to convey information in support of a description or problem hypothesis. The extent to which data and information are carefully managed in service of communication is directly related to the effectiveness of the communication effort.

Since MKLH's effectiveness is largely based on its ability to inform and persuade, its ability to manage information is a critical part of its operation.

Management is the coordination of diverse elements and factors, over time, to achieve a certain end. The act of coordinating implies a directive function but also an adjustment function. An

individual who simply gives directives without paying heed to the positive and negative feedback resulting from his directives is not managing. Management is responsive as well as initiative in character.

Information Management Goals for MKLH - The information management system of MKLH should aim to be a flexible and responsive supporting mechanism for the Ministry's internal research and policy and program evaluation duties and should aim to be an initiating mechanism in the area of communication, forecasting and coordination of information flows between MKLH and other governmental and non-governmental entities.

With the expansion of the mandate of the Ministry of Environment to include population matters and the interaction of the two, the EPIMS unit will have to demonstrate initiative in inducing the other four assistant minister sections to work together in a coordinated fashion. We believe that information management can be a useful modus operandi for encouraging this kind of closer cooperation.

In order to achieve intra-ministry cooperation, i.e. within MKLH, the EPIMS unit should aim towards two initial targets:

- a) development of a "ready reference" system of information sources (people, written materials, visual aids - especially maps - and institutions), and
- b) development of a forecasting and trends analysis capability that would support each of the assistant ministers in their own areas but would also attempt to deal with the synergistic effects of the interaction of population and environment in the development program, in order to assist planning efforts and the evaluation of existing plan implementation. This may well include a systems modelling capability.

3.2 Framework of the Environment and Population Information Management System

Direction and Support - we suggest the following management structure for the EPIMS function at MKLH. It should be stressed that this structure is a normative one; one that we believe would be suitable for the information management process. Clearly, the actual structure that evolves will have to conform, in part, to the accepted governmental system of internal organization. Moreover, the proposed design will have to accommodate the kinds of MKLH staffing and budgetary resources that are available (although we provide some suggestions on that aspect later).

The proposed management structure for EPIMS should include the following elements:

Head of the EPIMS unit - this individual should be positioned so as to have formal access to the other assistant ministers and their staffs and resources directly. At the same time, he should not be clearly in either the population or environmental "camps". For these reasons, we propose that the head of the EPIMS unit be the Assistant Manager for Interaction of Population and the Environment (ASMEN III under the present arrangement).

Assistants to the Head of EPIMS - in line with the goals of the EPIMS as described in Section 3.1, we propose that the ASMEN III have two Deputy Assistant Ministers (Pembantu Asmen). These assistants' functions would be divided as follows:

- a) Deputy Assistant Minister III for Interaction of Population and the Environment (Pembantu ASMEN III, Keserasian Antara Kependudukan dan Lingkungan Hidup). This individual should have a small staff composed of a researcher(s) and a liaison(s) to assist him in the following tasks:
 - i identify areas of critical population/environment interaction which should be monitored in line with the goals of the GBHN of 1983 and of REPELITA IV;
 - ii identify indicators for the above-mentioned areas which could be used to plot forecasts and trends aimed especially at taking preventive measures to avoid crises and planning failures and, at the same time, maximize opportunities which appear to facilitate success for the five-year plan;
 - iii work closely with the staff of the EPIMS and other ASMEN in obtaining and providing information that pertain to tasks (i) and (ii) above.

- b) Deputy Assistant Minister III for EPIMS (Pembantu ASMEN III, Sistem Pengelolaan Informasi Kependudukan dan Lingkungan Hidup). This individual should have a small but well-trained staff to manage a computerized data base management system and a staff to undertake interpretation and communication. The tasks of the Deputy ASMEN III for EPIMS would include the following:
 - i access and retrieval of information to be carried in the EPIMS;
 - ii locating sources of information for the EPIMS and facilitating dissemination of EPIMS information to internal (within MKLH) and external users;
 - iii composing a variety of publications on population and the environment for different audiences (profiles, special reports, trends, monographs, etc.);
 - iv providing the Minister as well as other Assistant Ministers with data and information needed for regular tasks or urgent needs along with the updating of this "in-house" data base.

For the execution of tasks (iii) and (iv), it is expected that the staff of the Deputy ASMEN III for EPIMS will work closely with the staff of Deputy ASMEN III for Interaction of Population and the Environment and the staff of other ASMEN. The relationship of the different units under ASMEN III is shown below, in Figure 2, and summarized in Appendix 3.2.1.

The specific tasks of the Deputy ASMEN III for Interaction of Population and the Environment beyond those described above will probably emerge during the course of the pending reorganization of MKLH after the appointment of the Assistant Ministers for Human Resources and for Population Mobility and Dispersion. We will limit our suggestions in this area to providing some idea of the possible sources and kinds of information required for this subject area (Appendix 5.2) based on MKLH's program for REPELITA IV. This program is given in Appendix 3.2.2.

The specific tasks of the Deputy ASMEN III for EPIMS are described in more detail, since they pertain more directly to our terms of reference and to MKLH's immediate needs.

The data base management system described below utilizes a small computer system to expedite the accessing, storage and retrieval of the kinds of information for the "ready reference" goal and for in-house information needs described above as well as facilitating the processing of data for analytical studies, prediction and graphic aids.

3.3 A Description of the Database Management System of EPIMS

3.3.1 Suggested Information Management System at Menteri KLH

In this section we discuss and make preliminary recommendations concerning the development of a computerized information management system at MKLH. We will concentrate on that aspect of computer usage in this chapter. There are, of course, other uses to which an MKLH computer system would be put; these include word processing and data analysis. These uses are discussed briefly later in this section.

Currently the Ministry of Population and Environment possesses no in-house computer capability nor professional programmers. Some computer experience is available in the person of Dr Alwi Dahlan, who would be able to provide certain guidance and quality control, but programming staff and computer support personnel are not readily available. Further, as we interviewed people from other agencies, it became apparent that there is a critical shortage of programmers and other computer-skilled personnel in Indonesia. Those skilled programmers and technicians also tend to gravitate to jobs in private industry rather than government because of the disproportionate pay differentials between the two.

Consequently, a large-scale centralized data management is beyond the current technical capacity of KLH, to say nothing of the expense of a main-frame computer system sufficient to act as the central data bank. It is necessary for KLH to adopt a conservative approach to information management. As was pointed out in the 1980 information management review (PPLH 1980, 13) hasty actions should be avoided.

That review recommended a stepwise approach to information management with which we basically agree. Briefly stated, the report recommended that the Ministry begin by contenting itself with catalogs of data and information instead of attempting to actually store vast amounts of data. The Ministry would act as a clearing house for information, providing indirect access to the data stored elsewhere in Indonesia.

The central clearing house for information at MKLH can be defined in terms of a separate office with its own staff. This office, herein termed the Information Management Group (IMG), would be responsible for design and maintenance of computer data bases, selection and quality control of the resident information, and the production of reports and analyses as requested. It should not be assumed that the IMG would be a large group with a giant computer system tasked to store all the data they can get their hands on. In fact, this approach would almost certainly lead to disappointment, huge cost overruns and duplication of other database systems already in existence in Indonesia.

The design of the information management system should reflect realistic needs of MKLH personnel and the Ministry's clients. Some of these needs are identified, others will evolve as the users of the EPIMS gain experience. A few goals of the system are enumerated below:

Identification of Current Research Needs

It would be desirable if MKLH could use the EPIMS to point to research areas that should be addressed, advise consultants and provide information to other agencies requiring information on current research needs. This would require periodic reviews of the information to find areas of research that are currently being neglected, data gaps and inadequacies, or in which there is an unnecessary duplication of effort. The IMG would then search for researchers in Indonesia who are qualified to carry out the needed studies or indicate studies already in progress on a given study area. Reports could be prepared and sent to the qualified individuals or agencies so that they can be made aware of the research opportunities. This process requires two data bases:

- (1) a directory of current and past research projects, annotated and keyworded for search, and
- (2) a directory of all researchers available including descriptions of their research specialities, training, address, previous and current work, etc.

The research areas of current interest include methods to assess quality of life, effects of population trends and projections, social impact of projects and environmental impact assessment methods, among others. This is discussed further in other sections of this report.

Manpower and Financial Planning

Data for manpower and financial planning would be required periodically. This implies a data base on all current and future projects under MKLH sponsorship.

Index of available information

Available information is defined herein as that information that is available in Indonesia. This information can be in the form of published and unpublished documents, reports and papers; descriptions of research projects; government directives; raw and processed data. This information may or may not be available from existing Indonesian computer data bases. Most of this information will be from Indonesian sources generated in Indonesia, but it also includes foreign data bases and information available in Indonesia.

Given a research or development project, the researchers will require access to pertinent available information. The required information might include any or all of the information itemized above, and be located at MKLH or at another ministry or agency. It would be very helpful if the researchers could identify the available information, find out where it is, and how to order it.

This requirement implies an inventory of all data available from MKLH and other public and private agencies. This database should contain a description of the information, where it can be found, who owns it, and how it can be obtained. ONLY IN UNUSUAL CIRCUMSTANCES SHOULD THE DATA ITSELF BE STORED ON-LINE IN THE CENTRAL EPIMS AT MKLH.

This may well be the most important data base of all, but it will require aggressive measures by the MKLH Information Management Group (IMG) to acquire the needed information and ensure regular cooperation among agencies. It is probable that nearly all agencies will be willing to provide information, but may be reluctant or unable to fund an indepth survey of their own data. MKLH will probably have to form a team assigned to the task of ferreting out the data and documenting its existence. Note that only the description of the data and its location are actually stored in the MKLH central data bases; the data (information) will remain at the original location.

The above approach also pertains to the data collected for MKLH itself. The data will remain at the local sites, universities, etc., while the data documentation will be sent to the central EPIMS at MKLH. Field offices may require computer systems of their own; these systems should be tasked to maintain locally

important data bases. These systems MUST be compatible with the central system, at least to the extent that magnetic media can be exchanged for data transfer. If this is not possible for some time, MKLH should have the authority to request certain kinds of analyses to be done by local agency bodies to be used directly by the Ministry.

Information not readily available to MKLH consists primarily of information and data from foreign sources. Some of this is in the form of directories of experts (such as the UNEP Infoterra Service available through PDIN in Jakarta) but most of this will be in the form of published and unpublished information. It is suggested that MKLH include a directory of those Indonesian libraries and agencies with access to foreign information.

In-house Data at MKLH

Some data will be required for use by K LH personnel or technical teams. These data, such as water quality survey data, sometimes need to be analyzed or reviewed in-house. Only in these cases will actual data be stored in the MKLH central system and then only for the length of time they are being used. When they are no longer needed, the data will be copied to tape for long-term archival. This requirement implies two data sets:

- (1) a data set keeping track of all in-house data and
- (2) the data themselves.

Directory of In-house Documents and Reports

MKLH produces many documents and reports. A directory of these internal documents should be maintained even though they could and should also be loaded into the Index of Available Information discussed above. There may be a temptation to keep track of all papers, letters and communications produced at MKLH. We strongly recommend that the Ministry resist this temptation. The value of such a file is small compared to the cost of maintaining it. Further, each person would have to fill out a form describing each letter, a guaranteed source of annoyance and inefficiency. The IMG should be encouraged to evaluate each procedure with an eye toward improving efficiency and reducing bureaucracy.

Data Base Summary

From the above discussion, a list of data bases to be stored in the central EPIMS can be defined. These are:

1. Descriptions of current and past research projects
2. A directory of all technical personnel in Indonesia
3. A directory of all MKLH projects
4. A directory of "available" and external data and information sources
5. Files of currently in-use data
6. A directory of all internal data and information
7. A directory of K LH documents

As discussed in a subsequent chapter, a good relational database system is the optimal method of defining and maintaining these databases.

Quality Control

Quality control procedures should be designed at MKLH to provide assurance that the data are accurate, of sufficient precision, were collected properly and recorded honestly. Obviously MKLH will have little or no control over data collected by other agencies, but must insure that the descriptions of those data are as accurate as possible. Annotations as to the quality of data sets would be helpful, if possible.

Quality control within MKLH is another matter. The first step is to insure that the forms are accurately filled out and accurately entered into the database. If the data entry personnel are impressed with the importance of accuracy and completeness, and if the data in the database are checked carefully against the forms, the level of accuracy should be high.

Data collection procedures designed by MKLH technical teams should be reviewed by external experts, if possible. Where possible, data should be checked against sources and review procedures established.

Accuracy of data entry can be aided by the use of data entry programs (data filters). These programs can check the range and type of data being entered. If the data are out of a present range or the wrong type (say a letter was entered instead of a number), the operator can be notified for immediate correction. Most database management systems have this capability. For example, suppose water quality data were being entered into the database, reasonable ranges for the data values can be determined, say 10 to 20 degrees C for temperature, 300 to 3000 ppm for a hydrocarbon pollutant, etc. If the operator entered 30 degrees, the program would not accept the data and would force the operator to re-enter the data point.

The best assurance of quality data is having well-trained conscientious personnel. The information management group may want to develop training programs designed to encourage quality control.

Composition of Information Management Group

The Information Management Group, IMG, should be identified as a separate office, answerable to Dr Alwi Dahlan, Assistant Minister for Interaction of Population and Environment. At the outset it should consist of no more than two or three people. These personnel should be well qualified as the project will be very costly if the IMG is not well qualified.

Because of the technical complexity of data base system design, we strongly recommend that MKLH engage the services of a database

expert to help the team design the database and to provide training and other instruction. Database structure is not simple. Poorly designed databases can be larger than necessary, difficult to use and modify, and otherwise inadequate.

Assuming this assistance, the Information Management Group (IMG) could be structured as follows:

Information Specialist - assigned to locate the information required for the tasks outlined above, design the questionnaires, evaluate the reliability of the information and approve the inclusion of the data into the database system. This person would be available to consult with users, help them to formulate queries and requests for data and other necessary services. He or she would work closely with the Database Manager. Of the personnel at MKLH as of October 1983 Drs Harry Harsono appears to be the most likely candidate for this position.

Qualifications:

- strong professional background in the disciplines required by MKLH
- knowledge of the various activities conducted by MKLH throughout the Ministry
- general knowledge of activities of other Indonesian government agencies
- knowledge of key personnel in MKLH and other agencies.

Database Manager - designer of the database system and responsible for its integrity. Also responsible for programming, data entry, procedure design and enforcement.

Qualifications:

- technical knowledge concerning the mission and tasks of the Ministry
- experience or training in relational database management systems
- computer programming experience: Pascal, FORTRAN or BASIC languages, statistical programs and analysis, graphics

To our knowledge, no-one currently employed by MKLH meets these qualifications.

Assistant Database Manager - helps locate data, enters data, writes programs, assists users and otherwise facilitates the task of the Information Management Group.

Qualifications:

- general computer programming experience

We suggest a conservative approach at the outset, recognising that the Information Management Group will outgrow the initial computer system. While the hardware implications of this are

discussed in a later chapter, some mention of the changes in IMG personnel are appropriate here. Given the existence of the three people mentioned above, the Information Specialist, Database Manager and Assistant Database Manager, additional people may be required for specific tasks. These new positions may include:

Systems Programmer - directly responsible for maintaining the computer system, writing support programs, ensuring proper backup procedures, etc. This person will be required when the computer system itself is too large for the Database Manager to maintain. This will probably happen when MKLH purchases a supermini such as a VAX or large Data General system

Scientific Programmer - programmer skilled in computer simulation modelling and programming, graphics, numerical analysis and statistical methods. This person would be available for the special programming, modelling and analyses that the Ministry would require. such an individual might be hired part-time from a nearby university.

Assistant Information Specialist - this person would assist the Information Specialist in procuring data, contacting agencies, formulating requests and otherwise facilitating the mission of the Information Management Group.

Summary

The computerized information management system at MKLH will require the acquisition of two to three specialists, a computer system, and an adequate database management system. It should be recognized that MKLH cannot and should not attempt to store all the information that may be available on their system, but instead should store indexes, references and other information that would facilitate the acquisition of information from within MKLH and from other public and private agencies.

3.3.2 Information Management System Procedures

When the design of procedures is premature at this writing, some suggestions are possible. It should be remembered that the procedures outlined here are only suggestions, and careful thought and planning should attend the development of all procedures. The IMG should constantly refine their procedures with an eye toward reduction of confusion, unnecessary paperwork, and greater accuracy of data collection and entry.

Several flow diagrams for procedures discussed in this section are presented in Appendix 3.3. In the flow diagrams, order of precedence is from left to right; boxes denote processes, sauses represent products and diamonds signify decisions. These flow cuts are tentative and are included for illustrative purposes.

The procedures discussed in this chapter cover the establishment of computer systems in outlying areas (distributed computer systems), data documentation procedures, internal information request procedures, in-use data management and analysis procedures. Without doubt, many other procedures will have to be developed as time goes on. Procedural development will fall within the provinces of the Information Specialist and Database Manager.

Criteria for Establishment of Distributed Computer Systems

There will be a natural tendency for local offices of MKLH to desire a computer system of their own. This tendency will be amply justified in many cases, unjustified in others. While it is not possible at this writing to set forth an array of criteria, a general procedure for evaluating the necessity of establishing a local information management group is presented here.

- 1) The office is large and can support a computer system to manage their own data and information.
- 2) The office is the center of a large project(s) that is (are) generating a considerable body of information.
- 3) The benefits of computerization outweigh the costs. Assessment of the costs and benefits will be easier after KKLH central has some experience on which to base the estimates. The costs should include the designation of at least one local person to be responsible for the system and the data. This may or may not be a full time position.
- 4) Physical requirements of computerization can be met: adequate power supply and climate control.

Once a decision has been made to provide a computer for a local office, the Database Manager and the Information Specialist of the central IMG should ensure that (a) the external computer system is compatible with that of the central site, and (b) the local office is trained in the information management system procedures. There are several technical questions that bear on the use of satellite computer systems. Some of these concepts may be unfamiliar to the reader. Please refer to the section on concepts and equipment for detailed discussion of many of the technical points covered in this section.

The easiest way to insure compatibility with the central site is to ensure that all the computers are similar or identical, but this may not be possible or desirable. If the computers are identical or use the same operating system, data can be exchanged simply by mailing diskettes (floppy disks) back and forth. However, this approach has some drawbacks: the amount of data that can be transferred is limited to the small capacity of floppy disks, and mail may be slow or unreliable from remote parts of the country.

Larger and more sophisticated systems can communicate by magnetic tape. Standard tape formats exist that allow magnetic tape to be read by any computer. The disadvantages of this approach is that magnetic tape drivers are not available for most microcomputers, the drives are expensive, and the method requires relatively sophisticated programmers.

Computer-to-computer telephone communications is possible and many communications programs are available for microcomputers. This approach requires that each computer use the same communications protocol so that they each know what the other is doing, and good phone lines. Dedicated phone lines for computer communication are potentially available, but this is probably not practical in Indonesia at the present, particularly from outlying regions. This drawback may be overcome with the new communications satellite. In any case, telecommunications is a very complex subject, and MKLH should obtain the services of an expert to design and implement any telecommunications network applied to computer data transmission.

This leaves floppy disk communications as the only practical method of data communication at this time. Thus the principal criterion for computer selection in outlying offices is the interchangeability of floppy disks. Most systems using 8 inch floppy disks use a standard format and can be read on any other system. This is not the case with the smaller 5.25 inch floppies. These should be avoided in any case because of their limited capacity. See the Section on concepts and equipment for a detailed discussion of floppy disks.

One new development is the use of video cassette recorder (VCR) as microcomputers data backup devices. These devices are relatively inexpensive and can rapidly store up to 17 million characters (17 megabytes) on a single tape. If all of the MKLH computers can be equipped with this device, the problem of data transfer is easily solved. One caution, however: it will be imperative to ensure that the VCR data storage format is identical among all the computers.

Data Documentation Procedures

After the Information Management Group (IMG) has been established, the considerable task of obtaining the information to fill the databases must be attempted. The first step is to locate sources of information. Many of these information sources have been identified in this document; others must be located and contacted. A standard questionnaire should be developed for this use. This questionnaire must request all the information that the IMG requires for the respective databases. It should be simple and conducive to its use - an excessively complex and demanding form will discourage cooperation from other agencies. Sample questionnaires are included in the appendix.

The suggested procedure for data documentation is to request that the external agencies provide documentation of their data and

information. The questionnaires that MKLH uses should be made available to the external agencies and the Information Specialist should insure that the agencies receive and fill out the forms. This will require frequent interaction between MKLH and the other ministries and departments. The mere dissemination of forms and questionnaires to external agencies will probably be insufficient. This task is no less true for local offices of MKLH.

Internal Request Procedures

Internal users of the MKLH EPIMS will require simple procedures to facilitate acquisition of information from the databases. These procedures should be simple and timely. At first, MKLH personnel will not be familiar even with the concept of the information system. The IMG will have to give seminars and demonstrations of the procedures. After things have settled down, the request for information procedure might look something like the data request flow diagram in the appendix. Several pertinent points should be made:

- a) IMG will search for data or information but will expect the requestor to actually acquire the data or information from an external source.
- b) The procedure should be simple and quick.
- c) The IMG personnel should be willing to spend some time with the requestor to insure that the search parameters are such that this will yield the desired information. The requestor cannot be expected to formulate the queries.

In-use Data Management and Analysis Procedures

Data that are being used by MKLH personnel require special handling. In this case, actual data rather than descriptions of external data sets are stored in the database, and the IMG will be expected to assist in analysis and display of the data. This discussion assumes that the data are not already disk-resident.

The project leader will suggest data from some source. These data will have to be loaded into a database and perhaps some manipulation will be required. The project personnel will request analysis or graphical displays and the IMG will produce whatever results are possible within the constraints of the system. The project team will review these results with the Information Specialist who may be able to suggest additional analyses. When the data processing task is finished, the data sets will be off-loaded onto archive tape for storage. It will not be possible to maintain permanent on-line (disk) storage of data. However, it is easy to restore a data set from archive should a need arise in the future. A diagram of the data analysis procedure is illustrated in Appendix 3.3.

3.3.3 Concepts and Equipment for Information Management

Recent developments in computer technology and the power and flexibility of the Relational Database model make the computerization of the MKLH information management system much easier and cheaper than would have been possible even five years ago. Small computer systems in the range of US \$25,000 provide the performance of \$50,000 systems of 1978. Ten years ago, an information management system of the scope that we will describe below would have cost \$250,000 and up. In addition, the Ministry would have had to hire several systems analysts and database programmers.

The alternative to a computerized system is, of course, file-drawer and bookshelf information management. Card catalogues of information and an elaborate cross-referencing system would have to be developed. Full-time personnel would be required. Further, the cost of information storage and retrieval is enormously greater than the maintenance of a sensible and well-designed computerized system. The greatest problem of paper information systems is the difficulty of maintaining, correcting and updating the system. A card catalog requires considerable attention and, compared to well-designed computerized information retrieval systems, is very slow and costly.

It is germane to mention some of the costs of computerized information systems here. The initial expense of the equipment, software, programming and training are high. The system has to be well-designed and the programmers and operators are much more expensive than filing clerks. Further, while the amount of information that can be stored on a computer system is large, additional storage devices can be very expensive. Consequently, computerized information management systems should be designed with specific limitations in mind so as to avoid inappropriate and wasteful use of expensive technology.

The system we propose will consist of a large micro-computer, hard disk and cartridge backup, with relational database management software, graphics, programming languages, and statistical analysis software. This system will be expandable, so that as the needs and sophistication of MKLH grow, the computer system can grow with the Ministry. The proposed system will allow MKLH to walk before it has to run.

We are deliberately recommending a small system at the outset because a larger minicomputer system would require a systems programmer for support. Microcomputer systems are simpler. A second reason is to insure that MKLH will not become overextended during the initial learning phase. A small system will encourage economy, critical selection of data to be stored and a conservative approach. As MKLH gains experience, the Ministry needs will expand and a larger system will be required. Experience suggests that this will happen within two or three years.

There will be several options available at that time. Additional microcomputer systems can be added and networked together. Local

area network technology is progressing rapidly and reliable systems are available now. MKLH could send the microcomputer system to a field location and install a larger central system. Alternatively the microcomputer system could be assigned to general use within the central MKLH office. This would take some pressure off the minicomputer system, allowing more resources for the information management system.

It is difficult to anticipate the power of microcomputer systems within the next five years. It may well be that certain microcomputer systems will be able to keep pace within MKLH growth. An example is the CompuPro system. Currently it is available with the Intel 8086 16 bit central processing unit (CPU) and the 8087 numerical processor (a special device to speed up numerical calculations). Now, CompuPro offers multiuser system with master and slave CPUs that approaches minicomputer performance. Upgrading to that system would be relatively inexpensive. Future plans call for a full implementation of a 32 bit CPU system. Conversion to these more advanced systems require only the new CPU components and the software.

An additional comment is necessary here. Implementation of even the conservative information management system we suggest below will require a strong commitment from MKLH. The personnel assigned to the task should be committed full-time professionals whose workload is not diluted by outside commitments and who have few other MKLH tasks. The Ministry should not be impatient of results nor surprised by difficulties and delays. Outside training and assistance, especially in the early stages is strongly recommended.

Before we describe the system, some definitions of computer system concepts might be helpful. The next section will provide a brief tutorial.

Database Management Systems

Database management systems (DBMS) are computer programs designed to allow construction of a set of files that provide structured access to data stored in the files. The data are stored according to "schema" that define the relations among the data and allow selective extraction of the data. There are three basic types of DBMS: hierarchical, network and relational.

Database management systems require a data definition and linkage structure called the "schema". The complexity of the schema varies with the project and the type of database system in use. The hierarchical and network systems require extensive and careful schema definition because the relationships among the data must be defined by the schema itself. Further, retrieval of data for reports often requires special programs, to say nothing of data entry, editing and modification of the schema. In many systems "ad hoc" queries (eg "how many rivers are longer than 100 km in Indonesia") are difficult.

A hierarchical population database for Indonesia would be constructed with directories for each island, district, kabupaten, etc. This requires that the schema be carefully designed, with all requirements anticipated. Modifications to the schema are often difficult and costly. Large database systems often require several programmers and database managers in order to generate the reports (extract the data), maintain the database and develop new schema.

A much simpler and more powerful DBMS is the "relational database". A relational database is composed of files of records each of which is composed of fields. Technically, the file is called the "relation", which is composed of "tuples" (records) made up of "attributes" (fields). The relation is very much like a matrix: rows are records, columns are fields.

Because the DBMS is composed of relations, like a pile of flat data sheets, there need be no structure among the relations. However, common fields in the relations serve to tie them together. The decisions as to assignment of fields to relations and the structure of the set of all the relations is the schema design problem for the relational databases. There are definite design criteria that must be evaluated in order to minimise storage and execution time requirements. While the schema design is simpler than that for hierarchical and network database systems, it can be a complex task.

The relational database system is illustrated in Figure 2. There is usually a relation that contains the names of the other relations and descriptions of them. This relation is usually called the data dictionary (the 0th relation in Figure 2). All relations and their attributes are identified by name. The name of the relations must be unique within a database but attribute names among relations is necessary for many operations between relations. One can simply examine the data dictionary to find the names of the relations, call up the relation(s) desired and examine their individual structure to determine what the attribute names are.

Relational database systems are especially appropriate for applications requiring ad hoc queries. For example, suppose a large hydro-electric project were being planned and MKLH receives a request for a list of hydrologists and foresters who speak French (the contractor is a French company). There is a relation in the database containing the names, addresses, professional and language skills, degrees, etc. With a relational database system, this request can be met with a simple ad hoc query, something like:

```
List NAME, ADDRESS, TELEPHONE of SCIENTISTS where PROFESSION =  
Forester or PROFESSION = Hydrologist and LANGUAGE = French
```

The programs would search the relation named SCIENTISTS for those entries where the PROFESSION fields contained the character strings 'Forester' or 'Hydrologist' and the LANGUAGE field con-

tained the string 'French'. Each time it found an entry meeting the selection criteria, it would print the person's name, address and telephone number.

There are three basic operations of the relational model: 'selection', 'projection' and 'join'. The selection, projection and join operations are illustrated in Figures 3-5. Simple query commands can produce a subset of the records (selection), any one or more of the attributes from a selection of records (projection), or can join two or more relations into a third. The ad hoc query illustrated above is a projection from the SCIENTISTS relation.

Many operations can be easily performed with little or no programming. No elaborate data schema are necessary, relations are easy to add or delete, their schemas are easy to modify, data can be easily edited, retrieved, recombined, sorted and otherwise manipulated. More complex tasks and reports require programming, and many relational database systems provide a built-in programming language or with "hooks" to a standard computer language such as FORTRAN, COBOL, C, or Pascal.

Because of its power and ease of use, the relational model is rapidly becoming the dominant database structure in the computer industry, particularly among micro- and mini computer applications. They are easy to learn to use, and many packages have powerful auxiliary programs that make data entry, report generation, even data analysis very easy to do.

Example of Relational Database Use with Simulation Model

A simple example may help convey the utility of the relational database approach. Suppose the IMG is requested to provide a systems analysis of a particular region, say West Java. Data are needed on agricultural production, population, industrial production and energy consumption, forest production and reforestation and water resources. These data would reside in several relations, with the geographical index as at least one common attribute: West Java. Successive selections and/or projections from the various relations could be joined into a single relation or data set for external analysis. These data could then be assessed by statistical programs, graphics routines or models.

The analysis might consist of regression analysis on time series data in order to project future trends or the historical data might be used to estimate the parameters of more complex models. Good graphics are important, and many relational database systems interface directly into graphics routines. The computer system recommended below would be able to perform these operations.

THE RELATIONAL DATA BASE

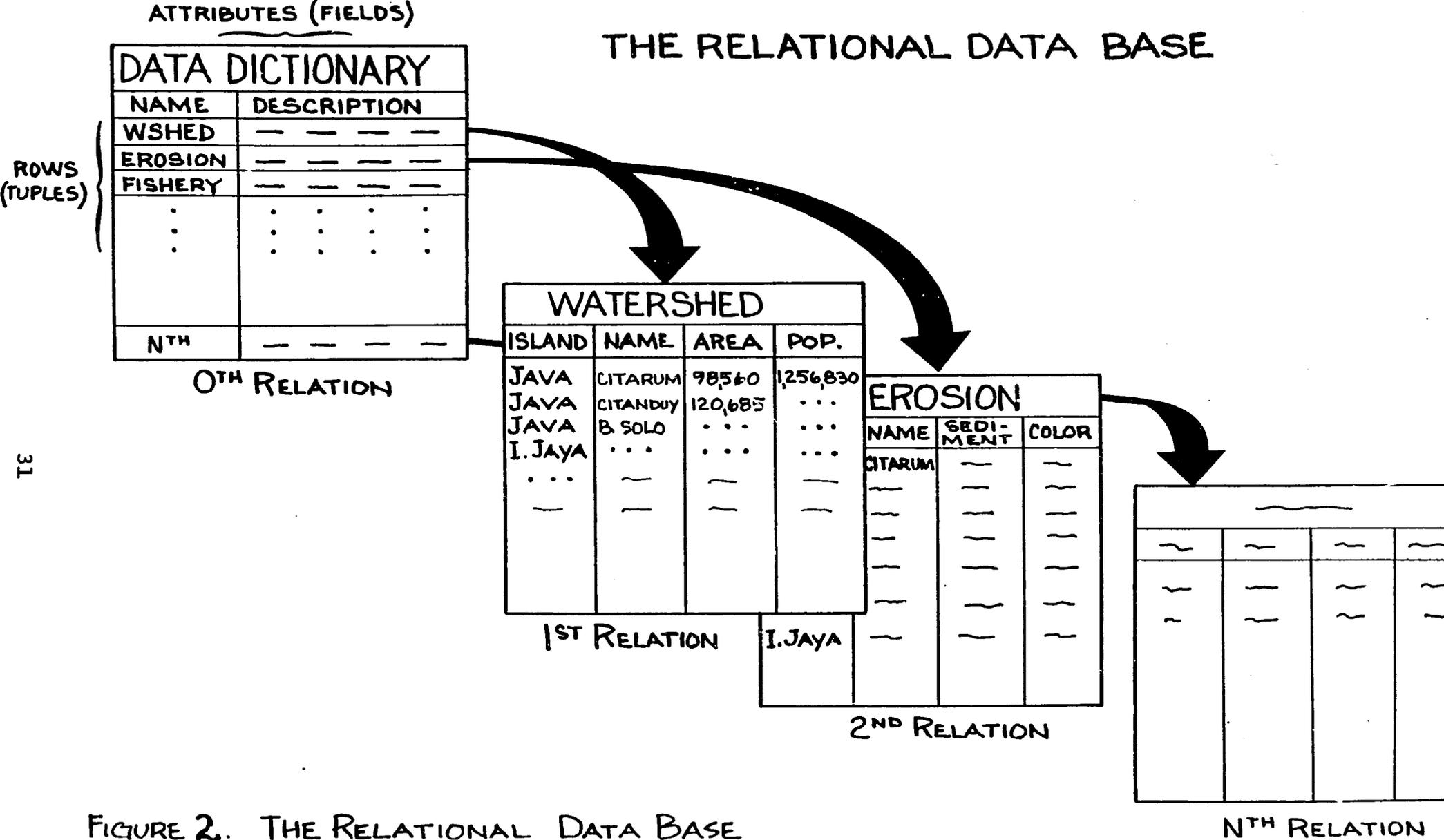


FIGURE 2. THE RELATIONAL DATA BASE

COMMAND: "SELECT FROM WATERSHED WHERE
AREA IS LESS THAN 100,000

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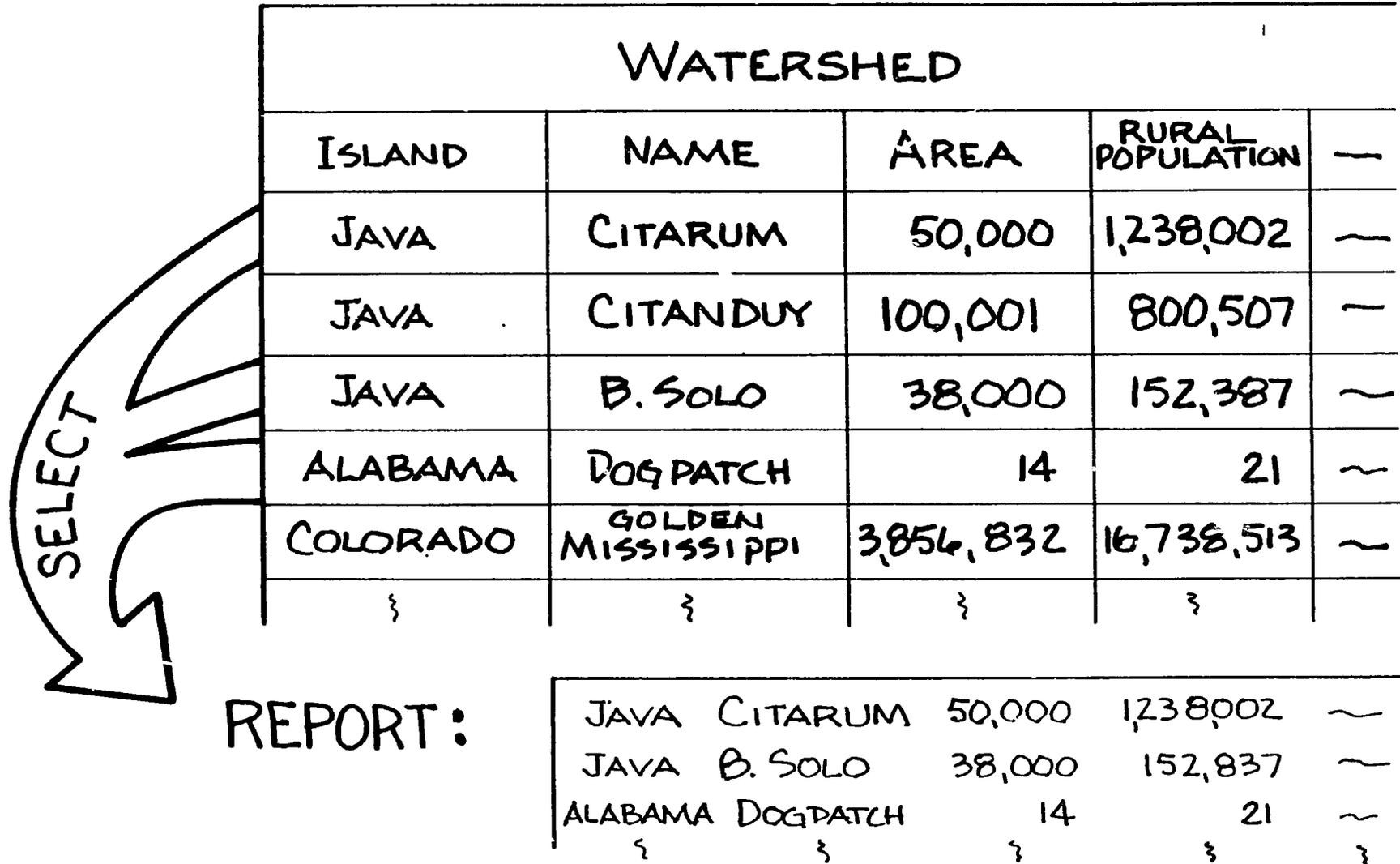


FIGURE 3. ILLUSTRATION OF SELECT OPERATION

COMMAND: "PROJECT NAME, POPULATION FROM WATERSHED WHERE AREA IS GREATER THAN 100,000"

WATERSHED				
ISLAND	NAME	AREA	RURAL POPULATION	~
JAVA	CITARUM	50,000	1238,002	—
JAVA	CITANDUY	100,001	800,507	~
JAVA	B. SOLO	38,000	152,387	~
ALABAMA	DOG PATCH	14	21	~
COLORADO	GOLDEN MISSISSIPPI	3,856,832	16,738,513	~
?	?	?	?	~



REPORT:

CITANDUY	800,507
GOLDEN MISSISSIPPI	16,738,513

FIGURE 4. ILLUSTRATION OF PROJECT OPERATION

COMMAND : "JOIN WATERSHED WITH EROSION FOR SOILLOSS WHERE ISLAND IS JAVA"

WATERSHED			
ISLAND	NAME	AREA	~
JAVA	CITARUM	50,000	123---
JAVA	CITANDUY	100,001	800---
JAVA	B. SOLO	38,000	152---
:	:	:	:
:	:	:	:
:	:	:	:

EROSION			
ISLAND	WATERSHED	SEDIMENT LEVEL	~
JAVA	CITARUM	1.385	~
JAVA	CITANDUY	1.568	~
JAVA	B. SOLO	0.038	~
:	:	:	:
:	:	:	:
:	:	:	:



SOILLOSS						
ISLAND	NAME	AREA	RURAL POPULATION	...	SEDIMENT LEVEL	~
JAVA	CITARUM	50,000	1238,002	...	1.385	~
JAVA	CITANDUY	100,001	800,507	...	1.568	~
JAVA	B. SOLO	38,000	152,387	...	0.038	~
JAVA	~	~	~	...	~	~
:	:	:	:	:	:	:
:	:	:	:	:	:	:
:	:	:	:	:	:	:

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FIGURE 5. ILLUSTRATION OF JOIN OPERATION

Computer Systems Briefing

Computer systems range in size from super computers (Cyber 205, Cray 1) to large mainframe computers (Cyber 800 series, IBM 3400 series) to supermini computers (VAX 11 series, Data General, Prime, Perkin-Elmer) to minicomputers (PDP 11, Data General Eclipse) to 16-bit microcomputers (Fortune, IBM PC, Compupro 816) to 8-bit microcomputers (Eagle II, Altos, Apple).

While there are only a few manufacturers making supercomputers, there are many more manufacturers of minicomputers and hundreds of microcomputer manufacturers. Likewise, there is a very large selection of peripheral equipment (disk drives, printers, graphics terminals and plotters) and software for mini and microcomputers. The selection of a computer system depends on the task for which the system is required. Programs requiring solution of very large systems of equations and rapid manipulation of data require a large mainframe or supercomputer. More modest requirements are met by the smaller machines.

While it is difficult to exactly identify the computer requirements of Menteri KLH in the long term, a good rule of thumb for planning computer systems is to consider a five year time horizon. Changes in technology and mission of MKLH over periods of more than five years make planning difficult. Expect that the system purchased now will be obsolescent or already obsolete in five years.

We recommend that MKLH adopt a conservative policy as discussed above and begin with a 16-bit microcomputer system. If the Ministry starts slowly and carefully with many design checks and performance reviews along the way, it will be possible to develop a computerized information system that will meet current needs without stressing or overtaxing current MKLH budgets and personal levels.

The term "16-bit" refers to the size of the computer data word. Data in the computer are stored as binary numbers (two states: on/off, 0/1, true/false, etc.) which can be represented by a positive or negative charge in a specific data location. This single charge is called a bit, taking the value of 0 or 1. In a 16-bit computer, 16 of these charges are arranged for form a word. Thus the biggest integer that can be represented in a 16-bit word is two raised to the 16th power, or just over 32,000. Words can be combined to form long integers, and decimal numbers commonly require four words. Eight bits are needed to represent characters such as the letters of the alphabet (A..Z, a..z), numerals (0..9) and symbols (...etc). Eight-bit computers have a word length of eight-bits (1 byte).

Sixteen-bit computers are faster than 8-bit computers, are more sophisticated and can execute larger programs. Many microcomputers allow more than one terminal (multi-user systems). However, most microcomputers suffer reduced performance with more than four people using it simultaneously. Computer memory is usually

called RAM (Random Access Memory) and is usually measured in bytes (see above). RAM is where programs and data are temporarily stored for execution. A computer program is really nothing more than a set of instructions telling the central processor unit (CPU) to take some data from a specific location in RAM, perform some operation on it and store the results in some other location in RAM. Of course, the program itself resides in RAM while being executed. The system has to remember where the program stops and the data begins, and so forth. Most of these kinds of things are done by a program that stays in RAM all the time, called the "operating system". sixteen-bit microcomputers usually come with 256,000 bytes of RAM (256k), expandable to 1 or 2 million bytes (1 to 2 megabytes). A 4-user microcomputer should have at least 1 megabyte of RAM.

Data are not stored in RAM, but are externally stored on magnetic media. The most common storage medium is the "floppy disk". A floppy disk or diskette has the appearance of a small phonograph record in a special envelope. The amount of storage on floppy disks ranges from about 100k to about 1.2 megabytes. Floppy disks are commonly available in two sizes, 5.25 and 8 inches. there is a standard format for 8-inch floppies (IBM format, single-sided, single density) that can be read by all 8-inch floppy drives. This standard format is very convenient for data transfer. Unfortunately, there is no standard format for 5.25 inch floppies; formats vary greatly among computer manufacturers. Floppy disks can be removed and are convenient for storage, but are too small and slow to support multi-user capability.

More data can be stored on hard disks. These disks are usually sealed in the computer (Winchester disks) and cannot be removed, but as much as 40 megabytes can be stored on Winchester disks. Large disk packs capable of storing billions of bytes are available for larger systems, but 80 megabyte systems are large for microcomputer systems. Hard disks are much faster than floppy disks and are required for multi-user systems. Since hard disks cannot be removed, the data in them must be backed up (transferred to external storage media, such as magnetic tape or floppy disks) in case of a disk failure or human error. To prevent data loss, most systems provide an additional floppy disk drive for backup. Some come equipped with a cartridge tape backup (17 megabytes per tape) and more advanced systems allow backup onto video cassette tapes or 9-track computer tape.

Because the data are often much more valuable than all the computer hardware combined, backup and archive procedures must be established and religiously practised. Sloppy file maintenance and archive practices will eventually cost the Ministry more than the initial investment in equipment. The need for careful backup procedures cannot be overemphasized.

Computer Processors

The processor or Central Processing Unit (CPU) is the component that actually does the work. It carries out all numerical and character operations. Most micro-computers have only one CPU. Common 8-bit "chips" or CPUs are the 8080, Z80 and 6502. Sixteen-bit chips are the MC68000, 8088, 8086, Z8000, etc. The MC68000 is really a 32-bit chip but is usually used in a 16-bit configuration. There are several new 32-bit chips under development that promise considerable computer power. However, software development lags considerably behind hardware development. Optimized software even for the common 8086 chip is not common. Digital Research, for example, will not release its optimized Pascal compiler (a program that translates human-oriented Pascal programs into machine language programs) until December 1983. The upshot is that while new hardware appears with incredible frequency, software development is much more difficult and slow. A conservative approach to the selection of hardware is probably justified by the certainty that new software will lag behind the introduction of a new chip by one to two years or longer.

One other consideration for a micro-computer system for MKLH: the need for fast numerical processing. Computers store real numbers (those with decimals) differently from integers. Integers are stored directly as binary numbers, but numbers (also called floating point numbers) are stored in exponential form, usually requiring 8 bytes on a micro-computer. Floating point arithmetic is very much slower than integer arithmetic. Large computers have floating point hardware that does all floating point arithmetic, but most micro-computers do floating point arithmetic with software routines. This can make solution of mathematical models very slow.

Most 16-bit micro-computers can be purchased with a hardware floating point processor. A typical combination is the 8086 CPU with the 8087 floating point processor. Hardware floating point will accelerate performance of numerical computations by as much as 200 times. MKLH should specify hardware floating point.

Printers

Printers are often a second thought in computer system selection; however, an inadequate printer can be as much of a productivity bottleneck as a slow computer. There are three basic types of printers: daisy-wheel "letter quality" printers, "dot matrix" printers and line printers. The first two types of printers print a single character at a time; line printers print a whole line at a time.

Daisy-wheel printers often use carbon ribbons and the characters are embossed on a plastic wheel which is spun to the strike point for printing of each letter. Daisy-wheel printers produce excellent quality print, but are very slow, 25 to 60 characters per second.

Dot matrix printers have a printhead with nine or more small wires in a matrix and characters are formed by selection of the wires. Dot matrix printers are much faster than daisy-wheel printers and often have fair quality "correspondence quality" print. Dot matrix printers can also produce graphics, some systems even provide color graphics (IDS PRISM). Typical dot matrix printer speeds range from 80 to 200 CPS.

Line printers are the workhorses of computer systems. If KLH acquires a larger system, one or more line printers will be required. Line printer speeds range from 200 lines per minute on up. Laser printers are extremely fast. Line printers are more expensive than dot matrix printers, but are a must for production shops. We recommend that MKLH purchase a line printer. Some lineprinters like the Printronix system has graphics capabilities. This would be a good choice.

Computer Software

Software is the generic term for the programs that tell the computer what to do with the data. Without software, the computer is nothing but a pile of metal and plastic. There are two basic classes of software, "systems software" and "applications software".

Systems software is the set of programs that operate the computer. This software includes the operating system, programming languages, and utility programs. The operating system is a set of programs that tell the computer how to store data on disks, how to interact with the terminal, how to move files from disk to RAM, how to load programs into RAM, how to execute the programs, etc. To the user, the operating system is seen as a set of commands. These commands are the way the user interacts with the computer. Common microcomputer operating systems are CP/M, MP/M, MS/DOS, UNIX, ZENIX, APPLE DOS.

CP/M, MS/DOS and APPLE DOS are single-user operating systems. There are many thousands of programs available for each of those operating systems. Most 8-bit microcomputers offer CP/M which is the most popular 16-bit operating system, although CP/M 86 is widely used. CP/M and MS/DOS are simple and easy to learn. However, Unix and its look-alikes are far more powerful.

Applications programs are the word processors, accounting systems, data base programs and all the programs written to do a specific task for the user, such as data analysis and graphics programs. Applications programs are usually written in a high-level computer programming language.

This brings up the final topic: programming languages. It is our expectation that MKLH will have to do little programming at first; most of the programming requirements can be met by the recommended applications programs. However, data analysis and graphics requirements may necessitate programming. There are several programming languages available for microcomputers: BASIC

(Beginners Allpurpose Symbolic Instruction Code), FORTRAN (FORMula TRANslator), Pascal, C, and Pl/1, among others.

BASIC is by far the most popular language in the microcomputer environment, because of its relative simplicity and the fact that for many years BASIC was the only language available for micros. BASIC is usually provided as an "interpreter", which is a language that is translated into machine code and executed one line at a time. While making a language easy to use, interpreters are usually quite slow, and BASIC is no exception. Further, the language does not require some of the more recent thinking in computer programming: variable declaration and structuring. BASIC is a very good language for small "throw-away" programs, but other languages are preferable for large, maintained programs.

FORTRAN, Pascal and C are examples of "compiled languages" rather than "interpreted languages". The programmer writes the program in the language, enters it into the computer, then calls the compiler to translate the whole program into machine code. The user then executes the machine code version. This compilation step allows for optimization of the machine code, resulting in considerable increases in performance over interpreted languages. FORTRAN is one of the oldest of the programming languages, and is the most popular for scientific work; COBOL is used for accounting and business programming. While FORTRAN and COBOL are widely used in mainframe environments, Pascal and C are the dominant compiled languages used in micricomputer environments. Pascal and C are very new languages, containing powerful structures not available in FORTRAN or COBOL. More importantly, Pascal and C are "structured" languages that result in very clear and orderly code. Surveys show that programming shops have reduced their programming costs by about 10% and their program maintenance costs by as much as 20% by converting to Pascal from FORTRAN. We recommend Pascal or C for all large MKLH programming tasks.

Recommended System Specification

Because Indonesia possesses reliable electric power at least in major population centers, it appears that installation of a computer system in Indonesia requires only those basic parameters required everywhere:

- o Reasonable air conditioning
- o Voltage regulator

Virtually any computer manufactured in the world is available somewhere in Jakarta. However, almost no local dealer stocks a large inventory, so a three-month or longer delivery period is to be expected. There are many computer dealers in Jakarta and more in Singapore. However, we recommend that selection of a dealer be regarded as being as important as the selection of equipment. There are several large systems houses in Jakarta that could provide the hardware, maintenance, custom programming and

training required by KLH.

We will not recommend a particular system at this point, but preliminary specifications can be defined.

Required Computer Hardware

MKLH should specify a 16-bit microcomputer with 1 mbyte RAM, hardware floating point processor, 40 mbyte Winchester, 4 terminals, cartridge backup. If cartridge backup is not available, then the system should have an 8-inch floppy backup. A Printronix-type printer should be used.

Communications

The central IMH at MKLH will have to supervise and insure that data in the field can be transferred to the DBMS at MKLH. These external offices, such as DPMA, BAPPEDA, BKLH, PSL etc. will have data or information that will be needed at various times by the central group at MKLH.

Computer-to-computer communication is technically possible. Good telephone communications and data transfer programs using compatible protocols allow files to be shipped from one computer to another. This is a relatively simple procedure and many programs are available that are designed for just this purpose. The problem is that both computers must be using the same program or programs that use the same protocol.

Communications over telephone lines require a modem (a device to convert computer input and output to telephone compatible forms) on each end. The telephone line quality is important, although some communications programs have very sophisticated transmission checking. With these programs, each computer checks a number associated with each data transfer (the checksum). A block of data is transmitted and the sender computes the checksum. When the receiver receives the data, it also calculates the checksum and sends it back to the sender. If the number is the same, the sender "knows" that the data were OK, so it sends the next block. If the number is different, then the sender retransmits the block. Poor telephone lines cause many retransmissions, thus slowing down the file transfer.

The local telephone lines appear to be marginal for data communications. Dedicated lines are possible but cost effective only where daily communications are required. Remote service via satellite may be quite good, making it possible for a BKLH computer in, say, Kalimantan, to transfer data to the Jakarta IMG.

Because of the complexity and expense of telephone data communications, we recommend that such linkups be deferred until either MKLH has a demonstrable and urgent need for such hookups, or until the IMG has the necessary experience and funds for hookups. In the interim, the IMG can use magnetic media for datatransfer.

Large amounts of magnetic media data transfer require the use of magnetic tape. The standard system is 9 track mag tape, encoded in ASCII or EBCDIC at a standard blocking factor and write density. (ASCII and EBCDIC are standard data encoding forms and are commonly used throughout the industry). Virtually all computer systems with 9 track tape drives can read and write these standard format tapes. Use fixed-block formats (avoid variable blocking) at 1600 or 6250 bits per inch. Any computer center can advise on tape formatting and blocking.

If, as we suggest, the central site stores only descriptions of the data in remote sites, floppy disk data transfer will be adequate. Be certain that the floppy disk formats are compatible (see above). The safest approach is to require that remote sites use the same computer system, but this is probably impractical. In that case MKLH will have to be able to read and write disks of various formats. This will probably be a must. MKLH will probably have need of both 8- and 5.25-inch disk drives. These are available on many systems such as the CompuPro.

Finally, the most primitive method of data transfer is to simply receive data from the external sources on paper and re-enter the data into the KLH central system. This will be true of all the forms filled out by Information Specialist, and much field data will not be available in magnetic format. These data will be entered by the Data Entry Person.

Required Computer Software

First choice operating system: UNIX or look-alike, second choice: MP/M. Programming languages: BASIC and Pascal or C. Of the latter, Pascal MT+86 from Digital Research is probably the best of the Pascals, C86 may be a good choice for C. MKLH may wish to defer the purchase of programming language until a definite need is established. Some computer systems such as Alpha Micro have proprietary operating systems. These systems often contain very good implementation of BASIC, Pascal or C, but some of them are poor. An independent, local expert can be consulted for assistance in software selection.

DATA MANAGEMENT SOFTWARE: With Unix, a very good RDBMS called INFORMIX is available. It comes with an excellent report generator and graphics. Another good RDBMS is Micro-Ingres. Under MP/M several RDBMS programs are available, including dBase II, Knowledge Man, among others. DBase II is the third largest selling computer program in the world and is a reliable and reasonably good package. DBase II has been around long enough for many auxiliary programs to have been developed, including ABSTAT, a statistical analysis package that uses dBase II only allows 32 attributes per relation and can join only two relations. It does allow 32,000 records per file. At the time of ordering, MKLH should consult with a database expert to help make the choice.

MISCELLANEOUS SOFTWARE: There are many word processors available

for micro-computers and we recommend that MKLH buy one. They are relatively inexpensive and well worth the cost. Many micro-computers come with a built in word processor, usually Wordstar or Spellbinder. Wordstar is the largest selling word processor largely because it was one of the first. It is easy to learn, but uses a large number of command menus that can be confusing. Spellbinder is in some respects more powerful than Wordstar and it is more like a dedicated word processor such as the Wang or Xerox 860. There are probably a hundred word processing programs available. Of that number, Wordstar probably accounts for 90% of the market, but many of the other programs are excellent.

Spreadsheet programs are useful for many accounting and financial planning tasks, and there are many of them including Visicalc (the first), Supercalc, UltraCalc, 123, MBA and others. The latter two integrate spreadsheets with data management and word processing, which may not be needed at MKLH but a spreadsheet program would probably prove useful.

Many applications programs are available, including simulation languages, graphics packages, and statistical analysis packages. They are advertized in most micro-computer magazines such as Byte, PC World, InfoWorld.

A Final Note

Because of the complexity of computer selection and DBMS design, we recommend that KLH secure the services of an expert consultant to assist in computer selection, design and training of MKLH personnel. It is possible that USAID funds could be made available for this purpose. Experts can be found locally at the University of Indonesia Computer Science Department and training is available from the University and from several software houses. These services may be limited by availability of personnel and budget constraints.

4. Suggested Inputs to the EPIMS

4.1 Improving Sources of Information on Population and Environment

As noted in Sections 2 and 3 of this study, information flows between agencies and between government and the private sector and the community are not as open and complete as they could or should be. With that fact in mind, we propose one general suggestion which is that MKLH exert itself to obtain high-level authorization to obtain the information it needs to do its job effectively. [12] Several other suggestions are offered to this same end below.

Not only is it important that MKLH have better access to information but it also needs to get this information from a variety of sources. These include:

- a) line departments, (full Ministries);
- b) specialized, non-departmental agencies;
- c) regional government entities;
- d) state and private enterprises;
- e) the MKLH network;
- f) community organizations, also called community self-reliant institutions;
- g) private research and service organizations;
- h) the foreign community.

It is beyond the scope of this report (or any report) to determine all the kinds of information that would be needed by MKLH for its program, given the vast range of its mandate. However, some suggestions can be offered as to organizational arrangements that may facilitate the flow of the information available (see Appendix 4.1. for a list of the formal liaisons, working groups and technical teams, the last two by subject connected to MKLH).

Line Departments. All of the sectoral departments liaisons, (penghubung sektoral) should be invited to a meeting at MKLH and the information needs of the Ministry spelled out to them. Since every ministry has one or more data collection and analysis cum publications unit, the liaisons should be given questionnaires to take back to their departments to have filled in. They should be responsible for keeping contact with the EPIMS liaison officer in charge of information sources. In many cases, the penghubung sektoral can be assisted by one or more individuals who are members of a kelompok kerja, (working group) or tim teknis, (technical team) under one or more of the ASMEN.

[12] There would appear to be legal justification for obtaining such authorization under U.U. no.4 (1982), (reference 24), especially provisions 9,15,16,18,19 and 20 and their explanation in the "Elucidation" section of the Law. However, it may also require either a Presidential Decision (KEPRES) which is unlikely or an Interministerial Decree (more likely) to give more emphasis to the underlying legal basis.

Finally, we strongly suggest that MKLH seize the opportunity provided by the formulation of the REPELITA IV, at this time, to include language in the plan requiring all agencies to cooperate in the provision of information upon request to MKLH. Discussions with a BAPPENAS official indicate that the agency would be open to such a request.

Specialized, Non-departmental Agencies. This group of agencies, which include the Central Bureau of Statistics and the Family Planning Program (BKKBN), also have liaison officers with MKLH. At this time, we suggest a strategy for gaining information from these agencies similar to that of the line departments. However, it should be noted that, BAKOSURTANAL excepted, these agencies are already rather accessible. Perhaps a more pressing need for these agencies is input on the kinds of data needed from them.

Regional Government Entities. For the purposes of this study, a few regional government offices were examined, and information needs and capabilities assessed. These entities are listed in Appendix 1. A common theme of these interviews concerned the need for the upgrading of the role of the BKLH, Biro Bina Kependudukan dan Lingkungan Hidup (Bureau for Supervision of Population and the Environment) of the provincial-level government.

Because of the great region-specific nature of environmental and population matters, we urge that the Government give this bureau a much higher status and broaden its capacity to assist regional (provincial) government (PEMDA I), provincial planning boards (BAPPEDA I) and line agency offices at the regional level (dinas, kanwil and balai litbang). [13]

Although the comments relating to the BKLH from the team's site visits covered a wide range of topics, we will address ourselves to the information aspects at this time.

New Role for the Regional Environment and Population Supervisory Bureau (BKLH)

Since the orientation of much of the data which MKLH receives is sectoral, it is difficult to assess the impact of any one department's programs on the wider socio-economic environment nor their impacts on other programs. In the absence of other institutional mechanisms, the role of putting together the regional and intersectoral environment and population impacts of development activities is, by implication, left to a new annual report, the Regional Environmental Balance (Neraca Lingkungan Wilayah). The Neraca Lingkungan is coordinated by MKLH, although the authority and the budget to carry it out is under another agency, the Ministry of Internal Affairs. The actual report writing is a joint effort of these two agencies along with regional line agency offices and research institutions, especially the Environmental Study Centers (PSLs).

[13] See glossary for a list of abbreviations and acronyms.

In principle, the Regional Environmental Balance report could be an essential part of the Government's resource management and socio-economic planning structure, given the widely varying environmental, developmental and socio-demographic characteristics of Indonesia. Unfortunately, to date, it has been of limited utility. This is the case for three reasons:

- (i) the structure and format of the report;
- (ii) the absence of any definite role for the report in national and regional policy making and planning and
- (iii) inadequacies in the data base, the technical analysis and the coverage of the report.

In the view of the team, these drawbacks to the Regional Environmental Balance report are directly related to the absence of a national environment and population information management strategy which is the issue this report attempts to address. Consequently, many of the problems that plague the regional report are similar to those discussed earlier for the national-level government.

An important difference between the national information system and the regional one - as reflected in the Regional Balance report - is the problem of reconciling national plans and programs with regional needs and the variation among regions in resources, environment and level of development. These critical regional differences, in relation to the development of an EPIMS, can be summarized as follows:

- (i) the need for regional government to coordinate the programs and projects of many sectoral agencies in line with regional government management capacity in such a way as to avoid conflicts and disruption;
- (ii) the need for regional government to target government programs and private investment to areas and fields of priority to the region;
- (iii) reconciliation of national plans to regional laws (peraturan gubernor), local customs and traditions, and
- (iv) provision for management of secondary effects (on environment and population) of major government and private programs and projects.

Regarding the issue of an environmental and population information management strategy, it is important to remember that most of the relevant issues are felt at the local and regional level even though where they may be instigated by national policies and programs. Also, there does not now exist an integrative planning and forecasting mechanism at the regional level to deal with these issues. MKLH itself does not have the authority to act directly at the regional level and no one line agency can deal with these essentially intersectoral issues. The BKLH presently has very weak monitoring and evaluation authority or capability,

even though it has a mandate for a much greater role within the decision letter (surat keputusan) which set it up. (14) Hence, we feel the BKLH is an appropriate place to focus attention on the critical regional support mechanism for the national EPIMS.

A Regional Population and Environmental Information Strategy.

What is presently a constraint could be turned into an opportunity for both MKLH and regional government if a coherent regional information management strategy for environment and population is adopted.

In addition to the Environmental Balance report, there are a rather large number of sectoral studies, (energy, forestry, population, industry, etc.) at the national, regional and local levels for programs, projects and research studies. But, without a strong, regional information coordination mechanism, these studies may not be effectively utilized.

The record of national and private large-scale projects shows that it has often been difficult for individual sponsoring or supervising agencies to adequately foresee and deal with unintended secondary effects of these undertakings. This problem has been frequently noted for projects in watershed rehabilitation and development, industrial development and transmigration (inter-island resettlement) projects amongst others.

The difficulties arise for several reasons including:

- time lags in the appearance of secondary effects;
- inadequate accounting for project-induced population movements, secondary development, especially services, and conflicts over resource and infrastructure development and utilization, and
- jurisdictional problems: large-scale programs frequently involve more than one major line agency and several local and/or regional governments, leading to problems of management and coordination.

It is difficult for national-level line agencies to foresee and deal with such a complex of issues. Logically, there should be a division of labor between that information needed by national-level agencies and that needed by regional-level agencies for an effective management system. Because the environmental and population issues likely to be involved cross agency boundaries, an integrating and monitoring agency should deal with these issues at the point of impact in the region. We foresee the BKLH as the one agency potentially best suited to this role.

A strategy for improving the effectiveness of information management within the BKLH and its Regional Environmental Balance

(14) Basic responsibilities and authority are outlined in the cooperative letter of agreement of 1979, (reference 16) and elaborated in the report on consultations of 1981 (reference 17).

report as well as improving the use of other sources of information within a regional information system might include the following elements:

One: better definition of the role of the BKLH. The present division of responsibilities is exemplified by the existence of a detailed national plan and sectorally-derived national programs alongside of separate regional plans and responsibilities for coordinating national programs. This situation seems to call for an "ombudsman" mechanism to deal with potential conflicts and to support regional planning capability and development monitoring. It is proposed that the BKLH be strengthened as a monitoring and evaluation body for regional government given its broad mandate on environmental and population matters.

A central task of the BKLH would be the coordination and dissemination of information and analyses to BAPPEDA I and PEMDA I. For this purpose, the function of the BKLH might be reorganized to include the chairing of a Regional Information and Documentation Center, (PUSIDO/Daerah) composed of university PSLs, regional research institutes, provincial-level sectoral agencies (dinas) and provincial statistical offices. For this body to be functional, the Ministry of Internal affairs should vest the BKLH with greater access to statistics and documentation available now to BAPPEDA I and PEMDA I, stressing the role of the BKLH as an information management and support organ.

Two: interim environmental and resource management reports should be compiled by the BKLH, rather than one big report once a year. These reports would be topical, i.e., by issue, sector or major project undertaking. The topics of these reports could be decided at a semi-annual meeting of the BKLH and regional government planners (BAPPEDA I) and the reports assignments farmed out to task forces composed of one or more of the organizations of the PUSIDO Daerah. The intent of such reports would be to contribute to a more solid, planning-oriented annual Regional Environmental Balance report that could be more useful to both regional and national planners.

Three: the Regional Environmental Balance report should be restructured to focus more on the population, resource management requirements and environmental impacts of regional activities and linkages of these activities among sectors than on the compilation of data only, much of which, in the form in which it is presented in the current Balance Report is simply redundant with what is already available to regional and national government planners. In addition, much more emphasis should be placed upon the institutional resources available at the regional level, both governmental, private non-profit (ORNOP and Lembaga Swadaya Masyarakat)[15] and the private sector (businesses and consultants). In this regard, the Regional Environmental Balance

[15] ORNOP (Organisasi Non-Pemerintah), non-governmental organizations; Lembaga Swadaya Masyarakat (Community Self-Support Institutions); non-governmental in nature.

report might include a listing and evaluation of these agencies and organizations and their roles in population, environmental and resource management, with, perhaps a brief description of their yearly programs. Also, the Environmental Balance should include an executive summary that recapitulates the main population, environmental and resource management issues along with a section on recommended directions and actions for regional government planners and decisionmakers to use as input on these subjects for their overall development planning and budget priority determination.

Four: the BKLH and the Regional Environmental Balance report should be linked up to the Environmental Impact Assessment process, (ANDAL). For some time, the intent of the ANDAL process, as envisioned by MKLH, has been to become a planning and design tool as well as function as a way of monitoring and evaluating major development activities. This intent is also reflected in the Basic Law on the Environment. Presently, the ANDAL process lacks a defined institutional mechanism at the regional level which could enable it to play the above-mentioned roles. This aspect of the ANDAL process is presently being developed with sectoral departments at the national level. While this is also necessary, it may not be sufficient with regard to the analysis of intersectoral and region-specific impacts, which individual, national-level departments may have more difficulty in assessing.

Since MKLH is currently working to set up its own EPIMS to coordinate the collection, analysis, presentation and dissemination of population and environmental information, it should make better use of the BKLH. The regional aspects and the role of the BKLH have not yet been defined fully for this system.

While the PSLs have a valuable role to play in this matter, their function should be, in part, to complement the role - or the potential role - of the BKLH in the management of regional information on population, environment and resource management. The national population and environmental information system should take advantage of the potential regional coordinating and clearing-house role of the BKLH in the provinces to support the policy evaluation and coordination function of MKLH in population and environmental matters. This would, at one and the same time, strengthen and define the role of the BKLH and provide greater breadth to the information available to the national system, not incidentally also providing a more solid basis for annual revisions of the annual MKLH population and environmental situation report.

State and Private Enterprise. This group includes government-owned or controlled enterprises, such as PERTAMINA, (State Petroleum Corporation), and a large number of other enterprises in fields such as public utilities, manufacturing, estate crops and transportation. Private enterprises include foreign or joint venture firms, as well as wholly domestically capitalized enterprises, including trade, road transport industry, contractors and consultants, amongst others.

To date, MKLH's links with this sector are not strong, though it is searching for a practical way to influence private sector environmental impacts. Particularly on the monitoring side, MKLH has been unable to generate a regular and reliable flow of information. Yet, the impact of this sector on population and the environment is quite large and will continue to grow. While individual line ministries will continue to be the principal intermediaries and supervising bodies for this sector, we suggest a few approaches in the information field by MKLH directly.

A Regional Employment and Environment Information Coordinating Board. (BAKORDA - Informasi Ketenagakerjaan dan Lingkungan Hidup). [16] At this time, MKLH and the Department of Industry have been weighing the feasibility of incentive and disincentive mechanisms for managing pollution control. We would like to suggest a kind of incentive mechanism in the form of a cooperative arrangement between the private sector and government. We propose the formation of a BAKORDA for employment and environment composed of the following entities, amongst others:

- i) BKLH: as the coordinating agency and representative of provincial government;
- ii) BKPM-D: Regional Investment Coordinating Board: industrial location and licensing;
- iii) PSLs (Environmental Study Centers): ANDAL and/or socio-environmental research;
- iv) Dinas, Kanwil and Balai Litbang Perindustrian: Different regional offices of the Department of Industry;
- v) DPMA and/or its local representative, Directorate of Water Issues Research, a part of the Public Works Department: water quality monitoring, water resources assessment, amongst others;
- vi) Regional Office of the Indonesian Chamber of Commerce: representative of private industry.

It is suggested that private and state enterprise, along with government contribute funds towards the BAKORDA to enable it to do the following:

- i) establishment of regional industrial pollution analysis laboratories, for data on pollution impacts;
- ii) provision of pollution monitoring equipment for on-site use;
- iii) coordination of the use of data generated by pollution monitoring units which currently exist especially at (ii), (iii), (iv) and (v) above;

From the team's discussions with officials at the Department of Industry and those at the DPMA, a formal pooling and coordination of pollution monitoring data does not now exist, mostly because of jurisdictional rules. At the same time, regional-level

[16] The name of the proposed body and its components are suggested for illustrative purposes only; clearly they will have to be adjusted to local and national requirements.

officials involved in pollution monitoring complain of a lack of guidance from MKLH. The Ministry of Environment, however, may not be able to set reasonable pollution standards without better access to data from the monitoring of pollution sources. We feel that better coordination and upgrading of regional-level pollution facilities will contribute directly to a more effective environmental information management system and that the BAKORDA described above could be one mechanism to assist such an effort.

MKLH Network. The main arm of MKLH's support network, the university-based environmental study centers, have done a commendable job with very limited resources. It is suggested that the Ministry continue to support their development and endeavor to bring them into closer contact with regional government and local line agency offices in particular.

It is reported that the Indonesian Environmental Forum (WALHI) is about to publish a state of the environment report. We would encourage MKLH to disseminate this report if it is satisfactory and to work closely with the WALHI to publish an annual "People's Report on the State of the Environment and Population" as a contribution to the development of community awareness and the growth of self-reliant institutions as called for in the Basic Law on Environment Management, Article 19.

Foreign and International Organizations. We recommend that MKLH make better use of the resources available from foreign governments, international organizations and foreign, private organizations in Indonesia. While MKLH has made modest use of these, it mostly results in the form of periodic consultancies, rather than an ongoing relationship. The USAID Regional Environmental Advisor for Asia has made a practice of spending one day a week working at the Ministry as a de facto liaison between USAID and MKLH. We hail this initiative and suggest that other such relationships be encouraged where possible.

As an initial effort in this area, we recommend that ASMEN III convene a meeting to request that a "liaison officer", (the functional equivalent of the MKLH's penghubung sektoral) be designated as MKLH's contact point with those foreign government and international organizations willing to participate. These contacts would meet periodically with ASMEN III or other designated MKLH officials to discuss current MKLH needs and proposals, (both on information and other matters). Likewise, these liaisons could be the conduits for supplying information to the EPIMS unit from their own information networks. Further, MKLH should consider publishing an English language newsletter to keep this contact group informed of the activities of MKLH as well as the environment and population activities of those foreign-based organizations participating in the network.

5. Output of the EPIMS

The primary aim of this mission was to help design a country environmental profile and secondarily to assess the feasibility for a data base management system to contribute to such an effort. We recommend that the EPIMS as proposed in section 3 of this report produce several different kinds of information vehicles on environment and population. Some suggestions are offered below.

5.1 Current MKLH Information Products

The team was requested to examine the existing capability of MKLH to conduct an environmental profile. The Ministry has produced one such report to date, Salim and Dahlan, 1979(20). The team reviewed a draft Environmental Profile for 1983. This review is included as Appendix 5.1.

MKLH issues a variety of other information products at this time, including:

- a) reports of MKLH-sponsored research into particular environmental issues, much of which is done with the cooperation of the PSLs;
- b) an annual report of the activities of Assistant Minister I for the Natural Environment (since 1981). We know of no annual reports published by the other assistant ministers;
- c) compilations of the training materials of MKLH-sponsored ANDAL courses run by several of the PSLs. These are unedited and, though topics are standardized, the contents of individual presentations vary significantly in coverage, format and quality;
- d) speeches, internal planning documents and so forth;
- e) a number of magazines and newsletters of generally good quality.

5.2 Proposed Products of the EPIMS

We propose the following types of information materials from the EPIMS system.

Environment and Population Profile of Indonesia

This document would be aimed at policymakers as well as the general public, both Indonesian and foreign parties. The emphasis of this report should be on trends and indicators of population and environmental dynamics in relation to the development process. The document should emphasize the use of maps, charts, figures and a minimum of text for maximum impact on its audience. A possible example of the kind of report we have in mind is the U.S. Government's Environmental Trends. We foresee a need for publishing such a document at least once every REPELITA period and preferably once a year.

Environmental Quality Report Population Dynamics Report

These two reports are aimed at the overall state of the environment and population. They should reflect the overall progress, areas of difficulty and specific issues and topics requiring special attention with suggestions concerning how to resolve the problems. These reports should also include an annual update of legal and institutional changes concerning these subjects and a section on the quality of life. Finally, a basic data set of population, environment and the interaction of the two is recommended as an appendix to these reports. See Appendix 5.2. for a list of the kinds of information to be included for these reports as well as for the Profile, above.

We believe that combining the Profile with the two status reports above could comprise an effective reference for policy makers and the public without overburdening the EPIMS as they might if published separately.

Regional Report on Population and the Environment

This report would replace the current Neraca Lingkungan Wilayah and would be the result of both the BKLH and EPIMS units working through the PUSIDO-Daerah and the BAKORDA described in 4.1 above. Ideally, the regional reports should also be part of the MKLH system for formulating its annual environment and population reports.

Special Reports

These should consist of a series of reports by topic. Probably, the bulk of these reports will relate to matters of urgent attention such as the handling of natural disasters and severe pollution problems. In addition, we suggest that MKLH make a survey of other reports being done on its areas of interest by other institutions to identify those that should have wider circulation through its EPIMS publications section. For this purpose, we suggest that the kelompok kerja and tim teknis that are or will be formed under the five assistant ministers be closely involved in the identification of such reports and the composing of others.

Directories and Bibliographies

Annual publications in which the EPIMS, working in concert with PDIN and others, and consisting of directories of literature and expertise, projects and other activities, and including institutional developments in the fields of population and the environment. Special attention should be given to the activities of community self-reliant institutions (LSM).

Others. Special journals and publications for education and information exchange including magazines, newsletters and proceedings of the annual PSL conference. For the time being, the ones

that exist are adequate although they seem to be weighted towards the natural environment. The Built Environment needs to take more initiative in this field.

In addition, an editorial board should be created to produce an ANDAL course textbook based on the materials currently used in the PSL courses plus the results of evaluations of the courses given by the trainees. This should be a looseleaf-style textbook to facilitate the process of updating and rearranging the materials. We suggest that this task be assigned to one or more of the PSLs.

The exact number and format of the above documents is difficult to determine at this time because:

- a) the Ministry is still evolving its population functions and those of the interaction of population and the environment, and
- b) the REPELITA IV, on which much of the program of MKLH will be based, has not been completed yet. Nevertheless, we have included a translation of the MKLH program for REPELITA IV and, based on it, have formulated a list of topics on which information should be sought for the creation of the documents described in 5.2 of this report, (see Appendix 5.2.).

6. An Indonesian National Environmental Profile: Tasks and Manpower Needs

6.1. Aims and Tasks of the National Environment Profile. [17]

In Section I of the report, the team noted the need for an environment and population profile which could be used to assist MKLH in planning its program of activities for the upcoming REPELITA IV as well as provide it with an integrated overview of the current situation and medium term trends in resource and environmental management and population dynamics.

In addition to this primary goal, a national environmental profile might comprise the first significant test of the EPIMS framework. In this regard the profiling exercise could serve a number of purposes:

- 1) The drafting of a profile would have to make use of the resources of all the MKLH divisions, i.e. those in population and in environment and be coordinated through the Assistant Minister for Interaction of Population and the Environment. Hence, the profile exercise could provide valuable experience in the coordination of information available from each of the other Assistant Ministers and their external networks to produce an agency-wide document useful to all divisions. This could induce an improvement in the internal cooperation and coherence in MKLH's approach to environment and population management as well as point out where such linkages and coordination are now lacking.
- 2) The profiling exercise could provide the EPIMS group with useful experience in gathering and analyzing data and information systematically and on the basis of a clearly-defined agenda. At this time, the agenda is the MKLH plan for REPELITA IV, (Appendix 3.2.2) which would be further refined to identify particular information needs for a profile.
- 3) While this report has addressed the issue of information management, the profile exercise also offers an opportunity to develop a management information approach complementary to the EPIMS. A management information system attempts to identify the kinds of information and procedures needed for decision-making and problem-solving. In this regard the EPIMS team could use the profiling exercise as a problem-solving experiment. The "problem" would be the coordination of a dispersed information network to elicit useful kinds of information in a form which lends itself to policy and program evaluation for at least the period of the upcoming five-year plan. In dealing with this problem, the exercise

[17] Hereafter the profile is referred to as an environmental profile. Since MKLH explicitly deals with the impacts of people in their environments, the profile would necessarily examine all major population factors in its analysis.

could point out the current weaknesses and/or capabilities of MKLH's information network (externally and internally). In 4.1 of this report, the team has suggested several paths to improving the flow of information needed for a profile as well as for the EPIMS, in general.

- 4) Finally, the profile exercise could provide the Minister of State for the Environment and Population with a ready body of information on all aspects of environment and population for his use in Cabinet debates and in the coordination of the environmental aspects of the programs of the other ministries. It could also provide a kind of baseline which the Minister could use to evaluate the progress of the Ministry's own program during the plan period.

The national environmental profile is not intended to be a full implementation of the EPIMS framework. This is the case for several reasons:

- 1) The Ministry intends to put out the profile by the start of the REPELITA IV period, April, 1984, which is too short a time to set up the EPIMS;
- 2) The EPIMS should be regarded as an evolving mechanism. Presently, the internal coordination of information in MKLH and its utilization of external sources is not as effective as it could be, and could not approach the optimum during the period of the profile exercise.

However, the profile exercise should not become simply a "desk study" such as was the draft 1983 profile (reviewed in Appendix 5.1). As previously noted, many of the studies used in that and other MKLH documents were not adequate in their format and scope for use in a profile. As a result, we propose the following steps for conducting the profile exercise:

- 1) setting an agenda of goals, scope and topical coverage for the profile with particular attention to ways of discussing areas in which population, environment and resources intersect in the development plan. A preliminary attempt at this agenda-setting has been included as Appendix 5.2.
- 2) identification of those studies and data sets already available to MKLH which could be used for the study as well as those issue areas in which MKLH would have to commission special studies and statistical runs to get the information it needs. This should be the task of the Tim Teknis that now exist, including a special team assigned to look at population studies since there are not yet any technical teams for this subject area. A phase II profile team should include one month of consultant time for identifying the parameters of information types and quality to assist MKLH in this identification exercise;

- 3) training of EPIMS staff in the systematic organization of data and information for the purpose of preparing a profile. This may require intensive work with one or more foreign consultants for 1-2 months after the initial core team of the IMG has been set up at MKLH. (see Section 3.3);
- 4) training of EPIMS staff in the use of computer manipulation of data in those areas in which that may be necessary. This task should be a cooperative effort between a foreign or domestic consultant with experience in the management of environmental and population data for profiling and prediction; This task should be done concurrently with the Phase II profile though the EPIMS staff may not be fully prepared to undertake a full-scale use of computer-assisted data analysis for the profile exercise;
- 5) related to steps (4) and (5), above, preparation of a series of "trial studies" as training exercises in systematic data and information management. Such trial studies, e.g. the situation of the forestry sector or of the transmigration program would be ones also needed in the profile exercise and could be incorporated into it if the results are adequate. This exercise may involve the assistance of a consultant familiar with sectoral overviews of this type;
- 6) preparation of a draft profile for review by the proposed Kelompok Kerja for the EPIMS or other board if the former has not yet been established (see Appendix 3.2.1 for members of the review board);
- 7) publication of the Environment and Population Profile by the beginning of REPELITA IV, (April, 1984), for its use in preparation of the first year plan.

Since the time frame for completion of the profile exercise is rather short (six months from October, 1983), it is unrealistic to expect that MKLH will have its own computer facilities, including support staff, up and running in time to be effectively used. Hence, it might be more effective if the report were to be a joint undertaking with one or more independent organizations with which MKLH has an ongoing relationship. One of these bodies might be the Lembaga Demografi (Demographic Institute) of the University of Indonesia. Another might be one of the Environmental Study Centers that have computer facilities and experience (e.g. PSLH-ITB, Bandung or PUSDI-PSL-IPB, Bogor, both of which are close to Jakarta).

In order to facilitate coordination of this group effort, an editorial board for the profile should be created, with members of the participating institutions serving on it. It is suggested that the "editor-in-chief" be an individual with publications experience, especially technical report writing, but not a member of one of the participating institutions, if possible. Prior to the Phase II Profile Exercise, the editorial board and its chief should be designated.

As noted in the text, a number of information support bodies now exist who have expressed their willingness to supply special analytical studies, on request, to MKLH, if given adequate direction as to scope, parameters and format. These bodies include the Central Bureau of Statistics (BPS), the National Family Planning Board (BKKBN) and the Investment Coordinating Boards of the different regions amongst others. These groups have been identified in Appendix 3.2.1 as members of the proposed EPIMS Kelompok Kerja.[18]

6.2. Foreign Manpower Assistance

MKLH has requested further assistance in the development of its EPIMS capability during the next year. One of its needs is in funding assistance for the "hardware" aspects of the Data Base Management System (DBMS), i.e. the kind of equipment recommended in section 3.3.

A more urgent need, at this time, is for foreign technical assistance to work with MKLH and the proposed national profile editorial board in the creation of the Environment and Population Profile.

In the light of the tasks mentioned above, we foresee the need, at this time for two individuals to work closely with the Ministry for at least two and possibly three months. Part of this time should be around November, 1983 to work with the group in the production of the draft profile and to conduct further training as necessary.

To undertake the tasks described above, we suggest that the individuals chosen for the consultancies possess the following qualifications and experience.[19]

- 1) familiarity with Indonesia and, preferably, with the Indonesian language (Bahasa Indonesia). Virtually all of the professional staff of MKLH and most of the staff of other agencies speak some English but are more comfortable using the national language. Barring the latter, experience with Indonesia at least is strongly desirable.

[18] In addition, baseline studies of all of Indonesia's provinces have been compiled by the Department of Industry's Data and Analysis Bureau. Virtually all of the data in these studies is secondary source material from other departments and the Central Bureau of Statistics.

[19] In this section, we are describing two positions. However, since we foresee the period of the consultancy to be divided into two periods, it is possible that more than two individuals may be employed over the two periods, depending upon the particular needs of the Ministry and the stage of progress of the profile.

- 2) Capability and experience in the design and implementation of a national environmental profile. In this regard, the Indonesian case has two prerequisites for the individuals to be selected: (a) the person(s) should have had experience preparing a profile for a large and ecologically and socio-economically diverse country such as is the case with Indonesia and (b) the person(s) selected should have some familiarity with the interaction of population and the environment, including impacts on resources and the environment from migration, high-density population pressures and significant differences in socio-economic development and cultures by region. Relatedly, it would be very desirable for the individuals to be familiar with ways of measuring and evaluating quality of life changes, (physical and socio-cultural) resulting from e.g. economic development and urbanization. In addition to the above, it would be desirable for the individual to approach the design of the profile in a creative way, since the information sources available to the person will be diverse and dispersed for the most part. However, if the individual working with the profile team clearly sets out the kinds of information needs by type and format, Ministry staff will probably be able to find this information. It should be noted that almost all of this information will be in Bahasa Indonesia.
- 3) Capability in the management of information and experience in the training of individuals in information management. MKLH has stressed that any foreign technical assistance should be aimed at working closely with the Ministry's staff to train them in the gathering and selection of information for a profile.
- 4) Capability in data processing and in the presentation of data in various forms. One individual should be familiar with computer-aided data processing and quality control. Since it is possible to commission special statistical studies for the purpose of this profile, such an individual should be capable of specifying the format and parameters of the information desired. Relatedly, this individual or another should be familiar with forecasting and trends methods since the proposed profile will combine both an issues and a situation report section for population and the environment with an analysis of underlying trends for at least the medium term (five years). Finally, the individual should understand the effective use of maps and other graphic aids for description and forecasting.

As a final note, we would stress the selection of individuals who are willing to take the initiative in the design and formulation of this profile, yet would be flexible and responsive in dealing with the serious limitations that exist at this time, in the availability of comprehensive environment and population information in the Ministry.

APPENDIX 1.1.

Formal Scope of Work for the IIED Design Team for a Country Environmental Profile of Indonesia (CEP, and Team Members of the Design Effort

This scope of work was developed in communications between the Government of Indonesia, IIED and USAID (Washington and Jakarta Mission).

Task 1:

A review of a sample of existing CEPs to be provided by IIED.

Task 2:

An analysis of the range of perceived goals and objectives of a CEP in consideration of the national setting and local conditions.

Task 3:

A brief and concise definition of who the development and environmental community and likely CEP users are. Such a review would include a description of these entities including their mandates, organization, etc.

Task 4:

A review of the national development plan, development and environmental policy, and the environmental sector review. This task specifically involves an assessment of the concerns, activities and content of the development plan and sector review as they may

- coincide with the CEP, and
- could benefit from the CEP.

Task 5:

An analysis of specifically what kinds and quality of data are necessary for the development of a CEP useful to GOI and donor planners and technical experts. These data could, for example, include:

- spatial (mapped) information
- raw and reduced numerical data
- references (e.g. bibliographic) material
- listing of accessible professional expertise
- models, etc.

Task 6:

An appropriate, pragmatic and detailed plan for the optimal categorization, accession, retrieval, interphasing (e.g. with relation to international or national data bases of utility such as demographic statistics) and communication of environmental information of all types.

Task 7:

A discussion and identification of national and international sources of information.

Task 8:

Identification of individuals and institutions capable of contributing to a CEP. These data should include addresses, availability, professional descriptors and the level of experience.

Task 9:

A discussion of useful methods of:

- integrating data and analyses to foster a holistic systems view rather than a modular or sectoral view of the environment and projected effects upon it,
- ensuring that the CEP is not restricted to a snapshot in time but reflects plausible trends in resource use and character,
- accommodating a periodic (e.g. annual) update of the CEP.

Task 10:

Initiating the collection and systematic accession of data into the system developed during the course of task 7.

Task 11:

The development of a strategy and scope-of-work for a CEP including identification of the elements and participants (e.g. contractors) to be employed in a team approach. This task includes details or scheduling, logistics, level-of-effort and support necessary.

Task 12:

A discussion of alternative methods leading to a CEP and alternative CEP formats, content and approach.

Task 13:

A discussion of the problems foreseen in CEP development and use.

Task 14:

A discussion of the timing and modes of presentation of the CEP to administrators and the public with particular reference to the media, potential for broad-based environmental education, sequels to the CEP and specific linkage with related efforts - e.g. the environmental sector review, agricultural projects, etc.

Task 15:

The generation and submission of a draft report addressing tasks 1-16 herein.

Task 16:

The constitution and convening of a committee of qualified and interested reviewers, critics and referees from GOI, USAID, other donors and PVOs to scope (determine algorithms for public/academic inputs and review CEP plans (draft and final).

Task 17:

Review of draft CEP plan (e.g. by committee - of Task 16, PVOs, USAID and GOI).

Task 18:

Upon receipt of comments, the revision of the draft and submission of the final CEP plan, potential technical participants, schedules, logistics, costs, constraints, and other items mentioned above.

Team Members

IIED Team:

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MKLH Team:

1. Drs. Harry Harsono Amir, M.Sc.,
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3. Drs. M.S. Kismadi, M.A.,
MKLH Staff Member for Foreign Relations.
4. Dr. Alwi Dahlan,
Assistant Minister III
Interaction of Population and the
Environment.

Policy and Strategy Analyses currently being conducted by MKLH
(the State Ministry for Population and Environment),
with special reference to AID's supporting role

Summary

Several wide-ranging policy and program reviews are currently underway at MKLH. The key exercise is the drafting of a National Environmental Plan, to be included in Repelita IV. Supplementing this are the Environmental Monitoring and Information System, and the preparation of an Environmental Profile. USAID is supporting each of these: the Sector Review, the design of an Environmental Monitoring and Information System, and the preparation of the Environmental Profile.

These efforts are aimed mainly at MKLH's environmental management mandate, although the Information System and Environmental Profile are expected to apply to the Ministry's new population mandate as well. A key step in establishing a strategy for development of national population policies is a planned National Symposium on Indonesian Society in the Year 2000. USAID is being asked to support this activity also.

USAID's contribution to the Environmental Sector Review and to the design of an Environmental Information System have been funded by the AID/W Environmental Planning and Management Project. The Environmental Profile and the Year 2000 Symposium are prime candidates for funding under the new USAID Development Studies Project.

Repelita Planning

By early October, MKLH will submit to BAPPENAS (the National Planning Agency) a National Environmental Plan for Repelita IV (1984-89). Related to this Environmental Plan for Repelita IV will be a program plan for the first-year plan of Repelita IV, covering the period April 1984 to March 1985.

The three assistant ministers at MKLH have begun drafting the plan, drawing from their respective staffs, Indonesian experts, and the work-in-progress of the Environmental Sector Review.

* Compiled by Mr Will Knowland, USAID Regional Environmental Advisor for Asia.

Environmental Sector Review

The Environmental Sector Review is a series of consultancies by foreign experts to review current planning, policies, and programs in key environmental management areas. The review began in June and will be completed in December.

The Sector Review is intended to bring together a small group of internationally recognized scholars and experts (i) to review Indonesia's current policies and programs affecting the environment, (ii) to recommend specific steps to be taken for improving the implementation of environmental policies, and (iii) to recommend specific steps for developing necessary new policies.

Dr. Naya Djajadiningrat, Staff Expert, KLH, is the full time coordinator for the review. Dr. Donald Graybill is the Senior Environmental Advisor, to coordinate the foreign experts' contributions. Core funding for the Sector Review is being provided by UNDP, with bilateral donors (Britain, Japan, Canada, Denmark, and the U.S.) providing consultancies on specific topics.

Topics being addressed under the Review include:

- water quality
- toxic wastes and industrial pollution control
- tax incentives and disincentives
- industrial and urban siting
- coastal resources
- forestry
- education and training

USAID has already provided, through funding under the ST/FNR Environmental Planning and Management Project, a one-month consultancy by Dr. Harold Day. Dr. Day's consultancy (30 June - 4 August) reviewed Indonesia's water quality management situation, policies, and programs, concentrating on Java and Bali.

Additional support by USAID may be possible. USAID may be able to facilitate participation in the Review by Dr. Andrew P. Vayda, a human ecology specialist with considerable experience in Indonesia. Also, MKLH would like to incorporate and perhaps extend the Watershed Assessment work already completed by USAID. These possibilities will be worked out through the regular part-time involvement of USAID's Regional Environmental Advisor, Will Knowland.

Environmental Information Management System

In May 1983, MKLH formally requested from USAID technical assistance in developing a national environmental information monitoring and analysis plan. USAID has arranged for the International Institute for Environment and Development to provide three consultancies to assist MKLH to define measurable environmental quality goals, to develop a system to monitor progress towards these goals, to design an information management system, and to

determine the strategy for obtaining new information needed for environment/population decision-making.

In the first consultancy, Mr James Tarrant, former Technical Advisor to PSLH-ITB under the USAID Assistance to Environmental Centers Project, is reviewing Indonesia's environmental information needs and sources, and developing a general strategy for environmental information monitoring, including the role of an Environmental Profile [see below].

For the second consultancy, concurrent with the first, Dr. Kenneth Reed, an environmental information systems management specialist, is examining the details of an environmental information and data base management system appropriate to the GOI's needs.

The final consultancy of the series, to be fielded probably in November, will have Dr. Joshua Dickinson, an environmental management consultant with considerable experience with AID profiles in Latin America, review the proposed information system and profile planning.

Environmental Profile

An Environmental Profile - a national environmental situation report - is an inherent follow-on to the design of an environmental information management system. The Ministry has already experimented with the drafting of a national environmental quality survey. AID has been a pioneer in developing Environmental Profiles, and a proposal for funding the preparation of the Indonesian Profile under the new USAID Development Project is part of the scope of work of James Tarrant's consultancy [see above].

Year 2000 Planning

As an important early step in developing a strategy for examining population issues and designing a national population strategy, MKLH plans to sponsor a major symposium on Man and Society in Indonesia the year 2000 in mid-November.

In June the Ministry made a preliminary inquiry of USAID as to recommendations for futurologists who would be helpful for considering the trends shaping the situation of the year 2000. After reviewing a list of candidates prepared by AID/W, the Minister has recently requested that USAID support the participation of Robert McNamara, former president of the World Bank and of Alvin Toffler, author of The Third Wave. A proposal to support this activity is being prepared for funding under USAID's new Development Studies Project.

Drafted 12 August 1983
Revised 26 August
By Will Knowland

Site Visits of the IIED Information Management
Design Team in Indonesia

29 August 1983:

1. Interview with the Director of PDIN/LIPI, Jakarta
Dr. Ny. Luwarsih W.
2. Interview with the Head of the Data Processing Bureau
of the Central Bureau of Statistics, Jakarta
Drs. Leopold. M.Sc.

30 August 1983:

1. Interviews with Prof. Drs. Kardomu Darmoyuwono, Deputy
Director for Natural Resources, and Dr. Jean-Paul
Malingreau, Consultant Advisor of BAKOSURTANAL,
Cibinong.
2. Interview with Ir. Indro, University of Indonesia
Computer Center.
3. Interview with Drs. Sardin Pabbadja and Staff of the
Population Data Bureau of BKKBN, Jakarta.
4. Interview with Ir. M. Afiat Wirjoasmoro, Head of the
Data and Analysis Bureau of the Department of Industry,
Jakarta, and his staff.

31 August 1983:

1. Interview with Ir. Mohammed Yahya, Head and Ir.
Badruddin Mahbub, Dipl.SE., Head of the Environment and
Water Quality Section of DPMA, Bandung (also on
1/9/83).
2. Interview with the Librarian of the Ecology Institute,
University of Pajajaran.

1 September 1983:

1. Interview with Dr. Eddy Bratasuwarjo of Ecology
Institute, University of Padjajaran, Bandung.
2. Interview with Prof. Ir. Hasan Poerbo, Chairman of the
Research Council, PSLH-ITB, Bandung.

5 September 1983:

1. Interview with Prof. Drs. Kartomo Wirosoehardjo, M.A.,
Demography Institute of the University of Indonesia.

7 September 1983:

1. Interviews with Head of the BKPM, Provincial Government
of Central Java, Semarang and Ir. Sulistiawa, Asst. for
Environmental Water Quality Assessment.
2. Interview with Dr. Segun, Director of the PSL of Gadjah
Mada University, Jogjakarta, and staff.

APPENDIX 2.1.

Principal Government Agencies with
Environmental Responsibility

<u>GOVERNMENT AGENCY</u>	<u>ENVIRONMENTAL RESPONSIBILITY</u>
Ministry of Health	Sanitation, food quality, pesticides.
Ministry of Agriculture	Renewable resources, especially in agriculture, aspects of coastal zone management, fisheries, animal husbandry.
Ministry of Forestry	Forest protection, production, nature refuges, forestry research (LPPH), regreening and reforestation.
Ministry of Mining and Energy	Non-renewable resources, off-shore mining; environmental geology.
Ministry of Public Works	Water management, human settlements, city planning, pollution, energy.
Ministry of Industry	Industrial pollution control.
Ministry of Communications	Noise pollution, pollution by shipping.
Ministry of Manpower	Labor development and organization; occupational safety.
Ministry of Transmigration	Transmigration settlements.
Ministry of Trade and Cooperatives	Trade in protected animals, plants, cultural objects.
Ministry of Education and Culture	Environmental education, protection of culture.
State Ministry for Research and Technology	Ecology, oceanography, natural resource inventory, supervision of research, technology development.
Ministry of Justice	Codification of environmental law.
Ministry of Finance	Environmental budget.
Ministry of Internal (Home) Affairs	Supervision of Municipal and Provincial Agencies dealing with environment.

State Ministry for Population and the Environment (MKLH)

Coordination of Environmental and Population affairs, environmental supervision of development projects, environmental impact analysis.

Bakosurtanal

National Coordinating Agency of Survey and Mapping.

Lembaga Ilmu Pengetahuan Indonesia (LIPI)

Indonesian Institute of Sciences

Lembaga Biologi Nasional (LBN)

National Institute of Biology. (Part of LIPI).

Source: Reference (7) from Salim and Dahlan, 1979 (Reference 20) and updated by the authors.

APPENDIX 2.2.

Environmental Study Center Network

GROUP A: Centers providing major in-country training and leadership in research

<u>UNIVERSITY</u>	<u>SPECIALISATION</u>
University of Indonesia (UI) Jakarta, Java	Human ecology; economic and social aspects of the environment
Bogor Agricultural University (IPB), Bogor, Java	Watershed management; coastal zone management; natural resource management
Bandung Institute of Technology (ITB), Bandung, Java	Human settlements; industrial ecology
Padjadjaran University (UNPAD), Bandung, Java	Ecological toxicology; environmental law

GROUP B: Priority Centers for immediate development

Gadjah Mada University (UGM), Yogyakarta, Java	Geographical ecology
Hasanuddin University (UNHAS), Ujung Pandang, Sulawesi	Ecology of lakes and coastal zones
Syiah Kuala University (UNSYIAH), Banda Aceh, Sumatra	Human ecology
Andalas University (UNAND) Padang, Sumatra	Ecology of Barisan mountain area; regional development
Sriwijaya University (UNSRI) Palembang, Sumatra	Ecology of tidal swamplands
Diponegoro University (UNDIP), Surabaya, Java	Ecology of marine and mangrove areas
Surabaya Institute of Technology (ITS), Surabaya, Java	Industrial ecology and coastal zone settlements
Airlangga University (UNAIR) Surabaya, Java	Environmental health
Udayana University (UNUD) Denpasar, Bali	Ecology of island parks and tourism

Mulawarman University (UNMUL) Samarinda, East Kalimantan	Ecology of lowland tropical rain forests
Brawijaya University (UNIBRAW), Malang, Java	Brantas river basin
Lambung Mangkurat University (UNLAM), Banjarmasin, Kalimantan	Freshwater and swampland ecology
Sam Ratulangi University (UNSRAT), Manado, Sulawesi	Ecology of coastal, sea and island areas
<u>GROUP C: Additional centers or university "balai" subunits requiring manpower development</u>	
University of Riau (RIAU) (UNRI), Pekanbaru, Sumatra	Ecology of swamps, lowlands and islands
University of Lampung (UNILA), Tanjungkarung, Sumatra	Ecology of transmigration and human resettlement
General Soedirman University (UNSOED), Purwokerto, Java	Ecology of brackish water and coastal areas
Nusa Cendana University (INDANA), Kupang, Timor	Ecology of dry land areas
Jember University (UNEJ) Jember, Java	Upland ecology
Tanjung Pura University (UNTAN), Pontianak, Kalimantan	Swamp and peatland ecology
Palangkaraya University (UNPAR), Palangkarya, Kalimantan	Peatland ecology, "lahan basah" and swamp ecology
Pattimura University (UNPATTI), Ambon	Marine ecology
Tadulako University (UNTAD) Palu, Sulawesi	Ecology of human resettlement
Cenderawasih University (UNCEN), Irian Jaya	Montane ecology

Source: Reference (8) from MKLH sources.

APPENDIX 2.3.

Indonesian Environmental Forum (WALHI)

Name of Society	Contact
1. Lestari Educational Foundation	T. Azis Saleh
2. Association for the Conservation of Nature	Gunawan Alif
3. Landscape Architecture Association	Zain Rachman
4. Indonesian Bird Society	H.M. Kamil Oesman
5. LP3ES: Lembaga Penelitian, Pendidikan, dan Pengetahuan Ekonomi Sosial	Nashihin Hasan and Sasmito
6. Science Journalist Group	Soegiarto
7. Green Indonesia Foundation	Ny. Corrie P. Nasarany
8. Youth Science Club, Gelanggang Remaja, Jakarta	Gedjo Rahardjo
9. Organization of Commercial Radio Broadcasting in Indonesia	Muksin Suwanda
10. Consumer Foundation	
11. Sinar Harapan Newspaper	Winarta Adisubrata
12. Bina Desa	Sumartoyo
13. Environmental Pollution Study Group	Purtumo
14. Biological Science Club	Muhsin
15. Kusuma Buana Foundation	Henny B.
16. Youth Movement for Population Affairs	Bambang HP
17. Association for Parks and Healthy Environment	Iin Hasim S. Ny. Iien Noer Sajidi BAP

(An advisory body descended from "Kelompok Sepuluh", a group of ten and now 79 NGO environmentally related societies working for and supported by the Ministry); kindly supplied by Dr. R.E. Soeriaatmadja; see Sardar, 1981.

Source: Reference (7).

Proposed Structure of the EPIMS

- I. Tasks of the ASMEN III, Head of the EPIMS, might include:
1. Allocating staff for EPIMS and their supervision;
 2. Chairing a special Kelompok Kerja on Population and Environmental Information Management;
 3. Coordinating the flow of information to and from the dispersed information network with the help of his staff.
- II. Working Group on Environment and Population Information Management (Kelompok Kerja Pengelolaan Informasi Kependudukan dan Lingkungan Hidup)

Purpose: to supervise the development of EPIMS, including:

- a) staffing needs and training;
- b) equipment needs and sources of such, (including the sharing of resources amongst other institutions);
- c) supervision and guidance on the kinds of information to be managed by EPIMS and the kinds of output from EPIMS;
- d) peer review on the information policies and direction of information development, especially:
 - forms and kinds of data and information;
 - methodologies used in data collection and analysis;
 - priority setting for research tasks and monitoring and evaluation activities of the components of the dispersed information system;
 - assisting the ASMEN III in coordinating information flows between government departments and between national and regional departments.

Composition of the Kelompok Kerja: [1]

Chairman: ASMEN III, KLH
Members: 1. ASMEN I, KLH
2. ASMEN II, KLH
3. ASMEN IV, KLH
4. ASMEN V, KLH
5. Secretary-General, KLH, also to represent the PSL system

[1] Clearly, the composition of the Kelompok Kerja could include representatives from every government agency and department but this is not feasible. This representation should be at the Tim Teknis level. The Kelompok Kerja team should be oriented to information management expertise and critical organizational representatives.

6. Representatives from:

- Lembaga Demografi
- BKKBN
- BAKOSURTANAL
- LIPI-PDIN
- BKPM-Pusat
- An individual designated to represent the BKLH if one does not already exist from Dalam Negeri (Ministry of Internal Affairs)
- LEMIGAS
- WALHI
- BPS
- P & K (Education and Culture)

III. Technical Team on Environment and Population Information Management (Tim Teknis Pengelolaan Informasi Kependudukan dan Lingkungan Hidup)

Purpose:

To provide input into the EPIMS system and designate required outputs of the system. This team would work closely with the EPIMS management team itself (i.e. the IMG).

Composition:

A representative from each of the 20 technical teams now in existence. Chairman: Deputy Assistant Minister III, for EPIMS.

Population and Environment Development Program for REPELITA IV,
Ministry of State for Population and the Environment

I. Natural Environment

1. Management of the natural environmental system:

- (1) management of the watershed environmental system;
- (2) development of a regional environmental support system [1];
- (3) management of the coastal area environmental system;
- (4) management of the environmental system of protected areas;
- (5) development of the regional environmental system.

2. Management of coastal and marine preservation:

- (1) preservation of beaches and coral reefs;
- (2) preservation of coastal zones;
- (3) regulation on the use of seas as waste disposal areas;
- (4) management of marine resources and control of pollution;
- (5) cooperative regional management in the area of management and preservation of the seas.

3. Development of nature preservation:

- (1) establishment of nature refuges and national parks;
- (2) management of protected forests, protected areas and types and extent of special protection;
- (3) protection of waterways, rivers and lakes;
- (4) control of damage to the natural environment;
- (5) building up the love for nature.

[1] MKLH distinguishes between environmental carrying capacity and environmental support capacity. The first may be understood in its usual ecological meaning of the natural limits of the resource base to sustain exploitation in a stable and productive manner for a given population size. The latter concept is the system of human interventions to sustain the natural carrying capacity for a given population size, including interventions such as the use of environmentally sound technologies, build-up of infrastructure, re-use and re-cycling of resources and so forth.

4. Conservation of forests, soil and water:
 - (1) rehabilitation of critical lands;
 - (2) management of soil and water conservation for agricultural uses and control of forest destruction;
 - (3) rehabilitation and reclamation of waste (critical) lands and reclamation of mining areas;
 - (4) rehabilitation of (environmental) support areas;
 - (5) rehabilitation of waterways, beaches, rivers and lake areas;
 - (6) rehabilitation of wild animal habitats.
5. Management of the quality of the environment:
 - (1) development of environmental criteria and quality standards; waste material quality standards;
 - (2) monitoring of environmental quality;
 - (3) development of methods and techniques for Environmental Impact Analysis (EIA or ANDAL) and development of the capacity to carry out ANDAL;
 - (4) monitoring and evaluation of environmental impacts of development activities.

II. The Built Environment

1. Establishing a development management system for the built environment (in):
 - (1) sectoral development carried out by various departments and regional governments;
 - (2) development carried out by the community, by the use of foreign and domestic capital;
 - (3) development carried out by the informal sector.
2. Management of spatial patterns:
 - (1) zonal area patterns (wilayah);
 - (2) urban area patterns;
 - (3) rural area patterns;
 - (4) regional area patterns (kawasan);
3. Human Settlements Management:
 - (1) control of urban/metropolitan human settlements;
 - (2) development of middle-sized and small cities settlements;
 - (3) development of transmigration settlements;
 - (4) supervision of rural human settlements development;
 - (5) management of unique and traditional human settlements;
 - (6) rehabilitation of settlements resulting (from the damage) of natural disasters;

4. Control of environmental impacts:
 - (1) management of waste and establishment of environmental health infrastructure;
 - (2) pollution control;
 - (3) control and supervision of dangerous and toxic materials;
 - (4) regulation of development impacts on the built environment.

5. Increasing the carrying capacity of the environment:
 - (1) development of appropriate environmental management and technology;
 - (2) development of expertise;
 - (3) development of consultants and community self-reliant institutions;
 - (4) development of cost/benefit standards for the built environment.

III. Harmonious Interaction of Population and the Environment

1.
 - (1) development of basic qualities, such as school enrolment ratios, levels of skilled and educated people and the qualitative improvement in the employment of educated people;
 - (2) development of the productivity of the population with a lowering of the level of dependency and increase in the level of work participation (employment);
 - (3) increasing the dignity of the people;
 - (4) increasing self-reliance;
 - (5) increasing environmental ethics in community life.

2. The impact of development on the social structure and environment:
 - (1) development of procedures and applications for estimating social impacts along with developing methods for controlling those impacts;
 - (2) development of religious life and cultural awareness so that the community is mentally prepared to face social change;
 - (3) development of the concept of the capacity for the community to endure in the face of the impact of the development of technology and lifestyles which are not so compatible with existing social norms and views of the environment;
 - (4) development of the capacity of cultures and sub-cultures to become a unifying element in local and national environment as a way of giving life to the principle of "Bhinneka Tunggal Ika", (Unity out of Diversity);

- (5) creating indicators on the development of the quality of life to be included in population and environment policies.
3. Information and Research on Population and the Environment:
 - (1) development of the collecting and updating of population and environment information;
 - (2) improving the quality of data along with establishment of information standards;
 - (3) establishing and managing a network on population and environment information;
 - (4) improving the usability and usefulness of research by improvement of implementation capability, policy research, standardization of administrative systems and procedures and research assignments; standardizing quality along with evaluation research;
 - (5) establishing an information dissemination system for the results of research;
 - (6) developing coordination and agendas for research, in research on population and the environment.
 4. Education and Manpower on Population and the Environment:
 - (1) development of an educational system on population and the environment;
 - (2) development of course materials on population and the environment for formal, non-formal and in-service education;
 - (3) evaluation of the needs and development of manpower on population and the environment;
 - (4) supervision of other activities which support education and manpower development in population and the environment.
 5. Communication and Community Awareness:
 - (1) wide dissemination of communication of policies and programs on population and the environment;
 - (2) creation of communication materials along with a system to reach audiences that is compatible with the variety of information targets, including the apparatus for this;
 - (3) development of consciousness about population and environmental issues, along with the links between the two, for the wider community;
 - (4) development of participation and community self-management in the development of population and the environment;
 - (5) to search for cultural perceptions and concepts in the community regarding the subject of population and the environment.

IV. Human Resources

1. Control of Population Fertility:
 - (1) development of the means to increase the usefulness and usability of birth control;
 - (2) development of community participation in birth control.
2. Control of population morbidity and mortality:
 - (1) development of environmental health;
 - (2) development of health services;
 - (3) development of health consciousness.
3. Development of the physical quality of the population:
 - (1) development of nutrition improvement;
 - (2) development of supervision over harmful foods and drinks;
 - (3) development of the physical quality of the people.

V. Dispersion and Mobility of People

1. Development of population dispersion:
 - (1) allocation of the population among areas;
 - (2) allocation of the population among sectors.
2. Control of the urbanized populace:
 - (1) regulation of commuting (patterns);
 - (2) development of the population aspects of urbanization.
3. Supervision of population mobility:
 - (1) development of circular mobility (migration);
 - (2) development of employment opportunities in the formal sector;
 - (3) development of employment opportunities in the informal sector.
4. Population migration:
 - (1) development of the population aspects of transmigration;
 - (2) development of the population aspects of spontaneous migration.

Jakarta, 9 August 1983

State Minister for Population and the Environment,

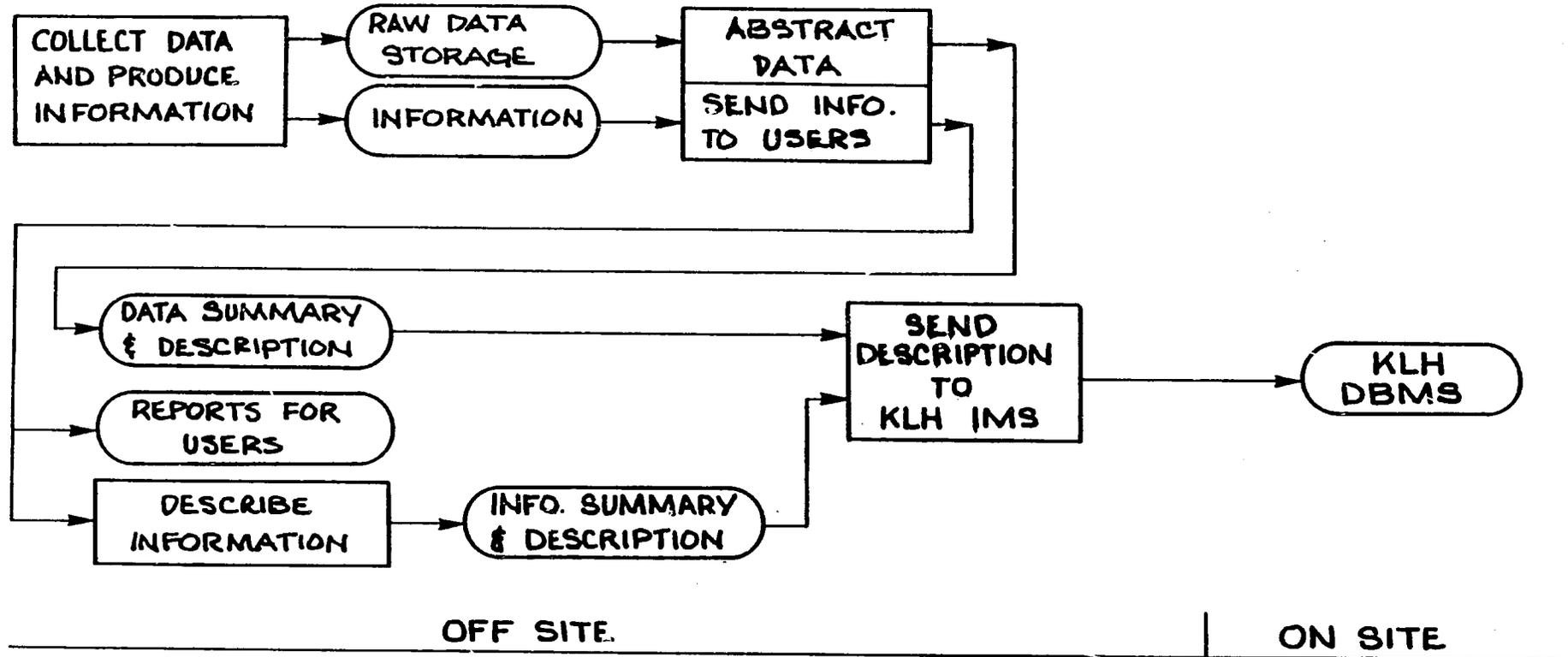
Prof. Dr. Emil Salim

English translation and Notes: J. Tarrant

12 August 1983

Appendix 3.3.1., Figure 1

INFORMATION FLOW DIAGRAM FROM EXTERNAL SOURCES INTO KLH IMS

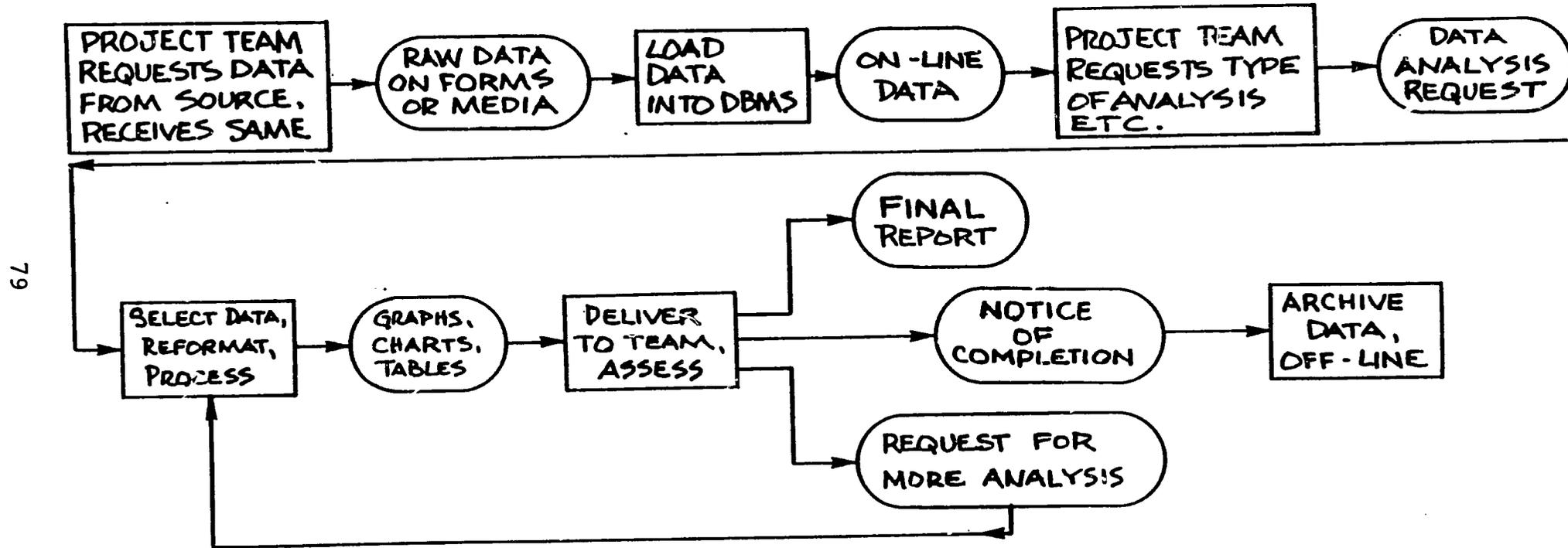


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BOXES - Represent Processes
 SAUSAGES - Represent Products

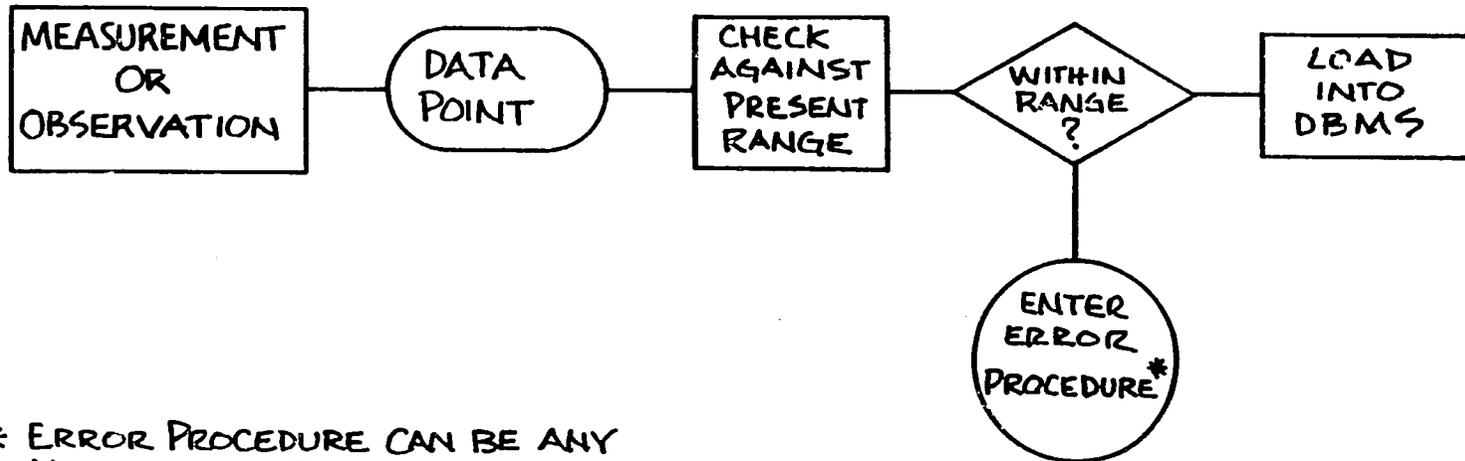
Appendix 3.3.1., Figure 2

PROCEDURES FOR UPLOADING AND ANALYSIS OF IN-HOUSE DATA



Appendix 3.3.1., Figure 3

QUALITY CONTROL FLOW DIAGRAM FOR KLH DATA COLLECTION

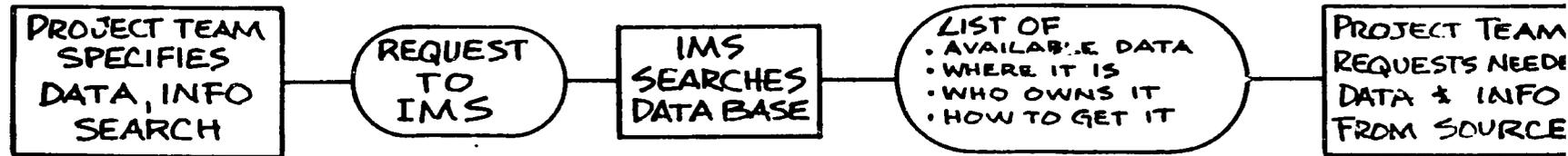


* ERROR PROCEDURE CAN BE ANY NUMBER OF REMEDIES

- REMEASURE
- FLAG
- DELETE DATA POINT

Appendix 3.3.1. Figure 4

INFORMATION FLOW DIAGRAM FOR DATA REQUEST PROCEDURES



APPENDIX 3.3.2

Sample Forms for Information System

Form for recording description of data sets. Return to:

Information Management Group
Menteri KLH
...etc...

DATA SET IDENTIFICATION _____

START DATE _____ FINISH DATE _____

QUANTITIES MEASURED _____

LOCATION OF DATA _____

CONTACT PERSON _____

ACQUISITION PROCEDURE _____

FORM OF DATA:

___ MACHINE-READABLE (Describe Format)

9 track tape _____

Floppy Disk _____

Other _____

___ PAPER FILE

Approximate number of pages _____

___ BOUND BOOK OR REPORT

Citation _____

Form for recording description of Reports, Documents and Papers. Do not use
this form for documenting raw data sets.

Return to:

Information Management Group
Menteri KLH
...etc...

IDENTIFICATION _____

SUBJECT KEYWORDS (See attached list) _____

Location of Information _____

Contact Person _____

Acquisition Procedure _____

FORM OF INFORMATION:

___ Book or Published Report
Full citation (Author, date, title, publisher, pages)

___ Unpublished Internal Document

Title _____

Author(s) _____

Date _____

___ Manuscript or unassembled data sets

Form for recording directory of technical personnel

Return to:

Information Management Group

Menteri KLH

...etc...

NAME: _____

DATE OF BIRTH _____ CITIZENSHIP _____

DEGREES HELD _____

HOME ADDRESS:

STREET _____

CITY _____

PHONE _____

EMPLOYER _____

TITLE _____

EMPLOYER ADDRESS _____

JOB TECHNICAL INTEREST _____

OTHER EXPERTISE _____

LANGUAGES (Fluent) _____

LANGUAGES (Reading knowledge) _____

UNIVERSITIES ATTENDED _____

Form for recording description of internal KLH Documents

Return to:
Information Management Group
Menteri KLH
...etc...

TITLE _____

DATE _____

AUTHOR(S) _____

PUBLISHER _____

NUMBER OF PAGES _____

KEYWORD DESCRIPTORS: _____

Appendix 4.1 MKLH Working Groups, Technical Teams and Their Relationship to Assistant Ministers

Division	Working Groups	Technical Teams
Secretary-General	<ol style="list-style-type: none"> 1. Law and the Apparatus for Natural Resources and 2. Manpower Management and Environment 	<ol style="list-style-type: none"> 1. Development of Law in Environmental Management
Assistant Minister I	<ol style="list-style-type: none"> 1. Environmental Quality 2. Coastal Zones and Marine Env't. 3. Integrated Watershed Management 	<ol style="list-style-type: none"> 1. Energy and Mining EIA 2. Electricity and Energy EIA 3. Coastal & Marine Env'ts. 4. Pollution of Natural Resources and Long-Term Environmental Management 5. Conservation of Forest Resources and nature protection 6. Costs and Calculations in Env't. 7. Agrarian Env't'l System 8. Establishment of EIA System 9. Integrated Watershed Management
Assistant Minister II	<ol style="list-style-type: none"> 1. Population and Human Settlements 2. Industry, Pollution Handling and the Environment 3. Spatial System and the Environment 4. Management of Toxic and Dangerous Substances 	<ol style="list-style-type: none"> 1. Spatial Systems and Environment 2. Toxic and Dangerous Substances Waste Disposal 3. Infrastructure Development & EIA 4. Pollution Handling & Industry EI. 5. Human Settlements & Transmigration
Assistant Minister III	<ol style="list-style-type: none"> 1. EPIMS, (proposed) 2. Interaction of Population and the Environment, (proposed) 	
Assistant Minister IV	----- position not yet filled -----	
Assistant Minister V	----- position not yet filled -----	

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Note: EIA - Environmental Impact Assessment (ANDAL in Indonesian language).
 Source: MKLH files

Review of the Draft Environmental
Quality Report for 1983 of Menteri KLH
and Proposed Revisions to It

The Ministry of Population and the Environment (MKLH), is carrying out the drafting of an Environmental Quality Report on Indonesia for planning, monitoring and evaluation purposes as well as public education and agenda-setting for research on environment and population issues. A first draft of the report has been substantially completed and has been summarily reviewed by James Tarrant for this report.

The following is divided into general and specific comments. General comments deal with the structure, design and topic coverage of the draft report. Specific comments relate to the report's coverage and quality of analysis of each section. Finally, some suggestions for revision of the draft report are offered.

I. GENERAL COMMENTS

This Environmental Quality Report is being prepared by a small team headed by Drs. Kismadi under Assistant Minister III, Dr. Alwi Dahlan. The principal drafter is Drs. H. Harsono. The report relies heavily on published reports from sectoral departments, as well as selected studies of research institutes and environmental study centers and material drawn from several provincial-level, "Annual Environmental Balance" reports (Neraca Lingkungan Wilayah), carried out by the Supervisory Bureau for Environment (BKLH).

1. Design of the Report

Drs. Harsono prefers to call this report an environmental quality report, since it is intended to be less a reference/source book on Indonesia's environment than an analysis of the current situation and problems. From the list of topics given under the "specific comments" section of this memo, it is evident that the principal emphasis of the report is on the issues relating to the physical environment. As a result, a number of important subjects are left out or are treated indirectly. I believe this is a result of relying on available sectoral department information in the absence of MKLH's own information system. While programs may be planned and implemented sectorally, their impacts are synergistic and wide-ranging. Hence, a different kind of approach to the usual sectoral department reporting is needed for an environmental quality report. This is discussed more fully in the text of this report.

The following topics were either poorly covered or left out of the draft report which I read:

1.1. Population and the Environment

This is the most important of the topics that were not covered or inadequately so. The population-related coverage in the report is buried in discussion of particular issues, such as environmental health or human settlements. Since population is a major policy issue in Indonesia and since its expression on the inner islands and outer islands is quite different, and because population dynamics are importantly affected by such influences as income levels and distribution, education, work opportunities and migration patterns, a strictly sectoral approach to the subject of population and environmental interaction may not identify problems and trends clearly and adequately.

A few areas of environment and population interaction which should be examined include:

1. migration patterns (seasonal and permanent);
2. capital investment patterns in relation to resources and population characteristics of different areas, especially regarding location of investment, technology characteristics (labor-saving, resource-intensive, etc.), backward and forward linkages in terms of area development (e.g. supporting services and industries, infrastructure requirements and demands on existing infrastructure, secondary and tertiary effects of new investment on surrounding area development and environmental quality);
3. distribution of income and permanent employment opportunities;
4. institutional and organizational development, which affects planning, regulation, savings and investment capability, technical assistance, social and economic services and labor-employment opportunities;
5. immigration/emigration patterns and impacts on resource use, for example, the Dayaks of Kalimantan and relations with Sabah, Sarawak, and Brunei; also Sumatera-Singapore and Irian Jaya-PNG;
6. role of cultures towards environment; language differences and effects on communication and dissemination of policies and technologies including those in the environment and population fields.

It should be noted that most of the above topics have been suggested for inclusion in MKLH's preview for the next five-year plan (Repelita IV).

In addition to the above, specific areas of interest to discussion of environmental issues would include:

1.2 Migration Trends

- i. Seasonal or other periodic migration patterns owing to:
 - additional income searching of rural households;
 - labor recruitment by plantations and other labor intensive industries;
 - social and demographic data broken down by region, settlement patterns, urban/rural; coastal/inland; upland/lowland, etc.; disposal of income from migratory labor.
- ii. Spontaneous migration of a permanent or semi-permanent nature. Especially common among the outer islands.
- iii. Transmigration program, including success/failure rates; impact on local environment and socio-economic structures.
- iv. Urban-rural migration; economically-induced migration, especially to industrial zones.

1.3. Social and Economic Trends of Households, including:

- i. Participation rates of women in employment, (part-time/full-time; household-based/out-of-household); effects on household income and size of family, quality of life.
- ii. Female-headed households; polygamous family trends; impacts on family welfare and access to physical resources and socio-economic resources.
- iii. Impact of certain socio-economic trends on household economics and behaviour, including: inflation, TV/Radio, public services (electricity, water, sanitation, security).

1.4. Population/resource trends, including:

- i. Household energy use (woodfuels, fossil fuels, electricity).
- ii. Food and fibre consumption patterns.
- iii. Agricultural practice and resource impacts:
 - Shifting agriculture
 - sawah agriculture
 - upland, dryland farming
 - fisheries, livestock practice
 - silvicultural practice.

In this set of topics, we are interested in underlying trends, in which population changes may be an important factor, as well as economic changes induced partly by population trends (such as the change in rice harvesting methods in Java).

1.5. Environmental Economics

The impact of industrial and resource exploitation development (including agriculture) on the environment is treated incompletely in this report and primarily from the aspect of physical pollution effects. However, underlying trends and capabilities are as important or more important to understanding the environmental picture and its relationship to population problems as is physical pollution. Some of these issues include:

- a. Resource recycling and re-use which, as in most developing countries, already plays a much more important environmental and socio-economic role than it currently plays in the developed world. This requires treatment of settlement patterns, the role of the informal sector and employment generation in general.
- b. The effects of market behaviour and prices on resource exploitation and environmental quality. Issues related to this matter include government price subsidies, especially for fossil fuels, rice, fertilizer as well as smaller program-specific subsidies of various commodities. Environmental impacts of such subsidies can be quite wide-ranging as in deforestation, air pollution, changes in land-use and cropping patterns and disposal of family income.
- c. Relative dependency or independence of the economy on exports of raw materials and commodities and the effects of this on the environment requires much more explicit treatment. For example, the environmental impact of the Government's decision to limit raw log exports in favor of pre-processing in-country. This relates to changes in investment patterns in the timber industry, especially participation by foreign companies and the nature of technology available to the timber industry as a result. A drastic increase in the number of sawmills and plywood factories will have a different set of environmental impacts and trends than that of the previous composition of the timber industry. The effects of this legislation on the level of timber exports and hence tree-cutting will have important environmental effects as well.
- d. The effects of changes in market preferences on resource use, employment opportunities and environmental impacts. At best, this subject is treated very indirectly in the report and with little reference to its population impacts. Examples of such impacts are the effect of increased meat consumption on nutrition, income disposal, expansion of the cattle industry and land use, including the possibility of use of so-called "critical" or "waste" lands. Other important areas are in the employment and environmental impacts of changes in the small industry sector e.g. batik vs. cheap factory-made cloth, growth in sugar consumption, (land use, nutrition impacts), woven and cane products vs. metal and plastic products, etc. This particular set of issues is not

dealt with at all in the report and neither is the informal sector's activities. Nevertheless, there is a growing literature in these fields based on Indonesian research.

1.6 Institutions and the Environment

It can be argued that environmental issues are primarily management and planning problems, whether at the household level or the national policy and programming level. Hence, it is surprising that very little attention is given to the institutional problems or capabilities for environmental management in this report nor of the population aspects of the same. Examples of such issues would include:

a. Institutional Problems:

- integration of environmental planning in to the planning and programming of sectoral agencies; relatedly the use of ANDAL as a planning/evaluation mechanism;

- planning and priority-setting of research agenda on environmental and population issues; integration of research into the management process at the national/sectoral level and the provincial planning level as well as the private sector;

- the use of regulations, guidelines, taxes and incentives for environmental and population management; the efficacy of their implementation and areas for further development and refinement.

- the generation and use of information on environmental and population issues and its use in education, policy research, and evaluation and in technical assistance and extension, especially in industry and agriculture.

b. Institutional Capabilities:

- description of libraries and information services of government agencies, universities, regional networks, international and foreign national agencies, as well as private organizations;

- description of the activities of the national environmental and population institutions, e.g. PSLs, Wahana, lembaga swadaya muda, research and think tanks, (LP3ES, CSIS, LEKNAS, LPPM, LAN, Agro-Economic Survey, etc.);

- a yearly updating of sources of environmental and population information and studies.

2. Comments on the Profile Design

It should be noted that this draft report was compiled from documents submitted to the Ministry from sectoral departments, a few research institutes and special studies and research projects. The MKLH staff seems to have relied mainly on this material rather than setting its own agenda and looking for the data relevant to that agenda. This gives the report an uneven quality, with some topics covered in great depth (usually on a technical level) and others skipped-over lightly or not treated at all. Because of the partly sectoral nature of the format of the report there is a certain amount of duplication of topics covered. However, the data for these overlapping topics is not necessarily comparable for many reasons, some of which have been discussed in this report already (see section 2). In brief, these problems are as follows:

- a. Gaps in the Data Base on Population and the Environment.
(see report text, section 2)
- b. Inadequate coverage of Information and Data Sources due to the apparent lack of a topical agenda and adequate list of sources. This problem could be ameliorated. Also, MKLH should make better use of its Kelompok Kerja for this purpose. This problem is compounded by a shortage of staff at MKLH and a lack of comprehensive analysis of problems for which MKLH has supervisory responsibility.
- c. Format and Presentation of the Reporting

Admittedly, what I have reviewed is a draft report, yet the format of the report as it presently stands is bound to have less of an impact on policy-makers and the public than it might have if designed differently. My suggested revisions pertain to the following issues:

- * concise, visual impact for multipurpose use of the report.
The report is far too technical in some parts and too theoretical or general in other parts. There is not a single map in the report nor visual diagrammatic aid, such as bar charts, trend-line charts, matrices, Venn diagrams and other aids. Though photos may have been contemplated for the final draft, their use must be directly related to the textual material. Much of the text nature of the report can be dispensed with and an emphasis placed on the effective presentation of the available data in a visual way. This is because most policy-makers may be "too busy" to read a lot of textual material and the public may not understand very technical details. The professionals in this field are more interested in sources of information and the policy research agenda of KLH which is better presented by concentrating on the population/resource use/environmental impacts of issues rather than technical details about which they might just quibble anyway.

* Inclusion of Sources and Reference as well as the Role of MKLH

Surprisingly few individuals and organizations understand what is the role of MKLH, both regarding its relations to other government agencies as well as its role in public education. This report represents a good opportunity for clarifying this role as well as a little self-advertising in order to encourage support for MKLH's coordinating role. This report should also provide appendices on sources of information both within Indonesia and outside the country for the use of institutional and private readers of this report. Other references should include the population/resource/environment specialized agencies within Indonesia who have a liaison and/or technical assistance function. Finally, a basic bibliography of relevant references for population and environmental management issues should be appended. for example, references to:

- basic legislation and relevant peraturan pemerintah;
- major MKLH publications, including periodicals;
- statistical sources in BPS and other agencies.

II. PARTICULAR COMMENTS

An outline of the sections of the draft environmental quality report is given below with my comments on individual sections, appearing beside the topics, where pertinent. The specific comments are necessarily abbreviated due to the length of the draft report. Regarding the headings, I have followed those used in the draft itself.

1. Human Settlement Environment

This section is very thin, mostly general description with little actual discussion of environmental topics. A few statistics are given in the last three sub-topics but with little integration of these to the overall discussion. No discussion of transmigration and little on non-governmental housing development. Little discussion of trends or the overall picture. Nothing on the UNEP project on low-cost environmental services for the KIP program in Bandung and Surabaya (Cipta Karya-PU), the only one of its kind to date.

2. Environmental Health

- 2.1. "Situation of Environmental Health" - very general
- 2.1.2. "Malaria" - no discussion related to the environmental aspects
- 2.1.3. "Blood Fever Sickness: - incomplete statistics
- 2.1.4. "Filariasis and Schistosomiasis" - general discussion
- 2.2. "Dealing with environmental health issues: - sketchy
- 2.2.1. "Supply of clean water" - mostly program statistics; little environmental discussion

- 2.2.2. "Provision of garbage, waste water and trash facilities" - thin; nothing on the informal sector
- 2.2.3. "Control of Sickness Vectors"
- 2.2.4. "Control of Hygiene and Food and Drink Sanitation"
- 2.2.4.1. "Mercury"
- 2.2.4.2. "Cadmium, Zinc, Copper" - some interesting data; should be in other sections of the report
- 2.2.5. "Control of factory hygiene and work safety"
- 2.2.5.1. "Work Climate" - wind and humidity; very general
- 2.2.5.2. "Noise" - general discussion
- 2.2.5.3. "Lung sic (condition of) of the work force" - general discussion
- 2.2.5.4. "Checking for dermatitis" (skindiseases) - general discussion
- 2.2.5.5. "Industrial toxicology and biological indicators"
 - a. Heavy Metals and Trace materials
 - b. Tetra-Ethyl lead
 - c. Pesticides
 - d. Lead
- 2.2.6. "Investigation of Chemical materials" - This section is lengthy but very uneven. Most of it is from the Ministry of Health. Some topics are only glossed over; others are covered to a technical depth unsuited to this kind of report. Evidently, what reports were available were used most extensively. In the introductory section, there is no discussion of why the medical aspects are treated to a much greater depth than their relation to the industrial and settlement environment. Moreover, many of the same issues are covered in other sections of the report (e.g. pesticides in agriculture and industrial toxicology in industry). There are a number of interesting findings in this section but it would be much better if they were included as supporting data for other sections. Environmental health is certainly a sub-speciality of environmental science but perhaps it should not be a separate section of an environmental quality report since it covers too many inter-related sectors, in a way that takes them out of context and gives them a too academic kind of treatment.

3. Agricultural Development and the Environment

- 3.1. "Conditions of agricultural development" - Statistics in this section are far from comprehensive. Data on insecticides seem to conflict with Section 2.2.5.5. above. Lengthy, yearbook-style discussion of the rice intensification program; little on other topics.
- 3.2. "Negative impacts on the environment" - general discussion only.
- 3.2.1. "Fertilizers" - good, general discussion; little on Indonesia itself, however.

- 3.2.2. "Pesticides" - long, technical discussion of pesticides use but from an agronomical view point; not much discussion of environmental aspects. Much longer and more technical than other sections.
- 3.2.3. "Forest clearings, erosion and critical land" - Considering the importance of this topic, the discussion is brief. Also, these topics should not be lumped together as one subject.
- 3.2.4. "Erosion of germ plasm" (genetic resources) - Very short discussion, very thin. More should be done with this section in the future, including special research studies.

3.3. Amelioration Measures

- 3.3.1. "Efforts to prevent and control critical land" - Brief, technical discussion; statistics on cropping patterns and erosion control measures from research paper of Lembaga Ekologi-UNPAD
 - 3.3.1.1. "Regreening and Reforestation" - Program statistics with general introduction.
 - 3.3.1.2. "Watershed Development" - general discussion
- 3.3.2. Management and Preservation of Forest Natural Resources - general discussion with Forestry Program statistics. Little critical review.
- 3.3.3. "Agriculture" - This section is handled primarily sectorally. Little discussion of fisheries and animal husbandry. Little discussion of upland farming practice and cropping patterns. Little discussion of plantation forestry, including the nuclear estate program of transmigration. This section is surprisingly brief considering that 80% of Indonesia's population lives in rural areas and 38% of the GDP is from agriculture. This section like the others, is better handled on an issue and regional basis, especially inner and outer islands, lowland and upland agriculture, etc.

4. Industry, Energy Resource Extraction and the Environment

- "Industry Sector - Introduction" - consists of one, long series of tables on industrial output. Only discussion of pollution is water pollution at a general level.
- Oil and gas
- Waterways
 - 1. Cepu Study Area
 - 2. Gerong-Plaju Rivers Study Area
 - 3. Cilacap Study Area
 - 4. East Sumatra Study Area
 - 5. Milk Station and Brandan Station
 - 6. Offshore Areas
- Issues
 - Unit Capacity of Oil Separation Facilities
 - Research on Oil Separation Unit Facilities
 - Toxicity Test for Waste Water of Oil Activities
 - Laboratory Studies
 - Summary

The oil and gas sector study above consists of a recapitulation of a LEMIGAS study on waterway pollution from refinery wastes. Obviously, this is not the only source of pollution from the oil and gas sector (e.g. exploration activities, production activities, construction, infrastructure, especially transport of products [pre-and post-refining], oil spills, air pollution [gas-well burning and at oil refineries]. In any event, the discussion is short and technical. The topic headings are not helpful. There is no discussion of other energy resource extraction activities, notably coal-mining and use, nor of other energy sources: hydroelectricity, woodfuels; nor of energy product use, especially refined oil products use in industry.

- Air Pollution by Industry
- "Dealing with Air Pollution" - this section is limited to a general discussion of the cement industry (but does not include lime extraction and smelting).
- Mining Sector
- "Water Pollution by Industry" - Consisting of a long table of pollutants by source, but only on Central Java; no citation, perhaps BKPM-Semarang.

Textile Industry, Metal Industry, Cooking Spices Industry, Paper Industry, Hide Industry (tanning), Fertilizer Industry, Soda Industry (industrial soda), Citrate Industry, Battery Industry, Paint Industry, Vehicle Industry, Chemical and Pharmaceutical Industry, Sawmills and Wood Processing.

- "Dealing with Water Pollution"
 1. Basic Chemical Industry sector
 2. Basic Metals Industry sector
 3. Light Industries (Aneka Industri)

The whole non-energy industry section is unnecessarily fragmented and uneven. A number of studies being undertaken by the Ministry of the Environment itself in this sector are not even mentioned. Also no mention of environmental impact assessments which have been done. No regional or intersectoral impacts discussion. This section is too general and without focus on trends by region and resource utilization.

5. "Soil, Water, Air, Marine Environments"

- Soil
- Resources
- "DAS Cimanuk" - Consists of discussion of mapping methods and requirements. Textbook style.
- Soil Management
- Irrigated and Dry Lands
- "Tidal cane growing in Lampung" - Evidently, a discussion of whatever materials happened to be available.
- "Bench mark soils project" - Highly technical, not much attempt to show the relationship of this project, (a worldwide effort) to soil mapping and management for environmental management.
- River Water Quality

Nearly all the rivers, watersheds and cities discussed herein are on Java. Nothing about rivers on the other islands, though admittedly, the worst problems are on Java. Each of the sub-sections are brief paragraph discussions. A preferable approach would be to attempt a regional discussion that would make the links between watersheds (upper/lower) and urban impacts clearer rather than treating them as all separate systems.

Air Quality

- "Introduction" - Theoretical discussion
- 1. DKI Jakarta
- 2. Bandung
- 3. Yogyakarta
- 4. Semarang
- 5. Surabaya

Brief discussions of general air quality problems in selected cities. Very partial, though for the most part, air quality is not as important as water quality at this time with the important exceptions of volcanic eruptions, dry season field burning, and forest fires. Almost nothing on these subjects is mentioned, however.

Marine Quality

- Pollution Sources
- Siltation-Sedimentation
- Oil
- Pesticides

Material taken from a LON study. It is complete enough and interesting but limited mostly to Jakarta Bay. Also, like other sections of the report there is too much technical discussion without a larger framework.

Domestic Wastes and Pathogenic Bacteria

Industrial Wastes and Heavy Metal Concentrations - Same study, looking at other aspects of the marine pollution problem.

Coastal and Marine Areas

- 1. Coastal Areas
- 1.1. Hutan Bakau, (Mangroves)
- Areas of Hutan Bakau
- Preservation
- Benthic plants (plankton, shelf flora and fauna)
- Potential and Uses
- Marine Fisheries resources
- Level of (fisheries) exploitation in the Malacca Straits
- Demersal Fish in the Java Sea
- Productivity in the South China Sea
- Acoustic Survey in the Bali Strait
- Indian Ocean
- Potential of squid and shrimp in the E. Indonesian Waters
- Tuna Fish Areas
- Marine Technology

This is a marine fisheries report; little attempt to discuss environmental aspects other than the carrying capacity of certain fishery areas. No discussion in this section on coral reef destruction. Also no discussion of other marine wildlife, such as sea turtles and their protection status, etc.

6. Regulations and Legislation on Environmental Management.

This section consists of a summary of U.U. no. 4 (1982), "Basic Legislation on Environmental Management". No discussion of institutions, the status of existing departmental regulations nor of peraturan gubernor (provincial regulations) on environmental matters.

APPENDIX 5.2.

Environment and Population Information Topics and Needs Based on the MKLH Program for REPELITA IV

This appendix is intended to provide a list of those topics relevant to the EPIMS including its various products such as a Phase II profile. It should not be construed as a Table of Contents for such a profile. Whenever possible, attention has been drawn to the interface of population and environment and resource management issues.

I. POPULATION

A. Demography

1. Population Size and Distribution

- a. by area
- b. by age structure
- c. by ethnic group/language group/religion

2. Socio Economic Characteristics of the Population

- a. education
- b. occupational strata
- i. agricultural sector
 - large landowners (specify measurement basis)
 - small landowners; sharecroppers (specify measurement basis)
 - landless labourers
 - plantation labourers
 - fisheries
 - inland
 - marine
 - livestock (shepherds)
 - rural agro-industry
 - forestry workers
- ii commerce, trade and service sectors
 - commerce
 - large commercial establishments (by no. of employees)
 - small commercial establishments (by no. of employees)
 - distribution, (area), (sub-category)
 - trade
 - agricultural
 - inter-island trade
 - large/small urban traders
 - services
 - formal sector
 - construction transport, repair-maintenance, hotel/tourism, food and drink
 - informal sector
 - transport, recycling, others (repair, skilled artisan)

- iii industrial sector
 - oil and gas
 - Non-oil mining
 - Basic Chemical Industries (follow KLUI categories)*
 - Basic Metals Industries (follow KLUI categories)
 - Light Industries (Aneka Industry) (follow KLUI categories)
 - Forest Industries (follow KLUI categories)
 - Small Industries (follow KLUI categories)

B. Population Movements

1. Spontaneous migration
 - a. urban-rural migration
 - i. - seasonal
 - ii. - permanent
 - b. rural-rural migration
 - i. - rainy/dry season activities
 - ii. - plantation/industrial crop labor movements
2. Induced migration
 - a. refugees:
 - i. volcanic eruptions
 - ii. earthquakes
 - iii. floods/landslides
 - iv. fires/others
 - b. displacement due to development activities
 - i. hydroelectric dams
 - ii. road/irrigation/infrastructure development
 - iii. urban encroachment
 - iv. others
3. Inter-island spontaneous migration
 - a. international migration
 - i. Malaysia/Kalimantan
 - ii. Singapore/Sumatra/Kalimantan
 - iii. Philippines/Sulawesi Utara/Maluku
 - iv. PNG/Irian Jaya
 - b. inter-island migration within Indonesia
4. transmigration program

* KLUI is Klasifikasi Lapangan Usaha Industri or Industrial Enterprise Fields Classification. This system replaces ISIC, or Indonesian Standard Industrial Classification.

C. Population, Health and the Quality of Life

1. Family Planning Program (KB)
2. Family size and Composition - Trends
 - a. extended/nuclear families
 - b. size of families
 - c. urban/rural differences in above
3. Role of women in the workforce
 - a. household income generation
 - b. out-of-household income generation
4. Nutritional status of the population
5. Infant mortality/child mortality
6. Life expectancy
7. Incidence of endemic diseases
8. Exposure of workforce to occupational hazards
9. Pollution-related diseases/illnesses
10. Literacy and amenities in the population (TV/radio; electricity water supply; sanitation; housing, etc.).

D. Socio-Economic Aspects of Population Management

1. Linkages between urban and rural labor markets:
 - a. relationships to urban-rural migration patterns;
 - b. kinds of labor organizational patterns (recruitment) including discussion of mandor; income and dependency issues; quality of workforce; use of resources and recycling;
 - c. The role of the informal sector labor market in employment generation, re-use and recycling of resources and, therefore, productivity.
2. Income and equity considerations. For example, analysis of the "poverty trap", which may be defined as: low income and poor income distribution leads to low level of capital investment for increased productivity and income (through purchase of better tools/equipment; training and education; resources, especially land), which, in turn, causes or exacerbates uneconomic and unsustainable use of owned or common resources which may worsen the level of poverty and quality of life.
3. Analysis and breakdown of GDP and monetary flows by strata of the population and by region (e.g., by one estimate, 80% of all the money transactions in Indonesia occur in the capital district of Jakarta and at least 90% in Java).
4. Analysis of trends in the structure and market orientation of industry and trade, e.g.:
 - a. large, resource-intensive, labor-saving industries versus smaller, labor-intensive, resource-conserving industries;
 - b. orientation of industrial markets:
 - i. proportion and type towards import substitution;
 - ii. proportion and type towards consumer goods;

- iii. proportion and type towards capital goods;
 - iv. proportion and type towards intermediate goods and processed commodities;
 - v. proportion and type towards raw materials extraction;
 - vi. orientation of markets towards exports, especially of ii, iii, iv, or v, above.
 - c. implications of analysis in 4(b), above, for labor skills requirements, labor migration and resource use; (for this purpose, an examination of the input-output table undertaken by Univ. of Indonesia might be useful, for example as well as other studies).
5. Analysis of the role of subsidies in the Indonesian economy with special attention to the policy goals of equity, social harmony and quality of life and basic needs of the poor social strata
- a. examination of the actual effects of subsidies in achieving the above policy goals;
 - b. the impact of subsidies on resource use and the environment; also on labor use, especially in rural areas and in resource recycling in urban areas, (eg. informal sector employment).

II. GEOGRAPHY AND NATURAL RESOURCES

A. Geographical Characteristics of Wawasan Nusantara*

1. Basic Geographical Information:
- a. Locational aspects in S.E. Asia:
(largest archipelago in the world; division between two major ecological zones at Wallace line; position at the meeting of two crustal plates); all of above with maps.
 - b. Basic Geological/Ecological description of Indonesian Islands: major geological formations; mountain ranges, volcanic systems; drainage systems etc.; major ecological systems; all of above should use maps and charts.
 - c. Climate
temperature, seasons, rainfall/storm systems; distribution of the above by area in Indonesia; use of maps and charts for above;
 - d. Brief Historical and Anthropological Description
 - i. History of settlement of islands;
 - ii. Development of rice culture, shifting agriculture, forest dwellers, etc.;
 - iii. Brief economic geography/history: trade and cultural impacts; (most of the above can be done through the use of maps with brief explanatory text).

2. Natural Resource Endowment
 - a. Soil Resources
 - i. distribution of major soil types and description of characteristics of these; by maps;
 - ii. arable land:
 - lowland, (and major cropping systems); distribution and condition;
 - upland, (and major cropping systems); distribution and condition;
 - coastal zone areas, (major cropping systems, other uses) condition;
 - non-arable land (natural); also "critical lands" (define).
 - b. Biotic Resources
 - * Forest Resources & other natural fauna and flora by ecosystem-type:
 - i. Closed Broadleaved Forest
 - Closed Broadleaved forests on water-logged land:
 - swamp forest
 - peat forest
 - heath forest
 - Closed broadleaved forests on Dry Lands
 - tropical rain forest
 - montane rain forest
 - subalpine rain forest
 - monsoon forests
 - mountain monsoon forest
 - forest fallow type, (overlaps with some critical land)
 - ii. Open Broadleaved Forests (including natural grass savannas)
 - iii. Coniferous forests
 - (natural stands of Pinus Mercusii and Agathis sp., etc.
 - iv. Scrub formation, belukar, secondary forest and natural scrub forests near volcanoes, and others.
 - v. Condition and Status of Forest Ecosystem-types (through maps).
 - Status
 - Production forests, (% cover, condition, major species)
 - Protection forests, (% cover, condition, major species, includes watershed protection forests)
 - Nature reserves (Cagar Alam), (% cover, condition, major species of trees)
 - Forest Reserves (% cover, condition, major species and intended uses)

* Indonesian legal concept for the territory (land, air, water) of the Indonesian archipelago.

- vi. Forest map of Indonesia according to above classification (showing % of land area and classes, distribution, status)
- vii. Estate Crops
 - Woody estate crops; rubber, oil palm, coconut palm spice and fruit trees, tea and coffee, others;
 - Non-woody estate crops: sugarcane, bamboo, rotan, citronella, others, (% of land area, distribution)
- viii Natural Grasslands and small Atolls
 - general characteristics, distribution, area, major plant species
 - current land use by type
- ix. Natural Fauna of Indonesia
 - Terrestrial Fauna
mammals, birds, reptiles, amphibians, insects, etc.
 - Aquatic Fauna
fish, mammals, reptiles, reef fauna, birds
 - For the above, maps and charts showing distribution and estimated number. Classification of natural fauna by endangered/threatened status; location of wildlife refugees/parks.

B. Water Resources

1. Ocean/sea areas within the legal and economic zone of Wasasan Nusantara (Indonesia);
2. Watersheds:
 - a. number, size, (length), distribution of major watersheds (best done through a map);
 - b. physical characteristics of the hydraulic regimes of major Indonesian watersheds;
 - c. upper/lower watershed divisions: sedimentation, peak and base flows, water quality;
 - d. major economic uses of upper/lower sections of the watershed.
3. Lakes:
 - a. size, distribution, physical characteristics, major economic uses, water quality.
4. Man-made waterways;
 - a. map showing network of primary and secondary irrigation and transport canals.
5. Man-made Impoundments:
 - a. size and areal distribution of large impoundments:
 - i. pumped storage reservoirs
 - ii. multi-purpose reservoirs (accompany with maps)
 - iii. Estimate of numbers of fish ponds and other small impoundments

C. Abiotic Resources

*For the following, use of geological maps is advisable

1. Fossil Fuel Resources

- a. Petroleum
- b. Natural Gas
- c. Coal (by type)

2. Non-Fuel Minerals

- a. Metals
- b. Tin, Cobalt, Aluminium, Copper, Zinc, Manganese, others
- c. Precious Metals: Gold, Silver, others
- d. Non-Metals:
- e. Limestone, Construction Stone, others
- f. Precious stones:
List and describe

D. Land-Use Patterns in Indonesia

1. Human Settlements, including patterns of settlement, conditions of housing supply, public services (water, energy, sanitation, health and institutional development). Quality and quantities.

a. Urban areas (define)

Large urban centers
Provincial and Kabupaten cities

b. Rural settlements (define)

- i. Description of various settlements patterns
- ii. Lowland settlements, upland settlements, coastal settlements; differences between Java, Bali and outer islands

c. Industrial and Service Enclaves

- i. Oil and gas exploration, production, and refining, storage facilities which are not in built-up areas
- ii. Other mining facilities, (coal, tin, aluminium, etc.)
- iii. Resorts, (describe by type)
- iv. For all the above, use of maps is advisable, along with explanatory text noting spatial planning relations between settlement/special area (enclave) zones and other settlements/zones, especially transport, market orientation (e.g. LNG facilities and Japan).

d. Infrastructure

- i. Dams, power lines, communication facilities;
- ii. Roads, Railways, airfields, communication facilities;
- iii. For the above, the use of map(s) to show the distribution with the appropriate key to indicate: primary, secondary etc. along with a short table of size and purpose, especially for hydroelectric facilities.

III. ENVIRONMENTAL IMPACTS BY ECONOMIC ACTIVITY

A. Agriculture

1. Cropping Systems

- i. upland/lowland; dryland farming; sawah; shifting agriculture.
- ii. effects of cropping patterns on soil and water resources. Quality and quantity of the resources affected.
- iii. Critical lands, (define)
 - area extent, rates of increase, local/downstream impacts
- iv. Effects of technology changes on cropping systems and environment: rice; non-rice; agro-processing; labor use; land tenure.
- v. Freshwater Fisheries
 - fishponds
 - lakes and streams
 - impact of technology changes on fisheries, (inland);
 - integration of fishpond technology with cropping systems:
 - lowland (sawah); (domestic animal/human waste recycling)
 - upland (domestic animal/human waste recycling)
- vi. Home Gardens and Tree Gardens (pekarangan, kebon rumah/halaman)
- vii. Environmental Impacts of Agricultural Input Use. Including effects on soil, water and the human quality of life.
 - Fertilizers;
 - Insecticides;
 - Improved seed varieties (vulnerability to diseases, pests); loss or disuse of traditional phenotypes and localized varieties, especially for rice;
- viii. Effects of Management Practice on Cash Crops/Estate Crops

2. Rural Industries and Marketing, Including Credit/ Capital

- a. Environmental Impacts of Agro-processing Industries
 - i. Rice Hulling/grinding mills
 - labor impacts
 - cropping pattern impacts
 - use of by-products or the lack of, compared to traditional practice.
 - ii. Other staple crop processing
 - cassava, corn and others;
 - effects on water quality and supplies
 - marketing impacts and the role of pre-processing, (environmental impacts);
 - labor, cropping patterns, by-product use, nutrition impacts.

- iii. Secondary crop processing
 - describe secondary crop industries for same factors as above (i and ii), including possible impacts on soil, water resources and use of inputs, especially fertilizers, pesticides (e.g. private input distributors and extension).

b. Marketing

- Examine for same set of factors as above, also source of credit and effects of credit/capital availability from private trader/middlemen (bandar) on cropping system management and consequent environmental impacts, especially soil and water and human nutrition.
- Examine the extent to which the marketing of wood-fuels is a kind of secondary crop in some areas, particularly among the landless; also examine the energy implications of agricultural by-products as an energy source (current and potential).

3. Role of Government Programs in Sustainable Cropping System Management

- a. Rice Intensification Programs (BIMAS, INMAS, INSUS, OPSUS)
- b. Secondary Crop Programs
- c. Irrigation Development
- d. Marketing and Cooperatives, including credit/capital
 - Emphasis of this section should be on natural resource and environmental impacts as well as human resource and health impacts. For example, implications of policy of heavy rice dependency as near sole staple crop on Java and Bali.
- e. Effects on soil and water management of government programs
- f. Effects on human nutrition, health, of government agricultural programs.

B. Forestry and the Environment

1. Industrial Forestry

- a. Timber Industry
 - i. Location and local impacts
 - processing of logs (debarking, etc)
 - sawmills, pulp mills, plywood factories
 - wood treatment (creosotes, varnishes glues and others)
 - use and disposal of by-products
 - b. Timber Industry Practice and Technology
 - i. Clear-cutting and selective cutting, etc. Extent of each and environmental impacts.
 - ii. Re-planting practice
 - methods, species, management methods, including inputs.

- c. Labor use in above areas of industry; foreign participation.
 - d. Emphasis of above section on rates of cutting by various types of forest and species and sustainability of the practices; also secondary effects of the logging industry on forest stands and soils, use of rivers, infrastructure development, effects on communities, including traditional forest communities and their traditional livelihood from forest products.
 - e. Effects of logging practice on non-timber flora and fauna: loss of habitats and species.
2. Plantation Forestry
- a. Coverage by type: rubber, palm oil and coconut palm, tea, coffee, spice and fruit trees, other fibre trees, exotic wood species: teak, mahogany, etc. (Java).
 - b. Environmental impacts of management practice:
 - i. management practice: tumpang sari, agro-forestry, watershed control, NES (nuclear estate); traditional estates; impacts on local socio-economic environment as well as physical environment;
 - ii. ecological impacts: monoculture; mixed species plantations.
 - c. Human Ecology impacts:
 - i. displacement of communities; interaction of transmigrant communities (nuclear estates) and local community practice;
 - ii. changes in local labor utilization from plantations practice, quality of life of laborers (e.g. tea-pickers),
3. Protection Forestry
- a. Watershed protection forests
 - i. preservation/re-planting of forests in peri-urban water catchment zones:
 - management of these and zoning/development problems (housing, industry, firewood collection)
 - ii. preservation/re-planting of forests in rural water catchment areas:
 - choice of reboisasi or penghijauan technologies;
 - impacts on rural communities;
 - forest management in watersheds where there are large water impoundments;
 - utilization of protection forests.
 - iii. Special watershed protection forest problems:
 - open forests and mixed savanna/forest watersheds
 - mangrove and swamp, peat forest protection

- b. State Forest Reserves:
 - i. use of these reserves; purpose and management;
- c. Nature Reserves (Cagar Alam);
 - i. Management of these forests: integration of their management with genetic stock preservation (flora and fauna); recreational uses and impacts.

C. Fisheries and Animal Husbandry

- 1. Marine and Coastal Fisheries
 - a. Fishing technology and management of fishing banks;
 - b. Territorial limitations to fishing zones and control over foreign/illegal fishing;
 - c. Effects of marine pollution on fisheries and marine environment, by source and synergistic effects;
 - management practice for fisheries and marine pollution control
- 2. Natural Marine Environmental Protection
 - a. Reef Preservation;
 - b. Small atoll protection;
 - c. Marine wildlife protection;
 - d. Issues and management of above.
- 3. Commercial Animal Husbandry
 - a. Livestock raising (cattle);
 - b. Dairy cattle industry;
 - c. Others (horses, chickens);
 - d. Management practice; environmental impacts on physical, socio-economic environments, e.g.:
 - i. possible use of critical lands for cattle-raising, other activities;
 - ii. effects of pollutants on dairy cattle feed and milk;
 - iii. other special issues relating to the environment.
- 4. Small-scale Animal Husbandry
 - a. Commercial: chickens, ducks, other birds;
 - b. Private, small farmer: goats, sheep, kerbau, cattle, others;
 - c. Environmental impacts:
 - feed supply: health and nutrition; land use changes;
 - management practice/effects on rural farming systems.
- 5. Zoos and Botanical Gardens

D. Industry

(with attention to air quality, water quality and supply and effects on the quality of life)

- 1. Industrial Pollution and Basic Metals
 - a. Source of Pollution:
 - construction; cleaning and washing of ores; smelting and refining; casting and finishing; maintenance;

- b. Kind of pollution:
 - Solid: slag, ash, tailings, sludge, construction debris, finishing ends and pieces.
 - liquid: chemical reagents from cleaning; acids, hot water, waste oils;
 - gaseous: particulates, sulfuric and nitrous oxides, hydrocarbons, heat, CO₂;
 - noise: generally high?
 - c. Other Types of Polluting Basic Metals Industries:
 - iron and steel, tin, copper and aluminium (large-scale); brass/bronze-working and blacksmithing (small-scale)
2. Basic Chemical Industries
- a. Source of Pollution: lime-burning, carbon refining chemical processing, chemical waste disposal, construction, maintenance
 - b. Kinds of Pollution:
 - solid: precipitated sludges, chemical sludges, ashes, mineral residues, construction debris;
 - liquid: spent acids and alkaloid liquids, synthetic organic chemicals, oxygen-demanding wastes, nutrient-rich wastes;
 - gaseous: heat, particulates, oxides of S and N; hydrocarbons; CO₂;
 - noise: variable by industry.
3. Light Industries
- a. Conversion and Fabricating
 - i. packaging - mostly debris and trimmings (solid)
 - ii. automotive - debris, waste oils, heat, paint, noise
 - iii. Electrical and electronics - debris, trimmings (solid)
 - iv. paper products - fibers, dust, paint, dyes, noise
 - v. hardware and machines - metal debris, paints, oils, noise
 - vi. soft goods (leather, textiles) - organic chemicals (from tanning and dyeing), debris, noise
 - vii. other metal and wood fabricating-debris, oils, resins, noise, dust
 - b. Food and Drink Processing
 - * Large-scale:
 - i. bottling
 - ii. canneries
 - iii. dairies
 - iv. beverages and ales
 - * small-scale:
 - i. slaughterhouses
 - ii. tapioca factories and agro-industries
 - iii. jamu and other prepared products, (candies, etc)
 - * types of pollutants: garbage, plant and animal wastes; organic chemicals, noise
 - c. construction
 - i. debris, noise, dust

4. Extractive Industries
 - a. Petroleum and Natural Gas and Coal mining
 - i. Source of pollution: construction (all stages) exploration (blasting, roads, etc.) extraction, transport, processing (as in LNG), refining, final use, waste disposal (several stages)
 - ii. Kinds of pollution:
 - solid: (coal) mine tailings, slag, ash (bottom ash, fly-ash) construction debris (all sources);
 - liquid: waste oils, hot water, chemical reagents, mine acids;
 - gaseous: particulates, hydrocarbons, oxides of S and N, heat and carbon monoxide and dioxide
 - noise: variable
 - b. Quarrying
 - i. Source of Pollution: quarry site, transport, limestone smelting, rock crushing, dredging;
 - ii. Type of Pollution: dust and particulates (burning), sediments (into waterways), from direct dumping or erosion from site; ash (smelting); noise;
5. Regional Environmental Impacts of Industry
 - a. Impact on local resource utilization
 - i. land: possible arable land loss; land price speculation.
 - ii. air and water: see above; also downstream impacts can be synergistic with other pollutants.
 - iii. local/regional raw materials and minerals: effects on endowment and condition of resources; prices; secondary impacts on other users of the same resources (competition).
 - iv. energy: local, regional, national impacts from energy demand by industries (fossil fuels, electricity, wood-fuels);
 - b. human resource impacts
 - i. labor market: skilled/unskilled labor demand; effects on other labor markets; induced migration into or out of area; occupational safety; impact on community health and quality of life; cultural and social impacts, also psychological.
 - c. infrastructural demand impacts: effects on: roads, railways, water transport, communications, power.
 - d. management impacts: local government supervision burden; demands on education, security, health and other public services that may or may not be carried, proportionately, by user industry;
 - e. economic impacts: creation or loss of local, small industries and service enterprises; impacts of new industry on producers of substitute or traditional goods; impacts on smaller competitors of large industry. Changes in terms of trade from resource use by import substitution vs export commodity industries.

6. Infrastructure Development and Environmental Impacts
 - a. Impacts from: Highways, secondary roads, rural roads programs;
 - b. Dam/Reservoir Development, Irrigation System Development, Energy facility development: pipelines, pumping stations, power lines, substations, others;
 - c. Communications facilities, other transport: railways, water transport (inland and especially marine transport), airfields;
 - d. Impact assessment should examine, for the above, most if not all of the factors mentioned in 5 (a-e) above.

IV. POPULATION, NATURAL RESOURCE AND ENVIRONMENT INTERFACE

This set of topics deals with trends and special issues which should be included in both an environmental information system and any output from it (such as reports, profiles).

- A. Environment and Natural Resource Policy for High Population Density, Low Resource Endowment Areas: Java, Bali, Madura
- B. Environment and Natural Resource Policy for Low Population, High Resource Endowment Areas: Outer Islands
- C. Role of Environment and Natural Resource Policy in Dealing with Population Movements:
 1. Urban-rural and other economically-motivated migration;
 2. Spontaneous migration, especially in the outer islands;
 3. Transmigration program.
- D. Intermediate and Traditional Technologies and their Role in the Development of an Indonesian Environmental and Natural Resource Management Philosophy
 1. The role of technology in sustainable environmental management; including labor and organization of producers/consumers;
 2. Technologies for sustainable environmental and resource management in:
 - Agriculture and Forestry
 - Industry
 - Public Services
 - Energy
 - Human Settlements
- E. The Interrelationships of Environmental Ethics, Population Policy and Economic Ideology
- F. Methods for Assessing Trends and Impacts of Development Activities on the Environment
- G. Trends for the Year 2000 and Beyond of Indonesian Social and Economic Development and their Impacts on the Environment and the Quality of Life

- V. LEGAL, INSTITUTIONAL AND EDUCATIONAL ASPECTS OF ENVIRONMENT AND POPULATION MANAGEMENT IN INDONESIA
- A. Legal Framework for Population and Environmental Management
1. Population Management
 - a. Incentives and Disincentives for family planning;
 - b. Government programs: BKKBN, educational programs, the media;
 - c. Development policy: GBHN and REPELITA;
 - d. the role of religion and adat laws.
 2. Environmental Management
 - a. Basic Law on Management of the Environment (Undang-Undang no. 4, 1982)
 - b. Existing Provincial Legislation (peraturan Gubernur) and others concerning: environmental management, natural resource management, control of population movement and settlement.
 - c. Pre-Republic Legislation and Traditional Law
 - i. Dutch Colonial Policy and Laws
 - ii. Adat law and the use of natural resources and lands
 - iii. Al Qur'anic Laws and Injunctions on use of natural resources, the environment and personal/social hygiene
 - d. Pancasila Ideology and Its Basis for Legislation on Natural Resource and Environmental Management
- B. Institutional Framework for Population and Environmental Management
1. Population Management
 - a. BKKBN
 - b. Line Ministerial Responsibilities Affecting Population
 - i. Department of Transmigration
 - ii. Department of Social Affairs
 - iii. Department of Health
 - iv. Department of Internal Affairs (Dalam Negeri)
 - v. Department of Education and Culture
 - vi. Other relevant departments: clarify responsibilities
 - vii. Coordinating role of Ministry of Population and Environment
 - c. Religious bodies;
 - d. Cultural associations;
 - e. foreign governments and private agencies;
 - f. non-governmental agencies and associations; role of the private sector in family planning;
 - g. Define the capabilities and barriers of the above agencies and groups in population management.
 2. Environmental and Natural Resource Management
 - a. Ministry of Population and the Environment
 - b. Line Ministerial responsibilities affecting environment and natural resource management:

- i. At this time, nearly every line department has some responsibility for environment and natural resource management. Describe these responsibilities and functions;
 - ii. Describe the non-governmental agencies and associations which have an interest or programs in environment and natural resource management, e.g.
 - Wahana Lingkungan (WALHI)
 - Research bodies: LP3ES, CSIS, LPPM, LAN, others;
 - Technical assistance and extension bodies (private/non-profit), e.g. Dian Desa, (Yogyakarta)
 - Yayasan Sugiopranoto, (Semarang)
 - Foreign, private organizations, e.g. Asia Foundation
Ford Foundation
Rockefeller Foundation
Oxfam, Catholic Relief Services, Yayasan Obor
 - iii. Foreign, governmental agencies, e.g.
 - United Nation agencies,
 - World Bank and ADB
 - bilateral donor agencies
3. For population environmental and natural resources management, describe the capabilities and constraints of the above-mentioned institutions, including the following criteria:
- a. funding levels and capabilities;
 - b. breadth and depth of programs/projects;
 - c. information resources;
 - d. technical expertise;
 - e. planning, management, extension and education ability;
 - f. networking and exchange of information and results
4. What is the role of a coordinating function, i.e. the role the Menteri KLH in the following:
- a. institutional development:
 - i. government institutions;
 - ii. private sector;
 - iii. non-governmental institutions;
 - iv. foreign, private and governmental institutions
 - b. research and program/project development;
 - c. information generation, use and exchange;
 - d. program and policy assessment, including:
 - i. the use of direct persuasion;
 - ii. the use of information and education;
 - iii. the use of certain tools:
 - ANDAL (Environmental Impact Assessment)
 - regulations, (see legal, above).

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