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NATURAL RESOURCES MANAGEMENT PROJECT

BAPPENAS – Ministry of Forestry
Assisted by
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**ABSTRACTS
OF
NATURAL RESOURCES MANAGEMENT PROJECT
STUDIES AND REPORTS**

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Preface

These abstracts of reports and studies produced by the NRM project is aimed at providing concise summaries of the individual NRM project reports and studies.

These are distributed both in English and Bahasa Indonesia and will be regularly updated throughout the life of the project.

Extra copies can be obtained from the NRM Policy Secretariat in Jakarta and from the NRMP suboffices in the Department of Forestry, Jakarta, in Litbang Pontianak, and in SBKSDA Manado.

NRMP REPORT No. 1

**Equipment and Infrastructure Development
for the Bukit Baka Forest Research Station, West Kalimantan
and Equipment Installation, Training, and Needs Assessment
for the Forestry Research Station, Samarinda, East Kalimantan**

This consultancy concerns development of a forest research facility in the Bukit Baka - Bukit Raya area on the border of West and Central Kalimantan, and equipment installation at the Forestry Research Center in Samarinda, East Kalimantan. The report aims first to indicate to NRMP personnel the actions necessary to develop the facility at Bukit Baka, specifically the infrastructure, equipment, and materials needed. Second, it reports on progress at the Samarinda station and recommends several follow-up actions.

Bukit Baka

The expedient construction of the Bukit Baka - Bukit Raya Research Station and procurement of the equipment and supplies necessary for it to become completely operation is vital if the project is to meet its objectives within the time frame specified. To this end, the consultant performed a survey trip to the project area and reviewed all previous reports.

Recommendations include installment of adequate travel and communication facilities at the site. Installation of radio capabilities and drafting of a protocol for both emergency and day-to-day communication is also recommended. The protocol should include as well approval criteria for visiting researchers.

Construction of 800 m² of headquarters, laboratory, and office space as well as 42 units of housing are recommended. Design and site preparation should be planned to avoid unnecessary tree felling and soil disruption, just as provision should be made for road improvement and maintenance. A topographic site survey must be performed to allow for the correct placement of all structures and to assure that waste water will not contaminate surface water supplies. Buildings should be constructed according to local style and Indonesian specifications.

Water and power needs may be met through hydraulic installations (ramjet pump for water and dynamo for electricity), but electrical power will need standby diesel generators as well. A decision about whether to pump water or pipe it from further up river will depend upon the topographical survey and an assessment of long-term costs.

The equipment and supplies required to support basic forestry and ecological resources were identified and listed. Because of budget constraints, these were prioritized in so far as possible, although it should be noted that provision of equipment without the supporting supplies is counterproductive.

Site preparation and construction of the buildings are expected to cost an estimated US\$ 236,000. An additional \$50,000 to \$75,000 would be needed for equipment and \$16,000 for supplies and chemicals to stock the labs.

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Forest Research Institute, Samarinda (FRIS)

Equipment and supplies provided by the Applied Agricultural Research Project arrived at the research institute in late 1990 and 1991. Just over \$200,000 of material had been received, and assistance had been given to install and calibrate the equipment. The staff had received some training on equipment use and care, but hands-on analytical training had not been possible because chemicals and other supplies were not available.

While nearly all of the equipment was complete and in good condition, there were several problems. These included a few missing manuals, substitutions of recommended equipment with inappropriate models or machines, and missing or broken parts. Inexplicably, the operating supplies which had been recommended by another consultant at the time of the original equipment order had never been delivered. Thus FRIS had none of the necessary supplies for daily operation of the equipment. Since prompt procurement of these supplies is so critical, the consultant assembled a list of necessary supplies. These would cost approximately \$16,000 to \$17,000.

In addition, the consultant noted two deficiencies in the equipment supplied. Specifically, the atomic absorption spectrophotometer FRIS had requested had not been provided; this is vital to basic soil, plant nutrition, hydrology, conservation, and ecological studies. Similarly, they had received no forest products testing equipment.

NRMP REPORT No. 2
Agroforestry in Bukit Baka - Bukit Raya

The objectives of this consultancy were to identify strategies for promoting community participation in agroforestry development in the Bukit Baka - Bukit Raya area on the boarder of West and Central Kalimantan. The consultant assessed possibilities for agroforestry in the field and proposed approaches for introducing agroforestry techniques and involving local communities. In addition, he conducted two training sessions in agroforestry development and identified agroforestry activities for the project to undertake.

The following six steps for selecting, testing, evaluating, and eventually multiplying appropriate agroforestry technology throughout the area are recommended:

- Start where the farmers are technologically and build on their expertise.
- Determine the constraints to agroforestry development in the villages and project site.
- Select appropriate technologies to overcome the constraints, remembering that simpler is generally better.
- Test the technology on a small scale on farmers' fields.
- Evaluate the results with the farmers.
- Train farmers as trainers to multiply the technology.

Participatory planning, implementation, monitoring, and evaluation of project activities are critical to promoting individual and community participation in agroforestry development. The following measures are recommended:

- Use indigenous work groups to implement activities.
- Develop community development units in each village as the focal point for village natural resources management planning, monitoring, and evaluation.
- Develop a farmer-based extension system to manage technology design, transfer, and evaluation.
- Emphasize on-the-job training in programs and activities.

It is equally important that agroforestry activities address what the community identifies as its priorities. These may or may not deal directly with agroforestry. Typically, communities are interested in developing potable water supply systems, improving food self-sufficiency, achieving land tenure security, and initiating income-generating projects. It is therefore recommended that NRMP assist the villages with designing, planning, and

implementing potable water systems, as well as with village mapping.

The local logging concession already sponsors a community development program (Bina Desa) which focuses on agricultural extension. NRMP could initiate a number of measures to strengthen this program:

- Provide support materials for village field workers.
- Institute field trips to observe successful technology or extension systems.
- Provide special training in participatory extension techniques, with an eye towards shifting from formal extension to facilitating roles.
- Assess how communities and concession personnel expect an extension workers to behave, and draft guidelines for them.

Similarly, the consultant recommended that the project integrate the Bukit Baka - Bukit Raya National Park project activities and village community development in the buffer zone around the park. One means of accomplishing this would be through emphasizing ecologically sound and sustainable management of watersheds, catchments, and the like as part of the village extension programs. Conversely, the project should utilize facilities, funding, and human resources allocated for the national park programs to support local community development activities as well, particularly the agroforestry program.

The agroforestry program should also be backed up through support studies and activities to determine which crops should be planted, what income-generating projects developed, and which technologies selected. This might begin with a market survey to determine the income-generating potential of locally produced goods, for instance handicrafts and crops, transportation mechanisms for delivering them to markets, and possibilities for value-added processing in the villages themselves.

The consultancy included two training sessions. The first was to train the long-term advisors in identifying potential agroforestry activities and implementing them. The second training, a two-day session with local farmers from Nanga Siyai village, the HPH Bina Desa staff, and the reforestation station staff, was a field demonstration of agroforestry techniques. This included an introduction to natural fertilizer production using composting, construction of a compost pile at the reforestation nursery, an introduction to basic tree pruning, and interviews with forestry staff about their perceptions of what constitutes a good forester. During the second session, local farmers and Bina Desa staff were introduced to contour farming, options to bench terracing,

construction and use of the A-frame transit, planting of hedgerows, field lay-out of contour lines, seed bed preparation, and planting of napier grass. Thirty-six individuals took part.

With regards to planning project agroforestry activities, the consultant recommended that the project start slowly and small. Details of the specific schedule of projects he proposed may be found in the report.

NRMP REPORT No. 3

**Topographical Measurement and Mapping
in Bukit Baka - Bukit Raya National Park**

The objective of this consultancy was to measure and map the topography of parts of the Bukit Baka - Bukit Raya National Park. One of the chief objectives of this work was to determine where the proposed forest research station should be located.

The survey team placed natural and human-made structures on a two-dimensional map of the area in order to record important landmarks and indicate scale. Topographical surveys were performed in the immediate area of the recommended forest research station, whereby the above two-dimensional map of the whole area was supplemented with elevation measurements for the proposed site.

In addition to drafting the map, the survey team also presented several recommendations regarding where the research station and other facilities should be located.

NRMP REPORT No. 4
**Recommendations for Applied Research
in Production Forest Management**

The objective of this consultancy was to provide recommendations for applied research relating to production forest management at the study concession in West and Central Kalimantan for consideration by NRMP. The report includes preliminary terms of reference for eleven proposed case studies.

The consultants found several circumstances to recommend development of forestry research at the site and in cooperation with the concession. First, the company appears to be a model concession holder that attempts to fully comply with Indonesian Selective Cutting and Replanting (TPTI) regulations; the concession staff are responsible, cooperative, and receptive to recommendations. Further, the study site and forest area provide an excellent setting and case study for the investigation of forest management issues Indonesian foresters and policy-makers currently face; low human populations and relatively little natural disturbance would accommodate "control" studies of the effects of various policies and practices. Finally, positive collaborative relationships between the concession and local communities would allow the project to evaluate innovative approaches to sustainable forest management through cooperative programs. Realizing an effective and fully-operating NRMP research program at the Bukit Baka field station, however, will depend upon overcoming the present shortage of available researchers, especially those with advanced training and with the flexibility to be temporarily absent from their institutions for the purpose of conducting field studies.

The major findings of the study, to some degree generalized to the sectoral level based upon the case study, are as follows:

- The conceptual basis for the majority of forest management practices required by the TPTI is not clearly presented in the documents provided for use by concession holders and provincial forestry officials.
- Managers and field staff at the concession believe that most, if not all, TPTI forest tending practices are not economically or ecologically beneficial, and that they do not warrant the financial investment required for meeting TPTI-mandated practices.
- There is a lack of basic ecological information about existing commercial timber species and their distribution in Indonesia's forests. This is inconsistent with the importance of these resources to the Indonesian economy.
- The TPTI-required forest tending practices employed by the concession are not economically viable, nor do they have any immediate ecological benefit. These practices may also cause unnecessary loss of biodiversity.

- A major obstacle to sustainable forest management in the study area is the impact of logging roads on surrounding areas.
- The policy changes instituted under the TPTI (as compared with the TPI) greatly reduce the total area and number of seedlings required for enrichment planting.
- The TPTI-mandated requirements do not appear to yield any ecological benefit to the forest, given the actual number and composition of seedlings which must be replanted in order to comply with TPTI regulations.
- The criteria for site selection under TPTI replanting requirements set stocking levels too low to ensure adequate reforestation.
- Re-inventory criteria under the ITT do not adequately account for the mix of dipterocarp and non-dipterocarp species. This may lead to a change in the commercial species composition.
- Assessment of damage to forest stands as required by TPTI guidelines appears to be constrained by a lack of trained field personnel, tight schedules, and inadequate equipment in the study concession.
- Replanting with exotic fast-growing species may not be the most appropriate or effective way to recover forest value, as opposed to treatments tailored to reclaiming degraded areas or enhancing post-harvest forest recovery.
- The calculation of annual allowable cut is not based on the predicted potential ability of a particular stand to recover.
- Preliminary findings indicate that the species composition and yield of the dipterocarpaceae, the most valuable timber species, are expected to significantly decline, pushing down the market value of timber from secondary forest stands.
- Dipterocarps provide the overwhelming majority of raw material resources to the plywood industry, so that declines in their availability will reduce industry output and export capacity.
- Commercial plantation production cannot be assumed to meet the shortfall in raw material for the plywood industry.
- Unless they are removed, direct financial incentives that act to increase the volume of timber cut, hauled, transported, and processed will render policy prescriptions aimed at reducing damage caused by harvesting activities ineffectual.

In response to these problems, the consultants recommend the following policy initiatives:

- Conservative calculations and projections of future levels of timber availability should exclude previously harvested production forest areas.
- The procedure for calculating the volumetric factor in the annual allowable cut should be re-evaluated.
- The procedure for calculating the exploitation factor in the annual allowable cut should be re-evaluated.
- Financial disincentives for reducing mortality to residual stands during harvesting should be instituted.
- The policy regarding the size, number, distribution and species composition of nucleus trees required per hectare for re-stocking should be re-evaluated to reflect the condition of the original stand and the natural stocking level and species composition.
- Replanting requirements should be revised to assist concession holders in implementing and monitoring replanting.
- Forest tending practices should be reviewed with a view to increasing the cost-effectiveness of such practices and reducing unnecessary losses of biodiversity.
- The current policy recommendations regarding the production factor in the calculation of the annual allowable cut should be reviewed.
- Policies requiring the concessionaire to pay for timber losses during extraction should be adopted.

Finally, the consultant recommended that NRMP consider:

- Reviewing the meaning of "sustainable" with regards to certification and labeling of tropical timber exports;
- Performing a survey of concessions in Kalimantan through a written questionnaire and site visits to selected other concessions.
- Assisting the private sector with data management through designing an analytical storage and retrieval system of forest records.
- Strengthening botanical documentation of the composition, distribution, densities, regeneration capacities, and current and potential uses of Indonesia's forest species.

- Providing recommendations for revising the enrichment and replanting programs.
- Developing silvicultural practices to reduce mortality of commercial species and enhance post-harvest forest recovery.
- Managing production forests to capture their full economic value by recognizing the full range of goods and services available.
- Assisting concessions with road planning, construction, maintenance, and reclamation.
- Developing a local weather monitoring system to warn farmers and concession holders to take preventative action against drought and fire.
- Evaluating the potential of the second harvest to yield a viable timber crop.

NRMP REPORT No. 5

**Balancing Forest and Marine Conservation
with Local Livelihoods
in Kalimantan and North Sulawesi**

The objective of this short-term consultancy was to ensure that natural resource management strategies formulated under the NRMP encourage active participation of local communities, and that they address critical social issues such as potential conflicts between local communities and large-scale users of forest and marine resources. In addition, the social scientist assisted in identifying and implementing selected community-oriented development activities as part of project planning in the Bukit Baka - Bukit Raya area of West and Central Kalimantan and the Bunaken National Park in North Sulawesi.

Building upon the "Social Soundness Awareness" study of the two areas prepared in July 1990, the consultant performed a review of the literature, returned to the communities the original team had surveyed, visited several communities they had not visited, and systematically collected qualitative and quantitative data on issues particularly germane to developing and implementing a management plan for both sites.

Among the premises of the study is the fact that balancing local community use of forest and marine resources with environmental management requires a detailed understanding of resource use patterns by local communities. These may be highly site- and local culture- specific. In addition, they are not static, but rather evolve continuously in response to the changing ecological, economic, and political conditions faced by local communities. Hence successful natural resource management plans reflect and build upon the differences in resources available to local communities, community and household vulnerabilities, and the resulting diverse livelihood strategies that occur within and across villages. In sum, it is not possible to formulate a "generic" natural resource management strategy that will meet with success in all local communities.

There are several key socioeconomic factors which must be taken account of if natural resource management plans are to be implemented successfully. In all cases, because local governing institutions vary widely across villages, the benefits of development activities are not automatically equally distributed within villages. To be successful, natural resource management plans should take account of the mechanisms by which the benefits of development activities are distributed in each affected village. In brief, NRMP should identify the members of each village or community that are key to successful implementation of the management plan for that area.

In Bukit Baka, household rice security is the dominant concern of virtually all local communities in the area; management plans must recognize the importance of protecting and preferably improving rice production. Similarly, the employment effects of logging concessions on local communities are greatest in villages with the lowest levels of household rice security. However, employment opportunities generated by nearby forestry concessions are

generally concentrated in low-paying occupations. The secondary employment effects of forestry concessions (e.g. providing opportunities for marketing local produce) are for the most part constrained by long distances, high transport costs, and lack of assurance that produce offered for sale will be purchased.

Existing knowledge of sustainable harvesting rates for traditional forest products and their effect on commercial forest resources in Bukit Baka/Bukit Raya and similar areas should be greatly expanded before finalization of natural resource management plans for these areas. In addition to their impacts upon the natural resource base, the marketing needs for any forestry-based cottage industries should be considered; their success will depend on the development of marketing networks and expansion of current knowledge of the extent of existing rattan supplies.

In Bunaken National Park, baseline data -- especially data regarding the social aspects of coastal and marine resource use -- should be collected before natural resource management plans are finalized and implemented. It is already clear, however, that all facets of the natural resource management plan for Bunaken Island and similar areas should take account of the limited availability of fresh water, as this is likely to be the binding constraint on most economically productive activities otherwise suited to such areas. Further, jurisdiction over land and resource use in Bunaken National Park should be clarified before management plans for the marine resource base are finalized or implemented.

NRMP REPORT No. 6

**Proposal for the Development of
Comprehensive Environmental and Natural Resource Accounts
for Economic Planning and Environmental Management**

Resource accounting is a tool for data development which uses the structure of the national income accounts to organize data on services of the natural environment which are excluded from conventional accounts because they are not marketed. This allows development of valuable data on the economic role of the environment that can be used to address both economic and environmental policy and planning questions.

Limitations of conventional national income accounting with respect to the environment include the facts that they only include depreciation of built capital, not of natural resource capital; do not include non-marketed inputs into economic activities such as water, land, or waste absorption capacities; add expenditures for protecting against a polluted environment but not subtract the harm caused by pollution; and omit direct consumption of environmental services.

Natural resource accounting is designed to address some of these omissions by building a framework within which to account for the economic value of the services provided by the environment. The use of the word "economic" is crucial in this context; resource accountants are interested in valuing use of the environment within a framework which allocates scarce goods to their most productive uses. For this reason, the proposed natural resource accounting framework covers only those resources which are in scarce supply.

Indonesia has led the world in implementation of natural resource accounting. This has been of great importance in drawing attention to the deterioration of the Indonesian natural resource base and its significance for future economic growth. However, national policy-makers may be interested in resource accounting which existing approaches are not designed to address. In particular, they are likely to be interested in the links between economic growth, use of natural resources, and environmental degradation; estimating these factors requires additional information about the contribution of non-marketed services to economic well-being and the depreciation of these services.

The objective of this consultancy was to design Comprehensive Environmental and Natural Resource Accounts (CENRA) for Indonesia. The CENRA is intended to take a broad approach to resource accounting which will allow development of an information base on environment-economy linkages for use by national policy-makers.

The consultants envision that in the short-term the emphasis of the CENRA project will be to identify all of the services provided by the environment and to value them as well as possible, given time and data constraints, rather than to develop highly accurate data on just a few industrial sectors, environmental services, or geographic regions. These broad initial accounts, although imprecise, will indicate the relative order of magnitude of the various services, allowing data development in subsequent studies to focus on those of greatest importance to the economy. In the long

run, the hope is that the development of economic accounts on the environment will become a routine annual activity of the Indonesian government.

NRMP REPORT No. 7

**Bukit Baka Mini-Hydroelectric System
Implementation Plan**

The objective of this engineering consultancy was to formulate an implementation plan for installation of a mini-hydroelectric facility to power the proposed Bukit Baka Research Station.

The report includes a proposed implementation schedule for installation; recommended composition (supervisors and construction workers) of the installation work force; specifications of the necessary equipment and materials for the generator, turbine controls, penstock/pipeline system, and electrical distribution system; and a description of the parameters for the small hydroelectric system.

Also included are graphs of the source hydraulic profile, and drawings of the recommended overall site plan, intake/diversion structure, powerhouse/diversion pit, penstock installation, and distribution system.

NRMP REPORT No. 8

**Final Report
Bukit Baka - Bukit Raya Research Station**

The short-term Research Station Advisor completed a consultancy of three and one half months with the NRMP Bukit Baka team. In addition to coordinating technical and administrative activities at the project site, the advisor also assisted in the development of plans and infrastructure for the research station at Bukit Baka. Protocols (in handbook form) have been prepared for both the station and research activities there.

NRMP now has three long-term advisors in residence at Bukit Baka, namely the Natural Forest Management Advisor, Nature Conservation Advisor, and Social Forestry Advisor. It is expected that in 1992 two more advisors will be hired to complete the advisor team, namely the Forest Research Advisor and a second Natural Forest Management Advisor, sponsored by ITTO. Counterpart staff from appropriate Indonesian government agencies are expected for all long-term positions. The Pontianak NRM office may also need an additional clerk as staffing and visitor load increases in coming months. Guidelines for the NRMP team building have been prepared for implementation. Training in communications, correspondence, and coordination have been undertaken, and appropriate actions have been initiated to insure greater teamwork and efficiency.

Because of the expected increase in level of staffing and anticipated delay in construction of the research station, the construction of temporary quarters prior to the completion of the research station is recommended, and appropriate paperwork for its completion has been initiated. Details of additional support staff quarters for the station are presented in the report, as are recommendations for providing adequate housing at the permanent station as an incentive for staff of Litbang and other counterpart agencies to pursue assignment there.

Details of infrastructure development are presented in the report, including a topographical survey, road reparation, station layout, housing layout, and sanitation and waste disposal systems. All project advisors mention the importance of procuring a Global Positioning Instrument as an aid to field research.

The NRMP 1992-1993 research plan and competitive research grant development have been followed up through informal assistance to NRMP long-term staff in both Bukit Baka and Jakarta.

NRMP REPORT No. 9

**An Environmental Education and Awareness Campaign
for Bukit Baka - Bukit Raya National Park**

The recent establishment of Bukit Baka - Bukit Raya National Park has highlighted the need for local environmental awareness. While local residents can readily identify environmental problems and relate them to recent developments, their taking action is impeded by several factors. Central to these is a lack of information about the measures they could take to protect and improve their environment and their absence of awareness that they could make a change. These issues are relevant to the park's future management and sustainability as well as community participation in the park.

The consultancy focused on developing an environmental awareness campaign with local leaders from Nanga Siyai village and NRMP field staff. The topic of fire control and prevention was chosen because it was identified as an urgent concern by local residents and could also be used as a vehicle for introducing key environmental messages. The basic concept was to focus on immediate needs and relate these to messages which would also form a foundation for developing further environmental awareness. Because schools are one of the few avenues for reaching a larger audience in this remote area, the campaign's primary target group is 5th and 6th grade students, whereas their parents are the secondary target group.

The proposed strategy is designed so that participatory activities and media involve the students and gradually build their understanding and awareness. The activities also require them to discuss the information with their parents, which gradually builds the parents' awareness about the environmental importance of preventing fires and the fact that there are actions they could take to control and prevent fires. Extension workers will then assist to determine what actions the parents should take. The campaign is scheduled so that the culmination activity, a play adapted by the students, is presented on Independence Day, a major holiday, when a large audience would be possible.

The educational materials produced include:

- A guide to an introductory presentation to students about forest ecology and fire;
- A cartoon, *Hutan Kita* (Our Forest), about the richness of forest life and the impacts of fire upon this, as well as a guide to using the cartoon;
- A snakes and ladders game, *Apa Boleh Buat?* (What can be done?) about positive and negative actions concerning fire, as well as a guide on how to use the game in the classroom and possibly for future extension with farmers;
- A booklet, *Apakah Kebakaran Dapat Dihindari?* (Can Fires be Avoided?), illustrating possibilities for preventing and controlling fire, as well as a guide on how to use it in the classroom (as a basis for student essays or posters) and possibly for future extension with farmers;

- A flip book, *Apakah Kebakaran Dapat Dihindari?* (Can Fires be Avoided?), an enlargement of the book above;
- A story, *Tempat Kesayangan Liu* (Liu's Favorite Place), about fire's effect on one child's favorite place in the forest, as well as a guide to using it in class and as a drama presentation to parents; and
- A design for the T-shirts to be given to the students presenting the play.

NRMP should collect valuable information about local environmental knowledge, attitudes, and practices, as well as about local receptivity to various forms of messages and media, so that future educational messages and awareness strategies can be better focussed and targeted. Specifically, more information is also needed about communication channels and extension methods as the area's physical remoteness and meager facilities constrain application of more common approaches. These gaps, caused by limited time for the consultancy, should be addressed before the campaign begins intensive implementation.

NRMP REPORT No. 10

Recommendations for Controlled Timber Harvesting

During a three-week field survey, the consultant observed the study concession's harvesting system and appraised its efficiency and environmental impacts. The focus was on logging operations and their impacts on the forest ecosystem, but some attention was also paid to the road network and transportation system. The survey findings indicate that the concession possesses a solid basis for implementing sound forest management, but that a gradual change in the present harvesting system will be required to achieve the final goal of forest conservation and sustained timber yields.

The study concession is responsible for managing a forest concession of approximately 270,000 ha. It is known as one of the best operations in the country in terms of following the Indonesian Selective Cutting and Replanting (TPTI) rules with regard to timber harvesting and regeneration practices. The company is also actively involved in NRMP's efforts to develop sustainable forest management systems for Dipterocarp hill forests.

Harvesting operations are fairly efficient, given the tough terrain and climatic conditions of the area. Felling and skidding production are encouraged by incentives, and tractor and power saw operators are skillful and able to meet the production targets. The concession provides a regular supply of raw materials to processing plants in the provincial capital, despite the fact that this requires 140 km of road transport and 450 km of river transport. The road transport is especially well organized and executed by a fleet of 25 truck-trailer combinations. Forest roads are also well designed, constructed, and maintained.

Although efficient in many respects, the company's logging system is conventional and attended by substantial forest damage and other harmful environmental effects. The areas visited clearly exhibited stand damage due to felling and skidding and deforestation due to road construction. In some logging compartments the total affected area exceeded 40% of the forest after harvesting. The main damage-inducing factor is the construction of forest roads, which may lead to erosion and consequently to siltation of rivers, massive loss of forest vegetation, and compaction of the forest soil. The second factor of concern is skidding, which produces felling and vegetation damage similar to road construction. A large portion of the damage done by skidding is caused by intensive manoeuvring of the tractor in the stump area, an operation that could be carried out with less soil damage if the crews were trained to do controlled skidding. The production-oriented incentive system appeared to induce damage, especially in felling operations where directed felling is considered to waste time. As a rule, logs are felled downhill instead of towards the slope, increasing the risk of excessive damage to residual trees.

Better planning of harvesting operations and modification of the present logging system could reduce forest damage by 30% or even 50%. This potential was demonstrated by a small experiment in directed felling and controlled skidding. The immediate result was

a reduction in the length of skid trails and tractor movement in the stump area, and consequently a reduction of the area of disturbed and compacted forest floor. In another trial, the felling and skidding teams were asked to cooperate to determine the right lay of a tree to be felled in order to minimize damage to residual trees.

The survey made clear that harvesting impacts in the concession could be limited by modification of the present system. Little physical investment is needed to achieve this aim; essentially forest staff need to be instructed and trained in the new system. Most important is to stimulate their awareness of damage control and sustained timber production. Workers have proved able to understand this concept and are capable of rapidly adapting to a new system. A strategy for strengthening three levels of damage control was therefore formulated.

The concession possesses already an excellent basis for planning, damage control, and sustained management, namely the cruising or 100% preharvesting inventory. Cruising maps were used to select a site for training and research. Training in controlled and organized logging is envisaged and a number of experiments are planned to demonstrate how damage restriction can be achieved even as logging efficiency is maintained or even improved. This program should be planned to begin during the 1993 dry season. One professional felling instructor should be contracted for three weeks, while one felling, one crawler tractor, and one wheeled skidder crew should be assigned to the area for one year each. A number of permanent sampling plots should be located in the experimental area for long-term observations, for instance to monitor the recovery of the forest soil and vegetation from logging impacts.

NRMP REPORT No. 11

**Cruiser Identification
and Uses of Trees by Local People**

The principal aims of this study were to assess the accuracy with which timber cruisers in commercial logging concessions identify tree species and to identify possible conflicts between local community and commercial uses of forest resources in the study area in West Kalimantan.

Timber Cruisers

Forestry statistics and planning are based upon the baseline data on tree location, size, and species collected by timber cruisers. Unfortunately, few cruisers are provided with adequate training or equipment to allow them to accurately identify timber species. This results in species misclassifications, causing high-value hardwoods to be sold at prices charged for commercially unimportant timber and rare species to be depleted out of ignorance.

Cruisers are generally migrants to the area with no formal training in forest botany. Their training generally consists of on-the-job experience with a more senior cruiser for one to two years before running their own crews. These crews consist entirely of daily hired local labor, and species identification rests almost completely on their knowledge. Though it is commonly assumed that the names used by local people are equivalent to those required by industry, this is not the case; this leads to many misclassifications.

All trees > 25 cm in diameter at breast height (dbh) are entered in timber cruising records; for 50% of these the species is marked as unknown. In the cut class, trees > 50 cm dbh, this proportion of "species unknown" drops to 10%. Of the identified trees, the meranti timber species and other Dipterocarpaceae are generally correctly identified, but classifications of most other groups are unreliable. The unknown species include various sources of specialized commercial timbers, such as woods for fine furniture manufacture. Accurate identification of these trees would result in higher profits.

Aside from lack of training, another source of error in species identification was the volume of work a cruising team is expected to complete in one day. Since one team must classify, measure and map 600 trees a day, species identification is based almost entirely on a cursory examination of external bark characteristics and occasionally of slash features. Especially to an untrained eye, many species appear the same on the grounds of these features, so mistakes are bound to occur.

Training cruisers in identification would reduce the number unclassified and incorrectly classified trees in cruiser books without significantly reducing cruising speed. This would require a reference manual that clearly depicts the important identifying characteristics of local timber species, such as bark and leaf features. Cruisers should also be supplied with binoculars in order

to match leaf samples collected from forest litter with growing specimens still attached to tree limbs.

However, the relevance further training should be carefully assessed since the present value of cruiser identification is questionable. That is, chainsaw operators cut without any regard to the cruiser books. Their only concern is that trees appear > 50 cm dbh, are not marked with a "*pohon inti*" (nucleus tree) strip and do not seem, to their untrained eyes, to be of a species reserved for local people. Scalers do their own identifications based on timber characteristics. What is cruiser identification for?

Plants Used by Local People

The second component of the study was a survey of uses of plants, principally trees, by the inhabitants of two local villages. The villages are adjacent to one another, and there are no roads connecting them to any other village. The people are almost entirely dependent on the forest for their needs, and use numerous tree species in the course of their everyday lives.

It quickly became apparent that analysis of their needs should distinguish between destructive and non-destructive uses of local resources, especially in the light of proposed plans to set up extractive reserves in the region. While past efforts have tended to concentrate on non-destructive uses such as harvesting of tree parts (rubber, incense, etc.) and quickly regenerated resources, this study found substantial requirements for destructive uses, notably timber for construction. Most of the trees felled were meranti, in direct competition with local logging concessions, and of the same size class harvested by commercial operations. This may create conflicts between local residents and commercial users. With regards to local people's non-destructive uses, it was clear that logging practices impact upon the availability of these resources; the extent of these impacts and ways of mitigating them require further study.

Other Aspects

There are currently insufficient resources available to enable correct identification of trees in West Kalimantan. Training and establishment of a herbarium are required to correct this gap. A logical site for such a facility is Universitas Tanjungpura (UNTAN), where it could serve faculty and students (including those who will enter the area's forestry industry), and outside researchers.

NRMP REPORT No. 12

**Community Water Supply Feasibility Study
for the Bukit Baka - Bukit Raya Region**

The purpose of this consultancy was to do a feasibility study for improving community water supplies in villages in the vicinity of Bukit Baka - Bukit Raya National Park, particularly those impacted by ongoing logging activities in the area. The consultants visited eight prospective sites in West and Central Kalimantan to assess opportunities and estimate costs for improved water systems.

At each site, the consultants met with village leaders and community members to discuss the purpose of the visit and to determine their interest in and level of support for improving their water supplies. At present all eight communities use nearby rivers or small streams for both water supply and defecation. The impacts of this practice upon their general health was evident, particularly among the children. Due in part to the high sediment levels in rivers and streams (due to logging, agricultural development, and natural erosion), which is especially evident after heavy rains, all communities expressed a strong interest in improving their water systems.

The arrangement proposed to each village involved a partnership development approach consisting of support from the main forest concessionaire in the area, Sari Bumi Kusuma (SBK), USAID/Indonesia through NRMP, and from the beneficiary communities themselves. As part of its Bina Desa (community development) program, SBK agreed in principle to supply materials and equipment (M&E), provided that the beneficiary communities agreed to actively participate in their construction, operation, and maintenance. USAID, via NRMP, agreed to provide assistance in technical design and construction.

Assisted by four to eight residents of each village, the consultants located one or more potential spring sources in each village, tested the yield of each source, and surveyed the proposed pipeline route from the chosen source to the village. Groundwater springs were sought as sources to help insure acceptable water quality and avoid the sedimentation problems associated with most surface water in the area. Suitable springs were located in all but one community visited (Nanga Apat).

Preliminary system designs were developed, M&E costs estimated, and installation schedules developed. Each system consists of one or more spring catchments, the main pipeline, a water storage tank, and multiple public taps located throughout the village, at least one of which also has bathing and washing facilities. The system designs are relatively simple because each of the villages was fairly tightly clustered along the river bank (thereby simplifying distribution) and in all cases but one (the joint system for the villages of Riam Batang/Tumbang Taberau), only one water source (or group of closely contiguous springs) was used with each system.

The simplicity of the system designs helps keep down the cost, but the relatively small village populations (170-350 people) makes the per capita system costs somewhat higher than they would be for the larger rural communities commonly encountered in other provinces of

Indonesia. In all cases, the beneficiary communities have agreed to provide all needed local materials (such as sand, gravel and rock) and all necessary labor (for hauling both purchased and local materials to the site, and for construction) without pay.

Recommended Follow-Up

Depending upon the amount of financial resources available from USAID (for technical assistance) and SBK (for M&E and logistic support), one of three options should be chosen for follow-up:

Option One: Construct all six of the systems which have already been surveyed and designed.

Option Two: Construct only some of these systems, such as one or two communities each in West and Central Kalimantan.

Option Three: Do nothing further.

Option One is recommended, on several grounds. First, a relatively modest total M&E cost of about Rp. 30 million to construct six gravity flow, piped water systems would provide seven of the eight villages surveys with reliable water supplies of more than sufficient quantity and accessibility and high quality. This would in all likelihood have a significant positive impact upon their overall health. Further, village enthusiasm, willingness, and good faith to participate in constructing these systems is obvious.

The consultants therefore recommend that SBK fund the necessary M&E and USAID fund the necessary technical assistance to proceed with constructing these systems and providing the necessary training for the communities to maintain their own systems over the long term. The team further recommends that as project resources permit, trained and experienced local health education workers be brought in to provide hygiene education for all targeted villages in order to further amplify the health benefits of this activity.

In order to ensure the sustainability of the improved water systems, a participatory community approach is recommended on the following grounds:

- Fully involving beneficiary communities in the design and construction of the systems, will assure that they feel some investment in properly operating and maintaining the systems.
- Hands-on experience gained in construction will provide them with the practical skills required to repair their systems, making them less dependent upon SBK's continuing largesse.

- Supplementary organizational and financial management training will allow the communities to undertake and pay for maintenance and repair needs as they arise, also minimizing reliance on external sources.
- Incorporating sanitation and hygiene training will improve people's awareness of the links between water supply, sanitation and hygiene, and the health of the community and especially its children, giving community members that much more incentive to properly care for their systems.

Given the number of logging concessions throughout the country which may be experiencing similar problems with deteriorating water quality in nearby communities, use of the NRMP/SBK-sponsored systems should be monitored to determine whether they might serve as a model for replication for other concessionaires throughout Indonesia.

NRMP REPORT No. 13

Library Consultancy

The purpose of the library consultancy (September - December 1992) was to examine the present organization of the NRMP Policy Secretariat library and to make recommendations for improving it.

The NRM Project Library consists of approximately 1000 up-to-date documents in the natural resources field. The existing cataloguing and retrieval system had several inadequacies. Six key needs were identified:

- Subject retrieval
- A library classification system aligned with that at BAPPENAS
- A coherent cataloguing system
- A system for managing maps
- Suitable computer software/program
- Training of project library staff

These were addressed as follows:

- Subject indexing skills were taught, using the UNEP Thesaurus of Environmental Terms as a guide.
- The Dewey Decimal Classification was introduced.
- Simplified library cataloguing was implemented.
- A system for classifying, cataloguing and storing maps was introduced.
- After some false starts, a suitable library program based on database software was commissioned and installed.
- An *NRMP Library Manual of Practice* was prepared as a guide to using these systems and as a basis for training.
- Training in general and specific library skills was carried out with the two NRM Project Staff responsible for handling the Library. This was seen as the most vital area of the consultancy, and the two trainees appear to have rapidly absorbed the required skills.

The consultancy was supported by working visits to libraries with collections in parallel subject fields in Jakarta, Bogor and Bandung.

NRMP REPORT No. 14

**Livelihood Strategies and Marine Resource Use
among Residents of Bunaken National Park:
Recommendations for Local Involvement in Park Management**

The major objective of this short-term rural sociologist consultancy was to provide socioeconomic data about local communities as an empirical basis from which to make recommendations for increasing the involvement of local communities in the management plan for Bunaken National Park. A survey questionnaire was designed and then used to collect data among a random sample of 10% of the households in two villages on each of the islands of Bunaken, Manado Tua, Mantehage and Nain; and in the villages of Arakan and Wawontulap along the mainland coast.

This report summarizes the data on demographic profiles and processes, household food and income sources, coastal and fishing activities, (rainfed) agriculture, and local attitudes towards park management and marine conservation.

These data suggest that the major areas of conflict between local residents and marine conservation goals involve the people's:

- Collection and use of live coral for house and road construction (on all islands).
- Cutting of mangroves for firewood purposes, furniture making and boat construction (especially on Pulau Mantehage and P. Nain).
- Fishing on or near coral reefs with heavy [beach seine] nets (especially on P. Bunaken).
- Use of sloping land for agricultural purposes without taking appropriate soil conservation measures (especially on P. Manado Tua).
- Indiscriminate disposal of human and household waste in the sea (especially on P. Manado Tua, P. Mantehage and P. Nain).
- Spontaneous, informal tourist infrastructure development (especially on P. Bunaken).

The conflicts between the above uses of the marine resource at Bunaken Park and sustainable marine resource development are related to the following socioeconomic conditions prevailing in the communities located within the Park:

- Limited supply of household labor (on all islands).
- High population density, skewed land distribution or limited access to land, poor land quality, dependence on the purchase of staple foods from the proceeds of cash crop sales or cottage industry, limited income generating alternatives, most of which depend on the direct use of the marine resource (on P. Nain).

- Lack of year-round availability of fresh water (especially P. Bunaken).
- Marginal and declining levels of productivity in agriculture, and limited access to technology for improving agricultural productivity and reducing the impact of agricultural activities on the soil resource (especially on P. Manado Tua, where there is relatively open access to land and local enthusiasm for improving agricultural output is high).
- Limited access to equipment necessary for commercial off-shore fishing activities (except on P. Bunaken).
- Religious and ethnic diversity that tends to limit inter- and intra- island cooperation (especially on P. Mantehage and P. Nain).
- Lack of legitimacy of some village leaders in representing local interests.
- Limited and costly educational facilities.
- Limited income-generating opportunities for women.
- Circulation of rumors concerning future park management plans, leading to land speculation, insecure land tenure, and spontaneous, informal-sector tourist infrastructure development (on P. Bunaken).

In formulating local community participation initiatives within the context of natural resource management plans for marine national parks or reserves similar to Bunaken National Park, inclusion of the following elements should given consideration:

- Public information campaigns and creation of "resident participation committees".
- Sustainable development of wetlands areas based on exploiting opportunities for multiple use of mangrove resources.
- Promotion of agroforestry and sloping agricultural land technology (SALT) for sustainable agriculture in upland areas.
- Support for off-shore fishing activities as a means of reducing pressure on near-shore coastal fisheries.
- Locally-managed, small-scale eco-tourism development.
- Provision or upgrading of educational services as a means of providing diversified and non-island-based income-earning opportunities.

NRMP REPORT No. 15

**A Competitive Awards Scheme
for Applied Forest Management
and Nature Conservation**

The Natural Resources Management Project work plan incorporates support for applied forestry research utilizing the concept of a Competitive Awards Scheme (CAS). This report assesses the feasibility of implementing this concept and sets out a basic design for a CAS, based upon discussions with representatives of the Ministry of Forestry and other relevant bodies.

Following a review of current activities in forestry research it was concluded that a CAS could attract relevant research proposals by well qualified persons that would produce sound scientific results to assist in the successful fulfillment of NRMP objectives. However, it should be recognized by both the administrators of the NRMP and the individuals involved in the implementation of the CAS that the planning of a research program cannot follow the more normal sequence adopted in project-based research programs. That is, in the case of a CAS the organizers can only define research priorities. They are then dependent upon individual researchers to propose projects and individual studies.

The design presented in the report is concerned primarily with mechanisms for stimulating research proposals of an appropriate nature, reviewing the competence of individual proposals, selecting and approving proposals, monitoring the progress of the research projects, and reviewing the results.

The main elements of the scheme include:

- Use of the existing Project Coordinating Committee (PCC) as the body responsible for executive decisions on priorities for research and the granting of awards;
- Establishment of an Applied Research Committee (ARC) that will provide technical advice to the PCC on the suitability of individual research proposals. The ARC will be responsible for screening proposals and reviewing the research results, on the basis of criteria outlined in the report.
- Designation of the Center for Forestry Research and Development (Litbang Kehutanan) as the coordinating body.
- Designation of ARC and Litbang as the parties responsible for formulating a strategic plan, annual plans and a corresponding budget for funding research over the remaining 3.5 years of the NRMP, in accordance with guidelines detailed in the report.
- Allocation of US\$ 850,000 to cover the funding of research and supporting activities, such as regional workshops to help define research priorities and disseminate research results.

The success of any such scheme will depend heavily on parallel efforts in the NRMP to support the training of researchers and research administrators, institutional reforms to strengthen the organization and management of research, and the improvement of physical infrastructure necessary for the conduct of the approved

research activities. The importance of integrating plans for these parallel activities with the implementation of the proposed competitive awards scheme cannot be overemphasized.

NRMP REPORT No. 16

**Design of a Management Information System
for the Natural Resources Management Project**

The Indonesian Natural Resources Management Project (NRMP) links a complex set of activities which are dispersed both spatially and in their approaches, objectives, and outputs. A Management Information System (MIS) can support operational and strategic management of this project and help track its impact on the country's resource base.

The first step of this consultancy was to identify the specific purposes which the project MIS should serve; several stand out as important at this time. One is to help the project staff, USAID, and future evaluation teams get a better sense of what the project is doing, which activities are actually being carried out, and their relation to overall goals. This is referred to as the "management and compliance" function of the MIS. A second purpose is to facilitate tracking of the project's "incidental" impacts on several USAID interests which are not NRMP's direct objectives, specifically women, non-governmental organizations (NGOs), community participation, and creating markets for American technology. A third purpose is to permit the monitoring and evaluation of the project's progress towards meeting its goals.

In the first area, management and compliance, the MIS consultancy led to two major outcomes. The first is the creation of an automated system that manages the NRMP team's annual work plans, monthly reports, and an overall timeline of project activities. This system establishes a consistent list of project activities common to all planning, reporting and monitoring. The preliminary version of that list, prepared by the consultant with input from the chief of party and other project staff, will be refined when the team members prepare their 1993/4 annual work plans. The automated system of which it is a part provides a structured way to write monthly reports and ensure that they are linked to the overall activities list. It also produces a quarterly summary of work carried out by activity, which supplements the existing monthly reporting by person.

The second output in the management and compliance area is the recommendation that long-term experts write quarterly narratives which describe in a more qualitative way than the monthly reports their progress and problems in working towards project goals. This narrative should encourage them to think strategically about where they are headed and how much success they are having in getting there.

With regards to the second area, "incidental" impacts, the consultancy identified sources of monitoring and evaluation data. The report reviews the kinds of impacts which might be anticipated in each of the four key areas, and where data should be available to track each of them. The three areas of women, NGOs, and community participation are closely linked in this project. Studies of local communities near the national parks and NGO sub-contracts to work with those communities should provide the bulk of the information in these areas. Reports on participation in project

training activities will also be important. With regards to finding markets for American technology, the project seems unlikely to have much impact. If this does occur, it will be due to implementation of new strategies recommended to logging concessionaires or polluting factories for how to reduce their impacts on the environment.

Assessing the project's progress towards its goals poses much more complex and far-ranging challenges, for impacts will not be felt for several years, often not within the life of the project. Establishing a causal relationship between project inputs and final goals is very difficult. The scope of this mission did not allow significant headway on this task. However, the report does consider the causal links between project activities and goals and discusses the information needed to establish an impact at each step. This may serve as a basis for future analysis of how to monitor the impact of the NRMP.

It is hoped that the MIS will eventually provide information to the USAID PRISM monitoring system. Because PRISM is focused on the kinds of impacts which will not be observable for some years, the current report does not fully address its needs. However, if future work is undertaken to expand the system in the direction of impact monitoring, it should be possible to develop data of use to the PRISM system.

NRMP REPORT No. 17

**An Environmental Education and Awareness Strategy
for Bukit Baka - Bukit Raya National Park**

The primary purpose of this consultancy was to develop a park and environmental/ conservation awareness and education strategy for the Bukit Baka-Bukit Raya National Park. This included both developing the strategy (analyzing needs, audiences, conditions and resources, and then determining relevant targets, methodology and media) and gathering sample materials which could be used directly or as examples for training.

A training for 14 participants from Pontianak non-governmental organizations (NGOs) about gathering baseline data concerning local park and environmental knowledge, attitudes, and practices and developing strategies was conducted at Bukit Baka from March 8 through 15, 1993. The purpose was to gather data for the strategy, as well as to acquaint NGOs with the project and Bukit Baka in anticipation of their continued involvement.

The Strategy

The strategy was developed based upon the consultant's and NGOs' observations in three hamlets in NRMP's focus area in Bukit Baka. Information about the economic, social, cultural and political situation; health, agricultural, and educational conditions; and people's perceptions of the park and projected long-term relationship with it were then analyzed in light of project goals, activities, and resources, as well as the capabilities and interests of local government institutions and NGOs. Three priority components for the community education strategy were thus identified: conserving natural resources, establishing the park's identity, and promoting local community development.

The strategy is divided into three phases or aims:

- Developing basic understanding about the park and its programs, benefits, and conservation function in order to encourage understanding, acceptance, and support among target groups immediately affecting and affected by the park, particularly local communities.
- Reinforcing the importance of the park and its link to the forests and conservation by integrating into park activities messages relevant to target groups' interests and needs.
- Informing outsiders about the park, its programs, benefits, and conservation importance in order to encourage them to support the park and adopt "conservation friendly" practices.

The strategy includes suggestions for meeting the above sequences of goals through specific target audiences, activities, and supporting media. Based upon their relative importance in relationships to locally identified priorities as well as upon the above sequence of strategy stages, the various groups whom the strategy seeks to reach are divided into primary, secondary, and tertiary target audiences. (See table below.)

The approach for the first phase of the program is to use mass media to deliver information and reinforce this with smaller group or individual discussions with reinforcing media. Children are important channels for reinforcing messages in the village, and thus they are an important target audience. To build the communities' self-esteem as a foundation for their genuine participation in the park, activities are participatory and designed to build local people's confidence that their participation in the park's program and management is meaningful. Given the current project resources and urgent need to clarify the park, a mass media approach is the most feasible. When full-time field workers become available, more focused individual or small group methods could be used.

The strategy relies heavily on visual materials because they are communicative, provide concrete examples, and bridge literacy and language gaps among the variety of ethnic groups in the project area. In many cases the same media, such as the park logo or a cartoon mascot, are used for different target audiences and to deliver different messages as a means of maintaining consistency, reinforcing messages, and linking themes.

Recommended Follow-up

- Confirm data on the target group's knowledge, attitudes and practices about the Park, conservation, and the environment.
- Review the strategy's aims, target audiences, activities, and media to ensure that information is communicated appropriately and effectively.
- Produce, test, revise, and replicate the strategy communication media, particularly the park logo.
- Implement the strategy, initially through NRMP advisors and ultimately through local field workers.
- Sort and distribute to the field the collected materials for park, conservation, and community development education, and procure supplemental equipment to facilitate developing media and implementing the strategy.
- Further investigate possible working relationships and joint environmental education efforts with other organizations and government offices.

CONSERVATION AWARENESS STRATEGY

TARGET AUDIENCES	RATIONALE	AIMS
<p>IMMEDIATE: General village audience (in project focus area) School children (grades 4,5,6, in focus area) Logging concession staff National Park advisory team Bina Desa staff SBKSDA (Pontianak)</p>	<ul style="list-style-type: none"> ● Most affected by the park ● Participation and support essential ● Unaware of how to participate ● Unaware of their own impact on the Park's environment/conservation ● Knowledge about parks and their purpose limited ● Confused about park and project 	<p>To develop a basic understanding about what a park is and its conservation function</p>
<p>SECONDARY General village audience (in focus area) School children (in focus area) Women home gardeners Farmers Logging concession staff</p>	<ul style="list-style-type: none"> ● Agriculture and logging practices directly impact habitats/ecology /conservation ● Other actions/ behavior impact on habitats ● Not always aware of impact of their behavior/ practice 	<p>To reinforce the importance of the park by linking it to the forest's ecological/conservation function</p>
<p>TERTIARY Pontianak general public Park visitors</p>	<ul style="list-style-type: none"> ● Potential direct impact on Park/environment/ conservation ● Influence on provincial policy and legislation 	<p>To inform other groups about the park and its conservation importance</p>

NRMP REPORT No. 18

**Water Supply and Sanitation Program
in Bukit Baka - Bukit Raya, Kalimantan:
Program Status Report**

This consultancy follows an earlier water supply and sanitation program feasibility study of eight villages in the Bukit Baka - Bukit Raya area performed in November and December 1992 (NRMP Report No. 12). The purpose of the second consultancy was to review progress on phase two of the project, construction of seven village water supplies, through consultation with the various parties involved, namely the Chief Construction Supervisor (CSS) and other NRMP staff, the SBK logging concession, the provincial forestry office (Kanwil), and the beneficiary communities themselves.

Virtually all of the materials and equipment (M&E) which SBK had agreed to supply had been delivered. However, several supplies proved to be of inferior quality. When the engineers had clarified some misunderstandings about the M&E needs, SBK agreed to replace these supplies.

The CSS had been very successful in working with the beneficiary communities. When the consultant arrived, the residents had already transported much of the M&E supplied by SBK to their own villages. In addition, some communities had already collected the bulk of the necessary local materials they had agreed to supply. In Sungkup, construction of the water storage tank was already well underway, and it seemed likely that construction in all villages could be completed by year's end, moving from Belaban Ella, to Nanga Siyai, Tanjung Paku, Tumbang Taberau/Riam Batang, and Tumbang Kaburai.

In three villages the residents had located new water sources which they asked the engineers to evaluate. This resulted in a decision to move the system water source to another spring in Belaban Ella village. The engineers also considered ways to overcome the lack of any source with sufficient volume within reasonable proximity of the village in Tanjung Paku and Tumbang Kaburai.

In order to improve implementation of phase two of the project, the consultant recommended several measures to maximize use of the CSS's time. Specifically, the consultant suggested that the project procure another vehicle or that the CSS stay in the more distant villages during construction of their water supply systems, and that he no longer be required to travel to Pontianak monthly. Noting the pride that other communities have taken in such projects, the consultant also recommended that NRMP photograph the progress of the project in each village, from project design through the construction and sanitation training, in order to create a story board in each village.

NRMP REPORT No. 19

**The Role of Non-Governmental Organizations
in Supporting the NRMP
in Bukit Baka - Bukit Raya National Park**

The main objectives of this study were to identify and recommend possibilities for the Natural Resources Management Project (NRMP) in the Bukit Baka - Bukit Raya area, on the border of West and Central Kalimantan, to cooperate with private or non-governmental organizations (NGOs). The assessment inventoried NRMP's needs for NGO support, evaluated the capabilities of environment- or community development- oriented NGOs working in the two provinces, and identified NGOs with appropriate experience and capability to participate in the NRMP project.

Discussions with the NRMP staff revealed several possible areas for cooperation. First, most long-term technical advisors lack a counterpart with sufficient knowledge of the local situation to support technical project implementation, and feel that association with a local NGO would be helpful in filling out this picture. Second, technical staff in the project area identified fourteen field activities in which NGO work would be necessary to reduce their work loads. Third, NGO support would help the project secure community participation in specific project activities and the general management of the national park.

Meetings with nine NGOs in West and Central Kalimantan allowed the consultant to gather information on their staffing, funding, and previous experience. While these discussions indicated that all NGOs were interested in working with the NRMP project, all appeared somewhat inexperienced. However, the Institute of Dayakology Research and Development is recommended to support the project with research and data collection and with the development and implementation of a community-based forest fire control program; Yayasan Swadaya Dian Khatulistiwa is recommended to help the project strengthen its community development work, including the establishment of local community-based organizations.

To overcome the constraint of limited local NGO experience, it is recommended that one or more national NGOs provide training to strengthen the technical capabilities of these two local NGOs in selected fields. Of the six national NGOs with which the consultant conferred, Yayasan Bina Swadaya is recommended as the primary NGO for these tasks on the basis of its skills in rural assessment studies, social forestry, community development, income generation, and alternative tourism. NGOs which might provide supplementary training include Yayasan Indonesia Sejahtera, for community development and NGO strengthening, and Yayasan Pekerti Nusantara, for handicraft, small-scale industries, cooperatives, and micro-enterprise marketing development.

Finally, the consultant suggests arranging a workshop which would include a joint planning exercise and presentations by the NRMP project staff. This would provide NGOs with a better idea of the scope and objectives of the project and the expectations NRMP has for collaboration with the NGOs and allow the NRMP long-term technical advisors and the NGOs to coordinate their respective duties.

NRMP REPORT No. 20

**Integration of Provincial Regional Development Planning
into the Bukit Baka - Bukit Raya National Park Management Plan**

In both West and Central Kalimantan, integrated area development is well advanced and well recorded in spatial planning documents. In West Kalimantan, provincial-level working groups responsible for eight aspects of provincial integrated area planning have produced regional spatial plans for the province and its districts (*kabupaten*) through 2005. This process has been somewhat slower in Central Kalimantan, and plans for the *kabupaten* where the Bukit Raya component of the park is located have not yet been finalized.

The Bukit Baka - Bukit Raya National Park was formed by Minister of Forestry Decree No. 281/Kpts-II/92 (26 February 1992), based upon appropriate national and departmental legislation. Provincial spatial plans, completed prior to the decree, generally still refer to the park areas within their respective administrative districts by their original designation, the Bukit Baka Nature Reserve (West Kalimantan) and Bukit Raya Nature Reserve (Central Kalimantan).

Due to the park's isolation in terms of both physical distance and provincial development priorities, there are only a very limited number of currently planned programs which might impact upon the boundaries of the park or upon the park area itself. In addition, there are few communities living within the area or near the boundaries of the park.

At present there are no provincial-level (Tk. I) development programs planned for the Bukit Baka - Bukit Raya area. The Trans-Kalimantan Highway is planned to pass through a southern corridor which will not directly affect developments in the park area. In Central Kalimantan, the park is in a low priority development area due to its extreme isolation and difficult local communication.

At the *kabupaten* level (Tk. II) in West Kalimantan, Sintang district programs appear to be limited to upgrading a forestry concession road which touches upon the boundary of the park and improving health services to communities on the northern boundary of the park. In the Kotawaringan Timur district of Central Kalimantan, potential immediate impacts in the park area are limited to small-scale initiatives to upgrade village roads, stimulate rattan and rubber production, and improve primary education services.

Thus, on the basis of existing provincial- and *kabupaten*- level development planning there are unlikely to be any developmental threats to the integrity of the park area. It should be noted, however, that there are possibilities of future mineral surveys, oil and gas exploration, and inadvertent logging in park areas.

Given national and provincial policies regarding regional planning and specifically national parks, the legal status of the Bukit Baka - Bukit Raya National Park at present, and local development conditions and plans, a number of initiatives are recommended.

Foremost among these is inclusion of the park development, conservation, and management plans into provincial and kabupaten plans. As park activities are focussed in West Kalimantan at present, mechanisms for actively involving Central Kalimantan parties are also recommended, as is more intensive communication and coordination among all administrative bodies involved. In order to ensure the future integrity of the park, vigorous public and institutional awareness campaigns are also recommended, as well as greater efforts to involve local communities in planning park activities. Finally, clear delineation of park boundaries, comprehensive mapping of forestry concession roads, and provision of adequate financial and other support for these initiatives are also called for.

NRMP REPORT No. 21

**A Communication, Information, and Education Strategy
for Increasing Environmental Awareness in Bunaken National Park**

The report describes a public awareness strategy developed for Bunaken National Park, North Sulawesi. To support the recommended communication, information, and education strategy, support materials for use in implementing the strategy were gathered and production and implementation resources were researched.

Damage to coral reefs, sea grass, sandy areas, reef structures, reef flora and fauna, mangroves, sea water, and general degradation of the reef and beach habitats are principle challenges to marine conservation in Bunaken. Disturbance of nesting sites, littering, collection of skulls and other souvenirs, and intrusion into protected areas off park trails are among the threats to terrestrial conservation. Further, interest and investment in the park tends to focus only upon its tourism potential, particularly as related to the coral reefs. Other habitats and the park's crucial conservation function are largely ignored. Finally, land speculation, rumors, infractions of park regulations, village conflicts, controversy over control of the park, and a history of past conflicts among government institutions, dive operators, and non-governmental organizations (NGOs) have prejudiced attitudes about whose activities are damaging the park and impairs these groups' abilities to cooperate.

Against this background, significant and ever increasing numbers of foreign and to a small extent domestic tourists are coming to the park. Because of this group's relatively greater receptivity to environmental and conservation messages, removal from the above local conflicts, demonstrated potential to influence selected key target groups, and high visibility, the strategy therefore begins with them (See table below). Several dozen other target audiences representing park resident communities, tourism organizations, government institutions, park visitors, the mainland general public, and local NGOs are included at later stages.

The strategy is designed to meet five principle aims through five successive but overlapping phases which introduce, encourage and reinforce the adoption of appropriate Park practices and etiquette, conservation awareness and support for the Park. The five phases, their target audiences, the rationales for these choices of audiences, and the messages each phase is to convey are described in the attached schematic. The report details the sequence of messages, activities, and materials for effectively delivering each of the five principle aims to eleven target audiences.

To overcome people's saturation with present conservation messages, this strategy should employ messages directed toward positive actions which clearly identify appropriate behavior and are concretely linked to the audiences' interests. The media and materials proposed in the strategy include posters, displays, folders, comics and slides developed for the different targets. Many of the media are to be used by or adapted for different groups, both to conserve efforts and to reinforce messages by using them and visuals repeatedly and consistently.

Finally, implementation of the plan requires that NRMP:

- Review the strategy's sequence of aims, target groups, and packets of messages, actions, and materials.
- Gather more detailed information about park and Manado residents' knowledge, attitudes, and practices regarding the park, conservation and marine habitats.
- Determine how to implement the strategy.
- Work with the Natural Resources Office (SBKSDA) to assist them in introducing the recommended activities for day trippers.
- Research possibilities for working with other marine projects or sponsors to develop materials.
- Solicit outside assistance to develop the recommended media.
- Produce and distribute the sample tourism brochures, posters on conservation etiquette, and dive logs.
- Develop Bunaken National Park signs, mascots and a logo.
- Explore alternative methods of funding materials production and distribution.
- Assemble an information package for journalists and official visitors.
- Assemble a slide bank on marine habitats and conservation and procure the necessary additional equipment for storing it.
- Review and distribute the collected reference materials.

AIMS/PHASES	TARGET AUDIENCES	RATIONALE	MESSAGES
<p><i>Immediate Aim:</i></p> <p>Develop basic awareness about how behavior in the park affects conservation</p>	<p><i>First Rank Targets:</i></p> <ol style="list-style-type: none"> 1. International tourists 2. Domestic tourists 3. Local tourists/day trippers 	<ul style="list-style-type: none"> • Have some environmental awareness • Have an interest in the Park's habitats • More receptive to suggestions about Park etiquette • Can influence dive organizations' behavior and other tourism support groups 	<ul style="list-style-type: none"> • Explain the Park's features and why they are important • Explain the importance of conservation to the Park and its habitats/features • Explain appropriate Park etiquette, behavior, and actions • Reinforce the importance of observing park etiquette, behavior, and actions
<p><i>Second Aim:</i></p> <p>Develop understanding about conservation and impacts on Park habitats/features</p>	<p><i>Second Rank Targets:</i></p> <ol style="list-style-type: none"> 4. Dive organizations 5. Boat children 6. Fisherpeople 7. Park elementary students (grades 4,5, and 6) 8. SBKSDA staff 9. Provincial government decision-makers 	<ul style="list-style-type: none"> • Have vested/direct interest in the Park's resources • Behavior and attitudes have direct impact on Park's resources • Can influence general public 	<ul style="list-style-type: none"> • Identify current conservation problems related to the Park's habitats and features • Explain the impact of problems on the habitats/features and the consequences • Explain how proper Park etiquette, behavior, and actions can promote conservation • Introduce why conservation is important and its link to the Park • Reinforce the importance of target group's actions on conservation and implementing appropriate etiquette, behavior, and actions • Introduce basic marine ecology information

<p><i>Third Aim:</i></p> <p>Inform people about the Park, its purpose, and its link to conservation</p>	<p><i>Third Rank Targets:</i></p> <p>10. General park public 11. General public (mainland)</p>	<ul style="list-style-type: none"> • Have a long-term impact on the park's viability and function • Have preconceptions that influence receptivity to conservation messages 	<ul style="list-style-type: none"> • Explain the importance of the Park's habitats, their benefits, and linkages • Explain the effects of negative impacts and current ecological problems and their effect on the target • Explain the importance and need for conservation • Explain the Park's conservation importance • Explain the target's role in promoting/supporting conservation and the associated benefits
<p><i>Fourth Aim:</i></p> <p>Reinforce the importance of the Park and conservation as assets to the community</p>	<p><i>Fourth Rank Targets:</i></p> <p>To be determined as additional data available, but may include:</p> <ul style="list-style-type: none"> • Park resident students • Mainland students • Specialized Park residents (i.e. reef gleaners, farmers, mangrove harvesters, etc.) • General public 	<ul style="list-style-type: none"> • Have special interests and needs which have long-term impact 	<ul style="list-style-type: none"> • Improve understanding about marine ecology, habitats, and the Park's conservation function • Reinforce the importance of conservation • Reinforce the target's role in promoting/supporting conservation • Reinforce appropriate behavior and actions/Park etiquette

<p><i>Park Identity Aim:</i></p> <p>Affirm the Park as an important institution</p>	<p><i>Park Identity Targets:</i></p> <p>To be developed as part of previous targets, but with greater emphasis here and with specific components directed towards international, domestic, and local targets</p>	<ul style="list-style-type: none"> • Affirms the importance and esteem of the Park and conservation • Affirms the credibility and authority of the Park 	<ul style="list-style-type: none"> • Develop Park's regular extension and materials • Develop Park displays and exhibitions and public awareness presentations and activities • Install good quality and well designed signs based upon a consistent and appealing design theme, and develop Park design guidelines • Develop mascots and Park logo and guidelines for their use
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NRMP REPORT No. 22

**Study Design on
the Natural Resource Impacts of
Marine Sector Policy during the
Second Long-Term Development Plan**

The objective of this consultancy was to prepare a study design for the NRMP Policy Secretariat's upcoming Marine Sector Policy Study, including the approach, methodology, critical issues to be examined, research personnel, and schedule. The policy study's objectives are to identify key conflicts between existing economic policies and sustainable management of the marine resource base and to recommend policies to sustain economic development and the marine resource base in the long term.

The policy study's terms of reference are based upon several central observations. First, comprehensive, long-term planning and policy-making for marine resources are difficult because: a) marine resource management areas are diverse, far-reaching, and often transcend traditional sectoral boundaries; and b) administration of marine resources is spread across a large number of government agencies.

Second, aquatic, wetlands, and offshore marine resources are being rapidly depleted because: a) overlapping or conflicting policies give rise to heavy competition for some resources; b) marine resource policy stresses expanding exploitation to feed Indonesia's population and to build non-oil sources of foreign exchange; c) economic development goals for the sector do not recognize the need for sustainability; and d) there has been no comprehensive economic analysis of current policies' impacts upon these resources.

Because the marine sector is so diverse, separate components of the policy study will focus on offshore marine resources, wetlands resources, and inland aquatic resources, respectively. The terms of reference for these components are described below. The terms of reference for expert researchers may be found in Appendices 5 through 9 of the study design report.

Offshore Resources Study

Current policies which require only foreign operators to be licensed amount to an essentially open access regime. This encourages fishers to maximize their harvests and thus accelerates fisheries' depletion. Policies for controlling such overexploitation have typically focussed on area restrictions, catch and season limitations, or regulation of fishing techniques, all of which are typically difficult to enforce. Economic measures such as taxing the landed catch, controlling investment through licensing, or marketing tradeable catch permits should be explored as alternatives.

The offshore resources study should therefore examine the following:

- The evolution of marine fisheries development policies over the past two decades.

- Measures to control overexploitation of the fisheries resource.
- Allocation of catch quotas among small-, medium-, and large-scale vessels and foreign and domestic operators.
- Policies towards foreign investment in the sector.
- The effectiveness of fisheries regulation enforcement.
- Subsidies, taxes, and financial incentives affecting the sector.
- The impacts of macroeconomic policies upon marine resource use in different regions of the country.
- Programs for managing coral reef fisheries for ecotourism and local employment.
- The environmental implications of all of the above.

Wetlands Resources Study

Wetlands perform important functions as the buffer between the terrestrial and coastal environments and as nurseries for a wide variety of commercially harvested offshore fisheries resources. Unfortunately, these functions are threatened by wood harvesting, both by local communities and foreign woodchipping firms, as well as from the expansion of aquaculture ponds. Unchecked increases in exports pose a particular threat to key coastal resources.

The wetlands resources study should therefore examine the following:

- Policies towards wetlands development, presently and for the Second Long-Term Development Plan (PJPT II).
- Trends in wetlands cover loss.
- Proportion of wetlands loss attributable to various sources.
- Trends in total and export income from wetlands products.
- Export income potential of sustainably managed wetlands resources over PJPT II.
- Policies for poverty alleviation in wetlands-associated communities.
- Local wetlands issues throughout Indonesia.
- Regional implications of national wetlands policies.

- Effectiveness of environmental impacts analyses in evaluating and minimizing degradation of wetlands.
- Methods for resolving multiple-use conflicts and performing integrated planning.

Inland Aquatic Resources Study

Pollution and overexploitation are proceeding unchecked, causing shrinking nursery grounds, deteriorating water quality, and declining employment. This is at least partly because there is no single comprehensive legal or administrative system for controlling river cage development or monitoring its environmental impacts. However, each inland fishery requires a unique management system appropriate to its unique physical characteristics, labor distribution, traditional management system, and downstream activities. In this regard, local adat laws and practices may be a better model for self-regulating, cost-effective, and sustainable management of a given fishery than a concession system of renting water space to outsiders. Indeed, all inland fishery policies should consider the integrity of existing systems. Specifically, policies towards any stage of fisheries development -- cultivation, processing, distribution, and marketing -- should be evaluated to see how they affect management of the resource as a whole.

The inland aquatic resources study should therefore examine the following:

- Policies for inland fisheries at the national, provincial, district, and subdistrict levels.
- Impacts of policies on local resource use, economies, and environments.
- Possible mechanisms for gathering input from all involved parties.
- Institutional development necessary for policy and field management.
- Appropriateness and effectiveness of access enforcement.
- Credit and financing systems for small- and large- scale operations.
- Socioeconomic and environmental impacts of lake nucleus estates.
- Allocation of resources to small- and large-scale fishers.
- Government recognition of traditional management systems.

NRMP REPORT No. 23

**Management Information System
for the Natural Resources Management Project
Program Status Report**

This mission followed an earlier consultancy during which the NRMP Management Information System (MIS) was established (NRMP Report No. 16, February 1993). The objective of the second consultancy was to evaluate implementation of the MIS, hire and train a programmer to maintain the system, train the long-term staff to use it, establish an institutional mechanism to see that the MIS is maintained and used, identify and correct bugs in the software, and update documentation of the system.

The MIS is an automated system that manages the NRMP team's annual work plans, monthly reports, and a timeline of project activities in order to simplify project reporting and evaluation. The key to this system is a master list of project activities that all of the long-term advisors use to record their work. The master list not only provides a common context for tracking each individual's work, but makes it simple to discern what the advisors collectively have been doing, and by derivation what the project has done. In addition, the very formulation of the list of activities reflects what the project expects and hopes to accomplish, and the monthly report of activities is a straightforward means of tracking whether resources have or have not been allocated towards meeting those objectives.

Clearly the effectiveness of this system depends upon the appropriateness of the master list. Because the original list had been created by the consultant following discussion with a few members of the long-term project team, refining the list was a high priority. This time, the consultant was able to gather the advisors, discuss the purpose of the MIS with them, and revise the master list to suit their needs better. The group also agreed upon a system for revising the list as necessary.

In addition, the consultant hired and trained a dBase programmer to maintain and update the system. Together they identified a number of electronic bugs in the system and modified it to make it more user-friendly. The consultant then revised the MIS documentation to reflect these changes.

NRMP REPORT No. 24

**Water Supply and Sanitation Program
in Bukit Baka - Bukit Raya, Kalimantan
Second Status Report**

As a result of interest expressed by rural communities in and around the Bukit Baka - Bukit Raya National Park and the local logging concessions in Central and West Kalimantan, NRMP conducted a feasibility study to determine if a collaborative effort to help address these needs was possible. Activities were to focus on the communities of Nanga Siyai, Belaban Ella, and Sungkup in West Kalimantan and on the communities of Tanjung Paku, Tumbang Kaburai, Riam Batang and Tumbang Taberau in Central Kalimantan (NRMP Report No. 12).

As a result of the recommendations of this study, the rural communities themselves agreed to provide all labor and locally available materials at no cost, the logging concessionaire, P.T. Sari Bumi Kusuma (SBK) agreed to provide cement, pipes and other material which required procurement outside the BB/BR area, and the NRMP, which is assisting BAPPENAS and the Ministry of Forestry on the project arranged the required technical assistance. Groundwork for the activity was completed in February and March 1993 and the technical assistance team arrived to begin the process of helping villagers build their own water systems in April.

As described by the first Status Report (NRMP Report No. 18), construction activities were originally scheduled to take place between the end of harvest for the communities and the beginning of the following planting season. Preparation and training to help the communities organize themselves to participate in the planning and construction process as well as the ongoing operation and maintenance is an important component of the overall activity. Unfortunately, this aspect and the construction itself have been constrained by the priority need for community members to plant their crops so they have enough food for the following year. However, where construction activities have taken place, many community members have enthusiastically contributed labor and been eager to learn new skills.

Improved health is among the benefits to be derived from new water systems. However, community members seemed largely unaware of the link between clean water, good sanitation practice and many water-borne and water-washed diseases. As a result, one of the activities proposed is to provide a local consultant trained in rural health education to help community members learn good health and hygiene behavior specifically as it is related to the water system. This includes proper collection and storage of water, the reasons why cleanliness and system maintenance is important, the need to use the water supply system for getting drinking water, and importance of keeping it in good repair.

In recognition that communities had little experience in operation and maintenance management for community based infrastructure which provides benefit to all, specialized training sessions on operations and maintenance management were planned. The primary

focus of the training was monitoring system use and preventing abuses, overseeing routine maintenance tasks, and mobilizing community resources for necessary repairs.

Current Status

The construction phases for the communities of Sungkup and Belaban Ella are largely complete. Community members in Sungkup are particularly proud of their water system and new skills and have offered to help other communities without pay. In both cases some modification to the original designs were made at the request of the communities who wanted additional taps or washing facilities. In Belaban Ella, the community decided it did not need a 12 m³ storage tank and chose to build one half that size. This decision may cause problems in the community sometime in the future.

The construction activities for the communities of Tanjung Paku and Tumbang Kaburai are more than half complete. In both cases, the spring catchment has been completed, the main pipeline to the village installed and the water storage tank near the village now being constructed. Decisions have been made as to where public taps and washing/bathing facilities are to be located, but these have not yet been built. The distribution pipelines within these two villages also have yet to be built.

Formal construction activities have not yet started for the two systems to cover the three communities of Nanga Siyai, Riam Batang, and Tumbang Taberau. However, all of the cement and pipe has been delivered and the communities have begun to fulfill their commitments to haul sand and aggregate to the spring location to be used for the spring catchment.

Arrangements have been made to begin all construction before early October 1993. Current plans project completion of all construction activities in all communities by the end of November or very shortly thereafter.

The health education component has not yet begun, largely because it had been difficult to identify suitable candidates to conduct the training who are sensitive to Dayak culture and tradition. However, two Dayak public health nurses with experience in preventative health outreach have now been located and are anxious to join the activity and conduct the training.

During the construction of these water systems, the technical advisors have been training technicians in the skills necessary for operation and maintenance. Informally, they have also begun the process of sensitizing community members to the need for responsible system management. However, no formal training sessions in operations and maintenance management have yet been conducted. The primary focus has been on construction activities. This training is planned and will be scheduled when the systems are fully completed.

Conclusions, Recommendations and Preliminary Lessons Learned

Among the conclusions are that communities are clearly willing to commit time and energy to community-based activities which bring obvious benefit to them. However, planning and scheduling implementation was ambitious considering the relative inexperience of SBK and the communities with projects of this type. Unexpected delays have caused the activity implementation schedule to be extended. However, in spite of delays, an excellent effort to assist communities to meet their needs has been made. The water supply program is an excellent example of the collaboration which is possible between rural communities, the government (the Ministry of Forestry, assisted by NRMP), and logging concessionaires.

Recommendations for further activities are based upon the need to conclude this program activity in a responsible manner and upon the obvious opportunity to expand on the approach to include other communities and perhaps other activities. Therefore, extensions of the contracts of the Chief Construction Supervisor and the Water Systems Construction Specialist should be approved if necessary; a separate one-month contract to allow the Chief Construction Supervisor to return for follow-up training should be authorized. In addition, a contract to complete the health education component of the project should be concluded as soon as possible. At the completion of the activity, formal water system dedications should be held to recognize the contributions of all collaborating parties and to solidify the communities' sense of ownership.

NRMP should resist any urge to provide all assistance that might be requested for the maintenance and repair of water systems so that unwanted dependencies do not develop. However, it will be appropriate to provide advice and guidance in the interest of continuing to develop community capability. The Water Supply Engineer/Operations and Maintenance specialist should also return to make final system inspections, reinforce the lessons learned, and suggest approaches for broader support for provision of clean water in communities impacted by production forestry activity.

Although the water supply activity is not yet complete, a series of preliminary lessons have emerged. A more focussed effort to explore these lessons and provide guidance for activities that may benefit from them should be a major component of the final activity completion report. It appears that community-based programs which involve collaboration with communities rather than prescribe activities to meet real community needs have a good chance of success. However, community-based development activities take time because communities have competing priorities and they must learn how to organize and contribute meaningfully to the planning and implementation process and must understand the longer term implications of these activities. Logging concessionaires are likely to lack knowledge related to rural water supply provision such as system specifications and design. But, with expertise that is available within Indonesia, logging concessionaires could expand

their bina desa programs to include meeting the water supply needs of rural communities affected by their operations.

NRMP REPORT No. 25

**A Socio-Economic Survey
of Communities Living within Reach
of the Bukit Baka - Bukit Raya National Park
in Central Kalimantan**

A twenty-day socio-economic survey was conducted in three villages (Tumbang Habangoi, Tumbang Malawan, and Sebaung) located in or near the Bukit Raya (Central Kalimantan) region of Bukit Baka - Bukit Raya National Park. The purpose of this study was to ascertain the conditions of these communities, in particular the relationship between their current and likely future socioeconomic activities and the objectives of the National Park. The survey is intended to enable the Bukit Baka - Bukit Raya National Park Management Plan to incorporate measures which allow the economic activities of the communities to augment the objectives of the park.

Observations

The team surveyed the demographic features, social structure, household incomes, and agricultural and forest-related activities in the region. They found that traditional adat systems remain strong in these communities, virtually all of which are of the Dohoi sub-group of the Ot Danum, a Dayak group. Population increase is rapid, and families are large. Households of 5.3 to 6.2 persons partly explain the low mean per capita incomes; in the two villages closest to the park roughly 25% of the population falls below the official poverty line. Households are still subsistence-oriented in their world view, and do not seek to generate surpluses to purchase luxury goods.

Rice cultivation is the central occupation of virtually all households and is rooted in religious beliefs and supported extensively by ritual. Nonetheless, swidden farming fails to meet basic subsistence needs more than 50% of the time. With the introduction of the chainsaw, there appears to be a trend towards farming large swiddens cut from old forest. Now swiddens are usually planted with rattan following harvest, removing them from the rice bush/fallow cycle. Rice swiddens are thus receiving less attention as they become farther and farther removed from settlements.

The production of ironwood roof shingles for sale downriver is the major source of income in the two villages closest to the park. According to local opinion, ironwood trees are a rapidly dwindling resource which will be exhausted in two years' time. Preliminary figures suggest that the economics of rattan production are significantly better than that of shingle production. Relative to both, rice production yields poor economic returns for the labor inputs required.

The design of current bina desa programs conducted by timber concessionaires is unlikely to lead to the levels of income desired by local villages. It also requires sudden, major shifts in technology and thinking on the part of villagers. In contrast, it is worthy of note that timber companies have considerable expertise to contribute to the villagers' existing efforts to produce and market rattan.

Recommendations

There is an urgent need to reduce present population growth levels to guard the good health of the women, improve the per capita economies of households, and reduce future land pressures. NRMP should therefore develop a targeted program to educate children about the benefits of population control. An effective distribution system for dispensing birth control pills or other contraceptives must also be developed.

As there is a strong likelihood that the local people will consider that they own rights to land already cultivated within the boundaries of the national park, NRMP should carry out a brief investigation of Dohoi concepts land rights.

Achieving basic rice security should be NRMP's first priority since annual rice production is the paramount economic consideration of the vast majority of local households. To this end, a survey should be made of possibilities for irrigated rice farming, and extension programs to help families establish wet rice paddies should be developed. Further, attempts should be made to modify several local farming strategies. In all communities, the most fertile land should be set aside for rice cultivation and only less productive land be used for rattan. In Malawan and Sebaung villages, there should be immediate intervention to discourage farmers from clear-felling swiddens right to the river's edge, perhaps through introducing social forestry to arrest erosion along the banks. As the Dohoi in the Bukit Baka area of the park are much more successful swidden farmers, a survey of their respective farming approaches should be made with an eye to improving yields in Central Kalimantan. This might involve introducing more vigorous varieties of dryland rice.

The trend of downriver households migrating to traditional upriver territories is increasing land pressures in the upriver territories and pressing the local residents further and further into the park. There seems to be a strong case for making the traditional upriver village territories into buffer zones and barring non-residents access to the farming lands.

All communities cite health as a major concern, particularly the fact that when people are sick they are far from health care. Improving nutrition would probably increase their resistance to disease and resilience when ill, so NRMP should facilitate the introduction of more vegetable and fruit cultivation. The problem of domesticated pigs raiding vegetable gardens and fruit groves in the settlement area must be resolved, however.

NRMP should also sustain local Dohoi culture in so much as possible. For instance, the project could help revitalize rattan weaving through providing examples of traditional Ot Danum mats and marketing any mats subsequently produced. In addition, the project

could sponsor a "national park pesta" modeled on the dance and music competitions which many Dayak groups use to maintain the vitality of local artistic activities. This opportunity to draw neighboring communities together would reinforce their collective identification with the park and ownership of it.

Rattan Production and Bina Desa

Rattan production returns a daily income about six times greater than swidden cultivation, and the profits to be made from rattan gardening would rise several fold again if farmers were able to sidestep middlemen. This suggests that rattan is worth exploring as an alternative source of income, particularly as ironwood resources dry up. Rattan production would be far more promising, however, if local communities could tap into transportation and marketing networks. At present they have no such skills.

At the same time, the current approach of a typical bina desa program is unlikely to significantly improve community wealth. Community development also lies outside the general expertise of a timber company and, to achieve its major objectives, there is no reason for it to acquire these skills. In contrast, rattan production and transport to marketing centers lie within the general expertise of timber companies. They therefore could assist local communities to develop this expertise in order to manage their own rattan production. It is also possible that the community could use logged over areas for the rattan gardens, or even that a concession could contract them to plant rattan along with commercial trees as part of a reforestation program. This arrangement would benefit both parties by improving communities' competitive advantage in the market place and enhancing the company's image as a good corporate citizen.

This is not to suggest that the traditional bina desa concept should be discarded simply because that is not where logging concessions' expertise lies. Instead, companies should seek the assistance of organizations with greater skills in the area of community development, for instance by contracting non-governmental organizations (NGOs) to oversee their bina desa programs. Ideally, any NGO selected would be overseen by a board of local people and be accountable to the communities it serves.

Master Plan for the National Park

The above recommendations would best be realized through a united community development program. Yet NRMP is not a community development project, and herein lies a dilemma. The number of communities in the project area and their socioeconomic circumstances make it vital that the project get its community development efforts right in order to ensure that the park is removed from the pressures of land-hungry farmers. Further, linking the national park with a series of community development programs

will build the local people's interest in and identification with the park. The Bukit Baka - Bukit Raya National Park Management Master Plan should therefore seek means of giving local communities positive and tangible associations with management of the park, if necessary by recruiting expertise to accomplish this.

NRMP Report No. 26

**Effective Protection
and Natural Resource Management
in Indonesia**

With Indonesia expecting to exhaust her supply of forests within the next 35 to 40 years, much work has been done with respect to forestry management, practices, and policies. To supplement these efforts, this consultancy considered another set of domestic policies, i.e., the tariff and trade policies of the Indonesian economy.

Because policies, including trade policies, set up the incentive structure which drive resource flows into and out of sectors, they can have a significant impact on the use and management of resources, including natural resources such as forests. To this end, the report utilizes two measures of protection, the nominal and the effective rate of protection, to assess the impacts of the tariff and trade policies on the forestry sectors.

The empirical findings suggest that current trade regulations and the trade framework taxes the wood sector, and offers positive protection to producers of wood manufactures. Moreover, the current structure of the forestry industry has resulted in the harvesting of high-quality woods such as teak and mahogany for the production of commodity-grade plywood. That is, the price of wood to the plywood manufacturer is not dependent on the quality of the wood. This implies that Indonesia has not reaped the full benefit of its forest resources, as log harvesters are not given an incentive to view the different quality of wood at different prices that reflect their social value.

As suggested in the conclusion of the report, reforms of current policies can rectify the problem, without necessarily resulting in a reduction in export revenues, income expansion, or decline in value added exports.

NRMP Report No. 27

Conservation Areas in Production Forest

This consultancy aimed to provide input, from a biological and conservation perspective, for the Ministry of Forestry's current efforts to develop finalized guidelines for establishing conservation zones within production forest areas.

The study was prompted by ITTO initiatives to introduce guidelines on the conservation of biological diversity in tropical production forests. These guidelines were designed to be general and meant to be supplemented with specific guidelines by producing countries. In Indonesia, the Indonesian Timber Producers' Association (APHI) has issued instructions on how to set up 300-hectare conservation areas known as *kebun plasma nutfah* (KBN, germplasm gardens) in each logging concession. These guidelines, however, only vaguely describe the practical and theoretical underpinnings of KBN implementation, are unclear about what sort of germplasm KBNs are meant to conserve, stipulate KBN designs which are inappropriate to both conservation objectives and standard concession management practices, and call for skills which are not available in concessions.

In the course of a case study of attempted implementation of the APHI guidelines by a timber concession, various staff repeatedly referred to difficulties in identifying the objectives of the APHI guidelines. The local Forestry Service (Kanwil) officials expressed similar concern. Clearer objectives, they all believed, would lead to better implementation.

Based upon the data gathered, recommendations for three basic areas are presented:

- practical suggestions for improving implementation of conservation areas within production forest, regardless of the objectives;
- a summary of biological concerns to be considered in any conservation planning process; and
- a plan for setting up conservation areas which integrates their implementation with concession practices, other conservation efforts, and the activities of all involved parties.

NRMP Report No. 28

**Economic Issues Associated with the
Indonesian Selective Cutting and Replanting System (TPTI)**

Economic and financial variables attributable to the implementation of the Indonesian Selective Cutting and Planting System (TPTI) are not regularly assessed in a comprehensive manner. This report constitutes an initial assessment of the economic issues associated with TPTI, particularly on financial aspects of the TPTI, specifically with regards to post-harvest activities.

The assessment indicates that rigorous financial analyses are not required under the TPTI monitoring process. Hence there is a definite need for more comprehensive examination of the costs of the silvicultural prescriptions in the planning stages of natural production forest management. This would yield a number of benefits, including a better understanding of the financial implications of planned activities to the forest concession holder and a more accurate assessment of the true economic rent of the TPTI for Indonesian policy makers.

This report presents an initial discussion, based on field observations and simple examples, of areas that need to be explored and implemented in order to move understanding of the financial and economic aspects of the TPTI in a positive direction. Not intended as a definitive analysis, it is meant to aid initial setting of priorities and stimulate debate on reporting and monitoring all costs of the TPTI.

NRMP Report No. 29

**A Review of Planning Arrangements
for Sustainable Management
of Natural Production Forest
in Forest Concessions in Indonesia**

This report covers the first phase of a two-stage consultancy in the Ministry of Forestry. It examines planning arrangements for the management and use of natural forests in forest concessions in Indonesia, focusing on the guidelines for long-term forest planning (TKPH). It considers the structure and content of the guidelines, how amendments would enable forest information to be shown in a more effective manner, procedures for collection of economic information, issues concerning the potential harvest of non-wood products, and guidance for planning fire mitigation programs.

Section I of the RKP guidelines provides a firm foundation for the documentation of facts that can contribute to the determination of clear and coherent plans. Particularly helpful are the paragraphs on forest composition and structure, forest protection, social and community issues, prospects for forest management, and prospects for forest products processing. All could be strengthened, however, by having planners evaluate the managerial implications of each issue. New chapters could be included identifying and evaluating the major management issues expected to influence the management of forests within the duration of the long-term plan, on environmental impact assessment, and on economic and financial analysis.

Section II provides a broad basis for the formation of action plans and proposals aimed at achieving sustainable management of natural forests and, to a degree, for supporting the development of the locality within which a concession is located. It mixes the presentation of plans with basic and derived information and does not provide sufficiently clearly for monitoring and reporting of progress in plan implementation. There is no requirement for five- and one-year plans to be coordinated with a RKP. Positive though the present guidelines are, they could be reinforced by including the following new components: land use planning, public and community relations, implementation schedules for each set of activities, guidelines for monitoring and reporting of achievements, improved guidance for boundaries and forest management sub-divisions, a wood yield plan, a nursery management and transplanting plan, a unified forest products processing and marketing plan, a forest communities' settlement and development plan, and a requirement for corporate and business planning.

In sum, to a large extent the RKP guidelines cover the issues which are important for effective long-term forest resources planning. However, revision is desirable to encourage the formulation of plans which would have a broader scope than the present focus upon harvesting wood from old growth forests. New factors that need consideration are environmental and community development issues; there should also be greater technical and economic emphasis upon measurements of forest growth and yield forecasting. Rather than being presented as Forest Utilization Plans, the RKP should be considered as Forest Resources Development Plans that can be integrated into the overall development programs within a province. Thus the TKPH could become

a more active instrument for the realization of provincial development policies.

Further, there is a prominent need for clearly defined, realistic and attainable goals to be stated in each RKPH. Specific objectives are also necessary. With regards to implementation, monitoring and reporting mechanisms for forest utilization and development operations require strengthening to improve accountability of the concessionaire's management of state forest resources.

Finally, the report presents a suggested new format for long-term management planning. Guidance is provided on mechanisms for data collection that can be used in economic studies; for implementation, at a pilot level, of community-focused fire mitigation arrangement; and for the collection of data on non-wood forest products.

NRMP Report No. 30
Ecotourism Development
in Bunaken National Park and North Sulawesi

The purpose of this one-month consultancy was to prepare plans and recommendations for ecotourism development in and around Bunaken National Park (BNP), North Sulawesi which will maximize economic benefits over the long term while minimizing environmental costs. Tourism in the province is almost certain to take off, as indicated by current tourism statistics, almost unanimous confidence on the part of all players in the local tourism industry, and existing and potential tourism attractions.

The number of foreign tourists arrivals in Manado has increased 27% annually over the last four years, to nearly 13,000 this year. Due primarily to the world-class diving available in BNP and unique opportunities for wildlife viewing in several protected forests, international tourism is projected to continue expanding through the end of the decade, by which time Manado should be receiving about 50,000 foreign and 50,000 domestic tourists annually. In order to sustain tourism beyond this initial surge, tourism development must be planned, regulated, and continuously adapted so that it does not exceed the carrying capacity of these fragile natural attractions.

Examples from around the world show clearly that long-term economic benefits from tourism can best be sustained by aiming for low volume and high value. Over the long term, the price tourists are willing to pay to enjoy a truly unspoiled wonder of nature will continue to rise if admission is restricted. Indeed, it is often felt that prices charged to tourists today are too low to sustain the environment and that higher prices would be accepted if accompanied by small improvements in service quality. In North Sulawesi, this is most evident in the case of homestays in BNP and Tangkoko Nature Reserve.

The way to implement a low volume/high income generating/sustained environmental quality strategy is to push for quality in every aspect of the tourist experience. Most important is conservation of the exceptionally high quality of the marine and forest resources of the province. Today's international tourists, particularly divers and nature tourists, are extremely sensitive to the quality of the environment. If the environment deteriorates, word will spread quickly through the world tourist market and arrivals will consequently slow down, especially of up-market tourists. Also important are high standards of service, food quality, architecture, construction of facilities, promotion, and safety.

Quality will be high to the extent that tourism growth is planned and carefully controlled. Since the private sector and various public agencies (e.g., forestry, tourism, and environmental agencies) have already assumed important roles in the province's tourism push, control can be achieved only by a board in which all major players are represented.

To regulate industry growth, the province and the park urgently need a master plan for ecotourism development. Construction of facilities is now proceeding uncontrolled, and if tourism takes off before control measures are in place it will be much more difficult to achieve quality and high value. Among other things, the existing cottages on Bunaken Island, mostly owned by resident families, should be moved back from the beach and rebuilt according to a master plan and building specifications prepared by the park authority with consultant assistance. Foreign aid funding should be sought to hire an international team, including architects or planners to prepare a concept, master plan and room standards for facilities; an environmental engineer; advertising professionals to create a promotional theme and materials; and a marketer to prepare a marketing plan and initiate international marketing of North Sulawesi as a new destination.

Field observations revealed several possible new ecotourism attractions and ways to share the benefits of the ecotourism business with park residents. Among the ecotourist attractions proposed is a two-day overnight tour of the islands which showcases the unique and varied traditions of the area and provides islanders with income, simultaneously giving them a stake in conservation efforts. Additional small-scale ecotourism development is proposed for Tangkoko Nature Reserve, Rurukan village in the highlands, and a restaurant with cultural shows in Manado, the provincial capital.

NRMP Report No. 31

**Environment and Development in Indonesia:
An Input-Output Analysis of Natural Resource Issues**

This report presents the results of a model designed to project the impact of economic growth and technical change on employment, natural resource use, and environmental degradation in Indonesia. The study draws on data generated by twelve case studies of economic sectors that reflect the views on technological change of engineers, production managers, agricultural experts, energy specialists, and government policy advisors. The model is a dynamic input-output model that incorporates measures of natural resource use and environmental degradation.

Methodology

The time period of the model is 1985-2020, through the end of Indonesia's Second Long-Term Development Plan. It makes projections about two possible paths for GDP growth, a high growth path with annual growth averaging 7% and a moderate growth path with annual growth averaging 5%. Two technological scenarios are defined; the first (S1) assumes the continuation of current commercial trends and government policies, whereas the second (S2) postulates technological changes that would be introduced if government policies placed heavier emphasis upon environmental protection and resource conservation. Technological change is defined broadly to include changes in intermediate, capital, and labor inputs per unit of output as well as measures of natural resource use and environmental impact. The base scenario used for comparative analysis is the moderate economic growth path combined with the S1 set of technological assumptions, MS1.

Building upon the case studies, the final report includes analyses of the following issues:

- Employment demand and the supply of labor, including skilled labor;
- Demand for logs and the capacities of natural forests and plantations to supply them;
- Future demand for water and levels of pollutant discharges into water supplies; and
- Volumes of atmospheric pollution under various scenarios of technological change, including for electricity generation.

Findings and Recommendations

The model projects that moderate economic growth will be enough to absorb surplus labor by 2020. However, it also anticipates serious bottlenecks due to shortages of skilled labor, and thus recommends stepped up government investment in education.

Since the analysis demonstrates that the area of production forest is much too small to sustain expected growth in log demand, the report argues for a marked shift to plantations on degraded and unused land, consistent with Indonesia's abundance of labor. The report also recommends a number of measures for ensuring more sustainable logging.

Shortages of land for rice cultivation are unlikely, and Indonesia should be able to maintain rice self sufficiency in coming decades provided that there are substantial investments in improving irrigation efficiency in order to relieve possible water shortages. Additional government attention and investment will also be necessary in the non-rice food crops sector.

Given moderate growth of the manufacturing sector, accompanied by pressure on manufacturers to reduce water pollution, the analyses suggest that adequate water quality can readily be achieved using available technologies. However, if very rapid growth takes place in the major water polluting sectors, strict monitoring will be necessary to ensure that they meet effluent standards.

Under all scenarios, atmospheric emissions of carbon dioxide and oxides of sulfur and nitrogen will increase rapidly between 1990 and 2020 -- by 400 to 700 percent. Great efforts to limit these impacts will be needed in the transportation, electricity, and household sectors in particular.

Supporting Documents

- Training Manual for Dynamic Input-Output Model Using "Mathematica"
- Procedures for Carrying out Technological Case Studies
- Case Study of Households and Industry
- Case Study Methodology
- Present and Prospective Future Water Use in Indonesia: Guidelines for a Case Study
- Macroeconomic Projections for the NRMP-IEA Input-Output Model
- Case Study of the Forestry Sector
- Case Study of the Rice Sector
- Case Study of the Non-Rice Food Crops Sector
- Case Study of the Estate Crops Sector
- Case Study of the Livestock Sector
- Case Study of the Pulp and Paper Industry
- Case Study of the Cement Industry
- Case Study of the Chemicals Sector
- Case Study of the Food, Beverages and Tobacco Sector
- Case Study of the Textiles, Leather and Wearing Apparel Sector
- Projecting Energy Scenarios for Indonesia
- Case Study of the Basic Iron and Steel Sector

NRMP Report No. 32

**Use of Medicinal Plants in Nanga Juoi,
Menukung Regency, West Kalimantan**

As part of ongoing efforts to formulate appropriate environmental management and community development approaches in the Bukit Baka - Bukit Raya National Park area, NRMP has undertaken a number of surveys of local socioeconomic conditions and biodiversity. The most recent of these was a survey of local forest use, particularly medicinal plant use, in the Nanga Juoi region of Mukung Regency, West Kalimantan (*Survei Pemakaian Tumbuhan Obat di Nanga Juoi, Kecamatan Mukung, Kalimantan Barat*).

The Ransa Dayak people of Nanga Juoi identify several stages of forest succession following rainfed agriculture through which they determine when land may be cleared to resume cultivation. Agriculture is forbidden in selected traditional forest areas (*hutan adat*); anyone who wishes to extract timber from these areas must first obtain permission from a forest steward (*tumenggung*) selected by the community. Recent land use classifications have undermined this traditional conservation system, however. The area's inclusion in the newly established national park obliged the villagers to forfeit all use of their *hutan adat*, but subsequent transfer of parts of the park to a logging concession has made them question why they shouldn't also be allowed to harvest whatever they like from the area.

The local people harvest a tremendous variety of forest-dwelling animals and plants for food, agricultural pest control, medicine, and supernatural purposes. The focus of the report is an account of traditional health methods used by "black magic" practitioners (*belian*), traditional doctors (*dukun*), and the public to treat diseases resulting from what they classify as "supernatural" and "physical" sources. The Nanga Juoi *dukun*, like many *dukuns*, has an unusually extensive knowledge of botany. He attributes his knowledge of traditional medicine to the legacy of former generations of *dukuns* as well as his own inspiration and experimentation, shaped by his exposure to both recently introduced and indigenous religions and cultures.

The people of Nanga Juoi commonly use plant and animal preparations to relieve pain and discomfort, control fertility and pregnancy, cure disease, prevent infection, bolster stamina, and enhance beauty. Plants are made into powders, drinks, or pastes which are then ingested or applied to affected body parts in order to treat such health problems as fever, chills, asthma, fatigue, aches and pains, indigestion, menstrual irregularities, rashes, boils, pink eye, dysentery and other diarrheas, malaria, syphilis, hepatitis, cholera, tuberculosis, and venomous animal bites. The report's appendices detail the medicinal plants' local and latin names, distribution, applications, preparation, and use.

NRM/ARD CONSULTANCY REPORTS

NO.	TITLE
1.	Procurement Plan For Research Equipment at Bukit Baka and Equipment Installation at Samarinda Forestry Research Station
2.	Agroforestry in Bukit Baka – Bukit Raya
3.	Pengukuran dan Pemetaan Topografi Sebagian Daerah Taman Nasional Bukit Baka – Bukit Raya
4.	Applied Research Recommendations for Production Forest Management: An Economic and Ecological Review of the Indonesian Selective Cutting and Replanting System (TPTI)
5.	Balancing Forest and Marine Conservation with Local Livelihoods in Kalimantan and North Sulawesi
6.	Proposal to the GOI and USAID for the Development of Comprehensive Environmental and Natural Resource Accounts (CENRA) for Economic Planning and Management
7.	Bukit Baka Mini–Hydraulic System Implementation Plan
8.	Final Report: Bukit Baka – Bukit Raya 1992 Station Protocol: Bukit Baka – Bukit Raya 1992 Research Protocol: Bukit Baka – Bukit Raya 1992
9.	Environmental Education and Awareness in Bukit Baka (vol. 1) Environmental Education and Awareness in Bukit Baka Guide to Environment and Fire Campaign (vol.2)
10.	Recommendations for Controlled Timber Harvesting in the SBK Forest Concession
11.	Cruiser Identifications at SBK and Local uses of Trees by Local People
12.	Community Water Supply Feasibility Study for Bukit Baka – Bukit Raya, Kalimantan

NO.	TITLE
13.	Report on NRM Library Consultancy September – December 1992
14.	Livelihoods Strategies and Marine Resource among Residents of Bunaken National Park, North Sulawesi: Recommendations for Local Involvement in Park Management
15.	A Competitive Awards Scheme for Applied Management and Nature Conservation
16.	Design of a Management Information System for the Natural Resources Management Project
17.	Environmental Education and Awareness Strategy for Bukit Baka – Bukit Raya National Park (vol.1) NGO Training for a Local Environmental Education and Awareness Strategy (vol.2)
18.	Water Supply and Sanitation (WS&S) Program in Bukit Baka – Bukit Raya, Kalimantan Program Status Report
19.	The Role of NGOs in Supporting the NRM Project in Bukit Baka – Bukit Raya National Park
20.	Integration of Provincial Regional Development Planning into the Bukit Baka – Bukit Raya National Park Management Plan
21.	Communications, Information, and Education Strategy for Bunaken National Park
22.	Report on the Preparation of a Design for a Study of the Natural Resource Impacts of Marine Sector Policy During the Second Long–Term Development Plan
23.	Management Information System for the Natural Resources Management Project: Report on the Second Mission to Jakarta July – August 1993 (vol.1) Management Information System for the Natural Resources Management Project: User Manual and Technical Documentation (vol.2)
24.	Water Supply and Sanitation Program in Bukit Baka – Bukit Raya, Kalimantan Status Report No. 2

NO.	TITLE
25.	Report on Communities Living Within Reach of the Bukit Raya National Park in Kalimantan Tengah
26.	Effective Protection and Natural Resource Management in Indonesia
27.	Conservation Areas in Production Forest
28.	Economic Issues Associated with the Indonesian Selective Cutting and Replanting System (TPTI)
29.	A Review of Planning Arrangements for Sustainable Management of Natural Production Forest in Forest Concessions in Indonesia
30.	Ecotourism Development in Bunaken National park and North Sulawesi
31.	Environment and Development in Indonesia: An Input– Output Analysis of Natural Resource Issues
32.	Use of Medicinal Plants in Nanga Juoi, Menukung Regency, West Kalimantan