NATURAL RESOURCES MANAGEMENT PROJECT

BAPPENAS – Ministry of Forestry
Assisted by
USAID

PROPOSAL TO THE GOVERNMENT OF INDONESIA AND USAID FOR THE DEVELOPMENT OF COMPREHENSIVE ENVIRONMENTAL AND NATURAL RESOURCE ACCOUNTS (CENRA) FOR ECONOMIC PLANNING AND ENVIRONMENTAL MANAGEMENT

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I. INTRODUCTION

A. Purpose of Resource Accounting

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 can lead to calculation of a so-called "green GNP"; more importantly, it leads to development of valuable data on the economic role of the environment which can be used to address both economic and environmental policy and planning questions.

The limitations of conventional national income accounting with respect to the environment are well-known:

- The conventional accounts only include depreciation of built capital, and not of natural resource capital. Thus rapid harvesting of tropical forests like those of Indonesia shows up as an increase in income, without reflecting its negative effect on the country's future income-generating capacity.

- The conventional accounts do not include non-marketed inputs into economic activity, such as waste disposal services to agriculture and manufacturing or water and land in agriculture and forestry.

- The accounts add in expenditures to protect against a polluted environment but do not subtract out the harm caused by that pollution.

- The national income accounts omit direct consumption of environmental services such as fuelwood and recreation 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" in this context is crucial. Resource accountants are interested in valuing use of the environment in a framework which allocates scarce goods to their most productive uses. For this reason, natural resource accounts as understood by this project cover only resources which are in scarce supply. Thus they do not include such services of the natural environment as the energy provided by sunlight, since, while critically important in ecological terms, sunlight is not in scarce in economic terms.

B. Resource Accounting in Indonesia

Indonesia has led the world in implementation of natural resource accounting, through work begun in the 1980s by the World Resources Institute[1],

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[1] Repetto, Robert, William Magrath, Michael Wells, Christine Beer and Fabrizio Rossini, *Wasting Assets: Natural Resources in the National Income Accounts.* (Washington, D.C.: World Resources Institute, 1989)

and continued with Canadian support through the Environmental Management and Development in Indonesia (EMDI) project in the Ministry of Environment (KLH). 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 aspects of resource accounting which the WRI approach is not designed to address. In particular, they will be concerned with the links between national economic growth, use of natural resources, and degradation of the environment. To address such questions they will need information about the contribution of non-marketed services to economic well-being and the depreciation of those services, as well as about the data on depreciation of commercial assets which the WRI approach does address. These types of information are particularly important in order to incorporate environmental concerns into national economic planning, and are being sought for use in preparation of the next 25-year plan and Repelita VI.

C. CENRA Project

The CENRA project is designed to take a broad approach to resource accounting which will develop an information base on environment-economy linkages for use by national policy-makers. In the long run, the hope is that the development of economic accounts on the environment will become a routine annual activity of the GOI. In the short run, however, this project will concentrate simply on producing an initial set of accounts and using them to identify priorities for further resource accounting work.

The emphasis in the initial accounts will be on breadth rather than depth. The purpose is to identify <u>all</u> of the services provided by the environment and to value them as well as possible given the 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, while inaccurate, will indicate the relative order of magnitude of the various services, so that better data development work in subsequent iterations can focus on those which are of most importance to the economy.

II. POLICY APPLICATIONS OF RESOURCE ACCOUNTING

The CENRA accounts are designed to provide data to help the government develop sustainable policies for managing both the economy and the environment. The term "sustainable" is used differently in this project from in many other discussions of resource accounting.[2] The emphasis is on ensuring sustainability of overall income and economic growth, rather than either ensuring sustainability of natural resource-based income or protecting the physical resources themselves. For this reason, the primary policy target is national economic planning, whose concern with the environment is how it can best contribute to the well-being of the population in the broadest sense. Thus the major policy applications of the accounts will be to national planning, although the underlying data are likely to be of interest to many other groups as well.

In this vein, the CENRA project will provide specific outputs which will be important for Indonesian planning and environmental management. The first output discussed in this section has already been elaborated in plans for cooperative work on input/output analysis involving Bappenas, CENRA and the Canadian-funded Environmental Programming Support Services (EPSS) project. Other applications discussed here are expected to evolve as the project progresses.

A. Input/Output Analysis

The EPSS project has brought New York University's Institute for Economic Analysis (IEA) together with Bappenas to introduce an input-output analysis process which links sectoral demand for land and water to economic growth. This model will be used to help Bappenas identify and test growth scenarios for the next 25-year plan. The report on the first phase of this effort[3] includes a list of additional data, both in the natural resources arena and elsewhere, which are needed to more fully implement the I/O models. In natural resources this list overlaps substantially with the data required to build the natural resource accounts, providing an excellent opportunity to link the two activities.

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2 See, for example, papers by Hueting and Norgaard in Ahmad, El Serafy and Lutz, eds., *Environmental Accounting for Sustainable Development* (Washington, D.C.: The World Bank, 1989)

3 Duchin, Faye and Glenn-Marie Lange, "Input-Output Modeling: Development and the Environment." Final Report to Intera Kenting for CIDA contract. August 15, 1991 - March 31, 1992. Institute for Economic Analysis, New York University

A link between the two projects will benefit both of them. For the I/O project, relying on CENRA data will provide additional technical support and resources in a difficult data development area, probably well beyond what would have been available without that linkage. For CENRA, the link will ensure that the accounts respond to a clearly defined information need, and are closely tied to the Bappenas planning process. This tie will be very important in building GOI confidence in the utility of the accounting effort and demonstrating that such data do have short-run as well as long-run policy applications.

In order to implement this link, the data needs of the I/O model must receive high priority in scheduling the CENRA work. Since the time horizon for incorporating refined I/O results into Bappenas' 25-year planning process will be relatively short, the CENRA work plan (below) reflects the need to include the development of those data among the first areas for project attention.

The data needs identified by the I/O project which the resource accounts will address include:

- land use by sector, for sectors for which data are not currently available;
- actual use of land designated as "forest" by the forestry industries;
- water use by sector--volume, quality and source; and
- pollutant discharges into water bodies by sector, including runoff from agriculture and forestry.

B. Regional Data Development and Planning

The resource accounts will be developed only at the national level, because of the difficulty of implementing certain accounting items at the regional level, particularly imports and exports. However, they will be based in part on data which are collected at the provincial rather than the national level. This underlying disaggregated data will provide a valuable source of information both for assessing the regional impacts of national policies and for planning for provincial implementation of national strategies. They will thus be a useful policy and management tool both to national and to provincial policy makers.

The data collected at the provincial level vary greatly in quality, depending on the resources and technical skill available to the provincial administration. For this reason, it will be important for the project staff to develop some first-hand understanding of how data are being developed in the regions, what the numbers really mean, and how reliable they really are. In the first iteration of the accounts this will give a better understanding of how to use regional data, and how to correct for gaps or errors in data from provinces with less sophisticated data-collection systems. In planning for subsequent iterations of the accounts, it will help in planning how (or whether) effort can effectively be directed at improving regional data and strengthening their use for policy and planning. CENRA understanding of provincial data development and use will also help to target some intermediate project outputs towards provincial planning and management needs.

C. Environmental Impact Assessment

Indonesia requires that environmental impact assessments be completed for all major development projects, for review by the sectoral ministries under whose authority the projects fall. Experience has shown, however, that while EIAs may help eliminate projects which are clearly harmful to the environment, they provide little basis for choosing among those which are not harmful, especially when the choice involves intersectoral comparisons of competing claims for investment capital. One approach to this problem has been to require that all EIAs adhere to uniform protocols with respect to coverage, definitions, measurement techniques. However, since the EIAs are the responsibility of the sectoral ministries interested in maintaining their independence, this is not likely to be an effective strategy.

The resource accounts can be used to help address this issue. They can lead to the development of standardized information which would permit qualitative and quantitative comparisons of the environmental implications of projects originating from different sectors. In practice, each ministry might establish its own internal requirements for impact assessments, but would also call upon the projects to use the valuation of opportunity costs developed through the resource accounts to develop standardized measures of project impacts which could serve as a basis for intersectoral comparisons. Thus, for example, the evaluation of income generated from a paper and pulp plant might be adjusted to reflect its negative economic impact on downstream agriculture, using the values assigned to damages from water pollution which are developed in the resource accounts. The application of such an approach in all impact assessments would provide a *lingua franca*--a common means of expressing the project's environmental and economic implications throughout the government community.

III. THE RESOURCE ACCOUNTS

A. Accounts Framework

The proposed accounting system is an add-on to the conventional income accounting structure, leading to calculation of a modified form of GNP which includes the environment. Determining the exact structure of the accounts and the data needed to build them will be one of the first steps of the project; this section describes a general framework which can be used as a point of departure (see Figure 1). The top portion of this account shows the conventional national income accounts, and the bottom shows the modifications made in order to incorporate the environment.

In this framework "the environment" is treated as a collection of assets, each defined by the service it provides, rather than as set of spatially distinct places defined by location and physical features. Thus a forest would not be considered a single asset, even though spatially it may be discrete and clearly identifiable. Rather, it would be understood as a set of assets providing different services: commercial timber, fuelwood, water retention, shade, wildlife habitat, carbon fixation, and so on. Rather than valuing the whole forest, including its marketed and non-marketed services, as a single item, each service is valued separately. This approach is essential in order to allow trade-offs among the services and different depreciation schedules for the different service-based assets.

The modified account structure incorporates the environment in several ways. First, it includes the household sector as a distinct entity. Non-marketed resources gathered by households from the environment--fuelwood, food, medicinal plants, etc.--are entered as productive activities which consume inputs from the environment and produce outputs used by the household.

The accounts then bring in "pure" environmental services, categorized into three general classes. Waste disposal services appear on the input side of the table, valued negatively as a subsidy. These include services provided to businesses (industrial, agricultural and forestry discharge) and households (sewage). At the same time, these services impose negative externalities on businesses and households, which are considered a final output, valued negatively on the right side of the table and labelled "environmental damages." Finally, the direct services
to households or to society as a whole are a positive output, listed on the right hand side of the table. These input and output entries are balanced by another input entry, "Net Environmental Benefit", defined as services (waste disposal and direct final demand services) less damages. This balancing entry appears on the input side of the table; its placement is essentially an arbitrary convention.

The system then deducts a measure of depreciation of environmental and natural resource assets. These assets are also defined according to the services they provide rather than according

Figure 1: Modified National Income and Product Accounts

INPUT	*(conventional accounts)*	OUTPUT
Compensation of Employees (+) Proprietor's Income (+) Indirect Taxes (+) Gross Return to Capital (+)		Personal Consumption (+) Investment (+) Inventory Change (+ or -) Exports (+) Imports (-) Government Goods and Services (+)
CHARGES AGAINST GROSS NATIONAL PRODUCT (sum)		GROSS NATIONAL PRODUCT (sum)
Capital Depreciation (-)		Capital Depreciation (-)
CHARGES AGAINST NET NATIONAL PRODUCT (sum)		NET NATIONAL PRODUCT (sum)
----------	*(modified accounts)*	----------
Nonmarket Household Production (+) (+) a. Fuelwood b. Other production		Nonmarket Household Production a. Fuelwood b. Other production
Environmental Waste Disposal Services (-) to air, water and land		Environmental Damages (-) to air, water and land
Net Environmental Benefit (or Disbenefit) (sum of waste disposal, damages, and direct consumption)		Direct Consumption of Environmental Services (+)
Natural Resource Depreciation (-) a. Fuelwood biomass stock b. Resources producing nonmarketed services c. Resources producing commercial goods		Natural Resource Depreciation (-) a. Fuelwood biomass stock b. Resources producing nonmarketed services c. Resources producing commercial goods
CHARGES AGAINST MODIFIED NET NATIONAL PRODUCT (sum)		MODIFIED NET NATIONAL PRODUCT (sum)
Capital Depreciation (+) Natural Resource Depreciation (+)		Capital Depreciation (+) Natural Resource Depreciation (+)
CHARGES AGAINST MODIFIED GNP (sum)		MODIFIED GROSS NATIONAL PRODUCT

to their geographical discreetness. Thus in Figure 1, three asset classes are distinguished; fuelwood, assets producing non-marketed direct services (e.g. wildlife habitat), and assets producing marketed services (e.g. commercial timber). The specific categorization of assets for depreciation will depend, of course, on the particular implementation of the accounts.

These additional accounting entries, when incorporated into the conventional economic accounts, yield modified net national product. To obtain a similarly modified gross national product as a bottom line, the accounts simply add back capital and natural resource depreciation.

B. Tailoring the Framework for Indonesia

To implement this framework in Indonesia, the project staff will first think through what services are actually provided by the environment in each of these categories. This might lead to inclusion of line items like the following ones, to be valued in the accounting system:

Nonmarket Household Production

- Fuelwood gathering
- House construction
- Agricultural production (if not already estimated in the accounts)

Environmental Waste Disposal Services

- Water pollution by agriculture (fertilizer, pesticides, soil runoff), manufacturing sectors (organic and inorganic pollutants, toxics, soil runoff), forestry (soil runoff, organic and inorganic pollutants), households (sewage, automobile discharges to roads)
- Air pollution by agriculture (?), manufacturing, forestry (?), households (automobile exhaust, cooking fires)
- Land pollution by agriculture (runoff), manufacturing (solid waste disposal, mining impacts on land), forestry (erosion, soil runoff), households (solid waste disposal)

Other Non-marketed Input Services to Industry

- Water used by agriculture
- Land used in agriculture (if not sold) and forestry

Environmental Damages - costs imposed through

- Health impacts of air, water, and land pollution (sewage contamination in water supplies, pesticides, industrial chemicals)

- Impact of water pollution on water-intensive agriculture
- Impact of air pollution of rice cultivation

Direct environmental services to Indonesia or exported to the rest of the world

- Water and land as inputs into economic activity
- Tourism and recreation
- Wildlife habitat and protection of biodiversity
- Carbon fixation

Natural Resource Depreciation Each service listed above should be depreciated based on the change in the discounted flow of anticipated benefits which it will provide. Since these services may be mutually exclusive--e.g. land deforested to provide cropland will no longer provide forest services--the depreciation estimates necessarily embody a set of assumptions about how conflicts among the different services will be resolved. Depreciation estimates should be made both for commercial service flows and for flows of nonmarketed services.

This list is only a suggested one, and raises many questions of omissions and overlap. A more precise list of environmental services which better reflects the Indonesian environment will be developed at the start of the project, and refined through successive iterations of the accounts.

C. Valuation

Implementing these accounts involves making the best estimates possible given the data available. A number of approaches may be useful, depending on the assets to be valued and the applicability of existing data and valuation models.

1. Household production

Non-marketed environmental products consumed by the household sector could be valued using several approaches. One method is to value them at the price at which they could be bought in the market - if a market exists. For people who are largely outside of the market economy, however, this may not be meaningful. In that context a more useful approach would be to value these products in terms of the time it takes to collect them; then the problem is how to value time. Where paid employment is an option, both time and non-marketed forest products could be valued by using data on household expenditures, employment, and time-use.

2. Waste disposal services

Waste disposal services can be valued based on the cost which would be incurred if discharges were treated to remove the waste, since that would be the alternative if the environment did not provide the service. Empirical data on the

costs of such treatment may be available from factories, sewage treatment plants, farms, and households which do treat their wastes. The treatment costs actually incurred are already included in the national income accounts, but the potential cost if current discharges were also to be treated do not appear in the accounts; in estimating the value of waste disposal services, it is important only to include only those which are not currently incurred.

Calculating the cost of waste treatment calls for information about how much pollutant is being discharged, and how much it costs to remove the pollutants in order to bring the wastes up to specified levels of cleanliness. If Indonesian data are not available, it may be possible to substitute U.S. treatment costs per unit of discharge (possibly modified to reflect different cost structures), multiplied by Indonesian discharge levels, to obtain a rough estimate of the total cost of treatment. If Indonesian industrial discharge levels are also not known, they may be estimated as well, using engineering process information which describes the material inputs and outputs of different types of factories. For agriculture, engineering process information, adjusted for domestic fertilizer use, soil types, and other parameters, may be used to estimate agricultural runoff and costs of reducing it. Some work has been done on estimating emissions levels in parts of Indonesia; if feasible, these values might be applied to other areas of the country rather than using data from other countries.

3. Input services to Industry

The value of water and land used in manufacturing, agriculture, and forestry will be captured in the conventional accounts only to the extent that it is purchased and therefore accounted for as an input cost. Where there exists a functioning market, the use of non-marketed inputs may be estimated using the market prices, and included in the accounts as a subsidy. However, for water and for much land there will be no market prices to use as a proxy. In this case the cost and revenue structures of different activities might be used to estimate the marginal product of additional allocations of water or land to each activity, and so estimate their value. The methods used to analyze the allocation of limited water resources among conflicting uses in arid areas of the United States may also be useful in valuing similar environmental services in Indonesia.

4. Environmental damages

The damages imposed by use of the environment for waste disposal can be valued in several ways. One approach is to value the damages imposed at the cost of removing them. This method has the advantage of avoiding the need to use benefit estimation techniques which can be highly subjective. However, it has the disadvantage of equating the costs of pollution control with the benefits of cleaning the environment, making it impossible to use the accounts for cost benefit analysis.

An alternate approach is directly to estimate the costs imposed by pollution. This could include estimating such things as the cost of medical treatment to counteract the health impacts of water-borne disease, or the direct costs of defensive activities to protect against such disease (e.g. water purification, boiling water, etc.). Such studies are expensive to undertake,

however. For this reason it will be important to make use of whatever analysis has already been done, either in Indonesia or in other countries whose problems are comparable, in order to obtain at least rough estimates. The applicability of particular results would, of course, have to be considered carefully in attempting to use them in developing country accounts.

5. Direct environmental services

Services provided directly by the environment may be valued in a variety of ways, depending on the service. Demand for recreational services is often estimated using travel demand models. While domestic recreational use of the environment may be relatively unimportant in Indonesia, this issue will be quite important to the extent that the country relies on tourism as a source of income or foreign exchange. The value placed on natural resources may also be estimated using contingent valuation approaches, which ask resource users their hypothetical willingness to pay for the resource, or at what price the would be willing to give up access to it. In some instances, values established for certain environmental assets may be transferable across countries. For example, in assessing the potential of ecotourism in Africa, estimates have been developed of the values of individual animals of key species such as lions and elephants; if similar work has been done anywhere in southeast Asia, the results may be useful in the initial implementation of the resource accounts.

6. Depreciation

Theoretically, economic depreciation should be valued as the change in net present value of a future income stream over the accounting period. To actually estimate this, we would have to know the expected income stream from each of the environmental services and the change in those expectations over the accounting period. Such estimations are routinely made in private capital markets; companies like Weyerhauser, for example, have highly refined models of expected forest-based income, which allow them to bid on forest land purchases. The models needed to predict non-marketed income streams in a political environment are likely to include such factors as population growth, changes in the regulatory environment, and new technologies. Calibrating the models will be complex, because neither the assets nor the services they provide are sold; however this is not an impossible task.

Nevertheless, studies that attempt to estimate depreciation generally use assumptions which greatly simplify the process. The net rent method used to depreciation forests in the ongoing Indonesian resource accounting work values each unit of forest at its sale value less the cost of harvesting or extracting it, i.e. unit rent. The value of the whole stock is the unit rent times the quantity. Depreciation is then calculated as the difference between the opening and closing stock values over the accounting period, taking into account increases (e.g. tree planting) and depletions (e.g.harvesting or mineral extraction). So far this work has only considered commercial use of forests, leaving open the question of how to handle depreciation of non-marketed assets such as fuelwood or wildlife, for which a unit rent could not be calculated.

A pilot study on the Chesapeake Bay[4] in the United States incorporates non-marketed assets into the depreciation calculations, but makes equally simplistic assumptions. This study assumes that resource users always expect future income to be the same as current income, adjusting for physical changes in the stock. It then calculates the net present value of the expected stream of income at the start and end of the period, and takes the difference as depreciation. This is then modified with the benefit of hindsight, so that earlier years' depreciation estimates are recalculated using actual data on more recent income streams, as if the resource users in the earlier year had actually known what later incomes would be. This has the advantages of making the assumptions about future income streams explicit and incorporating non-market as well as marketed assets; however neither the particular assumptions about income streams nor the choice of discount rate reflect a careful assessment of the forces which may be expected to play a role.

The initial implementation of the resource accounts is likely to use equally simplistic methods to account for depreciation. It may apply several different methods, in order to compare the results, to the extent that they depend on the same underlying data. In later refinements of the accounts, more accurate depreciation estimates may be developed for key environmental services based on more realistic projections of future service flows which take into account economic growth or changes in environmental and economic policy.

7. On the use of rough estimates

While estimates like these will be crude, they may be a catalyst to the development of better data. They will give some sense of the orders of magnitude of the different items, suggesting where it will be worthwhile to build better databases and refine the next year's accounts. Dissemination of results like these may also help to identify better data on individual sectors or technologies, as people see the relevance of information which they had not previously understood to be connected to the accounting effort.

Grambsch, Anne (US Environmental Protection Agency), Greg Michaels, Kelly Lukins, and Henry Peskin, "Resource and Environmental Accounting in the Chesapeake Bay Region ("Chesapeaka") 1991 (Unpublished draft of a report forthcoming from the EPA in 1992)

IV. WORK PLAN AND OUTPUTS

A. Process of Account-Building

The development of the resource accounts will be an iterative process leading to increasingly more accurate sets of resource and environmental accounts. The current project covers the first iteration and planning for subsequent work, and will last two years.

During the development of the accounts, the CENRA team will produce a number of intermediate outputs which will be of use to others working on economic and environmental planning in Indonesia. One of these outputs will be the natural resources data for the EPSS input/output work, which should be developed in the course of the first year of CENRA work. In addition, the CENRA team will produce brief data reports and studies intended to stimulate interest in the accounts and to further understanding of how they can be used in other areas of Indonesian policy-making and management. These reports will be widely circulated to government officials and others interested in the issues. They are expected to serve several purposes. First, the development of data systems like the resource accounts depends on getting access to a wide range of information sources, many of which may not initially be perceived to be of relevance to the project. Previous experience with this kind of work suggests that the dissemination of data summaries or analyses based on admittedly inadequate data stimulates the identification of better information; thus this will be an important tool for identifying new data sources. In addition, the circulation of brief analytical studies on questions of importance to Indonesian policy-makers in areas such as forestry, environmental impact assessment, or regional development will show the relevance of these accounts to their concerns, and may thus generate broader support for institutionalizing the accounting process.

The tasks involved in building the first set of accounts will be as follows:

Task 1: Identification of environmental services (first month) The first step in building the resource accounts will be to develop a detailed list of environmental services along the lines of the one suggested in section 3 above. This will be done by the project staff, with input from other interested people, and will include all environmental services which might be of any importance in the country. It will not be definitive; additional services may emerge from the data as they are gathered, and some services initially thought to be important may turn out to be negligible.

The initial list should be as inclusive as possible, however. It will serve to organize the data identification and collection activities of subsequent tasks so that the project staff know what they are looking for in seeking reports and data. Moreover, by aiming at as broad a coverage as possible--albeit at a cost in terms of depth, especially at the start--the accounts can be used to establish the importance of different services relative to each other, and thus to target future deepening of the available data in the areas which are of most importance to the economy.

Task 2: Data Identification (months 1-4) Much of the data required by the

accounting system may already exist in government files, reports, and technical publications. The second task will be to determine what data are available, in what form, whether they are accessible, their coverage, and their likely quality. The data required are likely to include the following:

- Pollution discharge by industries, agriculture, and households; by pollutant; by receiving medium (air, water, land); and by location.
- Use of environmental services (land and water) as an input to manufacturing, agriculture and forestry, where these are not already captured by the conventional accounts.
- Cost of reducing pollution discharges to low or zero levels, in order to value the waste disposal services provided by the environment.
- Damages caused by pollutant discharges, by pollutant, in physical and value terms.
- Direct consumption services provided to households by the environment (e.g. recreational services, aesthetic services, ecological services, nonmarketed food, fuelwood, etc.) in both physical and monetary terms.
- Physical stocks of natural resource assets including forests, oil and minerals, water bodies, wetlands, recreation facilities, etc.; their location, their expected lifetimes, and the services they are likely to generate over their lifetimes in both physical and monetary terms.
- Economic activity by sector (production and composition of value added).

In practice, many of these data, particular those related to monetary values, will not exist in the desired form. The identification of data sources will therefore also include information which can be used to estimate proxies for the data actually desired. This task will rely both on inventorying the statistical information available from the GOI and donor agencies, and on searching the published and (insofar as possible) unpublished literature to locate studies which provide coefficients usable in estimating numbers not available directly. The two kinds of information searches will complement each other; as some statistics become available and others are determined to be non-existent, it will become more clear what kinds of coefficients or studies might be useful to fill in the gaps.

Task 3: Data Assembly and Preparation (months 2-8) This fairly mechanical task involves obtaining the data identified in task 2 in a form that permits simple manipulation and review. For those files that are already machine readable, this mostly involves the development of simple programs to put the data in a form that will permit manipulation by some generic data management system such as Dbase. For data available only in hard-copy form, it involves assessing their usefulness, and if appropriate entering them into the database management system so they can be manipulated easily.

Task 4: Data Assessment (months 6-14) This task involves assessing the quality

of the data, especially with respect to breadth of sectoral coverage and consistency of data definitions and sector breakdowns. This assessment will determine the suitability of each data set for use in the accounting framework. Besides determining such straightforward issues as the availability of needed information, the assessment will determine the level of sector detail that will enable the greatest degree of comparability across sectors and data sets. For example, while discharge information might exist for some sectors in 4-digit ISIC detail, for other sectors only 2-digit might be available. In addition, while we may be able to identify and estimate the disposal value of Indonesian industries at, say, the 4-digit level of detail, we might not be able to estimate the environmental damages associated with the disposal at the same level of detail. Although a consistency of sector detail and coverage is not essential to the accounts, it does make them more useful for sectoral comparisons.

Completion of these tasks may require going back to the data sources to request more detailed information that may have been aggregated in the delivered file. In particular, time will be allotted during this task for brief visits to a few selected provinces to assess the quality of the data originating at the regional level. These visits will be important for several reasons. First, they give the team a better understanding of how some of the key environmental data are collected and thus how they should best be interpreted. This may be particularly important in developing data for the input/output work. Some of the detailed land and water use data needed for that analysis will certainly be hard to obtain. Discussions with provincial officials and forest concession staff may provide information with which to adjust available statistics so they will better reflect actual resource use. In addition, the insight into local data collection practices obtained through these visits will be important later in the project in assessing how resources can best be used in developing better information in later iterations of the accounts.

The data needed by the input/output work should be available by the completion of this task (or earlier). Because the I/O project will rely on the data which underlie the accounts rather than on the valuations, it will be possible provide useful information without waiting for the CENRA project to tackle the difficult valuation issues. To the extent that these data do not require additional processing, it may be possible to provide them by the end of task 3.[5]

Task 5: Imputation (months 13-20) Much of the project effort will concentrate on the development of imputed values for environmental services and stocks. This task can be organized into several different kinds of effort, according to the data and techniques. Valuing the discharge services provided by environment to both industry and households will require familiarity with the techniques and data used to estimate discharge levels and the costs of pollution control; one person could usefully develop the skills to do these estimations for all sectors of the economy. Estimating direct services provided by the environment will require familiarity with the range of techniques for valuing

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Depending on the schedules of the two efforts, it may be useful to carry out parts of tasks 2-4 simultaneously, so the I/O data can be provided sooner. This will be worked out by the project staffs as needed.

benefits of environmental improvement which have been developed by environmental economists. Estimating depreciation, by contrast, will require skills related to modelling the changes in expected use of the resources and discounting them back to the present. The organization of the imputation work should therefore be by type of service rather than by industrial sector.

For the preliminary accounts, it is unlikely that there will be extensive *de novo* application of valuation techniques, such as travel cost method, alternative cost method, or contingent valuation. Rather, the project will "borrow" results from such studies, already undertaken in Indonesia or elsewhere for "similar" environmental and natural resource activities. Thus, for example, the value of industrial waste disposal to polluters can be based on control cost data developed in the United States and in the Netherlands if Indonesian data are not available. Data on the value of air and water pollution damage to urban populations can be drawn from studies done in the United States and in Latin America.

Such borrowing of data and coefficients obviously does not provide accurate information about the actual value of environmental services in Indonesia. However, it will provide an idea of the order of magnitude of those services. As the very rough data are disseminated to people working in these areas, understanding of which areas warrant further data development will emerge, providing guidance for subsequent iterations of the accounts.

The imputation work may make some use of outside consultants, as the need is identified for specialized expertise either in particular valuation techniques or in particular biological or resource issues. The needs for additional technical support will be determined during the data assessment of task 4, and short-term Indonesian or American consultants will be sought during the imputation phase as appropriate.

Task 6: Assembly of Preliminary Accounts (months 13-23) This task will go on in the background as data are being assembled and valuations carried out. As information is developed in Task 5, it will be entered into the accounts. By so doing, the different imputation efforts tasks will be coordinated. Specific benefits of this process will be the sharing of information and the assurance of consistency with respect to sector definitions and valuation concepts. Most importantly, the accounts themselves will serve as a guide to the imputation effort. In particular, they should direct our attention to those imputation and data development efforts that have the most important quantitative impacts for the accounts as a whole.

Task 7: Preparation of final project outputs (months 21-24) Two distinct products will result from the CENRA project. First, the first set of accounts will be published and distributed widely to everyone interested. It will include a summary table (along the lines of that discussed in section 3 above), underlying data at a reasonable (but not overwhelming) level of detail, a discussion of the methodology, and precise explanations of how the estimations and valuations were made. This will also include an assessment of the quality of the different data, and an identification of weaknesses in the underlying data. Although they will not all be distributed with the report, the disaggregated data underlying the

accounts will be available upon request.

Second, the project will produce an assessment of which portions of the accounts should receive further work in the second iteration. Refinements of the accounting process for subsequent iterations might take the form of strengthened base data collection, theoretical work on valuation techniques, or special studies to develop more precise understanding of the value of key nonmarketed services. The criteria for further work will include (but not be limited to):

- the magnitude of the preliminary numbers relative to the overall accounts
- the sensitivity of the preliminary results to refinements in the valuation methods or input data
- the political importance of particular sectors, environmental services, damages, etc.

This report will include a preliminary plan for continuing the resource accounting work which addresses the technical needs for additional work and the institutional framework for a continued effort.

Both of the final products will be distributed widely at least several weeks before the end of the project, to allow time for review and discussion, especially with respect to plans for future accounting work in Indonesia.

B. Outputs

1. Intermediate products

During the development of the first set of accounts, a number of intermediate outputs may be produced for wide dissemination within the government and among other interested agencies. The list below includes items which have proven useful in other contexts; the selection of specific outputs for the CENRA work will be made by the team members based on the data available and the outputs which seem likely to be of most interest.

Annotated bibliography of studies on the Indonesian environment This paper would review published and (insofar as possible) unpublished empirical work on estimating and valuing environmental services in Indonesia. These studies will have to be identified by the team in developing information about data sources, so publication of an annotated bibliography will not involve substantial additional work. It would be of use to policy analysts or researchers doing further empirical work on the Indonesian environment, who would be interested in building on each others' results.

Data directory A directory of statistics available on the Indonesian environment would also be of use to policy analysts or researchers. Such a directory for BPS

statistics was produced in 1989 under the EMDI project[6]; this would update and expand on that work. It would include, for each data set, the type of data and coverage; the name, address, and telephone number of the appropriate contact person; whether the data are available in hard copy or are machine readable; a preliminary judgement of their quality and usefulness; and any acquisition costs. Dissemination of such a data directory will be important in order to solicit information about other data from those who are not included in the report.

Statistical Reports The CENRA team will produce summary statistical reports on various key issues of interest to policy-makers. Depending on data availability and interest, these may cover:

- cost of air or water pollution control at specified discharge levels by industry sector
- inventory of the qualitative and quantitative pollution effects of industrial and household activities
- regional breakdown of the impacts of air or water pollution by households and industry by province
- use of land by industrial sector and by region

Analytical Studies The CENRA team will also produce analytical papers using the accounts data. Again depending on data availability and interest, these may cover such issues as:

- developing a common language for evaluating environmental impact assessments and ranking proposed projects
- identifying the impacts of environmental management strategies by region or by income class
- evaluating the benefits and opportunity costs of alternate forest or agricultural management strategies
- application of spatial analysis tools to evaluating the impacts of forestry and agriculture on rural environments

2. Final products

As discussed in the work plan above, the final output of the two-year CENRA effort will have two parts. The first will be a set of resource accounts, including aggregate and disaggregated statistics and explanations of how the data

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6 Bordt, Michael, Ano Herwana and Wahyu Agustina, "Inventory of Environmental Statistics at *Biro Pusat Statistik* (Central Bureau of Statistics) Jakarta, Indonesia" Draft, October 2 1989, produced by EMDI in cooperation with BPS

were developed and what they mean. The second will be an assessment of the areas in which work is most needed to improve the results in subsequent iterations of the accounts. This will address both technical considerations and how construction of the accounts can be institutionalized within the government in the future.

C. Schedule of Tasks and Deliverables

The time schedule for completing the tasks and producing CENRA outputs is as follows:

TIMING	TASK	OUTPUTS
Month 1	Task 1: identification of environmental services	Preliminary structure of aggregate accounts for internal use.
Months 1-4	Task 2: data identification	Data directory. Annotated bibliography of studies.
Months 2-8	Task 3: data assembly and preparation	Preliminary statistical reports, depending on interest and data availability.
Months 6-14	Task 4: data assessment	Selected short analytical studies, depending on interest and data availability.
Months 13-20.	Task 5: imputation	Statistical reports or short analytical studies, depending on interest and data availability
Months 13-23	Task 6: assembly of preliminary accounts	Preliminary accounts.
Months 21-24	Task 7: Preparation of final project outputs	Resource accounts, including aggregate and disaggregate data. Assessment of technical and institutional needs for subsequent iterations of the accounts.

D. Links to Other Data-Development Activities

The construction of a set of resource accounts is a collaborative effort relying on input from anyone involved in developing relevant data on Indonesia. CENRA will build on work underway in Indonesia and elsewhere in the world, and will at all times avoid duplication of effort. Several other efforts in particular will be important in providing inputs to the CENRA work.

KLH-EMDI Resource Accounting Project The Canadian-funded resource accounting work which has built on WRI's pioneering work in Indonesia will be a major source of information on stocks of commercial forest resources, oil and gas, and fisheries. EMDI is already using these data to produce one set of depreciation

estimates. CENRA will likely apply different methods to produce alternate estimates, which will provide an interesting comparison between the two results.

World Bank/IMF Water Pollution Control Cost Projects Several efforts are underway to develop data on water pollution control costs for Indonesia. One, in the IMF, is using United States technical coefficients and control cost data to estimate the costs of reducing discharges from all sectors of Indonesian industry, as part of a comparative study of a number of Asian countries. Although these numbers will be quite rough, as a fallback CENRA may be able to rely on them for the first iteration of the accounts.

A second effort, in the research arm of the World Bank, is developing data on the cost of water pollution control in Indonesia for three industrial sectors: cement, paper and pulp, and leather. Although these data will be limited in scope, they may provide an understanding of how and why control costs differ between the United States and Indonesia. This could provide information with which to adjust United States data to better reflect the Indonesian situation in other sectors, at least to the extent that differences between the two countries may be comparable across sectors.

This project is also considering an investigation of whether or how much households or villages would be willing to pay for improved sanitary facilities in order to improve local water supplies and public health. If this work is carried out, it will feed directly into the accounts by estimating the damages imposed on household by their own discharge of untreated sewage.

US Environmental Protection Agency Air Pollution Coefficients The EPA has developed a database of technical coefficients for air pollution discharges by industrial sector, based on United States industrial technology. To the extent that Indonesian data are not available, these can be used to develop initial estimates of the volume of Indonesian discharges by applying them to data about levels of output from domestic plants.

To the extent that it can rely on these efforts by other agencies, the CENRA will be able to focus its initial efforts in areas not already covered. For example, it could focus on the environmental (rather than commercial) dimensions of forestry and agriculture, on land and water use, and on developing better estimates of natural resource depreciation.

V. ORGANIZATION, STAFFING, AND INSTITUTIONALIZATION

A. General Considerations

The proposed plan for staffing and managing the CENRA project involves hiring one or preferably two young Indonesian economists or graduate students in economics who would work full time on identifying data and building the accounts. They would report to Dr. Henry Peskin, and would be closely supervised by him and by Dr. Joy Hecht through frequent visits to Jakarta. In addition, a working group of Indonesian civil servants from BPS, Bappenas and KLH who are expected to be interested in this project would be kept apprised of the progress of the work through occasional workshops, and would be counted on to supply data to the team members. Dr. Suparmoko, the coordinator of the EMDI-KLH resource accounting effort, would be brought in as a consultant to the project to manage this larger group, organize the workshops, assist the two full-time staff in making contacts and obtaining data, and so on.

The major unknown in this proposal is whether it will be possible to find two Indonesians who are interested and able to take the full-time positions. In general, USAID local consulting rates are too low to attract high caliber professionals. Since we are interested in graduate students or people who have recently completed graduate degrees rather than experienced professionals, this may be less of a problem than it is on some projects. However, it is also not clear whether it will be possible to find students able to take the initiative involved in working as independently as would be required by this arrangement.

The most promising approach to finding such candidates seems to be to look for them both in Indonesian universities and among Indonesian students in the United States. An Indonesian doctoral student from a U.S. university who might be interested in working on this project while writing a dissertation in a related field would be an ideal candidate for one of these slots. Such a person could be counted on to be committed to the work (since his or her thesis would depend on it), to have sufficient computer literacy to easily handle the data management tasks, and to work independently enough to be productive with supervision coming from overseas. A recent masters' student from an Indonesian university would provide a good second full-time staff member. Dr. Suparmoko, who teaches resource economics in Yogyakarta, has suggested that he may be able to line up such a person; one of his former students has a similar position in the KLH-EMDI resource accounting effort.

Several additional institutional questions must be resolved about this approach:

- What will be the institutional base of the full-time Indonesian staff? Because AID's NRM project is linked to Bappenas, this activity is also expected to come under their aegis. However, it is important to establish a strong link to the *Biro Pusat Statistik* (BPS, the Central Statistical Bureau), which will be an important supplier of data, and which plays a key role in the EMDI/KLH resource accounting work. It may be useful to

identify some part of BPS, possibly the Analysis Section or the Environmental Statistics Sub-section, as a counterpart organization to Bappenas, to ensure that BPS plays a strong role in the CENRA project.

- Where would the full-time Indonesian staff be physically located? In order to strengthen the link to BPS, having them work there is highly desirable. If this is impossible, they could sit in the ARD project office or at Bappenas, depending on where space is available.

- Should CENRA come under the ARD natural resources management project? CENRA will much easier to manage if it goes through the ARD project, provided this can be done without placing an undo burden on the ARD staff. If CENRA goes through ARD, the budget will have to include the firm's overhead; however if it does not, the budget will have to include substantial resources for setting up and managing an office, purchasing equipment, establishing administrative and accounting systems, and so on. For a relatively small effort, this may substantially delay the efficiency with which the work can get started.

B. Staffing

The CENRA project will be staffed as follows:

Project Director - Dr. Henry Peskin

The project director will have overall technical and managerial responsibility for the CENRA activity. He will be based in the United States, and will make about three two-week trips to Jakarta per year to provide technical guidance to the local staff and to meet with the larger group of interested experts. He will be in very frequent (weekly) communication with the Indonesian staff, who will send him copies of all the data and information they obtain so he can work with them as necessary. He will take an active role in identifying data and technical studies in the United States and building portions of the accounts for which Indonesian data are not available.

Specific responsibilities of the project director include:

- final responsibility for quality, timeliness, content of all project outputs;
- handling key negotiations with USAID, GOI, consultants, and staff;
- final say in the choice of staff and consultants;
- providing technical input into the identification and use of data
- taking a technical lead in valuation work;
- allocating responsibility for all project work, including producing intermediate outputs and writing the final report;
- supervising all project staff and consultants.

Senior Advisor - Dr. Joy E. Hecht

The senior advisor will get the Indonesian staff started on the development of the accounts and take the lead in helping them identify data, think creatively about how to proceed when data are not available, and produce intermediate

products and portions of the final report which are their responsibility. She will make a relatively extended stay in Indonesia at the start of the project in order to get the work launched effectively, and will return for shorter visits as the work progresses. She will play a key role in assessing the coverage and accuracy of the data, including visiting the provinces to learn more about regional data. She will contribute to identifying GOI demand for intermediate products and deciding what should be produced. She will also interface with the staff of the EPSS input/output project so as to ensure that their data needs will be met efficiently.

Specific responsibilities of the senior advisor include:

- supervising the Indonesian staff on a day-to-day basis and helping them develop an understanding of how to be creative and proactive in seeking data and making use of what is available;
- assisting the Indonesian staff in computer use if needed;
- assessing the appropriateness of available data to meet accounting needs, for both national and regional data;
- with the I/O staff, assessing the appropriateness of available data to meet I/O needs;
- contributing to decisions about what intermediate outputs should be produced and by whom;
- if appropriate, producing some of the intermediate outputs, particularly analytical studies;
- contributing to the final report as appropriate.

Project Associates - One or two Indonesian graduate students or recent graduates in economics

The project associates will be responsible for the day-to-day work of locating data, obtaining, them, putting them into consistent machine-readable form, and building the accounts. They will be directly responsible to the project director, especially for valuation and analytical work, but will work under the supervision of the senior associate for data-development activities when she is in Jakarta.

Specific responsibilities of the project associates will include:

- identifying, acquiring, and computerizing the data to be used in building the accounts;
- developing the information systems (in a spreadsheet or DBMS) to organize and structure the accounts;
- performing all calculations or aggregations under direction of the project director;
- document all data obtained and how all calculations are made, so that it is clear how all numbers in the accounts were derived;
- maintain weekly contact with the project director, forwarding copies of the data so they can be worked on in the United States as well as in Indonesia;
- produce intermediate outputs such as the literature review, the data directory, and statistical summaries;

- produce analytical studies as appropriate to their skills and interests;
- contribute to the final report as indicated by the project director.

Group Manager - Dr. Suparmoko

The group manager will coordinate the participation of the larger group of interested experts in the CENRA project. This group is expected to meet periodically when either the project director or the senior associate is in country, to review CENRA project, learn about how the work is being carried out, and provide data or suggestions as appropriate. The group manager will organize these meetings and serve as a liaison between the group and the rest of the CENRA team members.

Specific responsibilities of the group manager will include:

- organize group workshops about once every three months, as he and the other CENRA team members deem necessary or interesting;
- help the project associates in locating or obtaining data from the group members or from others in the GOI;
- ensure the links between the CENRA work and the EMDI-KLH work on resource accounting.

C. Institutionalization

Irrespective of where the CENRA activity is located institutionally, it is assumed that resource accounting will ultimately become a routine activity of the *Biro Pusat Statistik*, which has primary responsibility for developing statistics for the GOI. In designing this project, there was a clear tradeoff between the need to produce data quickly, for use in the upcoming 25-year planning process, and the desire to develop the skills and procedures necessary to construct a resource accounting program within the government. For the most part, this proposal places its emphasis on producing the data quickly. This may be seen in the decision to rely on a few full-time staff people outside the civil service who will build the accounts, rather than to train a group of BPS civil servants and give them responsibility for the work from the start.

This choice has been made for several reasons. First, there is a clear need to have data quickly to input into the planning process. This may be feasible if only two people who have no other responsibilities are doing the work. It probably would not be possible if a larger group of civil servants, all of whom have many other duties, are to take this on as yet an additional task.

Second, it was felt that in order to build understanding and support for comprehensive resource accounting, it was essential to distribute both intermediate and final outputs quickly, to a broad audience. With broad-based demand for accounting, it will be easier to obtain the resources (particularly skilled staff) needed to build a routine accounting activity. Without that broad-based support, although a number of BPS statisticians might know something about how the accounts are built, they will not be given the time to use their knowledge.

This is not to say that the CENRA work will ignore the need to transfer responsibility for the work into GOI hands. Several activities will contribute to the eventual routinization of resource accounting. First, a working group composed of interested people from BPS, Bappenas, KLH, the Ministry of Finance, and other organizations will be formed, as has already been mentioned. The meetings of this group will provide an opportunity to discuss how the accounts are being built, what kinds of data are going into them, the adequacy or insufficiency of those data, the valuation techniques used, and so on. These meetings can be used to identify priorities for improvements in data collection, help search for specific kinds of information, and identify user interests for the intermediate products. They will help BPS staff to understand what resource account involves, so they can work out how they will eventually assume responsibility for it.

The establishment of resource accounting within the GOI will be furthered if the two Indonesian project associates are associated with BPS from the start, even if the primary data user is initially Bappenas. This would involve identifying the division of BPS which expects to take on this activity, and giving that group some additional responsibility for monitoring the associates' work, so they develop a sound understanding of what is involved. Even if the associates do not sit in the BPS office, this affiliation may establish a greater sense of ownership than would occur through workshops alone.

The project reports, both intermediate and final, will play an important part in institutionalizing the accounting work. By publishing directories of data sources and studies, the team will be leaving a record which will be invaluable for people carrying out future iterations of the accounts. Moreover, the project associates will be required to document everything they do in processing or aggregating the data. This paper trail, which will not be published but will be available to anyone who needs it, will serve as a guide to future generations of resource accountants. In addition, the final report of the two-year project will assess the appropriate next steps in institutionalizing the accounting work. There should not be total staff turnover from the first iteration of the accounts to the subsequent ones. Rather, the need for expatriate technical assistance should drop, and the CENRA project associates should be able to work with BPS civil servants in developing future accounts.

This is not an activity which calls for formal training, by and large. Although some training in valuation techniques may be useful, most of the work of building the accounts requires only limited theoretical knowledge. Rather, it involves knowing how to work with statistical data and computers, and figuring out how to make do when data are not available to apply textbook rules. This is better learned by actually building a set of accounts than by studying it in a classroom. For this reason, even when emphasis <u>is</u> placed more heavily on building routine accounting processes, it is likely to involve very little in the way of formal training.

I. BUDGET

The estimated budget for this activity is around US$370,000 over the two year period.

NRM/ARD CONSULTANCY REPORTS

NO.	TITLE	AUTHOR
1.	Procurement Plan For Research Equipment at Bukit Baka and Equipment Installation at Samarinda Forestry Research Station	Roy Voss
2.	Agroforestry in Bukit Baka/ Bukit Raya	W.G. Granert
3.	Pengukuran dan Pemetaan Topografi Sebagian Daerah Taman Nasional Bukit Baka/Bukit Raya	Sahri Denny, cs
4.	Applied Research Recommendations for Production Forest Management An Economic and Ecological Review of the Indonesian Selective Cutting and Replanting System (TPTI) *	Lisa Curran & Monica Kusneti
5.	Balancing Forest and Marine Conservation with Local Livelihoods in Kalimantan and North Sulawesi	Jill M. Belsky

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