MICRO IMPACTS OF MACROECONOMIC ADJUSTMENT POLICIES IN THE NATURAL RESOURCES AND ENVIRONMENT SECTOR

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I. INTRODUCTION

A. *Overview*

The Micro Impacts of Macroeconomic Adjustment Policies (MIMAP) is a project that grew out of the concern that policies drawn to correct serious imbalances in aggregate demand and supply may have some unanticipated welfare impact at the household level. Negative welfare effects of economic policies should make policy makers anticipate the nature and magnitude of these effects so that corrective measures are appropriately designed. It is in these cases that MIMAP studies are conducted.

Adjustment policies are either stabilization or structural. Stabilization policies aim to reduce expenditures to correct external accounts imbalances; structural policies seek to accelerate economic growth and reduce imbalances. Stabilization meas ures such as reduced government purchases, increased taxes and trade barriers like export taxes serve as contractionary measures that deflate the income level. These are short-term solutions to the problem, but their adverse effect on income may harm certain sectors of the economy. It may even impede the country's devel opment efforts. Decreased level of aggregate demand, for example, could mean increased unemployment and, consequently, lower income levels.

Structural measures, on the other hand, are viewed as long-term solutions to external and internal imbalances. They correct imbalances via increased sufficiency and efficiency of investment at a level supportive of sustained economic growth.

Stabilization measures may run in conflict with structural adjustment programs. An effective stabilization measure such as reduced government expenditure on capital items like roads and communication networks undermines structural adjustment measures such as increased money

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supply. The result may be an immediate relief in fiscal deficit but a slowing down of economic growth.

How microeconomic units, represented by poor households, are affected by adjustment policies did not receive much considera tion in the past. Adjustment policies were evaluated more on the basis of how they alter the value of certain macroeconomic per formance indicators such as the balance of payment deficits, fiscal deficits, and rate of inflation. Hardly did studies go into analyzing how the changes in these macroeconomic variables translate into changes in the welfare level of those making up the bigger portion of society. This tendency may have been justi fied since economic adjustment measures were aimed primarily at attaining certain targets of economic performance at the macro level, and not toward directly achieving certain changes in the welfare levels.

With the growing anthropological orientation of most development policies and programs, however, measuring the impact of adjust ment policies in terms of changes in welfare indicators became a practice. In particular, the welfare impact on the economically disadvantaged members of society gained considerable importance in recent years. As earlier stated, knowledge of the nature and magnitude of the welfare effects of adjustment policies is neces sary if corrective measures to mitigate negative impacts have to be designed, when certain macroeconomic adjustment policies may indeed be required to solve problems in the economy.

Yet, analyzing the nature and extent of this linkage between macroeconomic policies and the welfare of microeconomic units remains a gray area in economic research. The level of study done on this issue has been limited to qualitative or conceptual discussions. Empirical studies that establish this linkage are not readily available.

Given the scant attention MIMAP studies received in the past, this research project, therefore, attempted to pursue the follow ing specific objectives (Lamberte et al. 1990):

a. To provide a framework for analyzing the impact of macroeco nomic adjustment policies at the micro level, i.e., the house hold units.

b. To describe and analyze the current state of macroeconomic policies and their impact on the economy.

c. To review sectoral studies that may provide insights into the factors that facilitate understanding of the impact of macroeco nomic adjustment policies on households.

d. To assess the availability of data needed to monitor the impact of macroeconomic policy at the household level.

e. To suggest areas for future research.

These objectives were applied to the following key sectors of the economy, which also defined the different study areas of the MIMAP project: agriculture, natural resources and environment, health, manufacturing and small-scale industries, and electrici ty. The gender issues relevant to MIMAP and the monitoring aspect in undertaking the MIMAP were also considered as separate sectors in the project. The study then conducted an exhaustive review of literature to identify specific research gaps within the MIMAP concerns and to find out how past studies

handled measurement issues on welfare effects of government policies and programs. The study also pinpointed important conceptual issues in analyzing MIMAP researches.

Understanding the linkages between macroeconomic adjustment policies and the households' welfare in the different identified sectors and issues will hopefully help firm up a workable MIMAP framework and point out possible research areas that can yield empirical data on the welfare impact of macroeconomic adjustment policies.

B. *MIMAP in the NRES*

Awareness of the rapid deterioration of the world's ecosystem and its negative consequences brought about a global concern for a healthy environment and a stable natural resource base. Conscious effort is now being exerted to incorporate this concern into the mainstream of policymaking.

An emerging area of interest in policymaking is the link between macroeconomic policies and the rate of resource depletion or degradation. This concern was first raised by the World Conser vation Strategy (WCS) in 1980. The WCS forwarded the concept of sustainable development. This concept recognizes the interdepend ence between economics and development, and the need to insure the welfare of future generations through an effective environ mental cum economic planning (IUCN/UNEP/WWF 1991).

The Philippines began to adopt an environment-conscious perspec tive in policymaking in the mid-1980s when it adopted the Philip pine Strategy for Sustainable Development (PSSD) as a national program. Concern for the country's natural resources and envi ronment (NRE) then became an explicit mandate of the government.

However, environmentalism is still a relatively new concern in the Philippines. The country has yet to fully work out how to operationalize this concern for the environment in its mix of fiscal expenditures and even in the choice of policy mix. How the various government policies impact on the country's NRE is a neglected area of policy- making, even in the recent past. The link between resource depletion and welfare levels has neither been addressed.

Yet, analyzing the link between adjustment policies and the welfare of households is precisely important in the natural resource sector, because of the country's heavy economic depend ence on these natural resources. A large segment of the popula tion also depend, directly or indirectly, on the available natural resources for subsistence and livelihood. Any economic policy that alters the rate of resource utilization will then impinge upon the welfare levels of the households that are eco nomically dependent on these resources. But evidences regarding the nature and magnitude of these influences are not readily available. Thus, a literature review to determine the existence of these evidences became a major concern of the study.

For the natural resource and environment sector (NRES), the following served as MIMAP's set of objectives:

a. To adapt the MIMAP framework to the NRES, bearing in mind the sector's unique characteristics.

b. To review a set of macroeconomic policies and major develop ments in the sector that significantly alter the rate of resource depletion and replenishment.

c. To examine the developments of the different economic reforms in the major natural resource sub-sectors.

d. To identify how the rate of resource depletion and degradation was influenced by major macro and sectoral economic policies during the 1970-90 period and to identify the corresponding determinants.

e. To assess the country's stock of remaining natural resources and to review patterns of resource depletion or degradation and their determinants.

f. To relate resource depletion with welfare indicators and identify impact variables used in past studies.

g. To develop a research proposal that will address the major gaps constraining further MIMAP studies in the NRES.

C. *Conceptual Framework*

The framework used in analyzing the micro impact of macroeconomic adjustment policies in the NRES was derived from a literature review and regression analysis, based on available data (Figure 1).

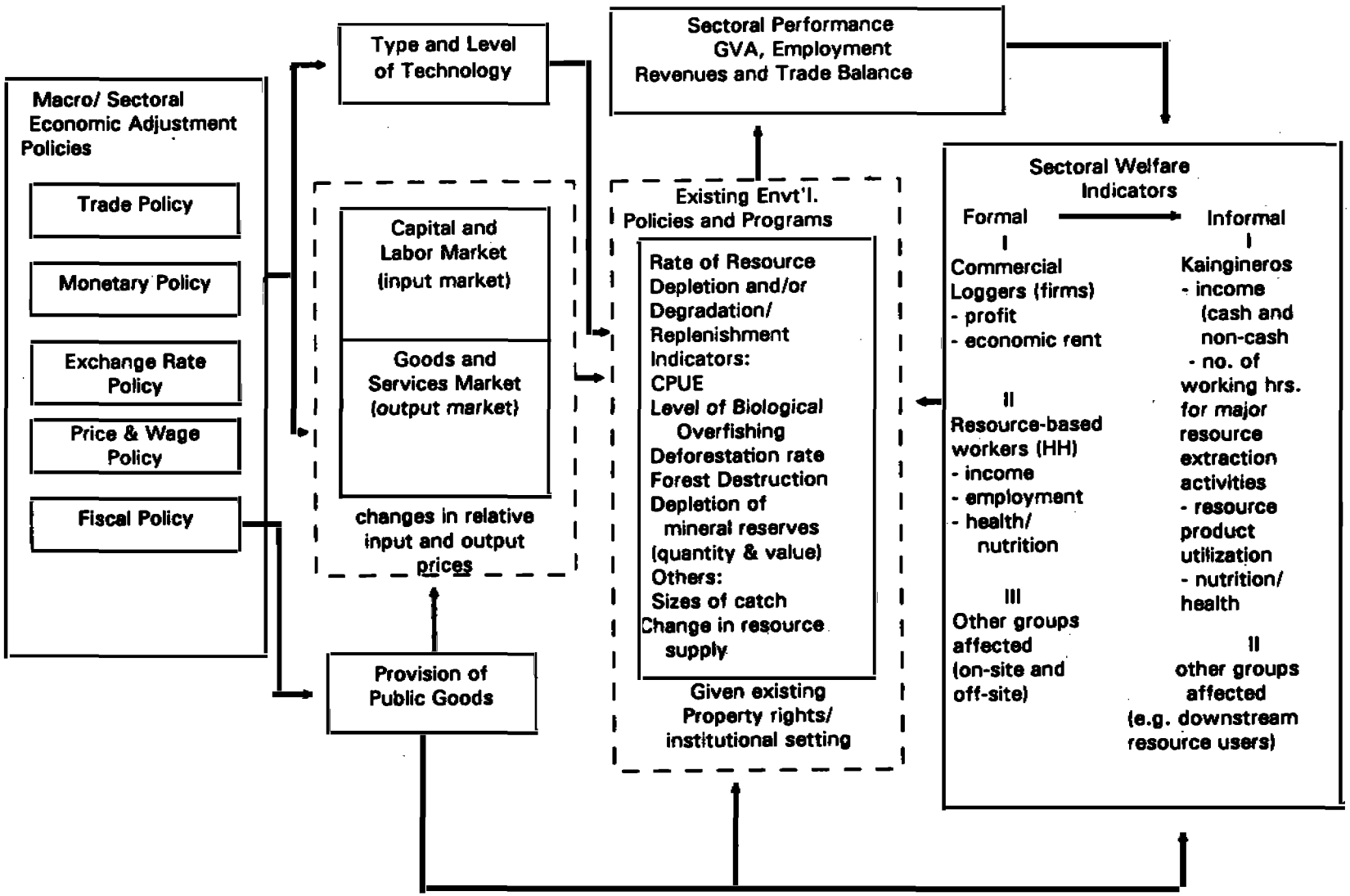
Sectoral policy influences on rate of resource depletion. Any given macro or sectoral adjustment policy may increase the rate of resource depletion or accelerate resource replenishment, if it changes the relative prices of inputs and outputs. In general, policies that increase the price of natural resource commodities raise the economic rent from the extraction activity, assuming no significant change in the cost structure of the resource user occurs. Trade restrictions, imposed on competing imported commod ities, to assist domestic producers may bolster higher output prices. Import restrictions create excess demand for local products, which may result in a demand-push inflation, provided their supply remains the same.

Increase in real prices of outputs may also result from a domes tic currency devaluation which makes imported products expensive, compared with locally produced products. An increased demand also occurs in the export market, due to the undervaluation of the domestic currency. The higher price of outputs tends to increase the profitability of resource extraction, thereby making it an attractive enterprise. Rate of depletion is necessarily hastened.

Excessive exploitation of natural resources may be physical or biological in nature, or an economic one. Biological overexploitation refers to the physical change in resource stocks result ing from the natural processes of change (i.e., growth and death) and from harvesting or extraction by man. A resource stock is said to be biologically overexploited if the rate of resource harvesting exceeds the resource's rate of renewal. Economic measures of depletion, on the other hand, consider the cost and returns of resource extraction. When costs of resource extrac tion exceed the returns, then a resource stock is economically overexploited. Given a favorable set of prices, physical resource depletion may happen before economic depletion. For a resource such as fisheries, however, economic overfishing can occur before biological overfishing.

Figure 1

FRAMEWORK FOR ANALYSIS OF MACROECONOMIC ADJUSTMENT POLICIES IN THE NRES



Favorable output prices may provide incentives for higher rate of resource replenishment. This can come about if the prevailing property rights structure sufficiently guarantees existing users that they can reap the fruits of the conservation or replenish ment (e.g., reforestation) efforts they may undertake. Resource users must also have the assurance that current favorable prices will remain until sometime in the future, to guarantee favorable returns to whatever efforts they do to replenish the stock of natural resources.

However, this security of tenure remains shaky at best since it may be granted only on a limited basis. This is because most of the country's natural resources are publicly owned, as they should rightfully be, to protect the interest of future generations. A constant risk also accompanies future returns from the resource. What you have on hand is sure and certain, over that which you expect to gain in the future. In general, therefore, favorable prices most likely hasten resource depletion more than they provide incentives for replenishment activities.

If input prices increase with other things remaining constant, the extraction rate will expectedly slow down. A limited capi talization available for resource extraction and a high produc tion cost will constrain extraction activities. In contrast, any policy directive that cuts production costs or allows easy access to capital through lower rate of interest will contribute to faster depletion of natural resources. An expansionary monetary policy has this effect on resource utilization via the change in the interest rate. On the other hand, trade controls, which raise the cost of capital, will likely decrease the rate of resource depletion. Recent government efforts to account for the true cost to society of resource depletion took the form of increased charges and fees imposed on a given unit of resource extracted. This pricing reform seeks to attain a socially optimal rate of extraction below the current rate.

Macroadjustment policy influences outside the NRES. The preced ing section showed how the rate of depletion or replenishment of natural resources responds to certain macroeconomic adjustment policies at work in the sector itself, especially when resource products are tradables. In most developing countries, the NRES dominates the export structure either directly through minerals, timber, petroleum, or fish; or indirectly through the export of agricultural crops which depends upon the wise use of land and water resources (Bromley,n.d.). This makes the resource sector very vulnerable to adjustment policies aimed at correcting trade deficit levels.

Adjustment policies may also consist of measures to accelerate economic growth, alongside other provisions to reduce expenditure levels. Increased government expenditures for public goods such as roads and other infrastructure facilities seek to enhance the efficiency of resource-based economic activities. Their ultimate impact, however, appears in the changes in prices of output and inputs. In particular, the provision of public goods causes cost of extraction to decline. For households who are not closely linked to input and output markets, giving them access to public goods also provides them access to natural resources. For both household and commercial resource users, a higher rate of resource use will expectedly take place.

The policy bias of the government also influences the type and level of technology adopted by resource-based industries. A government supporting industrialization of local industries may adopt policies that make modern technologies available to these industries at low cost. Since many industries use natural resources as inputs to their production activities, industrialization will tend to deplete resources faster, if no measures to promote proper and efficient use of these

resources are in place. In the same manner, the government may prohibit the importation of all types of technical inputs, to remove trade deficit and increase local employment. For many firms who are not flexible enough to change production activity, this policy may force them to adopt traditional or indigenous technologies, which are condu cive to resource conservation. Hence, extraction will likely slow down.

Indicators for changes in resource use levels. Several indicators assess changes in the level of resource utilization. The most significant of these are: a) the rate of deforestation (measured as the proportion of productive forest cover removed every year) or forest destruction (referring to that portion of forest land area converted to other land uses) in the forestry sub-sector; b) level of biological or economic overfishing (estimated by comparing current fishing levels with maximum sustainable yield and maximum economic yield, respectively), or catch per unit effort in the fishery sub-sector; and c) rate of depletion of mineral deposits relative to existing stock of these non-renewable resources. When these quantitative measures of resource depletion are not available, other measures of scar city are used such as size of catch of selected fish species, time spent for fuelwood collection per one week of fuelwood requirements or quantity of fuelwood collected at a specified period of time (considering size of household and livestock that also depend on fuelwood as energy source).

Factors in assessing resource depletion rates. The government's conservation projects and policies also affect the rate of resource utilization. Positive changes in resource stock may result from some government projects and from certain policy initiatives such as changes in the property rights structure governing resource use. Some government projects that improve the resource base include reforestation activities, installing artificial reefs, and declaring certain areas under the protected category. These measures are being undertaken to delay rate of resource depletion or hasten rate of resource regeneration. The extent to which these measures influence the level of resource stocks must form part of assessing how economic policies influence the status of the country's NRE. Failure to include these initiatives will give an improper measurement of the rate of resource depletion attributable to the policy change under consideration.

Attributing policy impact also requires considering the fact that, at any given time, several economic policies are at work, some having differing influences on the rate of resource depletion than others. The nature and likely magnitude of the impact on resource depletion of these different economic policies thus constitute a major area of analysis in the MIMAP study.

The extent to which these different economic policies influence the extraction rate of natural resources also depends on the prevailing structure of property rights over these natural re sources. Under conditions of open access, any increase in output prices or reduction in input prices may lead to faster rate of depletion. While the same nature of impact may be expected, whether the resource is a private or common property, the rate of extraction may be slower under property rights arrangements, than when access to these resources is open to everyone. A MIMAP study must then factor in the prevailing structure of rights to understand better the nature of impact on resource depletion of any economic policy.

Measuring the NRES' impact on GNP and households. So far, we have established how the rate of depletion or utilization of natural resources may change due to macroeconomic adjustment policies. But the overall indicator of impact may be seen in terms of level of output generated by

the NRES (as measured by the sector's contribution to Gross National Product or GNP), sectoral employment, and the sector's contribution to export and government's revenues. However, the MIMAP framework goes beyond assessing the impacts of adjustment policies on the basis of sector-level variables. Instead, it raises the question of whether these sector-specific impacts are translated into some improvements or deterioration in the level of welfare of the community or society dependent on the NRES.

Welfare impacts of macroeconomic adjustment policies is an important area of study in the light of the growing concern for the development of man over such aggregate economic concerns as GNP, employment, inflation, and trade deficits. Many experts now recognize that while aggregate economic indicators may show growth, this may not necessarily mean that the quality of life of man has improved or that the economic life of those who belong to the poorest of the poor has changed for the better. A very legitimate question to ask, therefore, is what extent has the welfare of the greater majority of resource-dependent households been changed by the various economic adjustment policies.

The ultimate challenge lies in capturing selected key indicators of welfare change for the different types of resource users. Resource users may be generally classified into formal or commer cial group and the informal or largely subsistence group. The difference between these two types is based largely on the market orientation of the extraction activity. If extraction is done to generate resource commodities for sale or for the market, then the resource users are classified as belonging to the formal or commercial sector. If resource extraction is primarily for household consumption, with a small portion brought to the mar ket, then these households are considered to belong to the sub sistence category.

The need to distinguish these types of resource users became necessary because of the hypothesized differing impact of macr oeconomic policies on the type of resource users. Policies that directly alter relative prices of inputs and outputs may bring about a greater impact on the formal sector, this being closely linked to the market. In contrast, a greater welfare impact on the subsistence households is expected through fiscal measures that provide public goods, credit, and subsidies to the small, marginal resource users. These need to be verified through the conduct of a thorough MIMAP study in the NRES, guided by the proposed framework of analysis.

II. DEVELOPMENT OF ENVIRONMENTAL CONCERNS AND MACRO AND SECTORAL ECONOMIC POLICIES IN THE PHILIPPINE NRES

A. *Introduction*

The 1980s earned the name, Decade of the Environment, because it was during this period that the concern for the environment gained universal recognition. This concern surfaced as a result not only of the many environment-related disasters already experienced by man, but also of the looming dangers of what would happen if people do not slow down the pace with which they ex ploit the NRES. A strong commitment by developed economies for greater environmental protection in developing countries like the Philippines also emerged in the 1980s, through the funding of major environmental programs such as the Philippine Rainfed Resources Development Project (RRDP), the Natural Resources Management Project (NRMP), the Natural Resource Accounting Project (NRAP), and the Fisheries Sectoral Program (FSP). These interests and com-

mitments by the world's economic and political powers recognize the seriousness of the problem and the need for coordinated activities by all countries since we are all part of the same environment -- the earth.

Past studies indicated that the value one attaches to environmental amenity is a function of one's income. As the country progresses economically, gauged from increasing per capita income of its people, the citizens' willingness to pay for services to preserve the environment also increases. In contrast, people who have low per capita income can hardly spare some amount for these services and would not be willing to spend as much as those from affluent societies. This tendency partly explains the strong dependence of developing countries on wealthier economies for efforts to protect the environment and the natural resource base.

The Philippine government is among many nations who profess strong commitment to a safe environment. While it may be said that some of our policymakers in the early days already recog nized the need to develop a strong environment protection pro gram, this sentiment was probably not shared by many as implied in the absence of explicit environmental policies prior to the 1970s. The 1970s' policies may also be characterized as still fragmented or sector-specific. A comprehensive national program on developing and conserving the country's NRE did not exist, partly explaining the poor implementation of environmental pro grams at that time.

This somehow changed in the 1980s, with the rise of environmentalism worldwide. The period saw a substantial inflow of foreign funds to support NRE programs such as the reforestation projects and the Integrated Social Forestry Program (ISFP). A more detailed account of the integration of environmental concerns in the national program is discussed in the next section.

B. *Integrating Environmental Concerns in National Development Planning*

The development of environmental concerns in the country's devel opment plan can be analyzed in three stages: the Martial rule stage of 1974-1982, the pre-Aquino years of 1983-87, and the period under the Aquino administration in 1987-1990 (Table 1). Table 2 summarizes the specific years when significant develop ments in the NRES took place.

The concern for the environment became integrated in the National Program in the mid-1970s, during the Martial Law era. This development was partly triggered by the series of calamities that hit the Philippines in the early 1970s (i.e., the floods in Luzon and the drought in Mindanao in the mid-1970s). Realizing that these disasters were somehow related to the alarming depletion of forest resources, the government passed a series of sectoral codes in the forestry, fishery, and mining sub-sectors: The Forestry Reform Code was promulgated in 1975, with the explicit goals of promoting high value added production of forest products through the development of the wood processing industry and the conservation of forest resources. The Fisheries Act and the Mineral Resources Development Decree were passed in 1974, which set out rules governing the extraction of fisheries and mineral resources, respectively. The water code was subsequently enacted in 1976.

These codes, however, were designed mainly to govern extraction activities in the different sub-sectors of the NRES. Conserva tion received less emphasis due to the country's high demand

Table 1. Comparison of Past and Present Administrations' Policies.

Martial Law Era (1974 up to the early 80's)	Pre-Aquino Administration (Medium Term Development Plan Period, 1983-1987)
A. Objectives:	A. Objectives:
1. Rationalization of the Natural Resource Sector.	1. Coordinated development for efficient and judicious utilization of natural resources to balance present and future requirements.
2. Development of comprehensive plans to address the environmental problems of the country.	2. Efficient management and increased productivity through the use of appropriate technology, stricter implementation of policies, and incorporation of environmental considerations into project planning.
	3. Institutional involvement to promote a conducive climate for the efficient and equitable sharing of natural resources development and utilization among Filipinos.

AQUINO ADMINISTRATION (1986-1989)

(Medium Term Development Plan Period, 1987 - 1992)*	Philippine Strategy for Sustainable Development (1989, draft)
A. Objectives:	A. Objectives:
1. Promote the efficient and judicious use of natural resources.	1. Resource rehabilitation
2. Ensure the sustainable productive capacity of natural resources.	2. Resource recovery (recycling of materials/energy in various forms)
3. Expand the implementation of community-based management of natural resources and conservation.	3. Pollution control (setting of air, water, land quality targets and the instruments institutions, to achieve the same).
4. Achieve a more equitable sharing of the benefits derived from the development and utilization of resources.	4. Water reduction (adopting low and non-waste technology.
5. Increase the sector's contribution to the national efforts directed towards poverty alleviation and enchanced welfare of small farmers and landless workers.	
6. Promote and maintain ecological balance.	

B. General Strategies

1. Formulation of Forestry Reform Code to promote high-value added production of forest resources through the rationalization of wood processing industry and to promote the conservation of forest resources

2. Formulation of Fisheries Act of 1974 to rationalise and codify existing existing fishery laws into a single act.

3. Formulation of Mineral Resources Development Decree that governed mineral resource extraction activities

4. Creation of National Environmental Protection Council (NEPC) to oversee the overall environmental planning in the Philippines

5. Bring a concerted effort towards the protection of the environment through a requirement of environmental impact assessments and statements as codified in the Philippine Environmental Policy

6. Setting of environmental quailty standards as codified is the Philippine Environmental Code.

7. Incorporation of the environmental concern at the project level through the requirement of submitting Environmental Impact Statements from projects that will be carried out in environmentally critical

B. General Strategies

1. Development approach in the management of natural resources.

2. Use of a system of fiscal and administrative tools, such as privilege fees, near rate charges and taxes, as

exploitation incentive, encourage domestic processing, effect conservation and proper utilization of resource to reflect their scarcity value and cost of development and delivery, and penalize inefficient utilization patterns.

3. Continuous assessment and updates of mass-oriented programs.

4. Consistency and linkages with other sectoral priorities.

5. Appropriateness and complementarity of technologies as to area-specific levels of efficiency and applicability.

6. Encourage participation of the private sector.

B.

Modified from Delos Angeles and Lasmarias (1990)

General Strategies

1. Sustainable development of the ecologically critical uplands.

2. Protection of the remaining natural forests.

3. Rehabilitation of demanded and marginal areas.

4. Determination and management of optimal land uses.

5. Intensification of mineral exploration and development including offshore areas.

6. Expansion of the Integrated Social Forestry Program.

7. Establishment of community-based forestry.

8. Survey, allocation and disposition of alienable or disposable (A & D) lands for the Comprehensive Agrarian Reform Program (CARP).

9. Rehabilitation in the disposition of public lands.

10. Delineation and management of people's mining areas.

B. General Strategies

1. Integration of economic and environment consideration in in decision-making.

2. Proper resource pricing.

3. Property rights reform.

4. Development of IPAJ

5. Residual management (pollution control)

6. Environmental education

7. Strengthening of citizens' participation

Table 2. History of the Environmental Concern in the Philippines

1974-75	- Forestry Occupants Management Program (FOM) - Fishery Decree - Forestry Reform Code - Mineral Resources Development Decree - Decree on control and prevention of marine pollution	Environmental concern largely at the sectoral level
1976	- Water Code enacted	
1977	- Environment Code and Philippine Environmental Policy enacted to have a comprehensive program for environmental protection and management - NEPC created to oversee overall environmental planning	Development of comprehensive plans to address the environmental problems of the country
1978	- Establishing EIS on identified environmentally critical areas	
1982	- FAR, FOM, CTF consolidated into one program called ISFP	
1983	- Philippine Development Plan incorporates the Integrated Area Development (IAD) approach. Equity and sustainability emerge as explicit concerns for national planning	Formal infusion of the environmental concern into the mainstream of development planning
1987-89	- Philippine Strategy for Sustainable Development - Philippine Development Plan identifies community based resource management and poverty alleviation schemes as instruments for environmental protection and management	

for foreign exchange which, in the short run, could have suffered if stronger environmental and resource conservation programs were pursued.

The change in the country's political structure in the 1970s also brought attention to the NRES in the 1970s. Sajise and Ruscoe (1991) noted that the change in the structure of the political system eventually led to a change in the vision of the governing power, which considered the environment as a separate sector within the Philippine macrosystem. This, in turn, could be due to the positive development of the environmental sector in the United States, triggered by the establishment of the Environment Protection Agency (EPA) at about the same time that the Marcos administration explicitly recognized the same concern in the country. This political move, together with the advent of natural disasters in the early 1970s, were identified as responsible for the increased attention given to the environment during the Martial Law era.

The passage of the Philippine Environmental Code (PEC) and Policy (PEP) in 1977 facilitated the incorporation of environmental policy at the macro level planning. These two laws outlined a comprehensive environmental plan for the Philippines, defining the management of all the natural systems of the country, in contrast to the sectoral focus in earlier years. The laws' provisions took into account the cross-sectoral linkages within the ecosystem. They also acknowledged that a meaningful manage ment of the NRE could be achieved only through integrative and holistic planning.

Institutional support was created to implement the PEP and PEC. The National Environmental Protection Council (NEPC) was created in 1976 to oversee the overall environmental planning in the Philippines. The Environmental Impact Statement (EIS) had to accompany development projects to ensure that critical areas are protected. When strictly followed, the EIS ensures that projects with huge environmental costs will not be carried out.

The holistic approach to environmental advocacy took shape through the Integrated Area Development Approach (IAD). Several pilot projects using this new approach of managing natural re sources at the community level began to function. In principle, a community governed by the IAD approach should develop ways of managing its resources in a manner that is compatible with envi ronmental protection.

The IAD approach became the major characteristic that distinguished environmental development during the pre-Aquino Administration period (1983- 1987). The 1983-87 Philippine Development Plan included the application of this approach in the different regions of the country. This strong influence at the macro level planning served as a landmark in promoting environmental concern. Aside from adopting the IAD approach, the Plan also identified sustainability as an essential parameter in development, as opposed to mere growth and equity. The Plan, therefore, explicitly recognized the importance of protecting and conserving the environment as an indispensable ingredient of true develop ment. Sustainability, in the context of the Plan, refers to the efficient and judicious use of natural resources to reconcile the needs of present and future generations. The adoption of appro priate technology and a system of fiscal and administrative tools (fees, taxes, set of incentives, etc.) in effecting sustainable resource use served as a general strategy for achieving greater environmental protection.

Under the Aquino Administration, the Philippine Development Plan continued to promote the concerns for the environment already set in earlier years. To achieve sustainable development, the Plan defined specific approaches and strategies to address the problem of environmental degradation and the depletion of natural resources. The reliance on community-based resource management schemes (CBRMs) is a strong feature of the present plan. The approach solicits greater degree of community participation in environmental management. It exemplifies the new development strategy of the country, forwarding the "bottom-up" style of development planning. The identified concerns included the imme diate rehabilitation of degraded and marginal lands, protection of remaining natural renewable resources, determination of optimal land uses, expansion of the areas under the ISFP, and the implementation of the different community-based resource manage ment projects.

In 1989, concern for the NRE became concretized through a system of strategies and reforms embodied in the 1989 PSSD. The PSSD provided an action-oriented plan which, unlike the previous plans, outlined in specific terms the actions needed to insure sustainability of the country's development. The major objec tives identified in the PSSD include that of rehabilitating resources, recycling materials to enhance resource recovery, developing and adopting more stringent pollution control measures, and reducing waste through appropriate technologies. The major strategy categories included proper resource pricing, property rights reforms, environmental education, greater community participation, and stronger residual management measures (Table 1).

C. *Macroeconomic Policies and the NRES*

The advent of environmentalism in the Philippines highlighted the need to recognize the probable impacts of human activities on the environment. Growth is now seen as a necessary condition for development, and the improvement of the environment as a sufficient condition for development. Evaluating development projects for possible negative consequences on the resource base became an accepted evaluation standard, at least in principle as there is still much to be done to operationalize this concept. This perspective also led to policies being looked at, not only in terms of the specific objectives for which they were set, but also in the context of their overall impact on the resource conservation schemes of the country and, eventually, on their impact on society's welfare.

Analyzing the possible impacts of economy-wide policies or macr oeconomic policies on the environment and resource extraction rates is still a new field of study. At the outset, one can say that such an analysis is not an easy one. To dissociate the impact of specific economic policies when several are at work at any given time, some even having opposite impacts on resource depletion, entails immense difficulty. Thus, most analyses on the subject remained only at the conceptual level. Yet, it is still worth investigating how such an analysis may be done through an empirical study.

To better understand how a set of macroeconomic policies can influence the NRES, it might be important to look at the role occupied by this sector in the economy. From an economic standpoint, the NRES is the source of livelihood to the majority of the country's populace and a major dollar earner. A government with a vast wealth of natural resources tend to rely heavily on ex-

ports of resource products, both in raw and processed form. Unfortunately, a heavier reliance on exports of raw products predominates, which works to the exporting country's disadvantage since most of these products are from depletable and degradable natural resource systems. While resource products have been consistently among the top ten export earners of the country, their marginal contribution over time have been declining. This signals a growing scarcity of the country's natural resource wealth.

The production characteristics of most firms engaged in extracting and processing natural resources also deserves consideration. Since most firms are adopting capital intensive production systems, government policies that influence prices of capital and the ease with which this may be accessed will have substantial impact on natural resource extraction. Use of modern facilities enables faster and more profitable business operations, which also encourages faster depletion of natural resources. Hence, policies that promote exports and greater capital intensity of production are immediately identified as having a depleting effect on the resource sector (Table 3).

Economic policies that contribute to greater capital intensity of extraction and export of natural resource commodities include devaluation policies, trade policies, and investment incentive policies. This section will focus on mapping out the history of these policies and the factors that led to their formulation. These will be useful in providing a background for subsequent analysis in the study.

Tables 4 and 5 show the chronology of the economic and political events that led to the macroeconomic adjustment policies imple mented from 1970 to 1990. The Philippines has been consistently affected by both internal and external economic shocks. External economic problems were either in the form of a balance of payment (BOP) crisis or an oil price hike. From 1970 to 1987, two major BOP crisis (1970 and 1983) and two oil price hikes (1974 and 1979) hit the country. To deal with these problems, the govern ment responded by immediately devaluating the peso; six devalua tions occurred from 1970 to 1987. While most of these devalua tions served as short-term solutions to exogeneously created problems, the 1981 devaluation became more of a strategy to resuscitate Philippine exports in the light of the world reces sion that took place in that period.

Investment incentives became common policy initiatives during periods of external shocks. As seen from Table 5, the devaluation in 1973, 1979, 1981, and 1983 were accompanied by Investment Incentive Codes. These codes defined the incentives extended to industries classified as pioneer industries by the Board of Investment (BOI). Most primary resource extraction industries fall under this category. A major incentive provided tax breaks of as high as 100 percent for capital imports designed to encour age use of capital in the resource-based industries. This provi sion, however, was replaced by the Investment Incentive Act of 1983 (BP 391), which offered import tax exemptions only on capital purchased by pioneer and non-pioneer exporting industries. BP 391 also provided performance-based incentives in the form of tax credits for net value earnings and use of local materials as inputs to production (Manasan 1990). Executive Order 226 issued in 1987 subsequently took over BP 391. This executive order retained much of the provisions of pre-1983 investment codes, under the rationale that they were needed to make the Philip pines more competitive with its Asian neighbors. EO 226 also reverted to the use of tax breaks to reduce capital cost, thus introducing distortions in capital prices that resulted in sub-optimal al-

Table 3. Hypothetical Impacts of Macroeconomic and Sectoral Policies on Resource Depletion

Resource Depleting Policies	*Resource Conserving Policies*
A. Macroeconomic Policies	
-Investment incentives, if they promote a capital intensive mode of production.	-Export duties because it increases the cost of resource extraction.
-Export incentives because they induce additional demand for resource products and promote a capital intensive mode of production.	-Import taxes because they make capital/intermediate inputs expensive.
-Devaluation because they cheapen world market prices of resource products, thus generating additional foreign demand for resource products.	
B. Sectoral Policies	
-Production assistance because it subsidizes resource extraction activities.	-Harvest fees and charges (resource pricing policies) because they increase the cost of resource extraction. -Harvest bans/effort controls such as log bans. -Export bans.

Table 4. Economic, Political and Natural Events

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
A. Economic Instabilities																		
a. BOP crisis	x													x				
b. Oil price hike					x					x								
c. Financial crisis												x						
d. Capital flight															x			
e. Trade surplus				x														
f. World recession					x							x						
B. Political,Economic Events																		
a. Martial rule		x																
b. GATT membership											x							
c. WB membership											x							
d. EDSA revolution																		x
e. Aquino government																		x
------calamities ------																		
strike RP																		

Table 5. History of Macroeconomic Policies with Impacts on the NREs

Sector	Year 1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Macroeconomic policies that affect the NREs																	
Devaluation	x			x	x					x		x		x			
Export taxes					x							x			x		
Export incen	x															x	
Investment Incentives				x						x		x					

locations of production inputs. Manasan (1990), citing her earlier works in 1986, showed that the EO 226 provisions brought down the user cost of capital more than that of BP 391. She showed that the user cost of capital decreased from 7.8 percent to 23.7 percent under BP 391, while EO 226 reduced the cost from 26.2 percent to 35.5 percent.

Along with investment incentive policies, drawn to promote competitiveness of Philippine products, another set of policies provided incentives for exports. The Export Incentives Act of 1970 responded to the adverse economic conditions prevailing in the early 1970s: the stagnation of exports, mounting foreign debt, and low investments (Alburo and Shepherd 1985). This economic climate was attributed to the expansionary policies adopted in the previous years, which sought to correct the excessive election spending during the late 1960s (Intal and Power 1989).

The pre-1983 incentive packages gave tax exemptions for imports of export-oriented industries. The provisions of the Act legislated incentives for non-traditional exports of goods and services (Alburo and Shepherd 1985). This bias led to further stagna tion of traditional exports (agriculture and mining) in favor of the growth of non-traditional exports, which were mostly manufac tured goods. The growth from the non-traditional export sector, however, came about only in 1974.

Another set of trade policies affecting the NRES are export taxes. These taxes serve as disincentives toward selected export items to promote a certain desired composition of exports. The export tax is essentially an *ad valorem* tax levied on the gross freight on board value of certain exports (Manasan 1990). The first export tax was levied in 1974 under RA 6125; another was imposed in 1984. These taxes aimed at stabilizing prices, gener ating government revenue, encouraging processing of raw materials, and protecting local industries. The 1974 tax sought to capture the windfall profits export firms experienced during the 1973 trade boom. It came at an inopportune time, however, be cause of the oil price-shock in that same year, which negated the windfall profits realized. Just like the incentives and export promotion acts, export taxes created a certain bias in the real location of resources resulting in a sub-optimal level of re source use.

Export promotion, along with export taxes, aimed to promote non-traditional exports, particularly high value added manufactured goods. This penalized the primary extractive sector engaged in the export of raw materials and gave protection to those engaged in the export of processed products. In 1986, export taxes were removed through Executive Order 26. Under this order, all export duties and taxes on all products except logs and lumber were removed. The exception for logs and lumber constituted a support for the conservation efforts in the forestry subsector. In this unique case, a macroeconomic policy was used directly to enhance conservation efforts in a natural resource sub-sector.

D. *Sectoral Economic Reforms*

Though having some influence on the production or extraction of natural resources, the macroeconomic policies outlined in the previous section sought to respond primarily to economic instabilities. Their impact on the rate of extraction, whether positive or negative, never received serious consideration in the past. The goals of conservation and wise resource utilization normal-

ly fall under the domain of the different resource sub-sectors and do not form a concern of the people responsible for the macroeconomic affairs of the country.

Although environmental concern already became a part of the mainstream development planning, the use of macroeconomic policies to achieve or at least support the sectoral goal of conser vation and sustainable use of resources was not yet a widespread practice. Based on the preceding section, only one macroeconomic policy (EO 26) explicitly took into account the sectoral goal of conservation. This shows that resource conservation and environmental protection as development goals continue being addressed at the sectoral level. This further means that the probable adverse environmental impacts of certain macroeconomic policies did not figure as major concerns of the country's policymakers.

The sectoral delineation of our natural resources may have con tributed to the difficulty of pinpointing which agency should be responsible for monitoring environmental effects associated with economy-wide economic policies. Cross-sectoral linkages of the different ecosystems also remain inadequately studied since the agencies responsible for agriculture, forestry, mining, fisheries, and related sub-sectors maintain different offices of the government. These various units concentrate on their own sub-sector and hardly bother about the impact of each sub-sector's activities on the others. Thus, hierarchical and distinct levels of decision and policymaking exist in the country.

At the sectoral level, policy alternatives to achieve the de sired level of resource use fall into three categories: a) a set of regulatory measures; b) a set of economic tools such as pric ing, use of tax, or subsidy; and c) some form of modifications in the institutional set-up governing relationship among resource users and between the government and the resource users (property rights reforms). Regulations have been the most common tool for redirecting resource use while management through incentives (e.g., pricing reforms) has had a much shorter history in public administration (Cruz and Delos Angeles 1988). Lately, local communities became increasingly involved in managing natural resources, constituting a major reform in the property rights structure governing access and management of natural resources.

The following discussions will focus on the general characteris tics of economic adjustment policies implemented at the natural resource sectoral level. These adjustments followed the classi fication of the major macroeconomic adjustments policies: pric ing, fiscal, and trade reforms. Tables 6-8 traces the development of these policies in the forestry, coastal, and mining sub-sectors.

Pricing policies. Economic reforms through pricing policies represents the most direct method of approximating the societal value of resources. For the forestry sub-sector, pricing poli cies take the form of either special deposits or regular harvest charges (Table 6). Regular forest charges such as harvest fees usually depend on the volume of forest resources harvested, while special deposits come in fixed amounts. Other charges levied on forest resource users include a real property tax on forest lands under concessions. The first set of pricing reforms in the for estry sub-sector took effect in 1970. These policies increased the forest charge for extraction from P6 to P13/cubic meters (cu m). An additional forestry research deposit was collected to generate funds for silvicultural research, which was identified as a research gap during the 1970s. These

Table 6. History of Economic Adjustments in the Forestry Sector

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1961	1982	1983	1984	1985	1986	1987
A. Forestry Sector																		
1. PRICING																		
a. Increasing amount of special deposits	x													x				x
b.Increasing regular forest charges (per M3)	x													x	x		x	
2. FISCAL																		
a. Expenditures for forest mgt. projects				x	x						x							
b. Real property taxation						x	x											
3. TRADE																		
a. Total export bans				x	x												x	x
b. Selective exportation of forest resources						x							x			x		
c. Imposition of import duties (rattan pole importation)																		

fees changed only in 1983 when the alarming rate of forest depletion and its associated ill effects caught the attention of the entire country.

However, the new forest charge of P30/cu m did not adequately capture the true cost to society of the removal of forest resources. Ideally, these costs must include the environmental cost arising from forest depletion, the scarcity value or user cost imposed on future resource users, and the normal cost of extraction. Prior to 1990, costs assumed by resource users were limited to the normal cost of business operation. In 1990, an environmental fee of P500 per cu m was imposed. Even this amount proved insufficient to cover the value of environmental damages caused by forest depletion and improper land use practices in the country's watershed.

The absence of data from which a value closer to the environmental cost may be estimated hinders current efforts to define a more adequate pricing reform in the forestry sub-sector. However, the importance of properly valuating natural and environmental resources is already gaining adherents in policymaking and in the different offices dealing with natural resources. More adequate pricing reforms thus look achievable in the near future, hopefully while the remaining natural resources are still intact.

In the fishery sub-sector, the pricing policies failed to regulate fishery exploitation. The government did not monitor the set fees which were intended primarily as a revenue-generating measure. As a result, rates set as far back as 10 years ago remain unrevised despite the inflation that took place during the period. The government's inability to employ the pricing mechanism as a tool to influence the rate of fishing activities stems from the lack of data, particularly on economic rent, which provide the basis for establishing a pricing reform in the fisheries sub-sector. An economic rent measures the profit accruing to resource users beyond what may be considered as normal profit. In a sense, this payment must accrue to the resource unit.

The first major attempt to develop a measure of economic rent in the fisheries sub-sector involved mangrove resources in 1990. Schatz (1990) came up with the value of P 3,900/hectare (ha)/year(yr) as economic rent for a hectare of mangroves. This represents payments for 13 cu m of wood products and 667 kilos (kg)/ha of fish produce, estimated as the mangroves' indirect contribution to fishery production. Since Schatz' estimates came from studies done in other countries, the Bureau of Fisheries and Aquatic Resources (BFAR) assembled a group of researchers to devise another set of estimates of economic rent for mangrove areas, under varying conditions but based on primary data. This study was expected to begin in 1992. Estimating the economic rent for mangroves has become urgent due to the alarming rate of mangrove conversion (4,572 ha per yr) from 1920 to 1988 (Natural Resources Accounting Project 1991).

While many traditionally view mangrove areas as wastelands, this perspective has been changing as the area of coverage dwindled substantially. With the increasing scarcity of mangroves, the importance this resource plays in the fish ecosystem has received attention, as discussed in Chapter IV.

A similar research undertaking will be conducted for the fisheries sub-sector, also in 1992. All these developments point to the increasing importance attached to pricing reforms as a way of attaining optimal rate of resource use.

In mining, the pricing policies usually take the form of subsi dies applied to the extraction of selected mineral products (Table 8). These policies aim to encourage resource extraction instead of regulating their extraction.

Fiscal policies. Like the macroeconomic fiscal adjustments of the government, the fiscal policies in the NRES seek to bring changes in government expenditures or taxation. However, these changes have different policy intents for each sub-sector. In the 1970s, government expenditures in the forestry sub-sector supported forestry management projects and a food production program to increase cattle production. The government's decision to appropriate budget for these projects were triggered by the series of natural calamities that hit the country in the early 1970s. These calamities seriously reduced the country's food production capacity, since flooding and drought damaged major agricultural production areas in Central Luzon and Mindanao.

In the mining sub-sector, mining firms received tax exemptions and preferential tax treatments superseding several tax codes that prevailed in earlier years. Tax exemptions, like price subsidies, were designed to help mining firms during adverse world market conditions. This reflects the explicit policy of the government to develop the mining industry.

Trade policies. Trade regimes implemented in the three sub- sectors were regulatory in nature. For the fishery and forestry sub-sectors, export bans helped control the composition of ex ports. The selective export ban of 1976 in forestry was imple mented to encourage high value added production in the form of manufactured wood products; at the same time, it promoted the conservation of forest resources. This policy protected the wood processing industry by lessening competition. In 1976, the Nominal Protection Rate (NPR) for logs, a protection measure provided through trade and pricing schemes, increased from -03 percent in 1975 to -33 percent in 1976 (Power and Tumaneng 1983). In 1987, squared logs or flinches were also banned.

While it is true that processing firms were encouraged to in crease production, it is also highly possible that industrial inefficiency could have resulted. In particular, the lower cost of production made possible by the protection extended to certain firms may have encouraged high wastage in inefficient industries (World Bank 1989). The economic reforms instituted to protect certain natural resource-based industries may thus run counter with the conservation goals of the country. Boado (1986) estimated that the conversion of exportable logs into high value added products like plywood, resulted in a loss in potential rents of about P0.5B.

In the fishery sub-sector, export bans were used for minor fish products (Table 7); but the use of export fees was also prevalent. The control on exports for selected products in the mining subsector came largely through the use of a permit system.

E. *Overall Review*

The preceding discussions highlighted the historical development of environmentalism in the Philippines and the macroeconomic policies perceived to have significant impact on the NRES. They demonstrate how environmental concerns in macroeconomic policies emerged in the Martial rule period. This was precipitated by the natural calamities in the early 1970s, which urged the government to protect the environment. These events were particularly perceived as signals of the increasing scarcity of natural resources and worsening environmental degradation in the face

Table 7. History of Economic Adjustments in the Fishery Sectors

B. Fishery Sub-Sector	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1. TRADE																		
a. Institution of	x																	
export fees for:	x																	
i) pearls																		
ii) Bangus fingerlings																		
iii) fishery products															x			
iv) mud crabs																	x	
b. Imposition of export bans on:																		
i) eel fries				x														
ii) shrimps														x				
c. Institution of import tariffs on fishery/ aquatic product importation													x					
d. Imposition of import bans										x								
2. PRICING																		
a. Institution of various extraction fees affecting:																		
i) fishing operations		x																
ii) seaweed industry				x														
iii) fishpen operations				x	x													
iv) bangus fry exporters					x													
v) fishing boat lessees							x											
vi) marine aquarium industry										x								
vii) mussel growers													x					
viii) pearl growers													x					
2. Decrease in extraction fees for fishpen operators										x								

Table 6. History of Economic Adjustments in the Mining Sector

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
C. Mining Sector																		
1. PRODUCTION																		
Production assistance extended to:																		
i) Gold mining		x						x										
ii) Smeltering operations							x											
iii) Copper mining													x					
2. PRICING																		
a. Price subsidies given to:																		
i) Fertilizer industry			x															
ii) Gold and Silver industry									x									
iv) Mineral industry														x				
b). Price – Roll back on fertilizers															x			
c). Mine Waste and Tailings Fee										x								
3. FISCAL																		
a. Tax incentives to protect and promote sectoral activities:																		
i) Tax exemptions:																		
cement enterprises							x											
government institutions													x					
copper industry															x			
fertilizer industry															x			
ii) Preferential tax treatments to marginal mining companies												x						
4. TRADE																		
Institution of export permits for copper industry															x			

of increasing pressure from the country's growing population. In spite of this formal recognition, concrete actions to protect the environment and conserve resources, though limited they may be, came only in the 1980s.

The stronger commitment displayed during this period compared with that in the 1970s was partly facilitated by the inflow of foreign supports for undertakings to conserve and protect the country's natural resource base.

The PSSD outlines the government strategies and priority programs to attain sustainable development. Sustainable development, which refers to economic growth without sacrificing the integrity of the environment, gained wide acceptance in the late 1980s. The concept continues to gain adherents since it is in society's greater interest to maintain the people's enthusiasm for sustain able development. However, this is being threatened by corrupt political leaders who have vested interest in exploiting the country's natural resources. Unfortunately, there are indica tions that a number of them are now in power. The recession, currently taking place worldwide, also threatens the ability of developing countries to concretize this environmental concern. So far, major environmental efforts were made possible through the financial assistance of several developed economies that have come to realize that there are no borders when it comes to the environment.

All these evolutionary accounts of environmentalism in the Phil ippines serve a specific purpose in conducting a MIMAP study. This MIMAP study contends that, to some extent, the rate of resource depletion and its replenishment will partly depend on the importance attached to it by policymakers as well as on the level of commitment (i.e., political and economic) given to environmentalism in the country. While we contend that some economic policies hasten resource depletion, we should not also discount the fact that other policy reforms (e.g., property rights reforms) and environmental programs (e.g., reforestation, social forestry, and environmental education) being undertaken by government and non-government agencies tend to reduce depletion of natural resources, and even contribute to its appreciation. It is, therefore, important to gain a perspective of the nature and extent of implementation of these other forms of intervention in the relevant project areas as part of any MIMAP undertakings in the NRES.

This chapter also pinpointed the macroeconomic policies most likely to have a strong influence on the NRES. How these policies may affect the sector will be discussed in the succeeding chapter. But the preceding discussions provide some evidences on how most macroeconomic policies such as pricing policies, fiscal policies, trade controls, and incentives structures may indeed have adverse environmental effect by promoting capital intensive firms operating in the NRES.

The preceding sections also showed that, at the macro level, policymakers respond to economic events with these economic policies but were hardly concerned about their impacts on the environment. The environmental goals were addressed only at the sectoral level.

Of the economic tools adopted to reduce pressure on natural resources, those which are widely used include pricing reforms, fiscal policies, and trade controls. Pricing policies as a tool have a limited history but with a big potential which is slowly being realized. The fiscal reforms most-

ly involved implementing conservation-oriented programs and some forms of taxation, while trade controls were imposed on certain natural products as a way of limiting their markets.

The analysis also showed that a bigger commitment to environmen tal protection, with concrete development and policy reforms, began to take shape in the late 1980s and is expected to become stronger in the 1990s. In the past, this commitment remained only in paper as the government was kept preoccupied with economic goals. While it may be true that these economic goals were deemed of utmost importance in the past, the government is now confronted with a stronger pressure to consider the environmental consequences of the patterns of economic growth it wishes to follow. Hence, while economic policies in the past and even today are evaluated on the basis of economic performance, this may no longer be valid. Even if one would claim that the said policies were implemented to respond to certain economic problems and were not developed to address environmental problems, the fact remains that certain macroeconomic adjustment policies harm the environment. As such, the environmental costs created must be considered in evaluating the net benefit to society of adopted policies. If macroeconomic policies are unavoidable, then some programs or policies that have mitigating influences on the environment must also be developed.

III. IMPACT OF GOVERNMENT POLICIES ON RATE OF NATURAL RESOURCE DEPLETION

A. *Introduction*

As cited in the preceding chapter, the extent to which natural resources will be utilized depends on a host of factors, includ ing the policy environment directly or indirectly affecting the NRES.

Government policies include macroeconomic policy instruments such as fiscal, monetary, exchange rate, wage, investment incentives, and provision of public goods such as infrastructure support and research. Sector-specific economic policies, meanwhile, seek to achieve a certain level of resource use in a particular NRES sub- sector. In the forestry sub-sector, for example, policies such as the logging ban, the log export ban, investment incentives for the domestic wood processing industry, changes in harvest fees, and government support for the ISFP influence the rate of re source depletion or replenishment. Similar government policies for the other sub-sectors, as discussed earlier, also affect the natural resource base (Appendix Tables 1-5 for a detailed listing of these policies).

A MIMAP, therefore, analyzes how the various macroeconomic policies, designed with a particular economic goal, can influence the state of the country's natural resources. In the past, the government formulated policies mainly to achieve economic objec tives such as greater employment, higher output and income, foreign exchange generation, and in prices. How these policies will influence the way natural resources are being utilized nor on how the welfare of those directly or indirectly dependent on the NRES are influenced by these policies did not receive ade quate consideration.

Greater environmental consciousness in the 1980s obliged many governments (at least morally) to subject their policy decisions and actions to the question of whether they will impose some

cost to society via the destruction of the natural resource base. This is because environmental damages could bring about low productivity or high cost of production, loss of property and even lives during natural disasters resulting from ecological imbalances, permanent destruction of natural resource systems, loss of genetic biodiversity, and other related catastrophes. Not only the present but also future generations will suffer as a result.

In many cases, some environmental costs always accompany certain desirable economic objectives. The challenge lies in being able to evaluate and value what these costs are and how they compare to the economic benefits realized in return. Of greater concern is the need to evaluate how these policies ultimately affect the welfare of those dependent on the NRES and of society as a whole. This chapter will thus focus on how macroeconomic and sector-specific economic policies alter the rate of natural resource depletion. The discussions will be largely theoretical, and available empirical evidences will be presented.

B. *Economic Policies as Determinants of Resource Depletion*

Rate of resource depletion may vary depending on existing economic policies and their effect on relative prices of outputs and inputs. Government economic policies may change input and output prices directly or indirectly. Direct changes in relative prices of outputs and inputs come from sector-specific policies such as taxation, subsidy, preferential rate of interest to a favored sub-sector, or through institutional reforms that alter the private discount rate via tenurial changes. Policies indirectly altering relative prices in the natural resource sub-sectors refer to the so-called macroeconomic policies consisting of fiscal, monetary, exchange rate, wage level, and provision of public goods.

C. *The Framework: A Model of Resource Depletion*

The standard profit maximizing model in utilizing natural re sources by Howe (1979) states that the net present value (NPV) is maximized by using the specific resource subject to the rate of resource depletion, R(t). This rate of depletion is, in turn, a function of capital (K), labor (L), and the level of stock renew al or production given by S(t). The NPV function is represented as --

$$NPV = (pR[K,L,S]^{r} - wL - iK)\, e^{-dt} \quad (1)$$

where:

NPV - present value of net benefits or profit.

p - price that measures marginal utility or benefit to consumers of the resource commodity.

R - rate of resource stock depletion.

K - capital employed in resource extraction.

L - labor used in resource extraction.

S - resource production/renewal function.

S(0) - current level of the stock.

w,i - wage and interest rate.

d - individual rate of discount or time preference.

The function above is maximized subject to the following con straint:

$S(t) = S(O) + (-R [n] + H (Z) dn$ (2)

where:

S(t) - natural resource production function.

S(0) - initial stock of the resource.

R(n) - rate or resource depletion over time.

H - natural rate of regeneration.

Z - vector of factors affecting rate of renewal of the re source stock.

From the above, the theoretical or likely relationship between the rate of resource depletion and prices of inputs and the output can be deduced. In general, policies that increase the prices of natural resource commodities hasten the rate of re source depletion. Policies that increase the prices of inputs or make production cost higher tend to decrease the depletion rate of resources. A higher discount rate also results in faster depletion of the resource because keeping the resource intact becomes less attractive when compared to alternative investment opportunities of the resource.

This third relationship gets more complicated due to the high fixed cost tied to investment in the resource sector, a factor that may inhibit slower rate of extrac tion even if variable costs rise. While one may be able to point out the likely nature of the impact on the rate of depletion (whether positive or negative), it is difficult to anticipate the magnitude of these effects since these become a function of how important are the different independent variables affecting the rate of depletion.

D. *Major Determinants of Resource Depletion*

The resource depletion model presented in equation (1) points to significant variables determining the depletion rate. These generally include prices of inputs and outputs, and the existing stock of resources. To determine how these variables affect the rate of resource depletion, a regression was applied on forest depletion data. Rate of deforestation (defor) served as the dependent variable, measured as the change in resource stock over time considering changes in stocks of old growth forest and of secondary forest. The estimates of change in resource stock made in the recently concluded Natural Resource Accounting Project (NRAP 1991) were used in the analysis.

The independent variables consisted of a) the average weighted nominal interest rates published by the Central Bank as the cost/price of capital (int), b) the real wage rates of agricul tural workers outside Metro Manila taken from the Philippine Statistical Yearbook (wage as the price of labor), c) the average price of major forestry products taken from the NRAP Report (output P), and d) the stock variable representing the estimated land area under old growth and secondary

forests at the start of every year (stock). The study used the log linear form of regression equation model. Table 9 gives the resulting regression model using 1970 to 1990 data.

In a log linear form of regression equation, the coefficient gives a measure of the dependent variable's elasticity or respon siveness to a given change in the different independent variables included in the model. In layman's terms, the regression coeffi cient measures the percentage change in the rate of deforestation for every one percent change in the value of the independent variables. A regression coefficient of -0.084 for real wage rate means that a one percent increase in real wage rate will bring about a 0.084 percent decrease in the rate of deforestation. This implies that a 100 percent increase in the real wage rate will diminish deforestation by 8.4 percent. This finding is consistent with the observation that an increase in the cost of labor may bring about lesser resource depletion since this change represents an increase in the cost of production. Though the elasticity coefficient for real wage rate is very inelastic, the value obtained is significant, with 99 percent level of confi dence. The low elasticity coefficient may be explained by the low proportion of labor cost in many logging firms in the coun try, being mostly capital intensive. As such, firms hardly respond to changes in labor price.

The deforestation elasticity of coefficient on the nominal rate of interest is relatively high at -0.31, but is still inelastic. The negative sign is consistent with the theory that a higher rate of interest can cause the rate of deforestation to go down since this would mean a higher cost of production, most especially in the capital intensive logging operations. The interest rate in this model is taken as the cost of money that determines cost of capital. The regression result showed that a 10 percent increase in the nominal rate of interest can cause rate of defor estation to go down by three percent. This figure may appear to be small but three percent of almost a million ha deforested annually is quite substantial. The nominal rate of interest could, therefore, be an important tool to alter the country's rapid deforestation rate.

The rate of deforestation's responsiveness to changes in output prices was estimated to be even higher at 77 percent per 100 percent change in output prices. This means that favorable output prices must have accounted for a significant portion of the rapid rate of deforestation that took place in the country. In general, a higher output price will induce resource users to extract the resource faster. This relationship was validated based on the regression results derived in the study.

The biggest elasticity coefficient was obtained between the level of forest stocks and the rate of deforestation. The regression coefficient is positive (2.77) and highly significant, showing the resource users' high propensity to cut down trees, as long as there are remaining forests resources. The result indicates that a one percent rise in the available forest resources (expressed in area under primary and secondary forest) would increase the rate of deforestation by 2.77 percent. The very high elasticity of deforestation with respect to stock simply shows that the most important determinant of forest destruction is the remaining forest cover itself, more than the changes in the economic varia bles such as input and output prices.

However, the above finding does not imply that the economic factors are not important. It merely points out that most loggers may have enjoyed supernormal profits or high economic rent in the past, leading them to disregard changes in prices, especially input price increases. The high elasticity coefficient for stock is also consistent with this analysis. It shows that most loggers'

Table 9. Results of Log–Linear Regression

Determinants	Coefficient	Level of Significance
output price	0.767	.01
interest	– 0.310	.05
real wage	– 0.084	.05
initial stock	2.77	.01
intercept	–15.33	

Functional Form:
Deforestation = f(level of initial stock, real wage rate, interest rate and price of output)

R2 = 0.96
Adj R2 = 0.95

cutting activity was guided by the size of the remaining forest areas. The bigger the area, the higher the cutting activity. In effect, the relative ease of access to forested land and the high economic rent obtained from these lands, as implied by the regression results, act as the main culprit to the sorry state of the country's forest resources.

Several factors accounted for the high economic rent. The most significant of these are the very favorable prices of logs and timber products, with production costs remaining relatively low. This favorable scenario was enhanced by government policies that promoted high foreign currency earnings for the country which encouraged faster extraction activities. Some of these policies are the favorable rate of interest that fostered capital inten sive production activities, provision of production subsidies to resource users, and easy access to credit. Though these policies may bring about higher economic growth, they achieve this at the expense of the country's natural assets and eventually of the poor resource-based households.

The above findings give us very important information on the likely impact of changes in relevant prices on the rate of re source depletion. These expected changes may not be substantial if the country still has a large stock of forest resources and if extracting firms still enjoy high economic rent. But they are potentially important tools for policymakers, especially if the corresponding property rights structure could limit open access to remaining forested areas and if the economic rent currently enjoyed by logging firms could fall, enough for them to become more sensitive to changes in input and output prices.

E. *Impact of Macroeconomic Policies on Resource Depletion*

This section focuses on the expected impacts of the different macroeconomic and sector-specific policies on the relative prices of inputs and outputs and how change in these sets of prices may affect the rate of resource depletion. The analysis is generally applicable to all types of natural resources, including that of the environment which provides important inputs to many of man's economic activities. The analysis will also be applied to the three major natural resource sub-sectors of the country: coastal, forest/upland, and mining.

Nelson (1984) developed a matrix for analyzing the impact of macroeconomic policies on forest resource depletion via their impact on relative prices. It considers the effect of the various policies on the cost of production and on the price of resource output. A distinction was made between tradable or non-tradable inputs and outputs. Tradable products are those that can be sold or purchased in the foreign market while nontradables are sold or bought only in the domestic market. The different policies analyzed were changes in the level of government expend itures and taxes, investment incentives, money supply, devaluation, and trade controls. Several situations occur wherein the anticipated impacts of these policies are ambiguous; but a definitive impact was observed of certain policies on the rate of depletion. However, the expected impacts indicated in the series of tables in this chapter should be treated as predictions embodying a set of hypotheses that need further testing through empirical analysis.

Table 10 describes how these various macroeconomic policies may alter the set of relative prices in the natural resource market.

Table 10. Predicted Impact of Macroeconomic Policies on Relative Prices and the Rate of Depletion

Policy	Domestic Price				Capital	Labor	Interest Rates	Rate of Depletion
	Output		Inputs					
	T	NT	T	NT				
increase in G	0	+	0	+	+	–	+	+/–
increase in T	0	–	0	–	–	+	–	+/–
increase in MS	0	+	0	+	–	–	–	+
Devaluation	+	0	+	+	?	0	?	+
Trade Taxes	+/–	0	+/–	0	0	0	?	–
Investment Incentives	0	+	0	+	–	0	?	+

Source: Nelson (1984)

Note: T – Tradeables
NT – Non tradeables
(–) – decrease
(+) – increase
(0) – no change
(?) – uncertain change

Inflationary policies. The table indicates that policies with inflationary impacts such as increases in money supply and government expenditures, and decreases in general taxes cause the aggregate demand to grow. Consequently, employment expands in the formal sector, pushing the nominal wage rate higher. This eventually causes an inflow of labor from the informal sector. The general rise in the price level, however, is expected to be more than the increase in the nominal wage rate, thus lowering the real wage rate. Inflationary policies tend to bring up the general price level of both non-tradable inputs and outputs. The prices of tradables are not expected to change because they are determined by world prices. Despite high prices of consumer goods, the informal resource users may not experience a wage increase even if demand for labor goes up in the formal sector, given the country's labor surplus. This situation places more pressure on the resource, leading to faster resource depletion. This is because, for the informal resource users, natural re sources offer a way out of the economic difficulties created by inflationary changes in government economic policies.

The pressure on the resource coming from the formal sector may have an opposite effect. If the firms are producing tradables, the price may remain the same since these prices are determined in the world market. Input prices (non-tradable intermediate inputs and labor) are, however, higher and these translate to higher production cost. As a result, a lower rate of depletion from the formal sector may occur.

Money supply, government expenditures and taxes. Changes in money supply as well as tax and government expenditures alter the nominal rate of interest. This, in turn, affects production cost, especially in capital intensive industries. Policies that decrease the nominal interest rate include increases in money supply and taxes, and decreases in government expenditures. These policies tend to lessen the nominal interest rate in the short run; but in the long run, the inflationary effects of increased money supply may cause nominal rate of interest to increase even more.

How will the change in the interest rate affect the rate of resource depletion? In capital intensive, resource-based industries, a higher rate of interest increases the operation costs of firms. A higher cost of production or extraction is then expected to dampen resource extraction activities. On the other hand, policies that lower the interest rate make it profitable for firms to employ more capital, thus hastening the depletion rate of natural resources.

Exchange rate policies. Other macroeconomic policy instruments used by the government to correct economic imbalances include the exchange rate and certain foreign trade policies. Exchange rate controls overvalue the domestic currency. An overvalued domes tic currency raises the prices of non-tradables relative to tradable items. This encourages the production of non-tradables, increasing domestic consumption of the lower priced tradables and lowering exports. The relatively cheaper foreign currency also supports consumption of imported items. This lessens resource depletion, assuming that the bulk of the natural resource products are tradables.

Trade taxes. Trade taxes will affect the rate of depletion only if outputs or inputs are traded in the foreign market. Export taxes bring down the returns received by exporters for their products, while import taxes raise the price of importables. In general, trade taxes tend to abate the rate of resource depletion since they worsen the terms of trade faced by the exporting country.

Investment policies. Investment incentives make up another set of policy instruments. Incentives for investment take the form of reduced tariffs on imported inputs, exemption from income taxes and related privileges, and reduced or subsidized interest rates. As a whole, these policies tend to raise the capital intensity of the firm which redound to lower production cost. With lower cost of production, faster depletion of the resource is expected to happen.

In summary, increased aggregate demand causes a general increase in the price level, except to the extent that commodity prices are determined in the world market. The difference between the changes in the prices of natural resource commodities and inputs of production ultimately determines the extent to which resource utilization will be affected. Increased taxation, lower govern ment expenditures, and increased money supply tend to shrink the nominal rate of interest, for as long as the inflationary effect of increased money supply is not substantial. A lower rate of interest leads to more capital intensive, resource extractive operations which hasten the rate of depletion. An overvalued exchange rate reduces the rate of depletion of tradable resource commodities by raising the price of nontradable items relative to tradable commodities. Trade taxes also dampen the rate of depletion by lowering relative prices of exportable items and in creasing costs of imported inputs.

F. *Sector-Specific Policies on Relative Prices and Resource Depletion*

This section will explore how the different economic adjustment policies for the three major resource sub-sectors may influence the way resources are used. The different sub-sectors or re source areas comprising the NRES are: the uplands with forest resources, mining, and coastal resources. Together, these three types of resources form the dominant base of the country's eco nomic growth and the source of livelihood to the majority of households in the formal and informal sectors.

The forestry sub-sector. In the forestry sub-sector, the sector al adjustment policies that figured prominently in the last two decades are presented in Table 11. The historical details of these different economic reforms are presented in Appendix Table 3. Table 11 identifies the expected impact of these various policies on the rate of forest depletion. Due to the growing concern for the environment, most if not all of these policies were formulated with the goal of limiting resource depletion. By affecting output and input prices, the policies lower a firm's profitability of extraction and slacken the extraction rate, other things being equal.

The government's ISFP also hopes to produce the same effect of achieving sustainable level of resource use. In particular, providing long-term leases or stewardship contracts to resource users will hopefully create in them the incentive to protect and manage the resource in a sustainable manner since their future is also at stake. A secure, long-term lease agreement would then decrease the private rate of time preference or discount rate. While the ISFP's rationale is valid, the mere granting of a long- term stewardship contract without providing support services and other forms of subsidies may not really make a difference. This contention was validated and has been used to explain why many ISFPs failed to take off the ground. The very few model ISFPs are heavily assisted in terms of increased access to output and input markets. Receiving substantial support services and subsi dies but lacking effective devices to monitor land use practices of program cooperators, these ISFP may even hasten the depletion rate of natural resources.

Table 11. Predicted Impact of Forest Management Policies on Relative Prices and the Rate of Forest Depletion

Policy	Domestic Price						Discount Rates	Rate of Depletion
	Output		Inputs		Capital	Labor		
	T	NT	T	NT				
Log Export Ban	–	–	0	0	0	0	?	–
Logging Ban	–	–	0	0	0	0	?	–
Harvest Fees (incl envt'l fee & taxes)	–	–	0	0	0	0	?	–
Export Taxes	–	0	0	0	+	0	?	–
Long Term Leases	0	0	0	0	0	0	–	–
Investment Incentives	0	0	–	0	–	0	?	+
ISFP	0	0	–	–	–/0	0	–	?

Source: Nelson (1984)

Note: T – Tradeables
NT – Non tradeables
(–) – decrease
(+) – increase
(0) – no change
(?) – uncertain change
ISFP – Integrated Social Forestry Program

Increased pressure on the resource may also come from increased migration to upland areas, encouraged by a fully subsidized ISFP. This means that the ISFP's expected impact on the rate of re source depletion is still ambiguous.

The same may be said of the incentives to local wood processing industries. These incentives are intended to increase efficiency of processing by making low cost technologies available to them. With a lower production cost, however, extraction activities has become more profitable than before, when there was no assurance of increased processing efficiency.

It should be stressed that different types of resource users may react or be affected differently by the same economic policies. Increased government expenditures and other expansionary economic policies that raise prices will harm the small, upland farmers or *kaingineros* most, since forest product prices are not expected to increase in the same proportion as other consumer products. To cope with this general increase in prices, the kaingineros tend to put more pressure on the resource through more intensive cultivation.

However, Nelson (1984) raised the possibility that the increase in the nominal wage rate, especially in the formal sector, may lure upland dwellers to join the formal economy labor force. As a result, there will be less pressure on the resource that will be coming from the informal sector. This mobility of labor, though, is unlikely in a developing country like the Philippines due to both the constraints on skills possessed by upland farmers and their dislocation once they have settled their families in a given upland area.

For commercial loggers, the high cost of production brought about by higher input prices may pull down the rate of depletion. Since most natural resource products are tradable, their prices are not expected to increase with the government's expansionary policies. The net effect on the rate of depletion by policies that increase aggregate demand is, therefore, ambiguous.

The net effect of increased money supply is also uncertain. While the inflationary impact of such a policy may slacken the deple tion rate of logging firms, the lower rate of interest induced by the increased money supply makes capital inexpensive. This en courages greater resource extraction activities in the forestry sub-sector.

The mineral sub-sector. Table 12 summarizes the different economic policies on the mining sub-sector and their expected impact on relative prices and on the rate of depletion.

The different sector-specific policies in mining and mineral-based industries all promote a high rate of depletion. Santos (undated) characterized the economic policies in this sub-sector as dominated by a series of investment incentives acts, the most dominant of which are the Investment Act of 1967, Export Incentives Act of 1970, and the Mineral Resources Development Act of 1974. Besides favorable policy support, the sub-sector also receives from the national government an annual budget for its development. From 1980 to 1987, the total appropriation was P556.8 million. Of this amount, some P13.2 million or 0.02 percent was spent for environmental research (Environmental Management Bureau 1990).

These incentives took the forms of a) exemption from custom duties and taxes on imported machinery, equipment, and spare parts; b) government's priority on loans including guarantees of

Table 12. Predicted Impact of Mining and Mineral Management Policies on Relative Prices and the Rate of Mineral Exhaustion

Policy	Domestic Price Of						
	Output		Inputs		Capital	Labor	Rate of Exhaustion
	T	NT	T	NT			
Production Assistance	0	+	0	+	–	+	+
Price Controls	0	+	0	+	0	0	+
Export Inc.	+	0	–	0	–	0	+
Domestic Taxes	+	+	–	0	–	0	+
Investment Incentives	+	0	–	0	–	0	+

Source: Adopted from Nelson (1984)

Note: T – Tradeables
NT – Non tradeables
(–) – decrease
(+) – increase
(0) – no change
(?) – uncertain change

foreign loans; and c) other forms of production assistance or subsidies. Production assistance was usually given to encourage gold mining, smelting operations, and copper production.

The price stabilization measures, on the other hand, consisted of legal bodies established to impose price controls on basic commodities such as fertilizer and cement, which are quite essential to development pursuits of almost all developing countries. Measures that encouraged exports included a) exemptions from payments of certain export duties; b) subsidies to reduce production cost; c) domestic tax exemptions; d) preferential tax treatments; and e) suspended payments of all taxes, duties, fees, and other charges.

These different policies all aimed at giving incentives to the industry, toward increased extraction activities. The government's strong bias for faster mineral resource extraction mirrors the strong dependence of this government on the mining sub-sector as a source of foreign currency. From an .8 percent GNP contribution of the sub-sector in 1960, the sub-sector's contribution rose to 2.6 percent in 1980. This level may be considered the sub-sector's peak since it registered a lower annual average of 1.88 percent between 1980 and 1990.

The weakening economic performance of the sub-sector was attributed by Santos (undated) to its general weakness, as a result of the different policy incentives given by the government. In particular, the different investment policies were seen as having developed the mineral sub-sector into a very capital intensive industry, with high dependence on imported raw materials and with large loans from government and foreign sources. All of these cast doubts on the strength and ability of the sub-sector to sustain the growth that it initially exhibited.

It is then not surprising to see the sub-sector's contribution weaken when most of these policy incentives were removed under the Aquino Administration. The cost of extraction may have also gone up after 1980 as a result of both the increasing scarcity of the resource and the high inflation characterizing the country's economy in the last decade. All of these could have combined to deflate the sub-sector's contribution to GNP which was registered at 1.46 percent in 1990.

The government's bias for the mineral sub-sector has generated environmental costs for which the resource-extracting firms were responsible but not made wholly accountable. In 1979, a mine waste and tailings decree was implemented by the then Ministry of Natural Resources (now, Department of Environment and Natural Resources or DENR). The decree imposed mine wastes and tailing fees on operating companies to compensate for damages caused on private lands, crops and infrastructure. The fees ranged from P0.05 to P0.10 per metric ton (mt) of mine tailing for firms with tailing ponds and P1.00 per mt for those without ponds or dams.

However, many questioned whether these very low rates were able to cover adequately the cost to society. It is strongly believed that they did not. In the Baguio mining district alone, Briones (1987) estimated the damages from mine tailings to be about US$5.75 million annually. A lot has yet to be done in instituting pricing reforms in mining. Unless this is addressed adequately, the unpaid costs will continue to contribute to inefficiency in resource use in this sub-sector.

The fishery sub-sector. The dominant policies instituted in the fishery sub-sector may be characterized as being more regulatory than economic in nature. Appendix Table 3 and Table 13 show that most fishery policies took the form of regulating fishing vessels, limiting fishing in

Table 13. Predicted Impact of Fishery Management Policies on Relative Prices and the Rate of Fishery Resource Depletion

Policy	Domestic Price Of						
	Output		Inputs		Capital	Labor	Rate of Depletion
	T	NT	T	NT			
Export Bans	–	–	0	0	0	0	–
Operation & Harvest Regulations	–	–	0	0	0	0	–
Export Taxes	–	0	0	0	0	0	–
Export Incentives	0	0	0	0	0	0	+
Investment Incentives	0	0	–	0	–	0	+
Control of Fishing Effort	–	–	0	0	0	0	–
Credit Program	+	+	0	0	0	0	+

Source: Adopted from Nelson (1984)

Note: T – Tradeables
NT – Non tradeables
(–) – decrease
(+) – increase
(0) – no change
(?) – uncertain change

protected zones, prohibiting the export of certain fish species or marine products like pearls and corals, limiting imports of some fish species, and others. While some fees are being collected to access some of the country's fishery resources, these fees may be considered very insignificant compared to the profit that resource users, especially those with access to modern fishing gadgets (i.e., the commercial fishery sector). As a result, biological and economic overfishing have already been reached several years ago (Silvestre and Pauley et al. 1985; Danzell et al. 1987).

While many policies in the fishery sub-sector seem to discourage resource depletion, evidences of resource overfishing tell us that these policies were not quite effective in curtailing fishing activities. The difficulty of enforcing the regulatory policies of the government due to both limited government resources for enforcement and the large coastal resources of the country make it difficult for the central government to limit open access to the nation's coastal resources. As a response to this observed ineffectiveness of the current system, the government is slowly decentralizing the management of these coastal resources. Fishing communities are now granted legitimate access subject to regulatory measures that will limit overfishing, most especially those brought about by the use of illegal fishing methods and unauthorized fishing gears. Efforts to estimate economic rents from coastal resources such as mangroves have also become a priority research identified in the near future. All these moves push toward developing appropriate and effective economic policies for the fishery sub-sector, to reduce resource depletion.

G. *Studies on Resource Depletion and Economic Policies*

Table 14 summarizes the limited literature or studies available, discussing to some extent the link of economic policies to resource depletion. As noted earlier, most of the analyses were conceptual in nature, except for a few studies which made use of trend, regression, and sensitivity analyses. The studies under scored those macroeconomic policies that can have significant impact on the NRES. These are investment incentives, pricing policies, trade controls, and, to some extent, exchange rate controls and fiscal policies.

Most of the studies reviewed were also devoted to evaluating the impact of these economic policies on the forestry sub-sector. The greater attention given to forestry resources shows the critical role played by this sub-sector in maintaining the earth's ecosystem and in sustaining economic growth of the country. It is also a resource area which is being subjected to extreme pressure from the country's growing population.

A predominant observation in all sub-sectors is the underpricing of natural resource products under the current pricing schemes. This creates excessive economic rent, which further triggers faster resource depletion. The monetary and exchange rate and trade policies adopted to respond to economic imbalances in the country have also encouraged faster depletion by making access to capital relatively easy, through lower interest rates and lower price of tradable inputs. Most studies were able to pinpoint causality between selected macro and sectoral economic policies and resource depletion, but they failed to measure the identified effects, except for the study by Delos Angeles et al. (1988).

Table 14. Summary of Studies with Impacts Analysis of Macro and Sectoral Economic Policies on Rate of Depletion.

Author/Year	Policy	Mechanics of Influence
Agrodev, Canada	BOI Investment incentives	Tax credits on domestic procurement of capital; duty and tax exemptions on imported capital equipment.
	Fiscal and monetary disincentives (unspecified)	Higher cost of incremental fishing.
	Licensing scheme	Improved system of fees
	Regulations	Better enforcement capabilities, decentralized enforcement at local level.
ADB, 1990	Harvest fees	Low charges leading to higher rents.
	Trade policies	Distort relative prices, make capital cheaper.
	Monetary and exchange rate policies	Affect interest rates
	Credit Support Program (Fisheries)	Provides incentive for gear acquisition.
	Restrictive/ regulatory fishery laws	Poor implementation and enforcement.
Cruz, W. and Delos Angeles, M.S. 1988	Pricing policy	Underpricing of the resource.

Impact	Level of Analysis
Increase fishing efforts leading to overfishing.	Descriptive/ conceptual
Reduce fishing efforts to MEY level.	
Curbs overexploitation and channel fishing to previously underfished areas, relieving pressure in overfished areas.	
Lessens trawler encroachment and use of illegal/destructive fishing gears.	
Excessive rent-seeking, leading to increased resource extraction.	Descriptive/ conceptual
Support capital intensity of production.	
High interest rates shorten gestation period of long-term investments (e.g., forest renewal).	
Induces capital intensive operation.	
Encroachment of trawls in municipal fishing grounds, use of illegal fishing methods continue.	
Overexploitation; excessive rent seeking and inequity.	Descriptive/ conceptual

	Property rights reform	Short duration of concessions (25 years).
Boado, E.L., 1986	Investment Incentives	Reduced capital and labor costs
	Export taxes and log export ban	Protect wood processing industries.
	Pricing/Tax Policies	Low user fees
	Poor provision of employment opportunities	Encroachment into forest lands.
Delos Angeles et al., 1988	Pricing policies	Higher forest charges and prices of inputs
	Interest rate policy	Higher interest rates.
World Bank, 1989	Timber pricing policy	Low user charges.
	Exchange rate policy	Overvaluation of currency.

Non–adoption of conservation practices.	
Increases rates of return by six %age points with the change in the new investment incentive.	Descriptive/ secondary data trend analysis
Increase wastage leading to resource depletion.	
Excessive rent seeking leading to higher extraction rates, and government's inability to capture some $.5B in rents in 1982.	
Resource depletion through shifting cultivation.	
Decrease net present worth of logging activities but still at profitable levels, increase in government revenue.	Benefit–cost analysis and sensitivity analysis
Reduces net present worth but does not make logging activity unprofitable.	
Promotes rent–seeking behavior that leads to rapid depletion of resources.	Conceptual/ descriptive
Unfavorable demand for export crops leading to a shift to food crop cultivation that induces soil degradation.	

	Taxes and subsidies	Tax bias for capital use through tariff exemptions on imported capital and low tax on diesel.
	Partial export prohibition on logs	Implicit subsidy to local lumber mills, plywood, and furniture manufacturers.
Power, J.H. and Tumaneng, 1983	Forest charges	Upward shift in supply curve resulting to a decrease in net price of products.
	Direct controls	Upward shift in supply curve, which limits output.
	Export taxes	Downward shift in domestic prices.
	Export quota	Limits equilibrium output.
USAID, 1989	Timber pricing policy	Low charges
	Import prohibitions on pulp and partial export prohibition on logs.	Give undue protection to local wood processing industry.
	Tariff policy	Tariff exemption on imported capital machinery.
	Logging concession system	Offers short–term leases
	Granting of buying monopoly on fry concessions	

Reduce employment and contribute to "push factors" for degradation, favor commercial trawling.	
Discourages industrial efficiency and redounds to faster depletion of resources.	
Increase government revenues and reduce intramarginal rents.	Graphical analysis and estimation of NPR, EPR and DRC.
No government revenues intramarginal rents are not captured.	
Less government revenues and lower producers surplus provide strong incentive for smuggling,	
foreign exchange earnings decline and intramarginal rents also drop.	
Loss in producer's surplus provides strong incentive for smuggling, rents are not captured.	
Increase profits for timber concessionaires leading to increased rate of extraction.	Conceptual/ descriptive.
Discourage efficiency through lack of competition leading to increased depletion of forest resources.	
Encourages mechanized logging.	
Non-adoption of long-term harvest strategies, provides no incentive to ensure long-term regeneration of forests.	
Lower price received by fry collectors, decreased income of fry collectors and loss of jobs.	

	Regulatory fishery policies	Poor enforcement and monitoring due to open access nature of fisheries.
	Subsidy on diesel fuel	Lower costs for commercial trawlers.
	Macroeconomic policies that change interest rates and exchange rates (unspecified)	Interest rates Overvaluation rate.
ito, C., 1986	Tax relief for mining companies	Induces graft and corruption.
	Undervaluation of mineral resources	Inefficient mining operations.
	Unpredictable government policies	Unstable political scenes.
Delos Angeles, M. and Lasmarias, N., 1990	Forest charges	Undervaluation of timber because of low forest charges.
	Pollution fees for mining companies	Inadequate fees.
Santos (undated)	Investment/export incentives	Tax and duty exemptions.

Overfishing.	
Increases numbers of commercial trawlers leading to overfishing	
Low interest rates encourage capital intensive logging and fishing.	
Lead to lower farmers' income for tradeables, forcing them to turn to resource depleting practices, reduce resource depletion through unfavorable terms of trade.	
Inequity	Descriptive/ Conceptual
Leads to wasteful use of mineral grounds.	
Reduces capital investments.	
Increase extraction because of existence of positive, inequitable gains from resource use, leads to inefficient processing of wood.	Descriptive/ Conceptual
No influence on mining activities.	
Mining firms are highly capital intensive, highly dependent on foreign raw materials, and incur large loans from the government and foreign sources leading to an underdeveloped industry	Descriptive/ conceptual

H. *Overall Review*

From the foregoing discussions, it can be seen that the effect of economic policies in the NRES largely come from changes in relative prices of natural resource commodities and in the inputs required to extract these commodities. Using 1970-1990 secondary data on deforestation and selected economic variables, the study also found that the most significant factor to depletion was the size of resource stocks accessible to resource users. Prices of outputs and inputs are also significant but have relatively lower elasticity of coefficients when compared to resource stocks.

Since the identified policies negatively influencing the NRES were created to achieve certain economic goals, some measurement of impact is necessary to assess the social and economic accept ability of these policies.

IV. DEPLETION PATTERNS AND THE STATE OF UPLAND, COASTAL AND MINING RESOURCES

A. *Introduction*

Natural resources constitute a form of assets that provides inputs to economic production activities and outputs to support life on earth. The air we breathe, the food nourishing us, and shelter where we find refuge are a few of the benefits generated from the environment and natural resources.

Like other conventional forms of assets, natural resources also "depreciate." This is especially true of depletable resources which, once used up, are no longer available for future use. Renewable resources can also depreciate when the rate of use exceeds the rate of renewal. Depreciation of the country's renewable resources is occurring at an alarming rate, due to rapid population growth. This situation poses a threat to the sustainable supply of natural resource commodities.

Associated with production and consumption activities is the generation of wastes or residuals that can harm human beings and other life forms. Examples of such residuals or external effects include soil erosion for land-using activities and different types of pollution brought about by mining exploration, manufacturing activities, and other productive and non-productive activ ities of man.

We are aware of the limits to the assimilative capacity of the environment and how the productive capacity of these resources to sustain economic growth is seriously being threatened. We also realize that these limits and asset depreciation have repercus sions on the social well-being of different social and economic units dependent (on-site) on the resource as well as those living in communities (off-site) outside but linked to the resource system through some natural processes. The boundary of society's welfare even extends to members of succeeding generations, whose interest and well-being depend to a large extent on the actions made by the present generation and its government.

The extent of change to society's welfare brought about by what becomes of the natural resource base has yet to be quantified. This represents a big research gap that needs attention. At present, it will be useful to identify the benefits that man derives from natural resources. This will help gain a better appreciation of the goods and services that will no longer be available to

mankind once natural resources are depleted. The extent of resource depletion or degradation will also be dis cussed so that, even at the conceptual level, we can grasp the magnitude of the cost to society of natural asset depreciation. Asset depreciation for this study is defined as the loss in productive capacity (i.e., degradation) of the resource as well as the loss in the physical quantity of the natural assets (i.e., depletion).

B. *Manifestations of Welfare Loss from Resource Depletion*

Effects of environmental deterioration can be felt and assessed in several ways. A measurable manifestation of environmental degradation is the declining productivity of the natural resource systems (e.g., crop yield, water yield, and fish harvest). Productivity change may take place not only within the resource system itself but also on off-site areas within the sphere of influence of the external effects being analyzed. Both on-site and off-site changes in production should, therefore, be estimated as they constitute one form of impact of environmental degra dation on man. To obtain the value of these changes, market prices of the natural resource commodities (e.g., fish, crop, and timber) or their shadow prices may be used. The replacement cost method, which measures what it takes to bring back the resource's undegraded condition, and the preventive expenditures method, which measures how much one is willing to spend to prevent the damage from taking place, could also be used to assess the impact of environmental degradation on society's welfare. Some examples of preventive expenditures include construction of soil erosion control measures, purchase of water treatment or purifying de vices, insulation of one's house from pollution. An example of the replacement cost method is the valuation of fertilizer ex penses needed to put back soil nutrients lost through soil ero sion.

Environmental degradation can also affect persons through changes in the individual's productivity. These changes may result from exposure to polluted air and water, oftentimes valued in terms of the foregone earnings during the period of contamination. The cost of medication should also be added to the value of lost earnings.

The above possible effects of environmental degradation on man give us a glimpse of the substantial magnitude of these effects. The extent of deterioration of the country's major natural re sources will thus be examined to provide some parameters of the magnitude of the environmental costs involved. The discussion will focus on the country's three major classifications of natural resources: the uplands which include watershed and forest resources, coastal, and mineral resources. These three resources are considered the life support systems as they form the base of our economic life, as well as the pillars of ecological balance and continued existence of the earth's ecosystem.

C. *Watershed and Upland Resources*

A watershed is an area of land bounded by a divide which drains water including soil particles, dissolved nutrients, and other nutrients and minerals to a common point along a river or stream (National Water Resource Council 1976). Approximately 70 percent of the total land area of the country are considered watersheds. These consist of about 419 rivers with a drainage area ranging from 40-100 kilometers (km) to 10,000 - 25,000 km. These water resources provide water to several irrigation systems, hydroelec tric dams, and domestic and industrial water systems (Alvarez 1984).

In the early 1970s, critical watersheds were found to form part of the 18 major river basins in the country. Due to their nature, critical watersheds must be untouched by man because of the very crucial role they play in maintaining the country's ecological balance. These watersheds, however, remain open to human encroachment due to the multiple goods and services they pro vide. Man's intrusion into most of the country's critical water sheds has endangered other ecosystems both upstream and down stream.

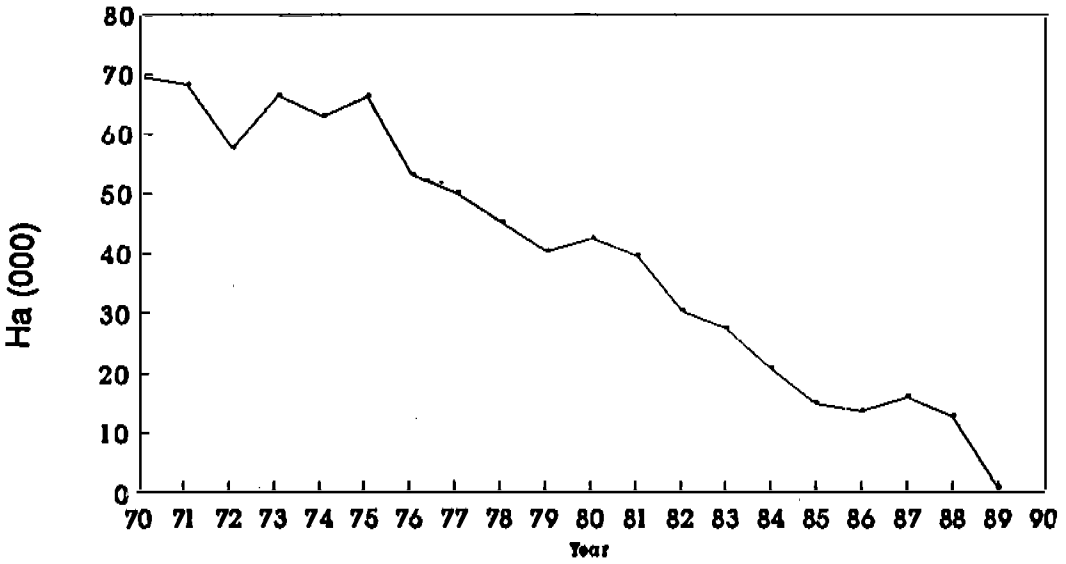
Upstream of the watersheds, the most fragile ecosystems are the crop lands and the water resources. Severe erosion in the up stream portion of the watershed impair the sustainable produc tivity of some resource ecosystems and sometimes result in irre versible consequences. Taking croplands as an example, continuous and accelerated rate of erosion brought about by unrestrained logging and improper land use practices of loggers and *kaingineros* within the watersheds could result to loss of productive topsoil and a consequent decline in crop production. Crop pro ductivity also decreases when the soil structure is destroyed; this is manifested in the inability of the soil to absorb or retain water and other nutrients. A less efficient use of additional inputs and the uneven flow of water occur, both of which are detrimental to downstream communities (in the form of floods that lead to loss of lives and properties).

Current logging and conversion of forests to other less stable land use systems could also alter significantly the watershed's hydrological processes and capacity. When forest trees are removed, the quantity and quality of water output from the water shed will also change. Water flows will be high and strong during the rainy season, mainly due to the absence of trees which hold water and protect the soil resource base. During the dry season, the supply of water may be nil, with occasional drought occurring in some parts of the country. In terms of water quality, water from forested land is generally more superior than water coming from other land uses. Hence, for watershed hydrology, it is ideal to retain tree cover in the country's watersheds at all times, especially those critical for water supply.

Figure 2 presents the loss of old growth and secondary forest cover from 1970 to 1990. The deforestation data measure the change in the old growth and secondary forest in thousand hec tares. The old growth forest in the Philippines was dominated by dipterocarp forests, which serve as the main sources of raw materials for lumber, veneer, plywood, furniture wood, and other hard wood-based products. From 5.3 million ha of old growth forest in 1970, only about a million ha remained in 1989. The annual decrease averaged 0.21 million ha, of which 130,000 ha per yr (66 %) resulted from logging and the remaining 80,000 ha (33 %) from forest conversion. The second growth dipterocarp forest showed a positive growth from 3.4 million ha in 1970 to 3.6 million ha in 1989. The growth came mainly from the logging of old growth forest (NRAP 1991).

The deforestation rate as depicted in Figure 2 indicates a de clining trend over time. The declining stocks of forest resources largely explain this trend, as indicated in the regres sion results presented in Chapter III. Figure 3 attempts to analyze how patterns of deforestation may have changed due to the various macroeconomic reforms implemented in the country. The figure shows that after devaluations and the adoption of invest ment and export incentives, the rate of deforestation generally increased. With other things assumed constant, the pattern supports the

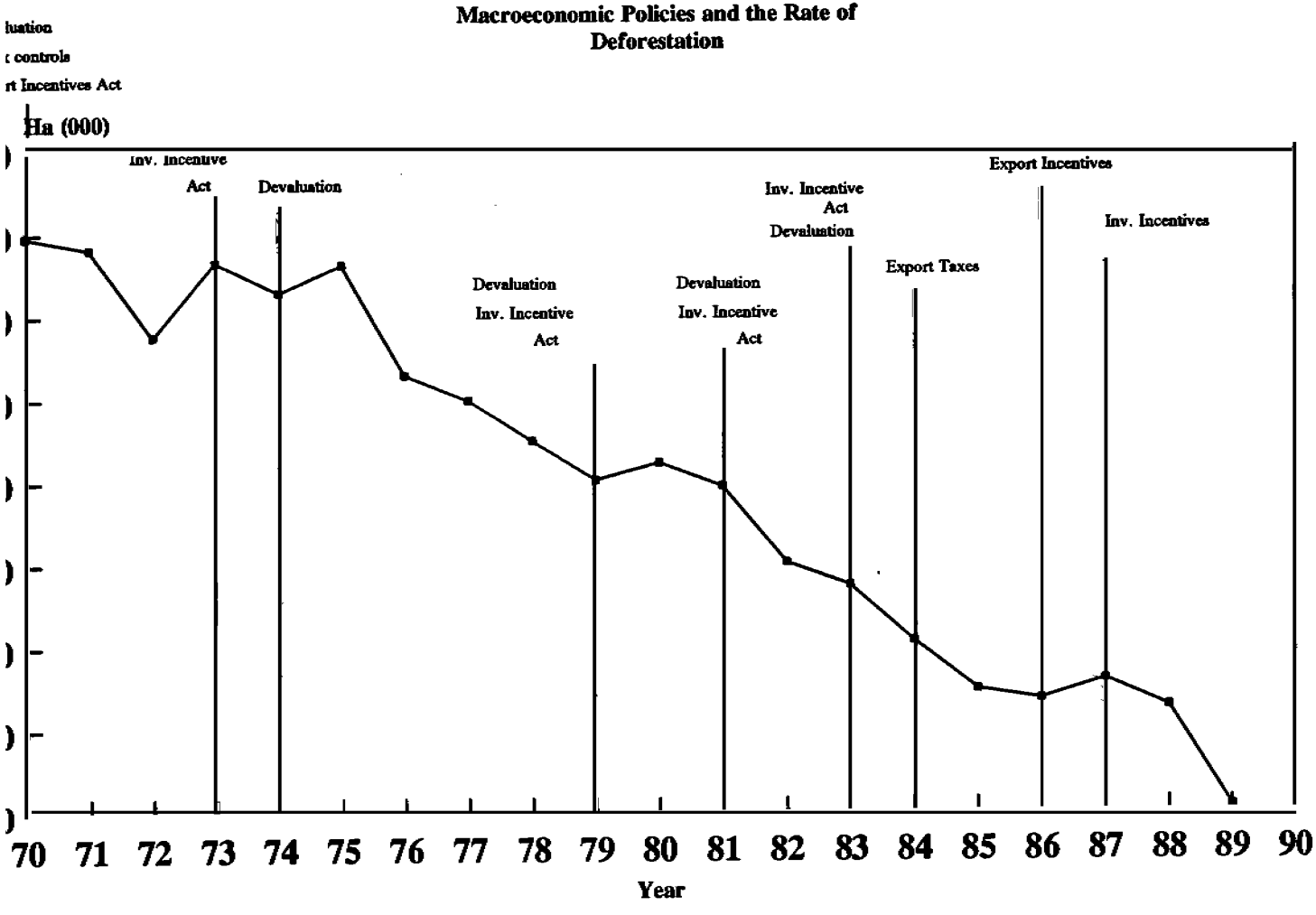
Figure 2
Deforestation Rate of Dipterocarp Forests (1970-'89)



Area Changes by Forest Type: Annual Averages (in thousand hectares)

Years	Old Growth	Second Growth
1970-1974	-305.9	20.6
1975-1979	-246.8	-1.2
1980-1984	-180.6	3.6
1985-1989	-104.8	20.4

Figure 3
Macroeconomic Policies and the Rate of Deforestation



contention that the major macroeconomic policies of the country contributed to resource depletion.

The sectoral economic reforms such as the log export ban and the ban on exports of protected species produced the opposite effects. The selective logging ban implemented in certain areas of the country bolstered these effects, even as the bill on total logging ban remains pending in the Senate. Thus, the sectoral reforms may have partly contributed in slowing down the rate of deforestation. Yet, the absolute magnitude of the decline in forest cover remains at an alarming rate. This poses serious environmental problems which will be elaborated in the following discussion.

Environmental hazards of forest/watershed denudation. The low land ecosystems are highly endangered by many kinds of environmental stress taking place upstream of the watershed. Soil particles and other materials carried down by excessive soil erosion eventually find their way to coastal water bodies, low land farms, and river systems in the low lying areas. Damages to coastal resources could occur as reduced fish production, destroyed fish habitat and coral reefs, and the lowered recreational value of these areas, especially when heavily silted. Siltation also destroys the mangrove ecosystem which is important in fish production. Moreover, the harvesting of mangrove products also causes resources degradation.

In Bacuit Bay (El Nido) in Palawan, Philippines, damages from sedimentation due to logging activities over a one-year period were studied. When computed, these damages were valued at US$40 million worth of fisheries and tourism earnings (Hodgson and Dixon 1988).

Effects on croplands depend on the type of materials that are carried to downstream farm areas. In some cases, the eroded soil could carry fertile topsoil. Thus, production in downstream farms could increase because of the rich materials deposited in downstream farms. Continued deposits of fertile soil is however unlikely; sooner or later, soil erosion lowers the downstream crop productivity.

The river ecosystem is also harmed by sedimentation, altering the quantity, quality, and movement of water for irrigation, domestic, and industrial uses. Heavily silted river systems can hold less quantity of water during the year. The turbidity of the water may also increase; this poor water quality is ill-suited for irrigation and related uses. Lower crop production ultimately results.

Nutrients carried by erosion into lakes also hasten eutrophication, resulting in a high level of water pollution and, consequently, lower fish production. Where the watershed drains into water structures like dams, damages from siltation or sedimenta tion are substantial. As concrete examples, the service life of most of the country's hydropower dams have been significantly reduced due to sedimentation. Cost of sedimentation may be estimated from the value of foregone benefits (e.g., reduced yield and lower power and water supply). When feasible, this environmental cost may also be estimated from the cost of removing the sediments such as dredging.

So far, the above discussion have focused on man's destructive activities in the upstream section of the watershed. These have had and continue to have devastating economic and social impacts on society in general, and to communities in the immediate down stream vicinities of the

watershed area, in particular. Analyzing the impact of the rate of resource depletion on society's welfare, using the watershed as the unit of analysis, is thus necessary in macroeconomic planning.

The watershed approach will allow a systems analysis of the upland-lowland interaction as linked by the hydrological cycle. This means that activities in the uplands will have their initial impact by altering the hydrological processes that link the two communities. Any change in these processes is bound to show through some economic and social effects on both the upstream and downstream ecology and community. The watershed approach, therefore, provides a convenient way of analyzing a natural resource unit.

Balangue (1980) gave three major functions of a typical water shed. The watershed serves as a protective cover for soil and water conservation, for wildlife sanctuary, and for cushioning the impact of adverse climatic changes. A multitude of forest products are provided by the watershed; these include water, timber, forage, fuelwood, agri-silvicultural crops, rattan, wildlife, and minor forest/plant products. The watershed also provides services or amenities in the form of recreational activities, scenic views, and aesthetic value. There is also a wide diversity of flora and fauna in most watershed resources of the country.

Extent and measures of degradation. Some studies indicate that in the early 1980s, about five million ha or 70 percent of the watershed areas of the country became both unproductive and hydrologically unstable due to various degrees of degradation and abusive land use practices (Alvarez 1984; Saplaco 1984; Veracion 1984). One can presume that the current rate of degradation is much worse now, because of massive deforestation and increased upland population growth that took place since then.

Watershed degradation is detected as high levels of erosion and sedimentation. Even in the 1970s, erosion and sedimentation were already identified as the most serious environmental problems not only of the country but also of other developing tropical countries. Thus, a number of environmental studies on the Philippines (Francisco 1986; Cruz et al. 1987; Briones 1985; Hodgson and Dixon 1988) focused their concerns on valuing the environmental impacts of soil erosion and sedimentation.

Francisco (1986) and Cruz et al. (1987) attempted to estimate the economic price of the damages associated with soil erosion (on-site) and sedimentation (off-site). The on-site cost was calculated based on the value of the equivalent inorganic fertilizer of the soil nutrients carried away for every ton of soil loss. This is termed as the replacement cost method. The cost of sedimentation was based on the productivity difference between irrigated and non-irrigated farms. The total project loss was subsequently estimated after getting the total hectarage of farm lands not irrigated due to water displacement by sediments. The loss in power generation resulting from lower volume of stored water was calculated as part of the off-site costs.

The process of natural resource degradation through siltation was documented in Bacuit Bay in Northern Palawan (Hodgson and Dixon 1988). Data showed that recent logging operations in Bacuit's upstream area led to a 50 percent loss of coral cover in a short span of one year. Coral larvae were also inhibited from settling by a fine layer of sediment; this implies lost years of reproductive growth. A one-year ecological survey of the bay was also done to monitor the im-

pact of erosion from logging on fish pro duction and on tourism. The decrease in fish production was obtained by establishing a relationship between fish reduction (both quantity and number of species lost) and sedimentation, based largely on results of other studies conducted elsewhere in the world.

For the effect of sedimentation on tourism, the study used actual records of gross revenue by the different resorts in the bay and an assumed yearly reduction in gross revenue as a result of the bay's pollution from sediments. The effect of logging under two management scenarios (with and without logging ban) was also analyzed. The estimated value of damages from logging-induced erosion reached US$40 million over a 10-year period. This value represents the projected losses from tourism and fisheries as a result of erosion.

In spite of the absence of comprehensive measurements to cost soil erosion and sedimentation, as well as other damages such as loss of bio-diversity and hydrological imbalances, these cost estimates still remain substantial and deserve serious attention.

D. *Depletion of Coastal Resources*

Coastal resources include several productive ecosystems in an ocean area close or contiguous to land. The Philippines' total coastline of 17,400 sq km consists of mangroves, coral reefs, fisheries, marshes, sea grass beds, estuaries, and other resource systems. These coastal resources provide a multitude of goods and services. Many of these goods can be generated on a sustained basis, given the appropriate rate and manner of resource exploitation.

Unfortunately, many of the country's coastal ecosystems are already degraded due to overexploitation and destructive practices by both commercial and municipal fishermen. In 1988, 675,677 small-scale/municipal fishermen operated 464,395 fishing boats and 56,715 men operated 3,436 commercial fishing vessels, i.e., greater than three tons in gross weight (Guerrero 1989). Legally, commercial fishing vessels can fish only in areas beyond the seven km allotted for municipal fishermen. But this did not stop commercial fleets from fishing on municipal fishing grounds, hastening the rate of exploitation of the fishery resource and destroying fish habitats.

Given the above situation, a disproportionate sharing of benefits exists in the fishery sub-sector. Of the total fisheries produc tion in 1990, municipal fisheries accounted for 45 percent while commercial fisheries contributed only 27 percent. This translate to only 1.6 per capita harvest for the municipal fisherman and 12.35 for the commercial sector. However, even the sharing of benefits in the commercial sector favors the boat owners, with only a small proportion of the benefits going to the laborers.

Fish is an important source of low cost animal protein for Filipinos. It provides 60 percent of the animal protein supply of the Filipinos' diet (Guerrero 1989). The coastline is a rich source of fish. Artisanal fisheries and small scale-fish processing industries are, therefore, sizable sources of income in many coastal areas. Certain fish species like tunas and shrimps are also exported.

Given the significance of coastline resources as food sources, reduced fishery production due to environmental degradation has considerable socioeconomic implications (Dixon 1986). In many poverty studies, small fishermen were identified as belonging to the poorest of the poor. A World Bank (1989) study cited that 65 percent of fishing families live below the poverty line of

P2,500 per month. This situation aggravates coastal resource overexploitation. The paradox is that man, in his effort to survive, ends up employing destructive practices that impair the future productivity of the very resource that enables him to survive. These practices further tie him and future generations to the vicious cycle of poverty.

The study by Dalzell et al. (1987) showed that the Philippine small pelagics were already economically overfished as early as the mid-1960s and biologically overfished in the mid-1970s. Pelagic fishes consisting of mackerel, sardines, roundscad, etc. represent 30-40 percent of the total marine catch in the country. Moreover, Silvestre and Pauly (1985) reported that the catch per unit effort (CPUE) of municipal fishermen in some regions of the country decreased by 42 percent.

Several devices regulate the use of natural resources. These include taxes, subsidies, direct regulations, pricing system, and assignment of property rights. In the past, the government relied largely on regulations for the fishery sub-sector (Chap ter II). However, these only established rules and regulations. The implementation leaves much to be desired, due in part to the low level of support given to this sub-sector compared to agriculture and forestry. There is also the inherent difficulty of monitoring violations in the large fishing grounds of the coun try, especially due to its open access. This difficulty is aggravated by the fact that the task is undertaken solely by the government.

Since overfishing continues at an unabated rate, regulatory measures were strengthened through community participation. Fisherfolk associations are now tapped as partners by the govern ment in protecting the resource base which should benefit them in the long run. Slowly, there is also an increasing attention given to pricing reform as a tool to regulate the rate of fish depletion. But this particular economic reform can be undertaken only after some ongoing studies successfully determine the value of natural resources.

Nevertheless, the declining CPUE and the increasing economic and biological overfishing pose as a more serious problem for the small fishing households (Table 15). This dismal performance supports the general observation that the country's macroeconomic and sectoral policies might have contributed to worsening resource depletion and subsequent welfare deterioration. This is because these policies, which are conducive to capital intensive production systems, favor the commercial fishing sector at the expense of the municipal sector.

The mangrove ecosystem. Tidal mangrove areas were traditionally viewed as wastelands, with no significant economic or ecological value. As a result, they were readily converted into more profitable land uses such as fishponds. Mangrove trees were also harvested for wood products. However, they are now increasingly recognized for their indirect contribution to fish growth. Mangroves serve as important nurseries and habitat for the multi-species marine life in the country. Mangroves also function as feeding and breeding grounds at certain periods and stages during the fish life cycle.

Mangroves yield conventional forest products such as firewood, poles, nipa for roof and wall thatching, and medicinal products. The 1989 World Bank report estimated the quantity of products harvestable from a hectare of mangrove using 1983 data from the Central Visayas Regional Project. A hectare of mangrove could yield 12.5 cu m of fuelwood and 800 kg of fish

Table 15. Level of CPUE, Economic and Biological Overfishing (1970–1990)

Year	Fishery Sector		
	Level of Biological Overfishing (in 000 MT)	CPUE (MT/Hp/Yr)	Level of Economic Overfishing (in 000 MT)
1970	88.9	3.25	663.9
1971	123.1	3.46	698.1
1972	222.4	2.62	797.4
1973	304.8	2.25	879.8
1974	368.4	2.34	943.4
1975	436.8	2.4	1011.8
1976	493.5	2.7	1068.5
1977	608.9	2.76	1183.9
1978	680.4	2.32	1255.4
1979	681.3	1.88	1256.3
1980	972.2	1.76	1547.2
1981	872.9	1.6	1447.9
1982	997.0	1.39	1572.0
1983	1210.2	1.25	1785.2
1984	1180.3	1.26	1755.3
1985	1152.1	0.84	1727.1
1986	1189.5	n.a.	1764.5
1987	1313.0	n.a.	1888.0
1988	1369.7	n.a.	1944.7
1989	1471.1	n.a.	2046.1
1990	1603.5	n.a.	2178.5

Sources: BFAR Statistics and Schatz, 1990

Notes:

MT – metric tons
CPUE – catch per unit effort
HP – horsepower
Yr. – years

products, with 100 kg coming from direct production of fish, shrimps, crabs, mollusks, and sea cucumber; the other 700 kg would come from indirect fish production. When valued, these products constitute the gross benefits that society stands to lose for every hectare of mangrove areas converted to other land uses. The net loss would depend on the social net benefits realizable from the alternative land use to which mangroves are converted.

Depletion of the country's mangrove areas took place at a rapid rate. From the 450,000 ha of mangrove forest reported in 1918 (Brown and Fisher 1920), the number dwindled to 227, 947 ha in 1972, based on a 1972 LANDSAT study (NRMC 1979). Another LANDSAT study in 1980 reported only 175,000 ha of mangrove areas remained; this further declined to 149,400 ha, based on the 1987-88 SPOT satellite survey (Swedish Space Corporation 1988). All these imply that from the 450,000 ha in 1918, only 28 percent remained in 1987, yielding an average yearly rate of depletion of 4,572 ha using 1920-88 data (NFRI 1988). The SPOT survey located 22 percent of the remaining mangroves in Palawan, 32 percent along the east and southwest coast of Mindanao, and 23 percent in Eastern Visayas and Bohol (World Bank 1989).

Coral reefs. Coral reefs are among the most productive ecosys tems on earth, contributing substantially to fish yields. This contribution reached 8 - 15 percent of the total catch for finfishes (Russ 1984), largely due to the substantial food pro duction taking place in live coral reef ecosystems. With an average production of coral reefs estimated at seven tons/ sq km, based on 1976-81 data, the estimated 30,000 sq km of Philippine coral reefs could have contributed as much as 210,000 tons/yr to total production. The annual yield of coral reef fishes was estimated at the range of 5 - 24 tons/sq km. The actual yield would depend on factors such as fishing intensity, bottom type, coral quality (percentage of living cover), and other environmental factors (World Bank 1989).

Coral reefs are useful as habitats to a large number of fish and invertebrate species (Stevenson 1982). Other functions of coral reefs relate to their aesthetic value, their ability to maintain high species diversity, and their prolific growth and excellent quality which contribute substantially to the fishery resource base. However, the ability of the coral reefs to provide these valuable services are already impaired. The 1976-81 underwater survey by DENR involving 600 sites throughout the country revealed that majority of the Philippine reefs are either "poor" (32 % of site surveyed had less than 25 % reef cover) or "fair" (39 % had 25-50 % reef cover). About 24 percent of the survey sites fell under the "good" category of having reef cover of 50-75 percent. Only less than six percent had "excellent" reef cover (Gomez et al. 1981).

Measures and causes of fishery resource depletion. Resource degradation has many physical manifestations. Deterioration of marine and terrestrial resources are seen from the physical and chemical damages to coral reefs, pollution of coastal waters, deforested or cleared mangroves, and declining fish landings or CPUE. The change in species composition and their age structure also serve as indicators of overfishing. Quantitative estimates of depletion in the fishery sector are in CPUEs and the comparison of actual yield to the maximum sustainable yield (MSY) and the maximum economic yield (MEY). The MSY and MEY for pelagics and demersal fisheries were estimated in earlier studies. Table 16 shows the biological and economic overfishing measured as the difference between actual yield and MSY and MEY, respectively.

Table 16. Total Fishing Effort and Catch Per Unit Effort (CPUE) for Small Pelagic and Demersal Fishes in the Philippines, 1965– 1985.

Year	Small Pelagics		Demersals	
	Effort (000 hp)	CPUE (mt/hp/yr)	Effort (000 hp)	CPUE (mt/hp/yr)
1965	105	2.50	182	1.13
1966	194	2.00	203	1.09
1967	210	1.55	264	0.20
1968	203	1.76	337	0.89
1969	166	2.11	431	0.65
1970	157	2.69	494	0.56
1971	155	2.93	536	0.53
1972	313	2.08	610	0.54
1973	292	1.74	676	0.51
1974	280	1.82	718	0.52
1975	266	1.94	653	0.46
1976	259	2.01	524	0.69
1977	280	2.03	509	0.73
1978	363	1.64	534	0.68
1979	416	1.20	534	0.68
1980	371	1.21	677	0.55
1981	491	1.13	677	0.47
1982	625	0.92	777	0.47
1983	621	0.85	946	0.40
1984	557	0.84	976	0.42
1985	558	0.84	–	–

Source: Schatz, 1990

Aside from depletion based on MSY and MEY statistics, a compari son of the increase in level of efforts (number of bancas used) relative to the catch performance was made. The 1980-85 data shows the number of bancas increased by 26 percent and motorized bancas by 29-42 percent while catch grew by only 17 percent (Russ 1984). Table 16 shows the CPUE data for small pelagics and demersals from 1965 to 1985.

The Fisheries Sector Program (1989) classified the following major causes of environmental problems affecting coastal resources: destructive harvesting activities, siltation, pollution, and overfishing. Destructive fishing activities include the use of dynamite or blast fishing, the practice of *muro-ami*, and the use of *kayakas* and cyanide for the collection of aquarium fishes. These indiscriminately kill aquatic organisms essential to sus taining marine productivity. The use of sodium cyanide by both fishermen and aquarium fish collectors destroy coral polyps and other invertebrates. Approximately 90 percent of tropical fish harvested in this manner die within a few months (World Bank 1989). The damages from muro-ami and kayakas fishing are physical and brought about by the fishing gadgets used.

The gathering of live corals and shells provides employment to some sectors of society. In the 1970s, the Philippines provided more than 90 percent of world ornamental coral imports. The government banned the export of unworked stony coral in 1977. However. illegal harvest continued due to the poor enforcement of the law. If this situation persists, the damage already inflicted on the country's marine resources will worsen.

Siltation arising from deforestation in the upland watershed deposit huge sediment loads in coastal areas, mangrove, and coral reef habitats. Mining also leaves sediment in rivers and in areas located near mining sites. The high concentration of suspended and settled sediments can adversely affect aquatic life by reducing the amount of solar radiation for photosynthesis and by mechanically interfering with respiration. The cost of dredging the river bed to remove heavy suspended sediments is a way of evaluating the extent of damage to the reef system.

The main cause of water pollution is the disposal of municipal and industrial wastes into water bodies. This harms nearshore areas and even sources of fresh water. According to the National Pollution Control Commission (NPCC), 50 of the 400 rivers it monitors are seriously polluted. Forty are virtually dead due to low, dissolved oxygen levels and high concentration of hydrogen sulfide, suspended solids, and heavy metals. Four of these are in Manila (NEPC n.d.). Sources of pollution include domestic sewage and agro-based industries like tanneries, sugar refiner ies, and nutrients released in some crop farms. Pollutants lead to fish poisoning, red tides, plankton "die-offs," and human fatalities, i.e., poisoning and related health hazards.

Overfishing can be viewed both as an effect and a cause. Poverty, greediness, and the open access nature of coastal resources lead to economic and biological overfishing. The open access characteristic of the large expanse of coastal resources invites all interested parties to avail of its wealth, contributing to overfishing. With decreasing catch, fishermen are forced to use finer meshed nets, poison, and other destructive fishing methods that meet short-term needs at the expense of future resource sustainability (Fisheries Sector Program 1989).

E. *The Mining Sub-Sector*

Unlike forest and coastal resources, mineral resources are depletable resources. They do not have the ability to regenerate; once taken from the ground, they cannot be replaced. As a re source sub-system, mines do not perform a direct ecological function such as providing habitat to a diverse number of living things. Mining operations, however, cause serious ecological dysfunctions. Mining, gold panning, and milling activities performed during mineral extraction and utilization bring environmental degradation such as air and water pollution. Environmental damages tend to be substantial for communities adjoining mining firms. But more important is their ultimate repercussions as society's welfare loss.

Economic profile of the mining industry. Traditionally, the importance of the mining sub-sector lies in its contribution to the economic growth of the country. The mining sub-sector earns foreign exchange; generates taxes, royalties, and profits; provides employment; and produces products essential to manufactur ing other materials.

In the Philippines, mining is generally associated with the production of hard mineral ores and concentrates (Santos 1988). Its primary products include copper, gold, nickel, chromite, cobalt, and silver which altogether account for 78 percent of the total value of mining production in 1990. Processed non-metallic products also contribute to the economy. The two most important processed minerals in the country are cement and fertilizer. Cement has been used extensively to meet the country's construc tion and infrastructure needs. A total of 203 million mt of cement were produced in 1989, accounting for three percent of the total value of non-metallic production. Not yet included in this figure is the amount of raw materials cement production consumes such as limestones and shale.

Fertilizers help boost agricultural production in the country. Like cement, fertilizers are derived from raw materials such as natural gas, fuel oil, naptha, coal, and electricity to produce ammonia, pyrite, sulphur, anhydrite, and gypsum needed for making sulphuric acid, ammonia, phosphate rock, potash salts, and other ingredients (Santos 1988a).

The total production value of primary raw and processed mineral products, along with other minor mineral products, reached P22 billion in 1990. This reflects a 10 percent annual rate of increase in the value of production since 1970. In real Gross Value Added (GVA), this amounts to P16 billion or 0.22 percent of total GNP for 1990. This shows that although the GVA of the sub-sector represents a P1 billion increase from the previous year's level of P15 billion, the sub-sector's contributions to the entire economy for the year was essentially minimal and has been decreasing at a rate of -0.92 percent annually since 1970.

The export structure of the mineral industry is dominated by crude minerals. However, the contribution of mining exports to total product exports has been declining at a rate of - 0.57 percent annually since 1970. This trend seems to be continuing despite the numerous incentives the government gave to the sub-sector. The tax relief incentives alone exempted mining firms of almost 75 percent of their taxes (Radecke 1980). Tariff exemp tions was used extensively to promote capital intensity of mining firms. In 1978 alone, tariff exemptions from capital imports amounted to P71 million.

Mineral imports, on the other hand, has been largely dominated by crude petroleum, representing 67 percent of total mineral imports in 1985 and 24 percent of total product imports of the country. This reflects the heavy dependence of the country on foreign sources of energy. The value of mineral imports to total product imports rose steadily at an annual rate of 33 percent from 1970 to 1985, while the rate of mineral exports in value terms declined. In 1970, the net exports of the country's' minerals amounted to a deficit of US$1437.5 million which increased to US$3230.3 million in 1985. The annual deficit averaged US$119.52 million in real terms. These figures show that the sub-sector contributes to the trade deficits of the country and drains the foreign reserves of the country. Yet the sub-sector continues to enjoy the status of being a foreign exchange earner.

The sub-sector's potential was used as basis to justify the series of incentives afforded to it. Against this gauge, the sub-sector did not come up to expectation as seen by the negative net export it realized. The analysis made by Santos (undated) revealed that policies favoring the mining sub-sector through a series of incentives failed to develop a strong and efficient industry. As a result, the contribution of the sub-sector as a dollar earner, especially during periods of BOP crisis, was not explored to its fullest. A publication of the Environmental Management Bureau (1990), however, attributed the dampened growth of the sub-sector to the worldwide recession and the softening of the metal prices in the latter part of 1980.

The mining sub-sector also generates employment, much needed in a country with labor surplus such as the Philippines. But as in its foreign exchange generation capacity, employment in the industry has been minimal. This is because mining is being promoted as capital intensive and, hence, has limited labor absorption capacity. On a national scale, the mining and quarrying industries absorbed only about 139 thousand workers in 1990 or 0.6 percent of the country's total employment. The average employment records from 1981 to 1988 was 121.75 thousand workers. Though mining's proportion is small, this number represents a significant size of the population, especially with each worker representing a household. A large number of households also work or engage in small mining operations. The report by Delos An geles and Lasmarias (1990) estimated gold panners in the Philip pines at 78,980. However, the production capacity of small-scale miners in the same year was estimated at only 48,373 grams (gm)/day. On a per panner basis, production amounted a national average of only 0.62 gm/day.

Measures of mineral scarcity. Minerals are classified as "under ground" depletable resources. It is, thus, difficult to determine the amount of mineral reserves the country has. With exhaustible resources, the rate of depletion depends on the cost structure of the mining firms, the price of the mineral products, the level of technology, and the rate of interest which measures the opportunity cost of investment to the mining sub-sector. Favorable cost structure and prices of mineral products and a higher return from alternative investment opportunities tend to deplete the mining resource at a very rapid rate. Unlike other natural resources, there is nothing wrong about exploiting the resource fast, for as long a certain amount, called the "user cost" is set aside for future generations. The user cost measures the foregone earnings to future generation resulting from the current extraction activity of the present generation. The ideal situation is to invest this user cost to assure future generations of a perpetual flow of income, even if the mineral resources are already totally depleted.

Some projections made a decade ago show that the country's copper reserves could be depleted by the year 1996, the gold reserves by 2020, iron by 2065, and chromium by the year 2014. These esti mates assume that no new deposits will be found (Environmental Management Bureau 1990). The projections are. however, subject to wide variations, because known reserves at any given time may be very small relative to potential reserves of the country. As mentioned earlier, the level of extraction as well as exploration depends on the economic factors affecting the profitability of extracting mineral resources. Discoveries and technological change often augment reserves. With technological change, new uses may also be found for "old metals;" thus offsetting the impact of dwindling reserves (Delos Angeles and Lasmarias 1990). The problem with using reserves as basis for measures of scarcity or exhaustion lies in the definition of reserves (Fischer 1982). Santos (1988a) categorizes reserves as --

a. Identified reserves are estimates of known mineral deposits, evaluated as to extent and grade, and whose contained minerals may or may not be economical to extract under prevailing techno logical and economic conditions.

b. Hypothetical reserves are mineral deposits, either economical or uneconomical to extract, whose existence is predicted on the basis of geological knowledge of unknown mineral districts.

c. Speculative resources are both economical and uneconomical material deposits whose existence is predicted on the basis of geological knowledge, in unknown mineral districts, or in uncon ventional form.

The above definitions imply that only a portion of what we call reserve estimates is accounted for by the present level of technology. In the absence of extensive exploration, reserve estimates are then very misleading basis of exhaustion. Delos An geles and Lasmarias (1990) noted that the reserve data estimates have not changed much since 1975, indicating minimal exploration activities in the Philippines. Thus, estimates of ore reserves may be an unreliable basis of exhaustion.

Economic indicators of scarcity are also beset with problems. For example, technological change could result in cost-efficient methods of extraction. Thus, a decrease in cost may not necessarily entail increasing mineral reserves, since they may reflect more of technological change than exhaustion. The structure of markets also influences the reliability of economic indicators of scarcity. Monopolistic and oligopolistic markets often undermine the function of prices to respond to scarcity. Profits and eventually rent may still be high even if scarcity is already taking place. Moreover, unfavorable prices set by the world market may affect resource rents by reducing the profitability of mining firms. Thus, resource rents may be declining largely due to market effects rather than due to scarcity.

The preceding discussions explain how scarcity is not an issue in the mining sub-sector. Even the nature of macro and sectoral policies are highly supportive of the current rate of extraction activities of the sub-sector. In fact, the incentives given to the sub-sector has effected a high rate of use of capital in the production process, ideally to make extraction more efficient and faster. Protection from adverse world economic conditions was also extended to the sub-sector through production assistance policies and price subsidies.

Social cost accounting in the mineral sub-sector. The absence of reliable scarcity estimates for mineral resources in the Philip pines and the little attention given to the scarcity issue war rants new perspectives in determining the optimal management of these depletable resources. One way of achieving the optimal management of these resources is through the accounting of the costs it imposes on society. This means that managing these depletable resources efficiently entails making the extraction process socially cost-effective. The social cost associated with the mining industry emanate chiefly from the externalities of mineral processing and the derived demand for other resources that complement the use of processed, non-metallic minerals.

Mineral extraction does not stop with the extraction of raw ores. Chemicals are used to separate the impurities from these ores to obtain the final high grade products. Once used, these chemicals are discharged in the form of mine tailings. It is from these discharges that externalities arise. In 1977, out of the 220,000 mt of raw ores generated by 24 active mineral-producing firms daily, about 140,000 mt of mine tailings were also discharged daily (Briones 1987).

Most large mining firms are found near river systems or coastal systems. It has been a common, cost-effective practice for these firms to discharge their tailings either directly to these sys tems or in inland impoundments. However, these inland impound ments also fail to contain these effluents due to the poor design of the impoundments (Pecache n.d.).

These methods of discharging tailings pollute the water system. The heavy metals found in these discharges provide a hostile environment for plants and animals. Their toxicity often destroy plant and animal life. The impact's magnitude on biodiversity, however, has not been fully assessed.

A well-known impact of mining effluents is the sedimentation of river systems. Siltation or sedimentation of rivers affect the irrigation system of farmlands. This ultimately reduces farm production because of the poor quality of the water available for crop lands. Briones (1987) valued farm production losses due to mine tailings in the Baguio mining district at US$5.75 million in the Amburayan irrigation system and US$8.49 million in the Agno irrigation system. These figures point to a substantial implicit cost in minerals production. Perhaps, the effects of mine dis charges on agricultural production is the most widely documented case of the adverse consequence of unmanaged mining production.

Another direct social cost arises from air pollution in terms of airborne dusts. Unlike water pollution, this externality forms part of the on-site costs. Dust are usually absorbed by those directly involved in the process of mineral extraction. But unlike those of water pollution, air pollution impacts has received little attention and their economic and health implica tions have not yet been quantified (Pecache n.d.).

A second set of consequences of mineral production arises from the use of non-metallic products such as cements. Cement used for construction is usually accompanied by sand and gravel. These products are extracted from river systems and mountains. They are products of the quarrying industry that go hand in hand with the mining industry. Quarrying leads to degradation of river systems and deforestation in the event that mountains will be cleared for this purpose. It also contributes to erosion which eventually results in the sedimentation of rivers and flooding.

The extent by which cement production influences the degradation of other resource system is poorly documented.

Mining also entails the use of timber. Mine shafts are reinforced by wood to avoid the caving in of mines. A GOP (1991) study of three large mining firms shows that for 1990 these firms used up a total of 10.24 million board feet of timber valued at P120.2 million. The Benguet pine forest was the major source of timber for these mines. Given the shortage of timber, the water shed in the area is now in danger because of the probable shift to illegal logging to supplement the demand for timber of these mining companies. This is compounded by the need to clear for ests to provide access roads to mines.

The previous discussions have shown the various social costs -- loss in production and biodiversity, and the influence on other resource systems -- associated with mineral production. Complete quantification of these social costs, however, is still unavail able. But fully accounted social costs can provide a basis for the management or optimal depletion of mining resources. As an initial effort toward this goal, effluent standards could be set to lessen the social costs of resource extraction. Policies such as economic incentives could then be formulated to influence the behavior of firms to abide by these standards. In this manner, management of depletable resources can be socially cost effective. However, the strict requirement for this approach to managing depletable resources should entail full accounting of social costs.

In the case of the Philippines, this approach is still far from being achieved. Present effluent charges are still low, reflecting the poor accounting of costs in mining activities. Indiscrim inate effluent discharges from this sub-sector is also being encouraged by production assistance policies and other forms of incentives that promote faster rate of mineral extraction. Since increased extraction activities impose certain costs to some members of society, then mineral policies may have partly contributed to a decline in society's welfare. It should be pointed out though that a number of studies have indicated a welfare gain for certain households within the mining communities. It may be necessary to get the net welfare effect to society in addition to the knowledge of the welfare impact differential, to secure the distributional welfare effect of policy changes.

F. *Conclusions*

This chapter highlighted the serious state of the country's forest and coastal resources and that of the environment due to mining effluent discharges. Though no complete and exhaustive accounting of these costs have been done, the scattered evidences presented in this report show that these costs could be very substantial. Some efforts to account for them are currently underway, but there is still some room for a thorough environmental cost accounting. Ongoing accounting studies are expected to come up with appropriate pricing schemes for resource extraction. A price reform is expected to play a big role in regulating the use of natural resources and the environment. The environmental cost estimates derived from these studies would also help policymakers evaluate the environmental cost of the different adjustment policies.

V. IMPACT STUDIES ON NATURAL RESOURCE DEPLETION AND THE WELFARE OF MICROECONOMIC UNITS DEPENDENT ON NATURAL RESOURCES

A. *Introduction*

This chapter presents some analyses on how resource-dependent households may be ultimately affected by the various macro and sectoral economic policies that influence the rate of resource depletion. The assumption used here is that changes in the rate of depletion resulting from certain economic adjustment policies will eventually change the welfare levels of poor households dependent on the natural resource. In like manner, changes in the environment triggered by adjustment policies may also impinge upon society's welfare.

Changes in the rate of resource depletion or the environment have repercussions on household welfare by influencing the quantity and characteristics of goods and services consumed by these households. The composition of goods and services may include those purchased from the income derived from the resource, those directly provided by natural resources such as environmental amenities, and the services embodied in public goods provided by the government. The concept of welfare as used in this text derives from the consumption of goods, either directly or indi rectly, and from the goods' characteristics.

While it is true that welfare measures depend on various physio logical characteristics such as age and sex, it is assumed that a good bestows the same amount of welfare on an individual, regard less of his physiological traits. The study also stresses that while the rate of resource use may influence the welfare level, the direction of causality works both ways. This means that welfare levels (e.g., poverty and employment status) of resource users also influence the rate of depletion. Moreover, the impact of any policy or intervention program is likely to differ by type of resource users. Two general types of resource users may be identified: the commercial users who are few in number but control the larger economic portion of the natural resource pie and the poor resource users who are large in number but control only a small economic portion of the natural resources. Since the latter group represents a bigger section of society, the impact on their welfare should be the prime concern of MIMAP studies. Within a given household unit, it is also possible for welfare impact to vary by gender or age group. Whenever there are strong reasons to believe that such variations may exist and cause equity impact differentials within a given household, then welfare impact studies must also consider these variations.

The study's hypothesis contends that small resource users (i.e., small upland farmers, municipal fisherfolk, gold panners, etc.) will respond or be affected by economic policies differently from commercial users (i.e., logging firms, commercial fishermen, and mining firms). To a large extent, the impact of many economic policies on the small resource users may be indirect and would depend on how the sub-sector closely linked to the market would respond to policy intervention. This is because many of the country's natural resources are considered finite in quantity, so that whatever they do on the resource will have some effect on the welfare of other resource users. A certain number of poor households are also employed in these firms and are likely to be affected by the firm's response to a given policy initiative.

Aside from the two general users, there are others who may be influenced by what becomes of these natural resources. These are the households or communities who may be affected by the change in the quality of the environment (i.e., air and water) and the change in the flow of some services (e.g., water for irrigation and power). The presence of a large number of households who are expected to suffer from the ill consequences of resource degradation shows that a huge social cost may accompany the choice of inappropriate economic adjustment policy mixes.

B. *Welfare and Economic Adjustment Policies: A Conceptual Analysis*

The MIMAP framework presented in Chapter I assumes that the welfare of poor households dependent on the NRES may change due to macro and sectoral economic policies and their impact on the rate of resource depletion. This implicitly assumes that a substantial portion of the households' income (cash and non-cash) is derived from the NRES. Hence, the quantity and quality of goods consumed by the households would depend on the imputed income derived from the sector. The term "goods" as used in this study also includes the services provided by the environment and the natural resource unit. In cases where a significant portion of the household's income comes from non-resource based employ ment, then that household may be more responsive to another set of prices not directly linked to resource depletion.

Other policies also have consequences on all types of households, regardless of the sector on which they depend. These include devaluation, increase in money supply, and similar expansionary policies that tend to have inflationary effect on prices of consumer goods not derived from the resource. The change in government expenditures can also directly influence the welfare status of households through the provision or withdrawal of certain public goods (e.g., public health, education, and nutrition program). These observations highlight the need to consider other policy effects on resource-based households that are not directly transmitted through changes in the rate of depletion.

Problems posed by varying responses to adjustment policies.

The welfare impact of adjustment programs is difficult to predict since different groups of consumers and producers will have varying responses to these adjustment policies. Some types of coping strategies may also be adopted (e.g., switching to other consumer goods in case of price increases or to other producer goods in cases where adjustment policies reduce profitability of existing enterprise) by these various groups to minimize or avoid adverse effects of the adjustment policies. The lack of data on who are the potential gainers or losers from a given policy reform makes it difficult to develop working hypotheses on the likely effects of stabilization policies on poor members of society. This type of information, however, is necessary in identifying appropriate policies that can mitigate adverse wel fare effects of certain unavoidable economic reforms.

Consider the case of contractionary adjustment policies aimed at deflating aggregate demand and levels of real output or prices in the short term. The decrease in the level of real output will hurt welfare levels by cutting down employment. But fiscal policy can be designed to have a differential impact on output and employment. This can be done by targeting fiscal reforms in such a way that the disadvantaged members of society are protected. Expenditure and output-switching policies also seem likely to shift aggregate supply and demand for labor. However, no work-

ing hypotheses are available on how quickly this occurs and how real incomes, employment, and output will respond. It is also difficult to predict the consequences of an adjustment in the exchange rate on the poor. When the peso depreciates, low income groups may suffer if the exporting or import-substituting sectors are relatively capital-intensive and if a large part of the basic wage goods are imported. But if the poor are predomi nantly rural, they will feel less the adverse consequences of real depreciation.

Delineating short- and long-term welfare effects of policy changes. In measuring the welfare impact, one should distinguish the short-term from the long-term welfare effects of policy changes. This is particularly important in the natural resource systems where the marginal effect of human activities may be insignificant but the cumulative impact could be substantial. Many forms of irreversible destruction occur in the NRES. Al though repairs may be feasible in some cases, these usually entail huge investment and even long periods of recovery or regeneration. The long-term effects of adjustment should thus be anticipated so that society can prevent events that may impose large social costs.

The adverse impact of adjustment policies may come from reduced public expenditures, increases in prices of consumer goods and services needed by the poor, and the decline in employment or real wages induced by contractionary adjustment policies (Ribe 1990). Adjustment policy effects may be classified into primary and secondary adjustment costs (Corden 1988). The primary adjustment costs, also called recession-induced costs, bring down incomes and employment. Secondary adjustment costs are short-run responses to overvalued currency, wage resistance, inappropriate use of import restrictions, or disorderly adjustment.

A cut in public expenditures is an economic policy action fre quently undertaken during an adjustment period. This creates unemployment for a number of unskilled and semi-skilled workers engaged in government projects affected by the budget cut. Be cause of limited labor mobility and inadequate skills, these laid-off workers suffer a drop in their income and overall wel fare level. Without alternative employment opportunities, these workers who are already hard up will experience more economic difficulties. Many experts believe that increased poverty will heighten the rate of resource depletion from both current upland occupants and new migrants who may be forced to move into the uplands for lack of alternative places to go. This kind of deductive reasoning, however, has been questioned by several authors. Lipton (1989) cited several studies in developing countries demonstrating how poor farmers tended to husband re sources more carefully, sometimes even if they were mere share croppers. Many common property resources are also well managed in traditional societies. As Lipton indicated, "there is very little truth to the belief that poor parents degraded the envi ronment because of improvident maternity."

The natural resource-dependent households may also suffer from the budget cut if the affected projects are intended for the NRES. Aside from its direct and indirect effect on employment and income, reduced public spending may also discourage invest ment that can slow down resource depletion. In this particular case, it is conceivable to think of a positive, long-run welfare impact resulting from less pressure on natural resources. This indicates some ambiguity in the welfare effect of cutting government expenditures. There has been little systematic empirical

analysis conducted to identify the actual changes in sectoral expenditures and the consequences of these changes on the poor.

The effects of government subsidies. Fiscal policy reforms could also come from a change in the level of government subsidies. Government subsidies usually take the form of lower prices of inputs or higher price of outputs. In some instances, certain inputs are provided for free. Subsidies are given to promote the adoption of a certain recommended technology or practice. They are also given to encourage the production of some products. In a natural resource system, a subsidy may be justified when the desired alteration of a firm's production activity or a household generates positive externalities to society (e.g., planting of trees in the watersheds). If the modification requires an investment cost beyond the capability of the resource user, then the user may receive some subsidy since the social benefits of this modification could be substantial.

Many stabilization and adjustment programs also include a cut in consumer subsidies as part of their effort to reduce the deficit. Consumer subsidies are of two types: marketwide subsidies which bring down the retail price of a good sold through the regular market channels, and targeted subsidies which lower the price of a good for an individual based on some indicator of need, usually income or location. Whatever form they take, subsidy reductions often become controversial and sometimes provoke strong opposition, mostly from the middle class because of their negative income effect.

The well-being of the poor during adjustment can, therefore, come from any or a combination of reductions in public expenditures, increases in prices, and changes in employment patterns. This brings out the need to set up a system of prioritizing government expenditures so that poverty alleviation and other social programs are not sacrificed. Subsidies also require careful study so that they effectively contribute to raise and maintain the welfare of poor households. Policies and programs should also be evaluated in terms of their wage and employment impacts so that the mix of policies causing the least welfare cost may be identified. Being stressed in all the above is the need to ensure that whatever negative welfare effects exist as a result of adjustment policies should be minimized through appropriately designed social and income generating programs.

C. *Identifying Welfare Indicators from Welfare Impact of Past NRES Policy Changes*

Distributional consequences of adjustment programs. Blejer and Guerrero (1988) did an extensive analysis of the distributional consequences of adjustment programs in the Philippines, using 1980-86 data. They developed a model to measure the distributional effects using a functional relationship among real earnings, real wages, real exchange rate, and level of overall economic activity. The study hypothesized that an increase in real wages and level of economic activity would increase total earnings. But an increase in real exchange rate may have varying conse quences on different income groups, depending on their involvement in the production and consumption of traded and nontraded goods. A negative relationship between underemployment and real wage rate was assumed to exist in the labor market.

Their analysis revealed that a huge income inequality exists in the Philippines. The quarterly income data from 1980 to 1986 showed that families in the lowest 30 percent income bracket received an average 6.3 percent of total income while those in the highest 10 percent got 44.6 percent of total income. The finding indicates that the underemployment effects of adjustment

programs during the period under study proved detrimental to low income groups more than to high income groups.

The model also revealed that the income inequality could be mitigated by an increase in real wages as induced by improved labor productivity. It further disclosed that a depreciation of the exchange rate can lessen the inequality. This would mean that the benefits obtained from improved competitiveness in the external market tends to benefit the poor more than they benefit those economically well-off. A higher interest rate also reduces inequality by lowering the income of high income groups as a result of lower economic activity, without altering the welfare level of lower income groups.

Inflation, or a general increase in price levels, tends to hurt the poor more than the richer households. This is because the rich have more wealth to protect themselves against price in creases. The study also analyzed the effects of government spending as another policy variable. It demonstrated that an increase in government expenditures contributes to distributional inequity. This discloses the bias of government spending in the Philippines toward high income groups.

The authors concluded that the macroeconomic adjustment policies of the 1980s adversely affected the poor. This was traced mainly to the underemployment that followed after the stabilization program. The series of inflations which took place in the period and the overvaluation of the exchange rate, both of which have regressive effects on the poor, also served as contributory factors. Hence, these economic policies, although useful in correcting for serious economic imbalances, brought certain undesirable welfare consequences which must be reviewed and appropriately addressed. The adverse welfare impact of an ad justment program could be mitigated by developing poverty alleviating measures or by choosing a socially desirable mix of economic policies. Regardless of the option taken, the government should determine the value of the potential welfare effects of these policy alternatives. It would even prove more useful if some welfare effects can be disaggregated by sector so that corrective measures can be designed according to the specific circumstances of the different sectors. Unfortunately, the available data are not disaggregated according to resource base, thus rendering sectoral analysis a difficult task.

Equity effects of environmental policies. Biswanger (1989) and Herrin (undated) looked into the equity effects of environmental policies. Biswanger showed that many policies designed to help small farmers may have helped the large farmers instead. He demonstrated how taxes and standards aimed at constraining high-cost production activity eventually improved absolute equity since they reduced large farmers' income without significantly changing the poor farmers' income level. The transmission mechanism to welfare effects are changes in the cost structure, prof itability, uncertainty or risk considerations, and credit re quirements of the resource-based activity. Since most of these variables are economic in nature, the more vulnerable groups are those sectors closely linked to the market.

Herrin's paper assessed the consequences of Philippine public policies on the distributive transition (defined as the shift from high income inequality to lower levels); structural transition (i.e., shift from low-productivity agricultural enterprises to high-productivity commercial industries); and demographic transitions (e.g., decline in mortality and associated fertility levels as well as change in migration patterns consistent with dispersed concentration of industries) in the Philippines. The size and pattern of government expenditures became the study's focus. The im-

pact indicators consisted of the share of industries and agriculture on output and employment, extent of unemployment and underemployment, rate of decline in fertility, improvement in life expectancy, and migration patterns and composition.

The study's analysis led Herrin to concur with the general observation that government priorities tended to favor large-scale economic projects which often have limited direct impact on welfare and are undertaken at the expense of basic social services. The numerous and sometimes conflicting objectives of the government (e.g., low food prices and higher farm income) make it highly possible for any one public policy to generate unintended side effects. For example, policies that protected manufacturing through tariffs, indirect sales taxes, and other trade restrictions resulted in an overvaluation of the currency. This, in turn, effectively lowered the price of tradables such as agricultural exports on which a large number of farm households depend. Because of the seemingly ambiguous effects of government economic policies, Herrin cautioned policymakers to evaluate the wide range of possible impacts of public policies. This evaluation is necessary in order to anticipate adverse consequences of any government policy through the development of other corrective policies.

D. *Welfare Indicators in the Forestry Sub-Sector*

The paper by Sarma reviewed the employment and direct wage income effect of Social Forestry (SF) projects in India and the Philippines. Quick surveys, case study results, and published statistics comprised the main sources of the study. Sarma highlighted a series of studies conducted by researchers from the University of the Philippines at Los Baños (UPLB), DENR, and the Philippine Council for Agriculture, Fishery , Forestry Resources Research and Development (PCARRD) which reported that kaingineros partici pating in SF projects experienced a 90 percent increase in family income over a four-year period. This occurred in spite of the minimal support given by the project to the participants, mostly in the form of free planting materials and some technical assistance. The study furthermore claimed that the SF projects also generated employment for rural residents, in terms of farm man agement and development, harvesting, marketing, and processing of agroforestry products.

This optimistic assessment, however, was not shared by many researchers who undertook similar works. In her study of impacts of agroforestry projects in selected areas in the Philippines, Delos Angeles (1983) claimed that she could not yet quantify these impacts, probably due to the long-term nature of the project. The author applied some statistical analysis to compare socioeconomic variables for cooperators and non-cooperators of the project. She found no significant difference between the two sets of data. In 1988, Delos Angeles et al. found that the Community Tree Farm (CTF) project yielded a cash return of only P550 per year. When all cost were imputed, the net returns reached a negative value of P739/ha/yr, reinforcing the observation about the low income status of upland farmers. The rela tionship between resource depletion and welfare was also tested in Pingali's (1991) works. Pingali found a positive correlation between the deforestation index, which measures loss of forest cover, and the proportion of household income spent on food in the upland areas. The study revealed that as the proportion of household income spent on food increased, a sign of low economic status, there emerged a greater tendency to convert forest land to other land uses.

Many site-specific cross section analysis also supported the general assessment that fiscal policy, through the ISFP, did not succeed in improving the welfare of rural households. Pulhin (1988) noted that ISFP sites exhibited poor productivity and no relationship existed between levels of living and compliance by the communities to the provisions of the Certificate of Stewardship Contract. This means that the ISFP proved ineffective in changing the quality of life of the beneficiaries. Casas (1988) gave the same observation, after undertaking a comparative analysis of the ISFP. He attributed the low income of ISFP cooperators to low productivity of farms and the fluctuating market prices. He also attributed the failure of the ISFP to poor implementation (i.e, lack of financial support and control, delayed releases of funds, some diverted funds, etc.). The following impact variables were measured: level of household savings and acquisition of household possessions, farm facilities and equipment.

In her review of social forestry projects in the country, Escueta (1989) reported that the lack of social services extended to ISFP sites, low production, and unstable prices for farm products mainly contributed to the failure of the project. She also observed that low income and poverty in many project sites led to mortgaging of farms or leasing out of their rights to farm. Moreover, many increasingly relied on part-time farming; some even abandoned their farms.

The study of the United Nations Economic and Social Commission for Asia and the Pacific or UN-ESCAP (1986) also raised some doubts on a related issue: the benefits society derives from the logging business. The study contended that while sale of logs and log products constituted an important component of national income and a chief source of foreign exchange, real earnings from these activities were overestimated. The net earnings of the producer countries were found to be substantially less since most logging companies belonged to foreign-based corporations. These firms used modern machinery and equipment, and employed high salaried expatriates. According to the estimates of Gillis (quoted in FAO/UNEP 1981), the net foreign exchange earnings from logging could hardly be more than 30 percent of the gross returns. Furthermore, the employment argument used to support continued logging operations no longer applied since most logging operations are performed by modern, labor-saving machinery, even if the countries suffer from labor surplus and underemployment. Rebugio (1980) reported that in 1975 only 0.42 percent of the workforce worked in forestry and logging, and an additional 1.15 percent in the timber processing industries.

A frequently used argument to favor logging is the improvement of infrastructure which helps develop the communities close to logging sites. Many studies proved the contrary. Infrastructure such as roads facilitated massive forest encroachment. This places a big doubt on whether the logging business helped to improve the economic situation of the rural poor.

Pasicolan (1988) identified another variable which may be taken as an indicator of resource depletion. This is the shift to other resource-extracting activities such as firewood extraction from a land use activity such as crop farming. This implies that reliance on nonresource-based activities may occur as the last alternative for households in natural resource areas. This could partly be attributed to the lack of access to other sources of employment.

In some other parts of the country, the migration of people from urban areas to rural communities, and even within rural areas, served as a common indicator of worsening economic con-

ditions. The direction of migration is toward areas where substantial resources can still be tapped for their subsistence.

E. *The Fishery Sub-Sector*

In the fishery sub-sector, most of past government's efforts concentrated in giving support to the aquaculture industry. This is due to its big export potential which realized P9.6 million in 1988, compared with only P4.8 million in 1986. The rise in export earnings came from the increased contribution of aquaculture to total fishery production (from 13.7 percent in 1978 to 26.1 percent in 1988). The high economic performance resulted from increased productivity, made possible by easy access to resources and markets arising further from favorable adjustment policies. Lundayan (1990), however, posed the question of whether the high economic performance helped improve the welfare of small fishermen and society, in general. Several reasons were cited to show that this may not be so.

One is the declining contribution of the municipal fishing industry to total production, which dropped by 12.6 percent between 1978 and 1988. The rise in employment, generated by the growing number of aquaculture farms, proved insignificant when compared to reduced employment brought about by the conversion of municipal fishing grounds to aquaculture and by the high capital intensity of aquaculture farms. The welfare level also declined due to less nutrients available to the country, since a big proportion of food produced goes to the export market.

Hence, it may be said that while macroeconomic adjustment policies tended to improve overall economic performance of the fishery sub-sector, this may have occurred at the expense of reduced welfare of poor fishing households dependent on the sub-sector.

Lundayan (1990) further raised some doubts on whether macroeconomic performance itself attained a high level. These doubts arose from the fact that while export earnings rose between 1978 and 1988, a corresponding increase in import expenditures occurred in the same period. Import expenditures climbed from P385,660 in 1986 to P1,312,467 in 1988, a 240.3 percent increase.

A number of cross section analyses were made on major fishing grounds of the country such as the Lingayen Gulf, the San Miguel Bay, and the Laguna de Bay. In Lingayen Gulf, Signey (1987) observed a declining average catch and the inability of the annual fish price to catch up with the general price increases. This underscores the failure of the Aquino administration to restrict fishing activities, especially the illegal ones. Smith and Salon (1987) looked into the enforcement of many regulatory policies and concluded that fishery regulations were poorly enforced. This was supported by the declining catch and the increasing number of motorized trawls. The data in San Miguel Bay yielded a declining income from non-trawl gears while trawler-operators experienced rising incomes. Hence, depletion of fishery resources has the ultimate impact of lowering the welfare levels of the community, as seen from the low earnings from fishing and the fisherfolk's inability to pay loans (AFSSRN 1986).

Anonuevo (1989) and Crawford and Rice (1989) analyzed the impact of credit policy to the fishery sub-sector, using data from the Lingayen Gulf and the Biyayang Dagat Program. Their conclusion confirms that the country's credit policy tends to promote high capital intensity in

fishing through the acquisition of fishing equipment. This intensifies fishing efforts and eventually dissipates economic rents. A low average net returns accrues to small fishermen since commercial trawlers are able to exploit municipal fishing grounds. In effect, the credit policy favors the commercial sector at any given time, although these benefits may not be sustainable since biological overfishing retards normal fisheries growth.

The fuel subsidy given to diesel consumers also has the same distributional impact, as supported by the analysis made by Smith (1989) and Wilfan (1986). Since commercial vessels are heavy users of diesel while small fishing boats use the premium gasoline, the commercial fishing sector enjoys most of the benefits from diesel fuel subsidy. The subsidy furthermore encourages increased fishing efforts through lower cost of fishing or increased capital intensity of the activity. This brings about higher rent dissipation and an eventual decline in fish catch and income by small fishing households. A decrease in employment and a worsening income distribution also occurs in the sub- sector.

Librero et al. (1986) confirmed the low economic status of the country's fishing households. She noted that aside from having low income, fishing households also spend a very high proportion of their income for food and have very poor access to basic amenities. The inequitable labor arrangement between commercial boat owners and laborers, and the absence of alternative sources of income contribute to the deteriorating economic status of small fishing households.

The economic advantage enjoyed by the aquaculture industry is an exception. This sector received government incentives via improved technology or better production techniques. The government hopes that the industry's increased production will generate higher income in related industries, and better nutrition and health for the entire nation. This optimism, however, is not shared by some who contend that aquaculture fish products are directed to the export market; this deprives society of any benefits from the projected improvement in nutritional intake coming from high fishpond productivity. While it is true that income levels of those engaged in pond culture may increase, the benefiting group represents only a very small segment of the population. The cost of developing pond culture involves the foregone benefits from mangrove areas converted to fishponds and the other environmental costs incurred from fishpond culture. The total environmental cost is yet to be estimated but indicators point to a substantial amount. In Laguna lake alone, re source depletion indicators already included decreasing catch, increasing reliance on destructive fishing methods, and intensified conflicts among resource users. Given a small area being shared by many, these manifestations may be taken as indicators of scarcity.

The foregoing review of welfare impact studies in the fishery sub-sector reveals the low economic status of municipal fishing households and the wide income disparity between this group and the commercial sector or trawl operators. Government policies (e.g., credit and subsidies), which encourage capital intensive operations, greatly contribute to the widening income inequality in the sub-sector and the worsening welfare status of poor fisherfolk. Most analyses, however, were based on cross section studies that do not allow a more quantitative assessment of the magnitude of the welfare impact of government policies or programs.

F. *Welfare Effects in the Mining Sub-Sector*

Several studies on the socioeconomic conditions of mining communities revealed that many of them benefit from the presence of mining companies in their localities. The benefits include absorption of local labor, providing a market for their agricultural produce, available social services such as health and medication, and assistance in infrastructure construction such as schools, roads, and playgrounds (Cola 1985; Santos et al. 1982). These benefits were observed in areas where the mining firms learned to blend with the communities and showed respect for local traditions and power structure. In some communities, however, social and economic unrest prevails. This happens when mining firms failed to integrate with the community system (Synergistic Consultants Inc. 1981) perhaps due to their over whelming concern for maximizing profits.

Aside from providing employment, the mining sub-sector gave rise to a big number of small-scale miners in the country, totaling 78,980 in 1988 (Delos Angeles and Lasmarias 1990). Not much is known about the conditions of these small-scale miners which had illegal status until the late 1980s. The forthcoming implementation of the "Minahang Bayan" bill will hopefully give small-scale miners the legal personality and, hopefully, help disclose their operations and socioeconomic conditions.

Table 17 provides some data on the entrepreneurial income from mining and quarrying, as cited in the report of Delos Angeles and Lasmarias (1990). Except in the National Capital Region, average incomes fall way below the threshold income level for all the other regions. This means that, as a whole, mining has done very little to help alleviate poverty in the country. Of an even greater concern to society are the negative environmental effects created by mining effluent charges. Table 18 contains the data on mine tailings disposal in the country from 1985 to 1988. In 1985, the total mine waste and tailings generated by mining firms totaled 145.59 million mt. This volume decreased in the succeeding years but the country was still confronted with almost 100 million mt of mine wastes and tailings, contributing substantially to land and water pollution (Environmental Management Bureau 1990).

Society's welfare is particularly disadvantaged by these effluent discharges through siltation of coastal resources, irrigation canals, and paddy fields in downstream areas. Aquatic life forms also suffer from discharges of certain toxic chemicals. Some 9,600 ha in Region I and 8,738 ha in Region II got covered by mine tailings occurring during the entire year. Communal irrigation systems also sustained damage from siltation. Irrigation canals suffered from siltation in terms of increased desilting cost requirements. In 1985, the desilting cost reached P6,000 per km for main canals and about P4,000 per km for lateral canals. The estimated desilting cost of affected canals every cropping season amounted to about P6 million (Environmental Management Bureau 1990). Added to this is the cost for lower production caused by siltation of croplands.

Heavy metals, particularly boron (B) and copper (Cu), also pollute irrigation and river systems. In the Agus Irrigation System, for instance, a high 36.85 ppm concentrations of Cu settled in the soil. This can cause yield losses by fixing nutrients essential for crop growth. Chemicals such as zinc, arsenic, and nickel were also detected in certain areas.

Like commercial mining, small-scale mining also poses serious threats to the environment as well as to the health of the miners themselves. Unregulated small-scale mining tend to result in

Table 17. Entrepreneurial Income from Mining and Quarrying, 1985

REGION	Average Income (b)	Comparison with Threshold Income (c)	Gini Ratio (d)
Philippines	10,326	< 28,584	0.378
National Capital Region	140,051	> 39,384	0.000
Region 1	11,562	< 28,488	0.309
Region 2	2,254	< 26,328	0.000
Region 3	10,856	< 30,600	0.000
Region 4	0	< 29,652	0.000
Region 5	5,352	< 25,776	0.270
Region 6	1,811	< 29,388	-0.004
Region 7	9,540	< 23,784	0.000
Region 8	5,997	< 24,192	0.000
Region 9	401	< 25,416	0.000
Region 10	9,376	< 27,144	-0.013
Region 11	5,742	< 28,656	-0.046
Region 12	598	< 26,796	0.000

Source: Delos Angeles and Lasmarias (1990)

Table 18. Total Mine Wastes and Tailings (in million metric tons)

Year	Mine Wastes	Tailings	Total	% Change
1985	76.3	69.3	145.6	
1986	35.7	55.1	90.8	-37.6
1987	40.3	53.1	93.4	2.8
1988	43.6	50.8	94.3	1.0

the uncontrolled use of toxic chemicals, deforestation, and soil erosion. Health hazards also arise from the use of mercury during gold smelting and the improper disposal of mercury wastes. The Environmental Management Bureau (1990) cited that about 26 tons of mercury are dumped annually into water bodies that drain into Butuan Bay in the northern part of Mindanao and into Davao Gulf in the south. These effluents may eventually find their way to the fish that we eat. Moreover, the opening up of lands weakens the soil structure, causing soil erosion and even land slides. Miners being buried during major landslides have already occurred. The ultimate consequence of all these is a major welfare loss to society.

From the preceding discussions, it can be said that the major welfare effects of mining activities come from the environmental damages that discharges of mine waste and tailings create and from the irresponsible practices of small-scale miners. These welfare effects must be estimated and added to the other costs of extraction to find out if the social benefits of mining still exceed the cost to society. Since mining activities are influenced by the level of support extended to the sub-sector by the government, there must be a conscious effort to ensure that policies developed do not unnecessarily impose huge environmental costs.

The literature review generally supports the claim that many economic policies of the government, causing faster resource depletion or extraction, yield a significant welfare loss. Not many studies, however, can quantify what these welfare losses are. Most of these merely point out the perceived nature of the impact.

G. *Resource Depletion and Welfare Impact Indicators of Economic Policies*

Table 19 summarizes the various studies reviewed in this section, containing some discussions on the impact of certain policies on welfare via the rate of resource depletion. In the forestry sub- sector, several studies evaluated the fiscal expenditures on the ISFP. The resource depletion indicators used were rate of defor estation, declining productivity of the resource base, and the shifting from one resource type (e.g., cropland) to another (e.g., public forest) in search of alternative sources of income. Welfare impact variables included level of farm income, income distribution through some measures such as Gini coefficient, indebtedness, mobility to go to other places, income sources, percentage of income spent on food, and increased technical knowledge. All these will presumably affect the level and con sumption mix of goods and services of households.

For the fishery sub-sector, the declining CPUE, increasing conflicts among users, increased use of destructive methods, and increasing efforts spent to catch a given size of harvest make up the depletion indicators. Welfare impact variables are more or less the same. For the mining subsector, depletion is not really a concern at the household level. Welfare indicators of households within mining communities include level of income and employment, access to basic services, and public utilities pro vided by the mining firms. For those households suffering from effluent discharges of these firms, welfare impact indicators may include reduced productivity and income, health expenditures, labor displacement, and loss of properties.

In almost all NRES sub-sectors, the welfare effect of government projects or policies were analyzed as to how they have changed the level and distribution of income received by resource-based households. In some cases, some indicators like the ability of the household to save and

Table 19. Studies on the Causes and Indicators of Depletion and its Welfare Impact on Resource-Based Households.

Author/Year	Policy(s) (implied or stated)	Causes of Depletion	Resource Depletion Indicators	Mechanics of Influence	Welfare Impact Indicators	Levels of Analysis
Delos Angeles, 1983	Fiscal Expenditures for Agro-forestry Projects			- Agro-forestry technology other income-generating activities.	- Insignificant increase in income. - More knowledge in resource conserving technologies. - No visible changes in nutrition/health.	Statistical analysis of secondary data.
Pasicolan, 1988		- Low productivity. - Absolute poverty.	- Reliance on other upland resources (e.g., fuel-wood).	- Dwindling natural resources.	- Unequal income distribution. - Low income.	Statistical analysis of primary data collected in Penablanca, Cagayan.
Escueta, E., Undated	Fiscal Expenditures for ISFP			- Poor implementation of projects and lack of support services. - Low production and unstable prices of farm products.	- Low income and poverty leading to: a. mortgaging of farm/ lease rights; b. parttime farming; and c. abandonement of farms.	Analysis of secondary and primary data obtained through field interviews.
Delos Angeles et.al., 1988	Fiscal Expenditures for ISFP			- Low returns from ISFP sites.	- Farmers seek other sources of jobs	Review of literature
Casas, E.V., 1988	Fiscal Expenditures for ISFP			- ISFP programs have low productivity. - Poor implementation of ISFP due to lack of funds.	- Low income of farmers and inability to save. - Farmers unable to acquire basic farm tools and HHI ammenities.	Comparative analysis of two ISFP sites
Sarma, MTR undated	Fiscal Expenditures for ISFP			- Emergence of wood-based industries.	- Increase in employment and income redounds to increased standard of living.	Conceptual/descriptive.
Pingali, PL, 1991			- Deforestation index.	- Loss of forest cover.	- HH income spent on food is higher in upland areas. - Migration higher in deforested areas. - Higher infant mortality in more degraded areas.	Correlation analysis using cross-sectional data

Lamberte, E.E., 1984			
Sevilla, J.C.C., 1984			
Signey, L.O., 1986			– Declining production data. – Declining average catch.

	– Total HH income, ave. HH income; ave. per capita income, access to agricultural services as seen from the no. of rural banks, no. of land transfer certificates issued, no. of land transfer tenant recipients, and acquisition of housing amenities; access to social services as indicated by total cases of children, youth and adults served by the MSSD, and total no. of youths and adults assisted by SEAP; access to health services as indicated by no. of hospitals/10,000 population, total bed capacity per 1,000 population, no. of rural health units, no. of active medical workers, cost disbursed for hospitals and other health buildings; and literacy levels, teacher–student ratio, enrolment in elementary, high school and college, expenditures for local construction of educational buildings.	Descriptive Satistical Analysis
	– Income and consumption, employment and ownership of non–human productive resources, health and nutrition, learning, housing utilities & the environment, public safety & justice, social mobility.	Descriptive
– Inability of annual fish price to catch up with increase in general price levels.	– Negative or small imputed income. – Inability to pay loans.	Analysis of secondary data from Lingayen Gulf.
– Labor arrangements; lack of other sources of income.	Low HH income; higher expenditures for food; and poor access to basic amenities.	Descriptive analysis of primary data obtained from a multi–staged sampling scheme.

Librero et. al., 1986			
Toress, A.T. and Ventura, R.F.	Fiscal Expenditures for Akian Aqua-culture Project		
Lim, C.P.,		– Population pressure. – Longer time spent for fishing. – Fishermen need to fish farther from the coast.	– Decreasing catch. – Use of more destructive fishing gear. – Conflicts among re-source users. – Migration.
AFSSRN, 1986	Credit Policy Regulation Policy	– Stiff competition. – Inadequate supervision of fishing grounds.	– Poor catch.
Anonuevo, C., 1989	Credit Policy	– Credit schemes that promote capital/equipment aquisition.	
Smith et. al., 1980		– Poverty.	– Declining yields. – Declining catch/effort data.
Pauly D. and Mines, AN, 1982			– Catch/effort data. – Yield per recruit. – Length-frequency data.

- Introduction of improved aquaculture technology leading to increased production. - Better production techniques.	– Increased knowledge in – Increased productivity and employment. – Improvement in income distribution and higher growth of income. – Better health and nutrition.	Statistical analysis of secondary data
	– Migration.	Analysis of primary data from Laguna Lake using a Logit Model.
- Manner of loan repayments and the character of the loans.	– Poor loan repayments (due to lower catch).	Statistical analysis of secondary data of KKK Biyayang Dagat schemes.
- Dissipation of rents.	– Low average net returns.	Statistical and descriptive analysis of primary data from Lingayen Gulf.
- Dissipation of rents. - Lack of employment opportunities.	– Per capita income. – Desire to change occupation. – Desire to migrate.	Review of literature and correlation analysis.
		Analysis of primary data collected from San Miguel Bay.

Smith, IR, 1983	Diesel fuel subsidy Regulatory policies	– Increase in fishing effort.	– Decline in trawlable biomass.
Crawford, BR and MA Rice, 1989	Credit Policy	– Capital intensive fishing	
Valerio, AT, 1989		– Industrial and animal discharges into the lake. – Population increase.	– Negative relations between level of fish yield.
Wilfan, R., 1986	Diesel fuel subsidy	– Increasing fish prices and foreign demand. – Reduced cost of diesel used in trawling. – Increased capital–intensity.	– Increasing level of economic and biological overfishing.
Aquero, M., 1986		– Large population size and lack of employment opportunities. – Favorable cost–price ratio.	– Decreasing catch per unit effort.
Smith, IR and O Salon, 1986	Regulatory policies	– Poor enforcement of regulations. – Increased fishing effort particularly by motorized trawls.	– Fecline in catch.

– Lack of alternative employment opportunities. – Diesel fuel subsidy favoring trawlers.	– Skewed distribution of income and assets. – Outmigration. – Reduced profits. – Uneven distribution of catch and incomes.	Analysis of primary data collected from San Miguel Bay.
– Acquisition of more capital/ increased effort.	– Low income causing low loan repayments.	Case study of BFAR's Biyayang Dagat program. OLS estimation of a Cobb Douglas production function.
– Increased capital use.	– Decrease in employment. – Worsening income distribution.	Descriptive/conceptual.
		Conceptual/descriptive Analysis
– Reduction in yields.	– Reduction in profits and losses for non–trawl gears. – Highly uneven distribu–tion of catch and incomes in favor of trawlers. – Outmigration of fishing community labor in search of higher income	Conceptual/descriptive analysis of San Miguel Bay.

Cola, R.M., 1985				– Expenditures of mining firms and and favorable mining firm policies. – Unfavorable/ hostile mining policies.	– Increased access to basic ammenities, increased income, increased productivity of fishery and livestock, decreased migration, slight increase in propensity to save employment of local labor. – Non–employment of local labor, decreased productivity of farms, and slight change in income.	Conceptual/descriptive.
Santos et al., 1982				– Investments of mining firms.	– Increased employment, increased availability of basic ammenities, higher literacy rate in mining communities, acquisition of new skills/ upgrading of human capital, increased income.	Descriptive/conceptual.
Briones, 1987				– Mining effluents/ tailings.	– Decreased productivity of downstream farmlands.	Conceptual/descriptive.

meet debt obligations were used. In others, the patterns of migration and the mix of income sources of the households served as indicators of the economic well-being of the people in the community. Other indicators of welfare impacts of a given intervention may have been used, but these were not captured in the studies reviewed. Since many of these studies were not precisely designed to measure welfare impacts, it is understandable that adequately identifying welfare impact indicators did not receive careful study.

H. *Constraints to Welfare Impact Measurement*

Measuring the welfare impact of adjustment policies on the poor households presents some difficulties. For one, the effects of externally induced recession are difficult to isolate from the effects of programs and policies designed to offset them. Some time lags also exist, before the impact of the intervention being monitored may be felt, especially when the resources being stud ied still have abundant stock. This underscores the need to situate geographically the data to be used in doing welfare impact studies, particularly in the NRES. This is because different resource areas will have varying state of degradation and, hence, may be affected differently by economic policies. The distributional impact of policy changes may, therefore, vary according to the location of the households. The spatial loca tion is also important in establishing the status quo or the "without" project situation, which will enable analysts to meas ure the welfare impact and also to have an understanding of the pre-project situation.

Schuster (1980) claimed that due to data constraints, most distributional analyses are partial analyses. To correct this situation, one must start by providing a description of the existing socioeconomic environment in the geographic area of concern. This is the first step in analyzing the distributional consequences of specific projects. The goal is to make the decisionmakers have a " feel" of the study area. Without this knowledge, it will be difficult to gauge the desirability of the proposed project which stands to change with the environment.

It also happens that what is observed at any given time may be the cumulative impact of many policy changes that took place in the past. This stresses the need for some time series panel data so that not only will the change be captured but the patterns of the change over time will also be understood. The short- and long-term effects will likely to be captured with the use of longitudinal data. The absence of such data, however, presents the most serious difficulty in undertaking welfare impact stud ies. The longitudinal data must also be disaggragated by natural resource unit (i.e., upland, mining, coastal) and even by some socioeconomic indicators such as income class. This is important because different resource-based communities are subjected to different policy initiatives and may also respond differently to macroeconomic policy reforms. Since equity or distributional issues also figure significantly in welfare studies, this disaggregation may prove helpful along this social concern.

The absence of longitudinal or time series data, however, does not excuse the absence of an empirical analysis on the welfare effects of adjustments. This analysis is necessary in designing appropriate programs to alleviate the adverse effects of some macroeconomic policies; if the effects are substantial, relative to the benefits from the policies, then other economic policies that can bring about almost the same results should be considered.

VI. SUMMARY AND CONCLUSIONS

This research study sought to assess the micro impacts of macr oeconomic adjustment policies in the NRES. The framework de veloped by Lamberte et al. was modified to fit the characteristics of the sector. The adopted framework was applied to evi dences found in available literature that demonstrate or least reveal welfare effects of adjustment policies.

The study revealed two sets of findings. One pertains to the level of knowledge on welfare effects, as obtained from the analysis of data from available studies and secondary sources. The other set contains a list of important points to consider in operationalizing the MIMAP framework in subsequent empirical studies. This latter set of findings emerged in the course of the study as the researchers attempted to piece together the little that is known about the micro impact of macroeconomic adjustment policies. To a large extent, the points raised explain why not much is known about these welfare effects.

The following comprise the significant findings of the analysis:

1. Several adjustment policies tended to encourage rapid deple tion or degradation of the NRE. Policies on taxes, subsidies including subsidized credits, trade controls, and related areas helped lower the cost of production or promote capital intensive forms of land uses, leading to increased rate of resource depletion. Changing these policies has the potential of regulating the use of the NRE, aside from reducing fiscal deficits of the country.

2. The rate of deforestation was significantly affected by the level of initial resource stocks, the prices of output, and the cost of inputs such as capital and labor. Elasticity coeffi cients for this set of prices came from a log linear regression run; these provided some estimates of the expected impact on deforestation of the change in economic prices.

3. Increasing rate of depletion has serious welfare effects on the resource-based households. Since different policies have varying consequences on the rate of depletion, it follows that these economic policies will produce varying welfare effects. Quantifying and estimating the value of these welfare effects is necessary to guide policy makers in identifying the appropriate policy mix or developing compensatory poverty alleviating programs. Since different types of households will likely experi ence different consequences from economic policies, it is also important to determine these welfare effect differentials.

The research study suggests that the following points be considered in future MIMAP studies:

Analytical Considerations for MIMAP Framework Use in the NRES

Number and hierarchy of resource users affected by policy re forms. Several parties live or work within one resource area; but they may react differently toward macroeconomic adjustment policies. Direct resource users are of two general types: the commercial sector and the small-scale, resource-dependent households. Although usually small in number, the commercial users control a larger portion of the natural resource pie. In contrast, the small-scale resource users are

many but have access to only a small portion of the natural resources. The welfare of the greater majority of these resource users should be the con cern of MIMAP studies.

However, impact should be traced on a hierarchy of resource users since whatever change occurs in activities of commercial users will eventually trigger a change in the welfare of the resource- poor households. The gender dimension must also be considered whenever they are perceived to be significant in identifying the equity aspect of welfare impact within a given household.

Cross-sectoral linkages of resource systems. Cross-sectoral linkages exist in the natural resource systems (e.g., upland land uses and lowland paddy farming), which create a chain of parties bound to be affected by what will become of the natural resources. When considering society's welfare, accounting for impacts on the various parties when they are judged significant becomes necessary. The cost of the accounting activity will also have to be considered.

Intergenerational considerations. Intergenerational impact of resource use, as affected by macroeconomic policies, pertains to the distribution of goods and the undesirable by-products to different groups belonging to different generations. These take non-zero values, given depletable natural resources and renewable but degradable natural assets. How to account for intergenera tional welfare impact of resource use remains a weak component of the MIMAP framework, as applied to the NRES.

Direction of causality of effects. The model assumes that the welfare of resource users will be affected by macroeconomic adjustment policies via their impact on the rate of natural resource depletion. While this direction of causality has some validity at least conceptually, sufficient data also show that welfare levels (e.g., poverty, unemployment) affect the rate of natural resource depletion. Since social welfare is in turn determined by a multitude of factors, including those of macroec onomic adjustment policies, isolating welfare impact of these economic policies becomes complicated.

Government environmental programs. Independent of or sometimes linked to macroeconomic adjustment policies are the different environmental programs of the government, funded largely by foreign loans and grants. These programs (e.g., reforestation and community-based resource management) are expected to contrib ute to resource appreciation or limit resource depletion. Hence, while macroeconomic policies have some impact on household welfare levels via their impact on resource depletion, positive effects of these programs make it difficult to assess MIMAP.

Several adjustment policies with conflicting welfare impacts. At any given time, several macroeconomic adjustment policies are at work, which may have differing impact on the rate of depletion (e.g., trade controls and investment incentives). Conceptually, it is not difficult to predict impact on depletion of any one adjustment policy; but when taken together, the net effect be comes ambiguous.

High fixed cost of resource-based firms. Elasticity of adjustment assesses the responsiveness of the first level of resource users to changes in economic policies. One may then expect a higher elasticity coefficient for the formal sector, being more sensi tive to input and output prices. However, this sector has a very high fixed cost already tied to its economic activity, which may

delay their response or probably even make them react contrary to what is expected of them. These point to another ambiguity in analyzing impact of economic policies.

Lack of longitudinal data and sector-disaggregated data. A related problem to the elasticity issue deals with the absence of NRES-specific longitudinal resource depletion and welfare data. Most data sets are aggregated countrywide; some are disaggregated on the basis of administrative boundaries. To assess the sector al performance of the various policies and probable linkage to the welfare of people in the NRE sub-sectors, it may be necessary to monitor selected welfare indicators for sample NRE sub-sectors of the country. Some ways of selecting representative forest/upland areas, coastal communities, and mining villages have to be done to serve as reference areas for monitoring and for impact assessment studies. The location aspect is important in order to capture welfare changes resulting from any given change. Since locational differences exist which can influence how the community will respond to policy changes, it is necessary to situate the data. As much as possible, panel data should be collected to minimize variation in the welfare cause on the differing socioeconomic status of the sample points.

Identifying relevant welfare and resource depletion indicators in the NRES. Key welfare indicators should be identified in order to monitor welfare change over time. This gains importance on account of the many variables that can define levels of living or welfare. To use research funds efficiently, the analyst should aim for fewer but adequate measures of resource depletion and welfare.

Absence of longitudinal, resource-based, disaggregated data. The most significant constraint in analyzing MIMAP in the NRES is the absence of longitudinal, resource-based, disaggregated data to serve as benchmark information in monitoring welfare changes over time. Key welfare indicators in the NRES also need to be identi fied for the time series or longitudinal data base for the sector. On the basis of these urgent constraints, a research proposal was developed as shown in Appendix 1.

Appendix A1

WELFARE IMPACT INDICATORS IN THE NRES

(Building a Database for a Time Series Analysis)

A. *Rationale*

A growing consensus is taking place, which view development as measurable not only in terms of some aggregate economic variables such as national income, rate of unemployment, and balance of payments but also in terms of a marked improvement in the quality of life of the people.

A recently concluded study on Micro Impact of Macroeconomic Adjustment Policies in the NRES reveals that empirical studies measuring the welfare impact of economic policies in the NRES are very limited. Existing studies presented only conceptual discus sions of the impact of policies on the rate of resource depletion. Very few studies indicated changes in the level and dis tribution of income as a result of government programs. Hardly any effort was discernible to develop some measures of welfare in the various natural resource sub-sectors. Coming up with a set of acceptable indicators of welfare and suggested methodologies on how they may be collected and measured stands as another research gap in assessing welfare impact of economic policies or programs at the household level.

The absence of MIMAP studies in the NRES mirror the difficulty of doing such an analysis in this sector. Foremost of these diffi culties arises from the absence of time series data required in monitoring changes in the welfare level of households in targeted communities. The welfare data collected were also aggregated based on administrative or geographical divisions of the country and not on the natural resource unit delineation. There is also a need to use longitudinal data in this sector since lags exist in adjustment which will not be captured using cross section data.

The measurement of welfare effects can best be undertaken with the cooperation of a set of households whose welfare will be monitored over a period of time. However, the large cost in volved in obtaining time series data and the short time commit ment of most funding agencies contribute to the absence of this type of data.

Thus, an assessment of whether some changes in welfare took place, as gauged from changes in the level of selected indicators, was never carried out so far due to data constraints. Impact studies were limited to identifying welfare levels of two groups of respondents: one "with" the intervention and the other "without." The difference in welfare levels was then attributed to the intervention being analyzed. While this approach of analysis may be done, it has a serious limitation in assuming that the two groups are homogeneous (i.e., basically of the same socioeconomic characteristics) with a life subjected to virtually similar environment (bio-physical and socioeconomic). The only difference is that one group is given the intervention and the other is not. Any difference in the welfare levels observed in the two groups may thus be explained by the intervention. What deforms the analysis further is the possible existence of significant differences in the initial welfare level of the two groups, opening up the possibility that variation in welfare observed after the intervention may come from some factors other than the intervention per se.

The ideal situation is to monitor changes in the welfare of the same group of households (panel data or its variant) over time, under the intervention. This is the "with project" scenario. To assess the welfare impact of such an intervention, it will still be necessary to make some projections of what would happen to the group, if the intervention is withheld. This accounts for changes that may take place anyway, even if the intervention is not introduced to the community. This procedure gives the "without project" scenario. The intervention's impact on welfare can now be taken as the difference in the value of relevant welfare indicators under the "with" and the "without" intervention scenario.

The intervention could come from government or non-government organizations. They usually carry certain economic or social goals. To what extent they are effective in achieving these goals is always worth asking since undertaking this type of projects entail some sacrifices by society. Welfare impact studies, therefore, also judge the efficiency and equity effects of the use of funds and the lessons learned in terms of effectiv ity of the type of intervention to achieve the set goals.

Time series data, however, are very scarce since not many funding agencies are willing to fund research undertakings over a long period of time, with the sole purpose of generating some data set. A literature search revealed only one such study: the Living Standards Measurement Study (LSMS), covering 1980 to 1990, funded by the World Bank. The LSMS' main objective was to im prove the quantitative basis for the design and monitoring of development policy. "It focuses on the development of measures of levels of living for individuals and households, the compari son of these measures across regions and socioeconomic groups within country and over time, and the analysis of observed dif ferences and trends, with a view to extracting lessons in support of policy formulation" (Grootaert 1986).

The LSMS' objective defines precisely what the country needs to undertake although not necessarily as exhaustive as the LSMS. Many lessons have already been derived from the 80 working papers published by the project as of 1991. The first three years of the study alone already produced the conceptual framework and an integrated framework for the measurement and analysis of levels of living.

But a crucial task in developing time series data for a welfare impact study is the selection of key welfare variables sensitive to changes in the major forms of development intervention that may be introduced in the community or major policy reforms of the country. The materials available from the LSMS could help in this task, serving as a major research objective.

Since most funding agencies only commit resources to short-term studies with immediate output, this type of project could be realized through short-term studies at different points in time and probably even funded by different agencies. What is impor tant is for the initial study to come up with a set of welfare impact indicators suited to the NRES, develop a system for accessing the data, and defining the mechanism under which the data are to be collected.

The terms and conditions for the use of the data by other re searchers interested in doing welfare impact study must also be defined to ensure that while other researchers can use the data, they must also contribute toward building the time series data set. Guidelines detailing all these, along with the data set, will form part of the major output of the proposed undertaking.

A descriptive account of the study areas, the community members, and the systems of interrelationship governing social behavior must be prepared, to give users of data a perspective of the prevailing situation in the area at the time the study was collected. While one may argue that there is no concrete assurance that other researchers may have the same interest in building a time series data, some means of creating interest along this endeavor (networking, symposia, and fora) should also be conceived.

The proposed study will thus pave the way toward developing a time series database which will be useful in undertaking a wel fare impact analysis in the NRES. Selected welfare variables responsive or sensitive to the various forms of interventions in the different types of resource communities (i.e., upland, coast al, mining) will be identified as a major component of the re search undertaking. This presupposes further that sample communities representing the various NRE sub-sectors are pinpointed as sources of the time series data.

B. *Objectives*

1. To identify key welfare variables sensitive to major types of development intervention and/or macroeconomic policies in key resource units (i.e., upland, coastal, mining) of the country;
2. To develop an analytical framework for the measurement and analysis of welfare effects of a development project or policy.
3. To develop a data base management system for handling time series data generated from sample communities representing the different key resource units.
4. To package this benchmark data set with the descriptive ac count of the socioeconomic setting in the sample communities for easy access by interested users.

C. *Methodology*

The analytical steps of this project, with the tentative time allotment, is outlined as follows:

1. Review of the Living Standard Measurement Study (LSMS) materi als which totaled around 80 working papers as of 1991 (three months).
2. Selection of at least three communities in each of the major geographic regions of the country (Luzon, Visayas and Mindanao) for the three key resource units (i.e., upland, mining and coastal). This is tentatively the sample size of resource-based communities which will serve as monitoring areas for welfare impact assessment studies.

   The sampling design will also be defined (one month).
3. Sorting out conceptual issues in the use of panel data or independent cross sections studies in the same sample areas or a combination of these. The analysis should help in the development of an analytical framework for the measurement and analysis of welfare impact variables (three months).

4. Planning and holding of a seminar workshop to validate the framework and to discuss the conceptual issues identified earlier. The workshop will serve as a venue for bringing together people who have some expertise on the subject matter, those who may be tapped as collaborators in the different regions, and potential users of the time series data (three months).
5. Development of research instruments, data management programs, training of research staff and collaborators, and establishing community contact in the study areas (two months).
6. Data collection, clean-up, coding, entry and processing (six months).
7. Data analysis and write up (four months).
8. Reproduction of data sets and guide manuals together with brief descriptive reports (two months).

D. *Proponent*

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Table A2. Economic, political and natural events (1970–86)

1970	1971	1972	1973	1974	1975
BOP crisis	Declining Terms of Trade	Martial Law	Gov't budget surplus	1st OPEC oil price hike	Increased investments in capital projects
Declining Terms of Trade	Rising Inflation	Government revamp	Trade surplus	Severe trade deficits	Budget deficit
Rising Inflation	Falling Level of Investments	Rising Inflation	World commodity boom	Growth of non–traditional exports emerging	IMF meeting in Manila
Falling Level of Investments	Increased activism/ radicalism	PD #1 creates NEDA	Inflation	Stagnant traditional export sector (mining & agriculture)	Trade deficits
	string of natural calamities hits RP		Government food program launched (Green Revolution)		

Table A2. Economic Adjustment Policies (1970–1987)

1970	1971	1972	1973	1974	1975
Forex controls			Tariff Reform Code	Expansionary domestic policy	Expansionary domestic policy
Peso devaluation			PD 92 Ammendment to Investment Incentives Act	Devaluation	
Import controls			Expansionary domestic policy	Ad–hoc Tariff exemptions	
Price control legislation enacted					
Export Incentives Act					
Tight fiscal and monetary policy					

1976	1977	1978	1979	1980	1981	1982
			2nd OPEC oil price hike World recession Trade deficit	RP becomes GATT member WB becomes a new source of financing RP uses first SAL (Structural Adj. Loan)	Worsening trade balance Dewey Dee scandal Shift away from import–substitution Financial crisis	

1976	1977	1978	1979	1980	1981	1982
			Monetary restraint Peso devaluation BP 44 Promotion Act for less developed areas	Financial liberalization through deregulation of lending and borrowing rates Trade liberalization	Peso devaluation PD 1789 Omnibus Investment Code Lossening of quantitative restrictions	Reduction of reserve requirement for import letters of credit Import surcharge of 3% for all imports Reduction of reserve requirement

1983	1984	1985	1986	1987
BOP crisis CB found to have over–stated the country's international reserve figures Run up in money supply Ninoy Aquino assassinated	Campaign for elections start RP experiences capital flight RP obtains USAID funds for fertilizer imports		Snap elections Overthrow of Marcos government Aquino-government installed and gov't revamp follows	

1983	1984	1985	1986	1987
Peso Devaluation Required reserves raised to 100% against marginal deposits for imports Requirement for all banks to sell 100% of their forex receipts 5% import duty BP Blg 391 Investment Incentive Policy Act 25% advanced sales tax on imports	New quantitative restrictions on imports Forex controls Additional export duties including an economic stabilization tax of 30% Forex transaction tax of 1% Removal of Price controls except for rice PD 1931 rationalization of duty and tax exemption privileges granted to GOCCs and all other units of government	Adoption of a monetarist adjustment program	EO 26 Abolishing all export duties on all export products except logs imposed under Sect. 514 of the Tariff and Customs Code	EO 226 Ammending BP 391 o 1983

Table A3. History of Economic Reforms in the Forestry Sector (1970–88)

1970	1971	1972	1973	1974	1975
Pricing – FAO no. 57 Forestry Research Deposit – FAO no. 11 Revised Forest License Regulation – FAO no. 32–1 Forest charges		**Pricing** – FAO no. 64 Special deposits will be used for the management of forest lands	**Trade** – PD 216 Prohibiting the exportation of abaca seedlings – PD 251 Authorizes log exports before January 1, 1976 **Fiscal** – PD 209 Authorizing for the Commission on Budget to release P 200,000 for two pilot projects in Ifugao and Benguet	**Fiscal** – PD 472 Authorization for the National Treasury to provide P 1M for the food production program of timber licencees and pasture leasees – PD 619 Authorizing a P 5M appropriation for the development of public land domains into grazing reserves for large scale ranching projects PD 705 Forestry Reform Code	**Trade** – PD 865 Ammending section 32 of PD 705 to allow temporarily limited and selective exportation of logs **Fiscal** – PD 853 as ammended by PD 888 Provides classification and valuation of timber and forest lands for the purposes of real property taxation – BFD Circular no. 2 Classification and valuation of timber and forest lands for purposes of real property taxation

1976	1977	1978	1979	1980
				Fiscal – LOI 1020 Strengthening the forest protection and law enforcement in the BFD through an allotment of P 5M for forest protection

1981	1982	1983
		Pricing
		– MNR AO no. 105 Interim guidelines governing the gathering and utilization of woodworks
		– BFD Circular no. 6 Revoking FAO no. 64 on collection and use of special deposits

1984	1985	1986	1987	1988
Pricing	Pricing	Trade	Trade	Pricing
– BFD Circular no. 16 Guidelines governing the acceptance and processing of application for the collection and disposition of woodwastes	– BFD Circular no. 11A–85 Revocation of BFD Circular no. 11–85 dated April 19, 1985 re: Processing and Rattan Poles importation guidelines	– MNR no. 2 No logs for export shall be loaded on board vessels unless authorized by MNR regulations	– MNR no. 2 – Ban on flitches or squared log exportation	– DENR AO no. 64 Environmental fee of 500/m3
– FAO no. 1 New rates of forest fees and charges in compliance with BP Blg. no. 325		Pricing – MNR no. 28 Prescribing schedule of fees for bidding and award of timber concessions	– EO 221 Authorizing the exportation of certain kinds of buntal fiber and filaments	
		– MNR MO no. 13 Simplifying the requirement for applications of lumber dealer permit	Pricing – DENR AO no. 79 P 10,000 Reforestation deposit	
		– FAO no. 1–A New rates of forest fees and charges		
		– MNR AO no. 38 Guidelines in bidding of areas for TLA		

Table A4. History of Economic Reforms in the Fishery Sector (1970–86)

1970	1971	1972	1973	1974	1975
Trade – FAO 93 Regulations governing the exportation of pearls – FAO 98 Ammended as FAO 98–1 Rules and regulations governing the exportation of Bangus fingerling	Pricing – GAO 106 Rules and regulations governing fishing in lakes and inland waters within watersheds. Permit fee: P10.00 or P 0.10 per kilo of fish		Pricing – FAO 108 Regulations governing the gathering and farming of seaweeds. Application fee is set at P20.00 and a license fee of P50.00/ 50,000 m3 – FAO 109 Regulations governing the construction or establishment of fishpens and fish enclosures in all inland waters. An annual license fee is set at P100/ha. Trade – Prohibition of eel fry and fingerling exportation	Trade – FAO 112 Rules and regulations in the issuance of permits for exportation of fish and fishery products. An application fee of P5.00, a permit fee of P30.00 and an inspection fee of 1/2 of 1% of FOB are charged	Pricing – FAO 114 Rules and regulations governing fishpen operations in Laguna Lake. Annual license fee set at P100.00/ha. – Memo Circular no. 5 Guidelines in the issuance of temporary permit to ship or transport Bangus fry.

1976	1977	1978	1979	1980	1981	1982
Pricing – FAO 721 Rules and regulations governing charter, contracts, lease or lease agreements of fishing boats or contract for assistance with a foreign person, corporation or entity.			**Trade** – FAO 124 Regulations governing the gathering, catching, taking and removing of marine tropical aquarium fishes. An exportation fee of 1/2 of 1% of FOB is charged – FAO 125 Rules and regulation governing the conversion of ordinary fish–pond permits to 10 year fish–ponds. Charges include a rental application fee of P2.00., an annual rental fee of P30.00/ha. and an annual rental fee of P50.00/ha after 5 years – FAO 126 Ban on the importation of piranha – MNR AO no. 12 Ban on the export of marine turtle and turtle eggs			**Trade** – FAO 135 Rules and regulations governing the importation of fish and fishery/ aquatic products **Pricing** – FAO 138 Rules and regulations governing the culture of mussels (tahong) An application fee of P20.00 and a license fee of P50.00 are charged – FAO 140 Rules and regulations governing the issuance of lease for pearl cultures. Fees charged include an application fee of P100.00, an annual renewal fee of P1,000/ km3 and a transfer fee of P100.00

1983	1984
Trade	Trade
– FAO 141 Bans the exportation of live Gravid shrimps of the genus Penaeus	– FAO 147 Rules and regulation governing the issuance of permits for the exportation of fish/ fishery aquatic products
– FAO 143 Bans the exportation of live prawns of the species P. monodon	

1985	1986
	Trade
	– FAO 143–1 Suspension of FAO 143 and setting an application fee of P100.00 and a permit fee of P500.00
	– FAO 162 Issuance of permit for exportation of live mud crabs

Table A5. History of Economic Reforms in the Mining Sector (1970–85)

1970	1971	1972	1973
	Production		**Pricing**
	– RA 6364 Gold Mining Assistance Act		– PD 135 Creation of the Fertilizer Industry Authority which marked the start of the subsidy era in the fertilizer industry

1974	1975	1976
		Pricing
– PD 436 Mineral Resources Development Decree		– LOI 451 Granting of official support for the PASAR smelter
		Fiscal
		– PD 972 Provides tax incentives to cement enterprise/ industries which converts from oil–fired to coal–fired operations
		– PD 230 Exempts the cement industry from the 4% export duty and grants 20% drawback on fuel used for manufacturing cement for export

1977	1978	1979	1980	1981
Production	Production			Fiscal
– PD 1070 Authorizing CB to grant assistance to primary gold producers	– CB Circular 602 Permitting CB to pay for gold and silver contents of delivered bullions based on the closing and buying price of gold in the London gold markets			– EO 674–B Grants preferential tax treatment to marginal mining companies

1982

Production

– LOI 1214 and CB Circular 873 Instituted a financial assistance program

Pricing

– EO 759 Established a Copper Stabilization Fund

Fiscal

– LOI 1250 Provided NSC with gov't. subsidy for subsequent importations of materials for the domestic liquid milk canning industry

1983

Fiscal

– PD 1887 Granted MMI Consumption from paying all taxes, fees and other charges due to national and municipal governments up to December, 1988

1984

Trade

– LOI 1387 Required copper exporters to secure clearance from MTI before making any copper export

Fiscal

– LOI 1416 Suspended payments of all taxes, duties and other charges by the copper mining companies to the national and local governments because of adverse market conditions

– LOI 1418 Gave tax exemptions from the 10% advalorem payments of fertilizer imports

Pricing

– LOI 1419 Roll–back of fertilizer prices and rationalization of fertilizer industry

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