MANGROVE FOREST IN SUSTAINABLE DEVELOPMENT

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ABSTRACT

The project is concerned with the depletion of world environmental resources and the philosophy of sustainable development as a desirable approach for the protection and conservation of resources. A further interest is also paid to the environmental problems facing developing countries and to the issue of how these nations have responded to their environmental degradation at the sustainable level with special reference to Southeast Asia. Moreover, the project deals particularly with the problem of the mangrove forest depletion in this region. The major issues raised include benefits of the forest, its pressures and impacts, responses on the sustained yield basis towards the mangrove degradation and some recommendations on sustainability, based on the experiences of the Philippines, Malaysia and Thailand.

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CHAPTER 1: INTRODUCTION

CHAPTER 1

INTRODUCTION

BACKGROUND

In the wake of the degradation of the world environment as well as the running-out of natural resources, many countries have pursued sustainable development for the sake of the protection and conservation of these resources so that they can remain productive as longer generation as possible. Already, some faunal resources are extinct, and environmental degradation has become more intense and widespread. Acceptance of practice of sustainability is urgent to take care of the remaining resources.

In developing countries where socio-economic heavily relies on natural resources, and the rapid population growth and poverty problems remain unchanged, the issue of sustainable development has attracted considerably official attention in this region. This does not mean that development activities pursued by developed countries are always harmless. Evidence shows that despite a number of sound environmental policies and management and the development of new technologies to lessen danger on the environment, high needs and aspirations have intensified resource uses in developed countries.

According to the influential report of the Brundtland Commission (Fri 1991:1), sustainable development is defined as a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations. The Commission made it clear that to succeed, several factors must be taken into account. These include the issue of population growth, equitable opportunities for all people to reach their basic needs, the development of new technologies, and the conservation and enhancement of natural resources.

In this research project, the focal interest is on the issue of the conservation and enhancement of natural resources with special reference to mangrove forests in Southeast Asia.

Extensive mangrove forests are found in Southeast Asia and the region contains the most productive forests in the world. The mangrove resource is fragile but of enormous importance to human livelihood as well as ecosystem. Unfortunately, the forests have been overexploited for years due to the lack of knowledge of their significance. During the period 1961 to 1986, the forests in Thailand, for instance, were denuded at an annual rate of 6,858.8 ha (decreasing from 367,000 ha in

1961 to 196,429 ha in 1986) while in the Philippines, the total denuded mangrove forests of 217,935 ha or about 40 percent of the entire area existing in 1920 was recorded over the last 60 years.

THE RESEARCH PROJECT OBJECTIVES

The project's interests cover the status, causes and impacts of resource degradation, and the responses of these nations to achieve sustainable development of the mangrove forest. Accordingly, the objectives are five-fold:

-to discuss the concept of environment and sustainable development as well as the situation of the world environmental resources.

-to examine the environmental degradation facing developing countries and their policies and management as responses towards the degradation with special reference to the region of Southeast Asia.

-to discuss the places of the mangrove forests in Southeast Asia. This includes benefits and uses of the forests, their pressures and causes and impacts of the degradation in Southeast Asia nations.

-to present approaches of three examples of the Southeast Asia region - the Philippine, Malaysia and Thailand - towards their mangrove forests on the sustainable development purpose.

-to make some recommendations concerning the achievement of the mangrove sustainable yield.

ORGANIZATION OF THE RESEARCH PROJECT

main parts. Firstly, it deals with the concept of environment and sustainable development as a desirable approach, including the reason why the concept of sustainable development is necessary. Then, it is concerned with the world environmental situation. Some reasons underlying the allegation of developing countries as a potential environmental stressor are also discussed. These issues are reviewed in Chapter 2.

Chapter 3 provides a review of environmental problems confronting developing countries, covering their causes and effects with special reference to Southeast Asia countries. The chapter also examines environmental policies and management as government responses towards their resource depletion.

The third part of the project presented in Chapter 4 is concerned with the place of mangrove forests. The major issues raised cover benefits and uses of the resource, its pressures and causes and impacts of the degradation in Southeast Asia.

Lastly, in Chapter 5, the project gives a explanation of the concept of the mangrove sustainable development. A review of approaches towards the resource degradation on the sustained yield in this region is included. However, due to constraints of time and available information the review is concerned with only

three countries, the Philippines, Malaysia and Thailand. The chapter concludes with some recommendations on sound guidelines for the achievement of the mangrove sustainable development, based on these three countries' experiences.

CHAPTER 2: ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

CHAPTER 2

ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

THE ENVIRONMENT AS OUR ENVIRONMENT

When ones are asked what the environment is, they very often come up with the answer "the environment is everything that surrounds us". Such a response simply implies that there are two main components on this planet- human beings and the environment, including lands, water, air, animals, forests and the other remaining resources and species. Though this common sense is to some extent acceptable, it fails to reflect the reality that these two components have naturally interrelated each other. In this connection, ecologists have lent a very helpful viewpoint. They have seen the relationship between human beings and the environment as a two-way process. On one way, the environment does have a control over human beings in that they can not survive without the environment. As supported by Deju, Bhappu, Evans and Baez, the environment is viewed as a huge pool of resources that helps humankind satisfy their needs and fulfil their wants (Deju, Bhappu, Evans and Baez 1972:1). On the other way, the ecologists' attention has been paid to an ability of human beings as a dominant species on the earth to manipulate other resources and species or the environment itself (Mckenzie and Utgard 1974:9). In other words, human beings also have an influence over the environment. In conclusion,

human beings are dependent and at the same time independent upon the environment, or as termed by Marston Bate, they can be part of and apart from the environment (Bate 1969:21).

In the economic sense, the focal idea is not far different from that of the ecologist. Economists have seen the environment as the source of natural resources. These resources directly serve as inputs for the production of goods and services which can eventually satisfy the needs of consumers (Gregony 1979:1), or in other terms, increase their well-being (Pearce and Turner 1990:1). This implicitly is a the two-way process as well.

Having reviewed the term "the environment", what have been seen is that human beings and the environment are closely interrelated. Particularly, human beings have a great potential to exploit all of the natural resources for the purpose of fulfilling their needs or satisfaction which are acceptably paralleled with quality of life (sometimes preferably mentioned as well-being or welfare). Hence, the environment has played a crucial role in human life as an ingredient for meeting human 's needs as well as quality of life. This represents one dimension of the interrelationship.

However, we as human beings can not ignore the fact that none of the resources is infinitely abundant.

The capacity of the environment to supply our needs is therefore limited. It should be realized that as we have exploited these environmental resources since we came to exist on the earth. Such a non-stop exploitation definitely tends to reduce this capacity. Instead of bringing about wanted satisfaction, the environment can then work negatively on our quality of life. This presents a potential control of the environment system over human's livelihood which is the other dimension of the interrelationship. Rather than creating a new concept of the environment, the review tries to present a common feature of these two important perspectives influencing on the environmental thinking. That is, the term "environment has two-sided functions-enabling human beings to survive and being under the control of human beings. These implication have also led to an undisagreeable conclusions that our present and future quality of life is not threatened by any species other than ourselves. Hence, our need to keep the environment intact is unescapable.

ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

ENVIRONMENT AND DEVELOPMENT

As mentioned earlier, the environment is essential in meeting our needs and aspirations. Hence, the term has long been recognized as a process in which quality

of life can eventually be created or improved by converting available resources, including both natural resources and other man-made resources such as technologies, financial resource and labours into desired patterns of needs. In practical terms, development can usually consist of an activity , a group of activities or a series of actions with a specific objective(s). The concept is as a result mentioned in many ways such as development itself, developmental activities and development process. At this stage, it can be seen that improved quality of life as an ultimate goal, the environment and development is inseparable.

However, in recent years, some development activities have been accused of acting against the betterment of human life. The term "development" therefore has to be examined in this research project.

The development concept has its own story. Though it is clearly designed for the goal of quality of life, such a goal is hardly measurable. This has brought about some difficulties in dealing with development in terms of the assessment of well-being. As a result, the definition varies from time to time and/or even from place to place. Particularly, after the Industrial Revolution, world population substantially increased. During the 1750's and 1950's, the number raised from 760 million to 2.5 million (Merrick 1986:16 quoted in the International

Institute for Environment and Development and World Resources Institute 1987:8). To match up with such increasing needs caused by this population growth, development was therefore aimed at accelerating production of goods and services. In other words, the achievement of development was tantamount to the capacity of supplying needs.

Again, after the 1950's when World War II was over, many countries had to recover their long-ill economic conditions resulting from the War, by seeking for development. This caused a tremendous need in the next two decades. Hence, from the 1950's to the 1970's, to be able to absorb those needs, development was more rigorously served for expanding productive capacity (Radclift 1987:15) to be able to absorb those needs or in economic terms, conceived of growth targets (Thirlwall 1989:8). Many development plans of the period aimed to increase production more rapidly than population or needs, and countries prescribed ways to manage production in order to achieve this objective. The development definition with the goal of pursuing economic growth was strongly supported by most economists who have always played a crucial role in shaping the development process. As a result, this concept of development became worldwide. Essentially, rates of growth of per capita Gross National Product (GNP) came to be an index of development and was used to measure the overall well-being.

Nevertheless, evidence showed later that though some countries especially in developing countries did achieve the GNP growth target, this narrow sense of development had not improved quality of many people's life. The level of their living mostly remained unchanged (Todaro 1989:87). Also, GNP was found to have little relevant to well-being. It was not a good indicator of quality of life. Even economists saw the inadequacy of the GNP measure.

In the 1970's, development came to be redefined. Since, the world population growth still kept growing, an increase in national products was unavoidably necessary. However, as countries learned that economic growth was not enough to constitute development, more emphasis was put upon other measures. These included sufficient health services, education achievement, access to resources, equitable distribution of income, employment opportunities and basic freedom especially for women and minority groups (Asian Development Bank 1990:8). Since then, development has taken into account not only the increase in value of goods and services, but also well-being. To summarize, redefinition does not seem to modify its very core idea, i.e. the creation or improvement of quality of life. It has, however, become more broadly defined. That is, it does include both quantitative and qualitative aspects which are necessarily required to asses the betterment of life.

ENVIRONMENT IN SUSTAINABLE DEVELOPMENT

We have so far learned that the environment has contributed to the well-being improvement through development process. Therefore, quality of life, the environment and development activities are automatically interwoven. Nonetheless, due to the fact that the environment is exhaustible and can produce harmful effects on people's life, environment protection needs to be taken into the ambient of the concept "development" to ensure that the environment and development will not react negatively on each other.

The environmental concern is actually ancient but the extent of the concern has been enlarged since the 1970's (World Commission on Environment and Development 1987:9-10). Sustainability has grown up side by side with the new definition of development. Particularly, many researches and studies had already shown some undesirable effects and even losses of the environment before the 1970's. Research revealed that the global economy multiplied about fifty-fold in the last hundred years, with four -fifth of this growth achieved since the 1950's (World Commission on Environment and Development 1987:4). Though we could not know the exact extent of environment loss, it was estimated that such a high economic growth had to deplete a large number of natural resources. Some evidence presented during the 1950's and 1970's showed environment

degradation damaged people's lives. For instance, in the 1950's, there was a disaster in Japan. Mercury-bearing waste from a local factory was piped into the sea. This led to contaminating fish and hundreds of people died from mercury poisoning and a number of others suffered disability. Also, in the 1970's, a rubbish dump at Love Canal in New York State was found to contain highly toxic chemicals, posing a serious threat to their population. Another example is in the North Coast of North America and in the North Western Europe. Sulphur dioxide from industrial chimneys caused acid rain, destroying lakes, forests and animal life (Cave 1990:4).

After the 1970's, the world population increased from 3.7 billion in 1970 to 4.8 billion in 1985 (World Commission on Environment and Development 1987:100). This made an increase of 1.1 billion in fifteen years. This immediately implies that human needs had also accelerated. In the light of pursuing the right development, there has been an considerably increasing realization in the unhealthy environment and its undesirable productions. As dangerous effects of the environment have indiscriminately harmed people life and even other living things on this planet. The environment issue has drawn attention from every corner of the world. To respond to this, many involvements trying to ensure that any development activity with the targets of economic growth and quality of life can be achieved without damaging the environment resulted in

the emergence of the concept "***sustainable development***". Sustainability by and large is perceived as a new approach providing a framework for the integration of environment policies and development strategies. Some of these attempts have been given by two dominant groups-ecologists and economists. From the ecologist side, they have been concerned with both sustaining and expanding the environmental resource base and the improvement of human's life. For them, sustainable development will occur when long-run social welfare improvement is not impeded by deterioration of either environment amenities or environmental productivities, or a combination of the two (Pelt, Kuyvenhoven and Nijkamp 1990:141).

There are a various approaches adopted by economists. Sustainable development is ,for example, defined as non-negative changes in social welfare over time (Pelt, Kuyvenhoven and Nijkamp 1990:140). Another meaning is maximising the net benefits of economic activities subject to maintaining the service and quality of natural resources over time (Pearce and Turner 1990:24). Similar to the former definitions, Repetto sees sustainable development as a development strategy that manages all assets, natural resources, and human resources as well as financial and physical assets for increasing long-term wealth and well-being (R. Retto 1986:15 quoted in Pearce, Barbier and Markanga 1990:24).

These definitions obviously share three basic features: fair opportunities of future generations to access natural resources, the achievement of economic growth and well-being, and the conservation of the environment. The most prevalent feature concerns future generations. Applied from the new concept of development, in sustainable development, the equitable distribution refers to wealth and chances in enjoying the same quality of the environment shared not only within one generation but also among generations. Moreover, all of the definitions apparently seems to emphasize the exhaustibility of natural resources and therefore talk about the same goal of guaranteeing economic growth without undermining the environment, thus resulting in improving welfare. However, although a lot of attention have been paid to the adoption of sustainable development, these definitions are not useful for analytical studies as to how the sustainability can be achieved.

In the 1987's, a more acceptable definition was developed by the World Commission on Environment and Development or known as the Brundtland Report (Fri 1991:1). The most outstanding task of the Commission was an attempt to turn the abstract term of sustainable development into a practical one. The Commission not only dealt with the problem of environment degradation to a large extent produced by the traditional development but also push it into the real world phenomena in order to elicit other

relevant factors and crises which can interact with the former problem such as widespread poverty especially in developing countries, world population growth, and technological advances. Having addressed those problems, the Brundtland Report suggested some requirements needed to sustainable development. They were (World Commission on Environment and Development 1987:49-65):

-the sustainability of development should be intimately linked to the dynamic of population growth.

-the sustainable development requires that societies can meet human needs both by increasing productive potential and be ensuring equitable opportunities for all.

-the orientation of technological development must be changed to pay greater attention to environmental factors.

-the Earth's natural resource basement must be conserved and enhanced. Particularly, the rate of the resource depletion should be compatible with a fair opportunity in accessing to natural resources of next generations.

Consequently, the Commission has ended up with a sounder term of sustainable development. It refers to a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations (World Commission on Environment and Development 1987:46).

So far, there is no general agreement about the precise meaning of the concept "sustainability".

Nevertheless, the Brundtland concept together with other concerns dealing with sustainability have increasingly influenced governmental bodies to take more actions in solving the environment problem and place the issue on the heart of their policies and planning which will be discussed in Chapter 3. Hence, it should be necessary to conclude at this stage that the environment and development can be compatible.

THE WORLD'S ENVIRONMENTAL CONSTRAINTS

The previous sections have reviewed the concept of the environment, its close relation to our well-being and why our great concern over the environment is required. Particularly, since we have learned that the environment has placed an enormous pressure on human's life, it is advisable to deal with how far we have depleted natural resources, and acted negatively to our quality of life.

Many patterns of techniques, technologies and other developmental strategies have been designed to achieve development. Such patterns have as a result generated many forms of stresses on the environment. Particularly when the development with sole objective of economic growth was pursued, a number of natural resources had been undermined or even extinguished. Since then, the environment has continuously been deteriorated to cope with

increasing human needs and wants. At the present time, many concerns would agree that the environment as well as the quality of life are in greater danger than at any other time in history. Since water, air, land and living resources and species are naturally of significance to human life, our life falls into the same dangerous situation. How serious is the problem? How much do we need sustainable development? This section outlines the major constraints on the exploitation of the world environment.

THE LOSS OF BIODIVERSITY

The estimated number of living species on earth varies from 5 million to 30 million, of which only 1.4 million have beenidentified and classified (The Director of United Nations Environmental Programme 1991:11). These species mostly are used in the development of agriculture, medicine and industry. The tropical forest is the largest store house of millions of animals, birds, insects and plants and contains about a half of the World' biological diversity (United Nations Environmental Programme 1988:9). Sadly, the forest is at present under the greatest threat of destruction. The causes are mainly indiscriminate logging, inappropriate infrastructure construction techniques, overpopulation and forest fires. It has been estimated that the global tropical deforestation is most likely to be about 14-20 million hectares per year (The

Executive Director of United Nations Environmental Programme 1991:11). According to the FAO figures, the latest annual rate increases from 0.6 per cent in 1980 to 1.2 per cent in 1990 (Laird 1991:4-5) which is approximately equivalent of one football field per second (United Nations Environmental Programme 1990:12). During the next three decades, species extinction caused primarily by deforestation is also likely to be between 5 to 15 per cent of the World species, i.e. a loss of 15,000- 50,000 species a year or about 40-140 a day (The Director of United Nations Environmental Programme 1991:11).

CLIMATE CHANGE

Climate change will also have environmental effects. An immense cause is emission of carbon dioxide and other gases from industries particularly in urban areas. Carbon dioxide and dangerous gases themselves have affected people's life by polluting the air. About half of the people living in urban areas worldwide - some 990 million - are still exposed to unhealthy levels of sulphur dioxide, and more than a billion people are exposed to excessive levels of particulates (The Director of United Nations Environmental Programme 1991:12). Tropical forests have also played a vital role in this change. The burning of the forest has long been recognized as changing the earth's climate by releasing carbon dioxide into the air. Moreover, deforestation can reduce rainfall. In spite of

the decreased rainfall, run-off and floods may also increase as absorbency of the exposed soil is much less than that of tree-covered soils.

In addition, these gases have increased the global temperature. The 1990's broke new ground as the hottest year on record (The Director of United Nations Environmental Programme 1991:12). Climate change is still accruing with frightening speed. Scientists predict an increase in average global temperature of 1.5 to 4.5 centigrade by the middle of the next century (United Nations Environmental Programme 1989:9).

Worryingly, as the climate has become warmer, it is expected that more water will evaporate, thus reducing water supplies. The Intergovernmental Panel on Climate Change (IPCC) has already reported that the global water vapour has risen by a few percent during the 1980's, compared with the 1970's (The Executive Director of United Nations Environmental Programme 1991:4). The increasingly warm temperature will also stir the world's weather systems into more intense activity, bringing more savage and more frequent storms to many part of the world. The warmer climate will also cause sea levels to rise. IPCC calculates that the world's ocean may go up about 20 centimetres by 2030 and about 65 centimetres by the end of the next century (Laird 1991:4-5). When sea water moves inland, ground water will become contaminated and many

inland areas will become too saline for agricultural uses, thus reducing food supplies as well as qualities.

WATER AND COASTAL ZONE POLLUTION

Oceans cover more than 70 per cent of the earth's surface and contain some of the earth's most complex and diverse ecosystems. Though the coastal zone constitutes only about 10 per cent of the total oceania area, its accounts for more than half of the ocean's biological productivity and nearly all the world's catch of fish (The Executive Director of UNEP 1990:10). In addition, coastal areas contain many kinds of ecosystem that are vital to marine life and humankind.

The oceania area pollution is attributed to the emission of billions of tonnes of discharged sewage. Several countries flush their waste from domestic and industrial effluent into oceans. In addition, the area has been deteriorated through accidental oil spills and the cleaning of contaminated ballast tanks. UNEP reports that every year somewhere between 2 and 20 million metric tonnes of oil are discharged in the world's oceans (United Nations Environmental Programme quoted in the International Institute for Environment and Development and the World Resources Institute 1987:128). Hence, water and the coastal zone are being polluted at a worrying speed. This problem can be linked to the loss of marine biodiversity.

THE LOSS OF WETLAND

Most losses of wetland are irreversible because land is created for corps, forestry, pasturage for domestic animals, and exploited for peat mining. Between 25 and 50 percent of the world's swamps and marshes have been already lost (O.L. Louchs quoted in the International Institute for Environment and Development and the World Resources Institute 1987:87).

SOIL EROSION

Almost every country in the world reports soil erosion. In many regions, rates of soil loss exceed rates of soil formation at least tenfold. It has also been estimated that about 25 billion tonnes of topsoil are lost from the world's crop lands each year, resulting from reduced forest and vegetation cases (the Executive Director of United Nations Environmental Programme 1991:11).

All of the premises of environmental effects and predictions on the world environmental situation have strongly confirmed that available natural resources upon which human life must rely have seriously been threatened and can be lost in the near future unless the protection of the environment is urgently and properly promoted. Before moving to the next chapter which is involved with how countries, and particularly developing countries have

responded to the environmental crisis. It is necessary consider why developing nations are alleged to be environmental destroyer.

DEVELOPING COUNTRIES: THE ENVIRONMENT AND DEVELOPMENT

As previously mentioned, people all over the world are being faced with many forms of negative environmental effects. Such a problem calls for urgent contributions from every country to prevent the environmental degradation. It has, however, seemed that much more attention is paid to developing countries as it is understood that they have an enormous potential to harm the environment. The first reason given is that developing countries have large populations and their population growth is still increasing at a rapid rate. India, for instance, has the second largest population in the world, over 750 million in an area of 3,288 thousand square kilometres (Gupta 1988:1). It is predicted that the world population will reach more than ten billion people sometimes in the twenty-first century. More than 90 per cent of this growth will occur in these countries ; and if, say, the people in developing nations want to enjoy only one-third of the per capita income level that the developed nations do, the world economy will have to expand more than thirty-fold over the next one hundred years (Fri 1991:2). This accelerating growth without doubt requires

intensified exploitation of natural resources. In other words, high population is a threat to the conservation of the environment of the developing world or of the world as a whole.

Poverty is another major characteristic of developing countries. In 1985, the world population was 4.8 billion and 3.66 billion lived in less developed regions (The Brundtland Report 1987:100). At the moment, about one-third of their population is living under the poverty line of U.S.$ 370 per person per year (The Executive Director of United Nations Environmental Programme 1991:10). It is conceivable that they are easily pushed to overuse environmental resources just to survive from day to day. The farmers, for example, in the highlands of Ethiopia and Nepal farm and erode steep hillsides to prevent starvation (P. Blaikie quoted in Adams 1990:87). More seriously, their economic condition has been worsened in the last two decades. They have ended up with more indebted. A high population growth has also driven their poverty into harder situation. Particularly since the economy of most poor countries is based on agriculture, their economic well-being is dependent on living resources. Again, to mitigate debt services, they are forced to draw heavily on environmental resource base. Some farmers have moved to marginal lands, thus causing deforestation, severe erosion and declining agricultural productivity.

Lastly, developing countries have already experienced considerably environmental degradation. For example, China as the world's leading producer of coal, burns approximately 900 million tonnes each year. In 1988, the air above the north-eastern Chinese city of Benxi was so polluted that the city itself was invisible in satellite photographs (Cave 1990:5) In Manila, five main rivers are classified as "biologically dead" but are host to a large number of dangerous bacteria and viruses, the cause of disease among human and the death of incalculable numbers of fish (Cave 1990:4). Mining has also produced many negative effects. In the Central Pacific, phosphate mining removed so much soil that agriculture became impossible in Banaba Islands. The absence of vegetation made water scarce and the people were eventually forced to leave the island (United Nations 1971:155). Another elaboration from mining is in South Africa. Gold and coal minings have resulted stream draining, silting and pollution from acid sulphates around mining areas (United Nations 1971:175). In the tropic as a whole, impoverished soils mainly produced by deforestation damage maize yields by 30 to 70 per cent. Particularly in Mexico, production declined from 3.8 to 0.6 tonne per hectare and in Nigeria, it went down from 6.5 to 1 tonne per hectare (Blackwell, Goodwillie and Webb 1991:5) Not only are these countries faced with chronic suffering from environment effects, it is obvious that they are also less able than the developed nations to cope with the negative effects of environmental disruption.

In conclusion, the environment-development dilemma appears to be greatest in the less-developed world. On account of their socio-economic conditions, they essentially have had to pursue development for their better living conditions or in absolute sense to struggle for their basic needs. To achieve this, the intensified exploitation of environmental resources seems inescapable although t his in turn could ruin their people's lives. The relationship between environmental degradation and development therefore could become a downwards spiral leading away from human well-being. Such a precarious condition has drawn attention to and concern with developing nations.

It is, however, evident that though developing nations seems to have a high potential to damage natural resources, they are not the sole environmental destroyers. A large proportion of environmental resource had been drawn upon by the developed regions. Essentially, we have to bear in mind that most adverse environmental effects are widespread and will not fade away. The present generation are now suffering from effects inherited from industrial developments in the rich countries. Very often, developing nations are also found to be the victims of these activities. A good example is the case of Africa. Thousands of tonnes of hazardous waste mostly from Europe were shipped into African regions (Boyd 1989:6). Rich

countries have long exploited natural resources in the poor nations through their external investments and assistance. Although such issues are important, they are not considered in this project.

So far, we have learned that to achieve sustainability, many policies and plans such as population growth, economic development, technological progress, and environmental management will need to be modified. In the next chapter, we will deal with environmental problems facing developing countries and in particular, their environmental policy and management responses to the problems.

CHAPTER 3: ENVIRONMENTAL POLICY AND MANAGEMENT

CHAPTER 3

ENVIRONMENTAL POLICY AND MANAGEMENT

The previous chapter reviewed the interrelationship between environment and development, the concept of sustainable development, the present situation and future trend of the global environment, and the precarious roles of developing countries on their own natural resources and on the world environment as a whole. Particularly, the review of sustainable development has indicated that if needs are to be met on a sustainable basis, the conservation and enhancement of natural resources is an essential task. In other words, natural resources should be managed sustainably. To relate with the objectives of this research study, the management issue is therefore addressed specifically.

The structure of the chapter therefore is mainly two-fold. Before going to a further discussion on environmental policy and management, we need to look at major problems of environmental resources facing developing countries, including causes and impacts of the problems. In the second part of the chapter, the policy and management responses of governments in these countries to their environment problems are examined with special reference to the Southeast Asian region.

PROBLEMS OF ENVIRONMENTAL RESOURCES IN DEVELOPING COUNTRIES

As briefly mentioned in the last chapter, primary or natural resources are the basis of economic development and social change for the people in developing countries. Hence, with respect to their high population and poverty, the degradation of environmental resources (particularly forests, land and coastal areas) is critical in this region. However, due to different resource endowments and structural factors, the nature, degree as well as cause of the degradation varies among and even within countries. As a result, it is difficult to give prioritise the problems. With such a variety of environmental threats, only some major problems facing developing countries are raised here and discussed according to their natures or countries/continents rather than according to their priorities.

DEFORESTATION

The tropical moist forests are unique to most developing countries. In particular, three large regions of the rainforests occur in the Central America (Amazon Basin), Equatorial Africa and South and Southeast Asia. Sadly, what has been happening is that thousands of square kilometres of the forests are depleted each year (Gupta 1988:3-5). A number of causes are attributed to this

undesirable deforestation.

Central America

Much more deforestation results from demand for land use and commercial and non-commercial timber or hardwoods. The two types of land use demand are for cattle ranching and agricultural purposes particularly slash and burn agriculture and shifting cultivation (Leonard 1987:123 and Adams 1990:124-126). Infrastructure constructions such as road building needed to get access to the forests are also substantially involved in the depletion.

South and Southeast Asia

Forest degradation has many causes in this region. The forests have been exploited for tropical hardwoods and firewood. It is estimated that the rate of the exploitation for these purposes goes to 6 to 17 million hectares per ten years (Furtado 1979:85). Similar to the Central America region, infrastructure works like highways, urban development and irrigation systems also affect many parts of the tropical forests. In addition, shifting cultivation has played an important role in degradation through the clearance and burning of large areas for crops.

Africa

African people have experienced a fast rate of the population growth which has placed much pressure on the forests. Cutting wood has become not only a major source of their income but also a necessity in meeting basic food needs. Forests have been cleared for more agricultural lands and livestock (Brown and Wolf 1985:10-12). Apart from this, fire-wood is the major fuel source for African's households and its supply is a major industry. Evidence reveals that in most African countries, households use ten times as much as all other commercial fuels combined (Brown and Wolf 1985:47). Hence, seeking for agricultural and livestock ranching purposes as well as firewood is the most vital threat to keeping the forest intact in this region.

In conclusion, the major causes of forest depletion in these three forested regions are: extraction for timber and firewood, agriculture practices (such as crop plantation), livestocks and other industrial developments (such as mining and constructions). As a consequence, developing countries have not only been losing a significant natural resource, they have also been unavoidably faced with severe impacts caused by the forest degradation.

The tropical rainforest is very rich in biodiversity (both fauna and flora) which enormously provides food supply, medicine and other basic needs for

people's life. Deforestation is tantamount to the reduction of biodiversity, thus diminishing the supply of these needs as well as damaging human life. In addition, the burning of the forests for agricultural purposes has effected climate change and contributed to natural disasters by releasing carbon dioxide (CO_2) into the air. For illustration, on the island of Borneo in 1982-1983, the extent of damage from the catastrophic fire was found significant (Gupta 1988:9). Further, forest loss deceases the moisture in the soil, leading to a reduction in the rainfall in these developing nations (Gupta 1988:10). Another immediate effect of clearing the forests both on lowlands and on steep slopes is the acceleration of soil erosion. The soils of the Amazon forest are low in nutrients even when a tree cover exists (Gupta 1988:14). Erosion also leads to runoff over the surface which causes flooding.

LAND OVEREXPLOITATION

In developing countries, the major cause of land degradation is agricultural expansion, including crop plantations and livestock ranching. For instance, in the African countries, the exploitation of land for grasslands is acute because livestock numbers have expanded rapidly. Between 1950 to 1983, for example, livestock figure went up nearly as fast as human population growth. In 1950, the continent's population had 219 million whereas livestock

population was 295 million; in 1983, the human population reached 513 million and the livestock increased to 521 million (Brown and Wolf 1985:13).

It is a matter of concern that land degradation as a result of agricultural extension is strongest in marginal or virgin land such as drier and steep areas. The spread of degradation in steep areas is higher in certain areas such as the Himalayas, the Andes, and parts of the East African Highlands (Gupta 1988:25). However, the most serious case recorded is in El Salvador where much of the cultivated land is on steep slopes. Its landscape is so heavily exhausted through intensive grazing, slash and burn agricultural method and firewood gathering that it cannot be recovered by either by reforestation, conservation measures or other solutions (Gupta 1988:19 and Leonard 1987:127-128). In addition to agricultural expansion, industrial and construction activities such as mining and extensive irrigation add to forest depletion.

The impact of soil erosion, reduced rainfall and siltation have been closely associated with land overexploitation (Majid 1979:54 and Gupta 1988:17). In the Klang Valley of Malaysia, for example, it was estimated that approximately one million tons of silt were carried down by the river annually, mainly due to overusing forested land (Majid 1979:55). The Africa land overuse is very intense. Not only are soils being degraded all across

the region but also where diminished rainfall occurs, desertification results (Brown and Wolf 1985:24-25). Rainfall levels in 1983 and 1984 in Sub Saharan Africa, where four-fifth of the continent's people live, were the lowest ever record (Brown and Wolf 1985:19).

Salinity is also caused by the spread of irrigation water system needed for agricultural activities. Some areas such as the drier part of India, Pakistan, Iraq, Iran, Syria, Jordan, other countries of western Asia, Peru, Argentina, Northeast Brazil and Maxican have already experienced serious salinization problem (Gupta 1988:22).

AIR AND WATER POLLUTION

Water pollution

All types of development, agricultural, industrial and settlement, can create water pollution. Domestic wastes and sewage such as detergent, fibres, plastic and the like are the most obvious problem caused by settlement development. Industrial activities moreover are involved in polluting water by discharging unwanted wastes into water sources. Food processing plants, paper mills oil refineries, mining, transportation and other constructions like dams and irrigation systems are examples of these activities. In rural areas, new techniques particularly chemical fertilizers and pesticides can also

cause water pollution. These chemicals wash off crop fields to pollute river and lakes and are absorbed into the subsurface to lower the quality of groundwater.

All polluted materials generated by these development activities are eventually flushed into canals, rivers, lakes, and other waterways. In Malaysia, it is revealed that eleven river basins experienced such pollution problem (Majid 1979:50). In particular, the Kelang and Juru rivers are considered dead due to pollutants from rubber factories and palm oil mills (Suhaimi 1983:17) The Philippines is another good illustration. As mentioned in Chapter 2, five main rivers in Manila are classified as "biologically dead".

The most critical impact is a lack of safe water supply as a number of polluted items cause various types of diseases and toxification in the water (Gupta 1988:36). In many urban areas in particular, city-dwellers are forced to live in unsatisfactory conditions with no access to properly treated water caused by the contamination of various chemicals from industrial effluent. For instance, in the polluted irrigated-parts of Kenya, 100 per cent infection rates have been noticed among schoolchildren; and in the infected areas of Egypt, the male and female life expectancy in the 1970's was only 27 and 25 years respectively (Gupta 1988:36). In overall, it is recorded that large areas of the Third World nations

are without safe drinking water thus bringing about threats to quality of life.

Sediment is another symptom of water pollution. Mining activities and mismanagement of dams and reservoirs are often attributed to this impact. The Aswan Dam on the Nile is a good example. It is reported that Lake Nasser where a huge structure with a large reservoir was established has a very high evaporation and sedimentation rate. Not only does it reduces storage capacity but it also prevents fertile silt from reaching the agricultural area downstream (Gupta 1988:34).

Air Pollution

The centre of air pollution mostly hangs over industrial and urban areas. As many Third World nations are passing through industrial urbanization, the air quality deteriorates. The major air pollutants are oxides of sulphur and nitrogen, carbon monoxide, hydrocarbons, photochemical oxidants, and particulates released by various modes of these developments like transportation, mining, stationary fuel combustion, and disposal of solid wastes (Gupta 1988:47).

These pollutants causes absolutely high incidences of respiratory diseases, eye ailments, shortness of breath, chest pains and irritant coughs. The best known

case is the Union Carbide factory in the city of Bhopal in India which produced chemicals for pesticides. Several thousands of people were affected by a major chemical leak in the 1980's. Some suffered from eye and respiratory ailments. Thousands are still suffering from respiratory, sleeping and digestive problems (Gupta 1988:55).

Pollutants and particularly sulphur dioxide can cause acid rain. A country like China, which has a large number of coal-powerful industrial activities which emit sulphur dioxide into the atmosphere, has a big chance to be faced with the problem of acid rain if the pollutant is released in a substantial amount (Gupta 1988:50).

Rural areas are also faced with air pollution mainly caused by the burning of natural vegetation and some industrial activities. The dust from the magnesite mines of Jhiroli in Atomora District in India is one example where pollution has impaired agriculture in nearby fields (Gupta 1988:48).

COASTAL ZONE DESTRUCTION

The coastal zone, comprising estuaries and other wetland areas is another critical resource for economic development in developing countries, and in Southeast Asia, the seas support some of the world's most productive marine fisheries (Valencia 1985:11). The coastal zone has

been continuously degraded over recent years. Threats to the coastal area are varied in these developing nations. The first threat is from agricultural activities. Overexploitation of fisheries, for instance, adversely affects the reproductive system of aquatic life, leading to a decreasing number of fishes. Crop plantation has also destroyed the coastal resource through emitting sewage and sediment.

Further, the effect of industrial developments on the coastal area is becoming more direct. Tin mining in Thailand, for example, has had a severe impact of degrading marine habitats along the coastal zone areas (Soegiarto 1983:99). Marine transportation as another industrial activity which threatens to pollute coastal resource by discharging petroleum from ships and cargo boats during tank cleaning. The Strait of Malacca illustrates the problem. The Strait is the busiest sea route in the region and has reputation of the dirtiest part of the sea in the world. Oil spillage from false collision, washing and leakages have been responsible for the high degree of pollution in the strait (Sahabat Alan Malaysia 1981:6). Oil pollution in the coastal zone is moreover found to be a result from drilling for oil and gas.

Factors such as urban expansion and resort development or tourism and other agricultural and

industrial developments have also placed pressures on the coastal resource. For instance, the first two factors are accused of clearing and draining wetlands particularly mangroves in Panama (Leonard 1987:143).

Since estuaries and swamp wetlands are the spawning or nursery ground for fishes and other commercial valuable species such as mangroves, any kind of coastal zone degradation directly leads to the diminution of these resources. In Honduras, the problem is overfishing. Conch populations have fallen off so dramatically that the exploitation either for commercial purposes or local consumption has ceased (Leonard 1987:139). In Thailand, industrial pollution is a major problem during 1973 to 1974, the cockle and shrimp farmers lost about $U.S. 1.5 million due to sugar mills discharging wastes into the sea (Piyakarnchana 1985:101). Pollutants such as DDT and chlorinated hydrocarbons released by agricultural and industrial activities can also contribute to some human diseases. Hepatitis and respiratory infection are often found in this area.

The above discussion has presented evidence in many developing countries showing that natural resources are deteriorating due to various types of "development". In turn, the degradation is causing a large number of negative consequences which affect the quality of human life. These environmental problems as well as their causes

and effects are summarized in Figure I.

ENVIRONMENTAL POLICY AND MANAGEMENT: GOVERNMENT RESPONSES IN SOUTHEAST ASIA COUNTRIES

Having learned from the second chapter and the previous discussion about the social and economic conditions and the environmental problems facing developing countries, the great challenge for these nations is then to balance intensive and extensive growth so as to avoid the environmental damage. Since government policy and management is seen to have a big role in mitigating the environment problem or in achieving sustainable development as a whole, this brings us to concern in this chapter to ask how and how far governments in developing countries have responded to the problem. Special reference is made to Southeast Asia as the target region in this research project.

ENVIRONMENTAL POLICY

There are indications that expression of concern about the environmental deterioration in Southeast Asia has become more frequent. As a result, some environmental policies and management strategies have been issued by governmental bodies. In terms of the policy, this research study is basically concerned with two areas, government institutions or agencies, and National Development Plans.

Government Institutions

One of responsibilities of government in reducing the environmental problems has been done through the establishment of organizations which are usually assigned specific tasks relating to taking care of the environment. In Malaysia, the most important legislation is the Environmental Quality Act, 1974 which established the Division of Environment in the Ministry of Science, Technology and The Environment (Shane 1979:18). The Division is primarily responsible for pollution control while other resource management functions are undertaken in other agencies. The Act also resulted in the appointment of a director-general of environment quality, and the establishment of the Environmental Quality Council which comprises representative of all relevant bodies concerning environmental protection (Rashid 1981:16). The Councial is fundamentally responsible for two advisory functions: to advise the Minister on issues pertaining to the Act and to advise the Director-General on any matter referred to him by the Minister (Majid 1979:60).

Due to recently fast economic growth, Thailand has been faced with serious threats to the environment. In response to this, the 1975 Improvement and Conservation of National Environmental Quality Act created a National Environmental Board in the Office of the Prime Minister (Piyakarnchana 1981:56 and Shane 1979:19). The

Board is composed of selected high ranking persons from with and outside the government. The staff is in charge of making environmental recommendations to the Cabinet and coordinating all environmental activities as well as acting on committees which deal with particular environmental topics such as air, water and land conservation (Shane 1979:19 and Sujarittanonta 1983:65). One further institution is the Environmental Research and Training Centre (ERTC) in the office of the National Environment Board which was set up with the support of the Japanese government in 1983. The fundamental purposes of ERTC are to carry out research and to provide technical support in the implementation of environmental policies and management of pollution.

The first official agency concerned with environmental protection in the Philippines, the National Water and Air Pollution Control Commission, was established in 1964 (Fernandez 1981:37). The Commission has the following major functions: research and study on pollution; the planning of programmes on pollution control; setting standard for its operational functions of licensing; approving plans and systems and issuing specific orders to pollution control; monitoring current information and developments; investigating specific situations; and enforcing specific pollution orders and imposing sanctions. The National Environmental Protection Council, established in 1977 is the central source of environmental policy and

inter-agency coordination. Council membership includes all relevant cabinet officers. It takes responsibility for the formulation and implementation of environmental impact assessment procedure (Fernandez 1981:38 and Shane 1979:19).

In Indonesia, the Office of the State Minister for Development Supervision and Environment was formed in 1978. The office is in charge of planning and implementing environmental policies together with the concerned ministries for related issues. It is also responsible for assessing existing environment-related regulations as well as assembling data on the environment from reports by other departments and institutions (Makarim 1982:280-281).

National Development Plans

Apart from governmental organizations, the National Development Plan is another channel through which government policies, objectives, plans, and programmes are expressed. This review focuses on recent plans in four countries: the Sixth National Economic and Social Development Plan of Thailand (1987-1991), the Philippines Sectoral Plan (1980-1992), the Fifth Five-Year Development Plan (1989/1990-1993/1994) of Indonesia, and the Fifth Malaysia Plan (1986-1990). It is evident that all of these countries put the problem of the natural resource degradation in an significant place. In particular, the

first three countries have specific objectives and programmes involving the protection and conservation as well as maximization of natural resources.

In the Sixth National Plan of Thailand, natural resource and environmental development becomes one of major programmes with the objectives of improving efficiency in the use of natural resources, improving agricultural productivity, and reducing the problem of soil deterioration, expanding exploration and development of the resources, and mastering plans for natural parks, animal protected areas and coastal natural resources.

The Philippines Development Plan is a sectoral one. One of the fundamental policies indicated in the sectoral plan focuses on the issue of natural resources. The policy is aimed at poverty alleviation and equitable benefits while maximizing and conserving natural resources as well as ensuring sustainable productivity.

Despite a generally lower economic growth, Indonesia has no less concern about environmental degradation. According to the present National Plan, the management of natural resources and the environment policy is one of much-concerned sectors. Moreover, its implementation plan is clearly described as follow (Department of Information, Republic of Indonesia 1991:55-60):

-enhancement of harmony between population and the environment; directing toward population reduction, family planning, transmigration and the development of settlements.

-management of natural resources and the environment; directing toward inventory-taking and evaluation of natural resources and the environment, development of land utilization and environment management, preservation of natural resources and the environment, rehabilitation of natural forests and critical land, upgrading of coastal and sea area, and pollution control and upgrading of environmental quality.

The Malaysia policy on the natural resource and environment in the National Plan is comparatively implicit and minimal. At the plan level, the recent Development Plan (1986-1990) does mention mobilizing and maximizing resources, but it seems that the implementation level puts emphasis only on increasing the efficiency of human resources. Nevertheless, there is evidence which indicates that some plans on environmental protection were implemented in the Third and the Fourth Malaysia Plans. The commitment to carry out environmental impact assessment (EIA) in the evaluation of development projects was contained in the former plan (Majid 1979:68 and Suhaimi 1983:20), and the EIA procedure was still encouraged and implemented in the latter plan (Tze 1985:8).

ENVIRONMENTAL MANAGEMENT

Most of development activities which are conceived as a prime cause of environmental problems

usually come in the form of development projects. Hence, if any policy concerned with mitigating the problem is to be met, it involves environmental management. The first prominent approach for management is environment impact assessment (EIA). Other key management is done through enforcing laws and legislation or in imposing regulations and controls. Both EIA application and legal management are discussed briefly below.

Environment Impact Assessment

It should be safe to say that industrialized countries experienced first the environmental consequence of economic development. As a result, most of approaches and techniques dealing with the problem have been developed in these nations. EIA is an approach generated by the United States in 1970 as a response to threats to both the natural and man-made environments (Rodgers 1976:28). In the literal idea, EIA is a fact-finding study and evaluation of the anticipated environmental consequences of development activities, plans, and programmes in an attempt to ensure that the best alternative is chosen. The approach is often used for big projects such as dams, highways, harbours and power stations. Its procedures are manifold, from the identification of the nature of impacts, the prediction of their severity, and the evaluation of environmental quality (Adams 1990:147 and Hufschmidt 1982:4). The approach offers a number of methods known as

checklists, overlay mapping, matrices, networks, system diagrams, and simulation modelling. Slightly different to the other methods mentioned above, cost-benefit analysis was recently modified from the conventional EIA by UNEP for the purposes of development-related decision making. In other words, this method is oriented more directly toward the decision-making process (Lohani and Halim 1987:79-81). In practice, a combination of these methods may be used in some cases; the assessment is usually presented in documents or reports known as environment impact statement (EIS).

A certain number of reports tell that EIA has been applied on a project-by-project basis in the Southeast Asia region. Malaysia is the first example. As mentioned earlier, in the Third and the Fourth Malaysia Plan, the government had a policy on the use of EIA as an aid to environmental planning and evaluation of development projects. It is exemplified by the project of a Fossil-Fuel Power Station in the vicinity of Port Klang near Kuala Lumpur. By adopting the network technique, the assessment showed a surprising but useful result that a number of predicted impacts of the project were found unimportant (Bisset 1987:26-37).

In Indonesia, the Office of the State Minister for Development Supervision and Environment with the assistance of UNEP has applied EIA with emphasis on the

cost-benefit analysis method such projects as the Jakarta Industrial Estate Pulogadang. However, other EIA techniques are also used in project analysis. The Sagaling Dam project in Java which had the objective of generating electricity and supplying drinking water is an illustration of the network method. The assessment found useful information that the ecosystem of the watershed was actually deteriorating through soil erosion, resulting in loss of nutrient. Further, it was indicated that the situation was likely to continue whether or not the dam was constructed (Bisset 1987:39-41).

In Thailand, EIA has only been undertaken by the National Environment Board's staff in special projects. Although the Board has developed guidelines and procedures for the investigation of environmental impact, there has been so far no systematic EIA study. Only the proclamation of types and sizes of mining industry for which an EIA will be required was approved by the government in July 1981 (Setamanit 1985:167-168). EIA has been involved in a certain number of projects. For example, the EIA matrix method was selected to analyze the Phoenix Pulp Mill project. What the final report of evaluation implied was that the project could result in both positive and negative environmental consequences. Apart from that, the assessment identified the significance of each of these consequences (Lohani and Halim 1987:95-98).

Laws, Regulations and Other Controls

Southeast Asia has witnessed an increasing amount of legislation pertaining to environmental protection. Malaysia has comprehensive laws explicitly concerning pollution abatement and the protection of the environment.

The Malaysia government has passed a set of comprehensive environmental laws. Land Conservation Act (1960), for example, was passed to conserve land on the hills and to protect them from soil erosion and encroachment of silt (Valencia 1985:13). The Act permits state authorities to designate appropriate tracts of land for protection and to enforce specific restrictions on the use of the protected areas (Shane 1979:29-30).

The Malaysian Forest Enactment Act is another illustration. The Act deals with the preservation of forests, logging and licensing of operations associated with the forest industry and the prohibition of the use of poison or dynamite in hunting and fishing in forest resources (Valencia 1985:13). In addition, such laws as Mining Enactment, Waters Enactment, Street, Drainage and Building Act (1974), Town and Country Planning Act (1976) are also enforced (Rashid 1981:12-14).

There is also other legislations dealing

with environment issues such as the National Land Code (1965), Local Government Acts and the Fisheries Act (1963). However, the most important act is the 1974 Environmental Quality Act which concerns air, water, and noise pollution from industrial activities. The Act allows for the use of fees as an instrument for abating the pollution problem. An industrial activity which is found to create an environmental threat and which is located in the vicinity of an agricultural area would be charged a huge fee (Valencia 1985:17). In addition, the Act deals with absolute and conditional restrictions in relation to certain areas such as catchment areas which is described as a pollution-free activities.

Though other Southeast Asia countries lack comprehensive laws, they have enforced some legislation, regulations and controls. Thailand does not have a explicit environmental laws. However, there are over fifty acts and regulations which are applicable the protection of the environment. Of these acts and regulations, a larger number are directly linked to the control of air and water pollution and the rest are related to the conservation of soil, water or air. The Factory Act as an example deals with establishment and operation, control, licensing and penalties and includes certain transitional provisions (Piyakarnchana 1981:56). Factories must be equipped with a effective waste-water treatment plant, and if the applicant acts against the requirements, the license

is not granted and penalties may be given in case of violation of the regulations.

The Public Health Act is also linked to environment protection. The Act is composed of nine chapters, one of which is directly concerned with the environment. Many types of nuisances are described, such as building, animal, noise, smell, dust, ash and so on. According to the Act, local authorities are given power to implement legal controls to abate such nuisances (Piyakarnchana 1981:59 and Shane 1979:25).

Some years ago, the approach to environmental protection in the Philippines was minimal. The Natural Water and Air Pollution Control Commission was created in 1964. (The Commission was reorganized during the martial law in 1976.) The Commission is assigned six main responsibilities, as reviewed earlier, and three of these duties are related to legal management. However, the care about national environment policy has been increased. As a result, the country has more recently promulgated a "Philippines Environmental Code" as a total approach to environmental protection (Talavera 1983:38). The Code involves the establishment of environmental policies and quality standards which are implemented by twenty government agencies. The activities of these agencies are also coordinated and integrated with the National Environment Protection Council. In water management, for

instance, there is actually a certain number of laws governing the construction, operation and maintenance of water systems. However, the Philippines Water Code strengthens these laws. All water is claimed to be State property and the rights and obligations of water users and owners are defined, and the administrative agencies are identified (Talavera 1983:39).

So far, the project has generally dealt with environmental problems facing developing countries. In the next chapter, we shall turn our attention to the degradation of a valuable resource - mangrove forest - as well as their environmental management responses to the problem with special reference to Southeast Asia.

Natures of problems	Causes	Eefftects
Deforestation	-extraction for timber -collection for fuel -agricultural practices such as shifting cultivation and invasion to marginal lands -other causes such as mining and constructions	-soil erosion and depletion -loss of biodiversity -flooding and landslides -reduction of rainfall -climate change and natural disasters
Land overuse	-agricultural expansions or developments -mining	-soil erosion and exhuastion -destruction of vegetation -reduction of rainfall -salinization -desertification
Water and Air	-agricultural practices such as using chimical fertilizers and pesticides -discharged wastes from industries -constructions and mining -human settlement (domestic sewage and wastes)	-sediment and siltation -toxification, leading to unsafe water and threats to aquatic life -acid rain -diseases particularly respiratory system like chest pain and shortness of breath
Coastal Zone	-agricultural activities such as overfishing and sewage from crop platation -marine trans-portation -offshore drilling for oil and gas -mining and tourism	-reduction of aquatic life both fauna and flora -toxification -diseases such as hepetitis and respiratory infection

FIGURE I Natures, causes and effects of environmental problems in developing countries

CHAPTER 4: THE PLACES OF MANGROVE FOREST

CHAPTER 4

THE PLACES OF MANGROVE FOREST

The last chapter has dealt with some major environmental problems facing most of developing countries and with environmental policy and management as responses of their government to the problems with special reference to the Southeast Asian countries. All of which have been previously discussed tells us that despite some attempts to tackle environmental problems from the basis of sustainable development, further actions from the governments are still urgent.

However, with the different nature of natural resources, a particular solution is required for a particular resource problem. To fulfil the objectives of this research project, we are looking at the destruction of mangrove forests which is a very controversial resource issue in Southeast Asia. Before proceeding to management issues in the next chapter, it is necessary to clearly understand the ecological and development place of mangrove forests.

The structure of this chapter is therefore three-fold. Benefits and uses of the forests both in the traditional or general aspect and in particular the ecological aspect is our first concern. Next, the second part deals with the nature of degradation encountering this

valuable resource. Its stressors or the causes of the degradation are also addressed. Lastly, the research project does intend to elicit and present impacts resulting from the mangrove destruction.

Mangrove forests/swamps/communities are the interfaces between land and sea or sheltered coastlines, existing in most tropical and subtropical intertidal regions such as Asia, North America, Africa and New Zealand (Mercer and Hamilton 1984:14). In the region of Southeast Asia, mangrove swamp vegetation forms an important component of the coastal line. The region has been found to be the richest mangrove community in the world (Macintosh 1983:186).

According to available data, it is indicated that there are about 4.8 million hectare (ha) of mangrove forests in Southeast Asia (Srivastava 1985:106). The Indonesia archipelago has over 81,000 kilometres of coastline (Soegiarto 1983:91) which is one of the longest in the world, consisting of a variety of ecosystems such as rocky stones, coral reefs, muddy shores, fresh water swamp forests, peat swamp forests, salt marshes and mangroves. It is hence not surprising that Indonesia has the largest mangrove forests in this region, about 3.6 million ha or 75 per cent of the total area (E.D. Gomez

quoted in Srivastava 1985:106). The forests are widely distributed in Sumatra, Kalimantan and Irian Jaya (P. Hardjosentono quoted in Koesoebiono 1983:113).

Mangroves comprise about 650,000 ha or 2.4 percent of the total area in Malaysia (Abraham 1984:165): 113,200 ha in Peninsular Malaysia, 173,600 ha in Sarawak and 365,300 ha in Sabah (Sundram 1984:168). This then makes Malaysia the second largest in S.E.A. and the third place in the world after Indonesia and Australia (Manan 1983:1).

Thailand and the Philippines come the third and the fourth in the Southeast Asia region. Thailand had approximately 2,259,375 rai or 367,000 ha of mangrove forest in 1961, but in 1986, the mangroves had decreased to about 1.227681 rai or 196,429 ha (Kongsangchai 1988:2). This tells that during the period 1961 to 1986, the mangrove forests were denuded at an annual rate of 6,858.8 ha. The latest figure presents the remaining forest area of about 1,128,494 rai or 180,559.04 ha (Rain Drop Association 1991:14). These mangroves are found along both coasts of the Gulf of Thailand and on the west coast of the peninsular facing to the Andaman Sea.

In 1920, the Philippine mangroves were estimated

to be as much as 450,000 ha. According to the Bureau of Forest Development (BFD), the total area of mangrove forests in this country is 232,065, geographically distributed in Luzon (16,769 ha), Visayas (65,119 ha), Mindanao (112,745 ha) and Parawan (37,432 ha) (Technical Staff 1986:170). This represents the deforested mangrove area of 217,935 ha over the past 60 years (or about 3,600 ha per year). However, other evidence reveals that the average annual rate of denudation of the mangroves in the period 1968 to 1983 ranged from 16,000 to 17,000 ha (Camocho and Bagarinao 1986:383). This implies that the forests have been more rapidly destroyed in recent years.

BENEFITS AND USES OF THE MANGROVE FOREST

Mangroves have a wide range of uses. Unfortunately, the mangrove areas have been considered as waste-lands or at best as idle-lands waiting to be adopted for other profitable purposes. This has without doubt led to the continuous destruction of the lands which will be discussed more in the coming section. In this research, the values of mangroves are categorized according to traditional or general use and the ecological use which is in fact critical to human societies but often unrecognized.

TRADITIONAL OR GENERAL BENEFITS OF THE MANGROVE FOREST

Benefits of mangrove forests are enormous. It seems that every single part of the forests as well as their vicinity can be utilized. they have played in four major roles.

Timber

Timber for charcoal, firewood and other wood production such as poles and piles for constructions and woodchips is by far the most common and valuable product of mangroves particularly for the people residing inside or adjacent to the mangrove areas. In Thailand, around 90 per cent of woods from the mangroves are depleted for charcoal making. The income gained from wood and charcoal production in 1984 amounted to 564.9 million bath or $US 22 million (Kongsangchai 1988:5-6).

The villagers who live in Matang mangroves, Malaysia, as another example, rely very much on the forests for their charcoal and firewood. These uses have acceptably become the most important form of mangrove utilization in Matang mangrove areas (Wei-Min 1984:313-315). A hectare of mangrove forest managed for charcoal in Matang may earn the net revenue of about $US 487 (Manan

1983:5).

Another study also shows a great demand for mangrove timber in the coastal rural areas of the Philippines. Particularly in Visayas region, the villagers make use of their mangroves for housing construction, firewood and fishpen poles (Cabahug, Ambi Nisperus and Truzan 1986:452).

Fisheries

Mangroves also play an crucial economic role for the fishery sector. That is, the potential values of the mangrove lands are a support of coastal and marine fisheries as well as a supply of wild fry for stocking ponds. For instance, three traditional fishery uses are reported in Matang mangroves: catching for crabs which is normally undertaken along banks of mangrove rivers and estuaries, cockle collection and fishing (Tuck 1986:315).

In the Philippines, mangrove swamps are rich in fish fry such as Bangos fry, penaeid shrimp or sugpo fry and milkfish fry which contribute a great benefit to the country (Jara 1984:101 and Food and Agricultural Organization and United Nations Environmental Programme 1980:38). There are a number of fry-gathering industries

which provide employment and income for local people.

During high tides, mangroves become the temporary habitat for populations of inshore fish and prawns for the majority of local fish species (Macintosh 1983:187). Hence, the forests constitute part of the catch. Fishing in Visayas is for example the primary livelihood of islanders. Fishes are caught in the mangrove plantation areas basically through traditional methods like fish traps, fishing nets and hook and line mostly for their home and local consumption (Cabahug, Ambi, Nisperus and Truzan 1986:453-454).

Pharmaceutical Values

Some trees and herb species found in mangrove swamps have medical or pharmaceutical values. In Thailand, it is reported that many dwellers in Ranong province use various mangrove species for medicines such as relieving constipation, menstrual fever and kidney stones (P. Sandee cited in Kongsangchai 1988:12). Moreover, abut 20 mangrove species in the country are found valuable medical properties, but scientific proof on their effectiveness and side effects need to be done before being recommended (K. Suphabpibul and J. Kongsangchai quoted in Kongsangchai 1988:12). It is also evident in the

Philippines that a certain number of mangrove plants can provide some medicine for ulcers, diarrhoea, epilepsy and insect bites (Technical Staff 1986:199).

The Nipa Palm

A remarkably versatile palm, named nipa, is found in mangrove communities. Nipa palms have provided many useful products to local people living near or in coastal and estuary mangrove forests. The older leaves are used for thatching material for roof shingles and walls of dwellings, poultry houses and rest houses in recreational areas, whereas the young leaves are mainly adopted for cigarette wrappers. In Malaysia, the manufacture of shingles remains an vital part-time traditional cottage industries; these shingles are mostly sold to charcoal manufactures and poultry farmers for roofing their charcoal and poultry sheds (Tuck 1984:314).

Nipa leaves' sap is also useful. It is processed for sugar, vinegar and alcohol production. A fermented beverage called "tuba" in the Philippines, "nira" and "arak" in Malaysia and Indonesia respectively is one example of nipa sap products (Mercer and Hamilton 1984:18). Nipa is also tapped for food (from nipa fruit) and barked for tannin. Nevertheless, though tannin was used by

Philippine fishermen for dying fishing nets, it is at the present rarely used or almost extinct in Thailand.

In addition, various parts of nipa palms have been useful for some ailments. In Kalimantan, Malaysia, the decayed wood is reported to have medical properties and the ash obtained by burning the roots or leaves is used to relieve both toothache and headache (Mercer and Hamilton 1984:17). Nipa is also used in the manufacture of hats, mats raincoats and fish nets.

ECOLOGICAL BENEFITS OF THE MANGROVE FOREST

Due to their implicit advantages, ecological uses of mangroves are very often abandoned or taken into consideration when converting them to other purposes. These uses are vital not only to aquatic life or ecosystem but also to human societies. Five major roles of mangrove forests are brought up and discussed in this research project.

Nursery Function

The nursery function of mangrove swamps is quite straightforward. This is due to their availability of shelter for juvenile aquatic organisms and an abundant

supply of organic food such as plankton and seagrass (Aksornkeo 1989:21 and Rain Drop Association 1991:14). Hence, numerous fish species and other organisms always have their earlier life in the swamps. With their role as a nursery or breeding ground, it can be said that these mangrove areas have contribution to the maintenance of the productivity of the coastal ecosystem.

Terrestrial Fauna Habitat

Mangrove forests also serve as a principal habitat for a large and diverse terrestrial fauna such as monkeys, otters and wild boars. Malaysia has utilized her mangrove forests as a bird sanctuary, for example, at Kuala Hula, Matang, and a monkey habitat in the Bako Natural Park, Sarawak (Manan 1983:5). PiPi islands in Kabi province occupying 2,232.08 rai or 357.13 ha and the Pangna Gulf natural park with an area of 31,668.92 rai or 5067.02 ha are two Thai examples of natural parks locating in mangrove areas (National Environment Board 1990:8).

Buffer Against Sea

Another ecological benefit of mangroves is that they act as an intertidal protective zone for coastal communities. The forests efficiently temper big tides and

occasional storms. Very importantly, they are a natural stabilizer and buffer against the destructive forces of typhoons (Mercer and Hamilton 1984:17 and Cabahug, Ambi, Nisperus and Truzon 1986:455). Hence, it can be safely stated that mangroves is the cheapest buffer since their dense stands form a self-regenerating coast and riverbank protection.

Land Erosion Control

The mangrove region also serves as a natural mean of controlling coastal erosion in that it offers protection against wind and wave erosion of coastal soil (Aksornkeao 1989:28). Coral and seagrass are two components of the region which have an important role in this function. The former acts to break the strength of big tides whereas the latter prevents the washing away of the sand. Moreover, the forests can help to protect the coastal marine ecosystem from destruction of silt and sediments caused by land-based activities.

Land Builder

Mangroves role in land builder is also evident. This function is their greatest value relative to protecting the degradation of the adjacent terrestrial

zone. In areas where reefs and mangroves coexist, carbonate sediments are often trapped. The interwoven root system of mangroves then form an effective barrier for the retention of sediments. As more sediments are laid down. The extending of the land is possible. A study in Nakornsrithamarat and Petchaburi provinces of Thailand showed that some new 62,906.25 rai or 10,065 ha had been created in this way in 1985 (National Environment Board 1990:7).

PRESSURES ON THE MANGROVES AND THEIR CAUSES

Mangroves are unique and fragile ecosystems. This environmental resource was sustainably exploited for centuries until the present century when many countries began to view mangroves as waste-lands best clear-felled or exploited for other uses. Such a view has placed a lot of pressures on the resource resulting in pollution, denudation or misuse. The causes involving the exploitation are manifold.

AGRICULTURE

With a continuing decrease in the availability of cultivated lands, agricultural development practices

have encouraged reclamation of marginal lands like mangroves. In particular, conversion of mangrove areas to rice farming is a common practice in Southeast Asia (Macintosh 1983:188). However, rice yields generally are much lower than from those of inland rice fields and mangrove paddy is more likely to be abandoned after a few seasons because of declining production through increasing soil acidity. In Thailand, agriculture is not yet a serious stressor (Kongsangchai 1988:7), and conversion of mangroves for agricultural purpose has so far only taken place as isolated cases in the Philippines in the provinces of Bohal, Palawan, Mindoro and Pangasinan (Technical Staff 1986:201). With the trend in population growth and transformation of agricultural lands to residential and industrial sites in this country, however, mangrove areas may soon be tapped for rice production. The International Rice Research Institute (IRRI) is also developing rice strains suitable for saline soils.

Apart from the invasion of mangrove lands to increase agricultural production, this stressor has involved increasing chlorinated hydrocarbons from pesticides and herbicides. In Indonesia, the amount of these chemicals has increased since 1968 when the country launched the agricultural intensification and extensification programmes (Soegiarto 1983:94). It is

evident that a certain percentage of the pesticides used in these programmes will leak out to the coastal and estuary environments.

In the Philippines, pesticides are becoming ubiquitous. Chlorinated hydrocarbon and organophlosphate types of pesticides from agricultural practices may adversely affect the mangrove ecosystem and mangroves themselves. According to the National Pollution Control Commission's research, 76 per cent of the total 75 water samples from major rivers throughout the country contains pesticides that are excessive over the standard (Camacho and Bagarinao 1986:71).

AQUACULTURE

Aquaculture is another vital factor in determining the quality of the mangrove environment. It can be said that many countries in Southeast Asia are under severe pressure to convert mangroves to aquaculture. The major type of conversion is fish/shrimp/prawn farming. This activity obviously brings about the deforestation of mangroves. From 1952 to 1982, the total area of brackish water fishponds increased from 88,681 to 195,831 ha in the Philippines (Bureau of Fisheries and Aquatic Resources (BFAR) cited in Technical Staff 1986:201). This means that

the average yearly fishpond development rate during these period of time was 3,700 ha. This extent of conversion into fishponds accounted for 23.5 per cent of the loss of her mangrove forests (Chamacho and Bagarinao 1986:383). Moreover, under the Integrated Fisheries Development Plan, it was projected that a total of 20,000 ha was developed within the period 1981 to 1990 (Technical Staff 1986:200).

The current demand and high prices paid for shrimp in the Japanese and American markets are encouraging the expansion of shrimp ponds in Indonesia. Also, the rapid expansion of this activity is being supported by loans from the Asian Development Bank and World Bank (Burbridge 1988:172). A combination of such a high demand for shrimp and the provision of loans has created a major pressure on Indonesia's mangroves.

The threat of the expansion of aquaculture is also encountered in Malaysia and Thailand. About 20 to 25 per cent of the total mangrove areas in Peninsular Malaysia has been transformed for the husbandry of brackish water finfish and shellfish farming(Abraham 1984:165). Prawn farming in Thailand has increased greatly; for example, the area of shrimp and prawn ponds went up from 12,092 ha in 1974 to 36,933 ha in 1983 and to 44,255 ha in 1985 (Kongsangchai 1988:3).

In addition to removing a huge area of mangroves, aquaculture involves polluting within the mangroves themselves and their proximity due to aquacultural practices. For example, shrimp ponds require fresh seawater replacement in order to keep the water hygienic for shrimps. Hence, seawater is pumped in and waste water is drained away, causing pollution in adjacent areas.

MINING

The physical destruction of mangroves is also associated with mining. The waste disposals from mining processing are discharged into adjacent river system or dumped directly into estuaries or the oceans. This has been most evident in Peninsular Malaysia and Southern Thailand. In the Philippines, however, only a few mangrove area affected by mining activities are reported. These are in Nonoe Island , Surigao del Norte where nickel is being mined and Sunirara Islands in Mindaro which is being mined for coal (Technical Staff 1986:201).

HUMAN SETTLEMENT AND URBAN AND INDUSTRIAL ACTIVITIES

Human settlement and urban and industrial activities have a close link with denuding mangroves by

exposing them to pollution through releasing heavy metals, suspended solids, chemicals, organic materials and sewage. The example of Thailand shows in Chacheongsoa and Chanburi Provinces, that the mangrove forests have gradually diminished due to land reclamation for urban settlement and industrial sites (S. Sopholpinich quoted in Kongsangchai 1988:6).

In Indonesia, it is reported that mangroves adjacent to centres of human settlement are being destroyed at an alarming rate. The people in those areas usually cause pollution by domestic and industrial wastes or destruction of the mangroves by taking out tons of sand and removing hundreds of coral heads for road and building construction (Soegiarto 1983:99). The status of the Malaysian mangrove lands being threatened by domestic and industrial effluents is also reported (Abraham 1984:165).

TIMBER AND OTHER WOOD PRODUCTIONS

Another source of destruction and exploitive practices has been the excessive cutting of mangrove timber for charcoal, fuelwood, woodchip and other wood products. Destruction for these purposes is recorded in the Philippines, Malaysia, Indonesia and Thailand. Particularly in Indonesia, large tracts of mangroves are being

systematically cut down primarily for woodchip production for pulp and rayon manufacturing in Japan. Indonesia's logging operation is claiming 200,000 ha of her mangrove forests each year (Mercer and Hamilton 1984:116).

OTHER STRESSORS

Other stressors of mangroves include oil pollution, tourism, harbours and ports construction, saltpan and other forms of misuse of the forests such as rubbish dumping. As mentioned in the previous chapter, petroleum discharge during tank-cleaning and from transfer operations at wells, terminals, storage tanks and refineries is attributable to the degradation of the marine environment, the Strait of Malacca being the best local example. In particular, leases for exploration or production of oil and gas covering a large area of the Strait have affected the status of the mangroves in that area. However, in the Philippines, there has been no report of serious oil pollution except for a few minor accidental oil leaks from transport ships (FAO and UNEP 1980:72). Apart from that, it is evident that some areas of the planted mangroves in Manila Bay have been replaced by saltpan and ports and harbours (Cabahug, Ambi, Nisperus and Truzan 1980:442).

IMPACTS OF THE MANGROVE DESTRUCTION

Not only are the benefits derived from mangroves often not recognized but only a few people have realized the far-reaching adverse implications that could stem from the irrational exploitation of this highly productive, but extremely fragile and vulnerable resource. This possibly is the major reason for the shortage of studies on the negative impacts of the destruction especially in terms of ecological damage. Some indication of this damage is given below.

MINING AND CONSTRUCTION

Mining and construction usually involve dredging and excavating in mangrove swamps. Such activities increase discharges of acid water into creeks and estuaries, the disruption of freshwater flows into the swamps, causing mixing freshwater and seawater, and diversion of waterways. Further, the activities are associated with the generation of suspended sediments and turbidity inside the mangroves and the nearby areas. IUCN's report on global states of mangrove ecosystems also concludes that the dominant effect of mining processing is the deposition of sediment, and excessive sedimentation is dangerous to mangroves through its blocking role in the

exchange water, nutrient and gases with the substrate and between the substrate and overlying water (Kongsangchai 1988:4). The most widespread and visible consequences of all of these alterations are the permanent loss of some areas of the forests (National Environment Board 1990:20), injury and death of aquatic organisms in the mangrove region (Asian Development Bank 1991:10), and reduction of commercially valuable fish species through destroying their breeding and nursery function (Burbridge 1988:172).

DENUDATION AND EXPOSURE OF SEDIMENTS

Excessive denudation or harvesting of mangroves leads to the exposure of sediments which rapidly oxidize and acidify. The denudation also permits terrestrial runoff and tidal incursion to accelerate surface erosion and leach plant nutrient. Apart from these two effects, clear-cutting can lower the level of the mangrove land surface, causing overlimited amount of freshwater in the areas (Jara 1984:105) and flush off sediment to nearby areas, resulting in turbidity and muddy water both of which ultimately disturb nursery and breeding grounds.

ACID SEDIMENTATION

Acid sedimentation as a result of

fish/shrimp/prawn ponds also creates unsuitable conditions for the growth of aquatic organism since the building of the ponds will render the soil intolerably acidic (Manan 1983:6 and Asian Development Bank 1991:6). Most fishponds cause the formation of sulfuric acid which is brought about by the abundant supply of sulfate and organic matter. This conversion makes the soil unsuitable for fish rearing, thus retarding the growth of fish and killing a certain number of fish particularly during heavy rains (Camacho and Bagarinao 1983:388 and Manan 1983:6).

HEALTH PROBLEMS

With the mangrove forests such a direct and indirect significant source of food for humans, wastes and sewage from domestic and industrial activities poses a potential public health problem, especially through the exposure of aquatic organisms to pollutants. The potential can be higher if the flesh is eaten raw, one example being that of the Anandara bivalve collected just off the Jakarta coast (Soegiarto 1983:97).

Investigations in Thailand have shown a different level of heavy metals in edible fishes from two selected

mangrove areas, Klong-Darn, Sumut Prakarn Province and Klong-Wan, Prachuab Khirikhan Province. The former site represents the area of possible recipient of industrial effluents from factories along the Bang Pakong River whereas Klon-Wan is free from any polluted environment (Kongsangchai 1988:6).

NATURAL BUFFER

The last effect addressed in this research project is often ignored in the decision to exploit the mangrove resource. As previously indicated, any form of disturbance placed on mangroves limits their ability to act as a buffer and offer protection against damages caused by natural marine disasters such as typhoons (National Environment Board 1990:15-16 and Cabahug, Ambi, Nisperus and Truzan 1986:442).

This chapter has discussed the importance of the mangrove resource. Unfortunately, the resource has become endangered. In the following chapter, we will then examine how these countries have responded to the resource degradation particularly on the sustainable development basis.

CHAPTER 5: MANGROVE FOREST IN SUSTAINABLE DEVELOPMENT

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MANGROVE FOREST IN SUSTAINABLE DEVELOPMENT

We have learned that mangroves are of vital importance to human livelihood as well as to the ecosystem but sadly these benefits are often overlooked. Hence, the resource has been without proper care and the mangrove areas have been exploited, degraded and transferred to other "development" uses such as agriculture, industry, human settlement, and aquaculture. The depletion figure given in the last chapter shows a rapid decline in mangrove productivity throughout the Southeast Asia region. To avoid further deterioration in the quality and quantity of the mangrove environment, its uses should be carried out with caution. That is, the resource needs proper management for sustained productivity. An original reason of this project was to consider guidelines contributing to the sustainable development of the resource.

However, because environmental and socio-economic conditions vary greatly within the region, it is difficult to formulate clear and precise guidelines for its sustainability but some recommendations are possible. This chapter is therefore concerned with three main things. Firstly, the presentation of an idea/concept of the sustainable development of mangrove forest. Secondly, the review of some Southeast Asian responses to mangrove depletion is given. Finally, some recommendations are made

concerning the achievement of mangrove sustainable development.

THE CONCEPT OF SUSTAINABLE DEVELOPMENT OF MANGROVE FOREST

As previously mentioned, pressure on environmental resources (some are already extinct and others are endangered) has brought the concept of sustainability as a desirable form of development to the fore. The Brundtland Commission suggested that to achieve sustainable development, the well-being of natural resources needs to be conserved and enhanced.

Mangrove forest is a renewable resource. In this project, we have borrowed the definition of this sort of resource from economists. Presented by Pearce and Turner, the essential feature of the resource is that its stock is not fixed (Pearce and Turner 1990:241). Another short and clear definition indicates that the type of resource is capable of growth and self-replenishment (Goldsmith 1980:90). Although capable of renewability and replenishment, various levels of yield are possible, depending on the intensity of exploitation. This implies that no renewable resource can regenerate to levels above the carrying capacity of the ecosystem within which it exists. Consequently, the overdepletion of the resource can lead to it extinction.

There are a number of concerns about how to utilize renewable resource at a sustainable level. For instance, it is said that sustainable development of the resource involves the integration of two general objectives: (1) maintenance of ecological integrity and environmental importance with respect to vital functions and values and (2) feasible and controllable forms of utilization (Pons and Fiselier 1991:106). Similarly, Baharudin suggests that three factors are of prime importance when discussing the concept of sustained yield management of the resource (Baharudin 1984:115-116):

1. Productivity. This means that the renewable resource is able to continuously yield the required products or services.

2. Replenishment. The resource should be also able to repair itself, either naturally or aided by mankind, i.e. the resource is renewable.

3. The sustenance of the production. This factor determines the continuity of both yield and growth. In other words, the resource is able to sustain its current rates of production and renewability.

In economic terms, sustainable development is said to deal with maintaining the services and quality of the stock of resources over time. The rule to achieve the development is also set up. That is, resource have to be utilized at rate less than or equal to the natural rate at which they can generate (Pearce and Turner 1990:24). Another economic idea of sustainable development involves the condition in which production and consumption patterns do not cause such environmental degradation, then they

remain within the boundaries set by the environment (Pelt, Kuyvenhoven and Nijkamp 1990:141). Another definition comes from Umali, Eusebio, Teroro, Chan, Ibrahim and Ong (1986:497). He states that the sustainable development of mangrove forest embraces two important principles: conservation for the perpetuation of the goods and services provided by mangrove forest, and sustained yield to ensure a stable supply and demand relationship (Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:497).

The various ideas about sustainable development of renewable resources and mangrove forests are stated that the resource should not be exploited beyond carrying capacity. This is a common principle or rule for development. The following section examines the approaches of three Southeast Asian nations to mangrove resource sustainability.

SUSTAINABLE DEVELOPMENT OF THE MANGROVE FOREST IN SOUTHEAST ASIA: THEIR RESPONSE TO THE MANGROVE DEPLETION

The depletion of mangroves is a matter of concern to countries in Southeast Asia, and the concept of sustainable development has been already applied to the management of the resource in some cases. This section examines the sustainable management of mangrove forest in three countries, the Philippines, Malaysia, and Thailand.

THE PHILIPPINES

In the Philippines, awareness of the ecological importance and socio-economic value of mangroves may be said to have had a headstart about two decades ago. Measures such as laws, rules and other legislations were introduced by the government to regulate mangrove exploitation and conserve the remaining forests. Moreover, government projects and programmes in mangrove management and conservation have been promulgated.

The determined effort towards the management of Philippine mangroves started to be evident in 1975 when the Ministry of Natural Resource (MNR), as principal government agency mandated to implement policies relating to the resource, created a Land Classification Composite Team which was tasked to delineate mangrove areas in the country by using socio-economic and ecological parameters (Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:490). The team classified these areas as permanent forests, timber lands agricultural lands, areas suitable for fish-pond development and other purposes. In the same year, the Philippine government also issued Presidential Decree (PD) No. 705, otherwise known as the Forestry Reform Code of the Philippines (Technical Staff 1986/175). Section 3 of the decree provides that strips of mangrove forest protecting shorelines, the shoreline roads and coastal communities from the destructive forces of the sea should be maintained

and not to be alienated. Also, these strips were to be kept free from artificial obstructions to enable floodwater to flow unimpeded to the sea and not flood the areas upstream.

In 1976, the MNR issued Special Order (SO) No. 309. which created the National Mangrove Committee (NATMANCOM) which was assigned to survey the regional inventory of mangrove resources with the assistance of the National Resources Management Centre (NRMC) (Technical Staff 1986:176 and Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:490). The survey report led to another further action towards mangrove management: the Bureau of Forest Development (BFD) issued Administrative Order (AO) No. 2 in 1979 which states that mangrove forests essential for foreshore protection and for support and maintenance for estuarine and marine life are to be preserved, provided that it will not be less than 25 percent of the total mangrove forest areas of any given locality (Technical Staff 1986:175 and Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:491). This was the first attempt of the Philippine government to use strict measures to limit exploitation in certain areas.

Since 1980, NATMANCOM has adopted the new management emphasis on in-depth research on the ecological importance of mangroves to Philippine coastal environment, including the application of scientific methods in the

rehabilitation of denuded mangrove areas. In addition, the committee was empowered to formulate and establish a comprehensive and integrated natural mangrove programmes, to select mangrove areas to be preserved and conserved, and to recommend measures for the proper allocation and disposition of the mangrove resource. To respond to these tasks, President Proclamation (PP) No. 2151 (which declares the total forest of 4,326.50 ha in specific areas and certain islands as wilderness untouched areas) was generated in 1981 (Technical Staff 1986:176). Moreover, the committee formulated guidelines for identifying areas to be preserved and conserved (Technical Staff 1986:206). These area are:

1. Mangrove Areas Adjoining the Mouth of Major River Systems: this zone is aimed at maintaining the ecological balance of estuaries areas. The areas should be closed from fishpond development and cover at least a 3-km stretch of mangroves on both sides of the mouth of the river fronting the sea.

2. Mangrove Areas Near or Adjacent to Traditional Productive fry and Fishing Ground: the areas should be preserved due to the importance of mangroves as breeding, spawning and nursery grounds for a variety of fishes and shellfishes.

3. Mangrove Areas Near Populated Areas/Urban Centres: these areas should be conserved for utilization by people dependent on mangrove forest products for their livelihood or domestic needs.

4. Mangrove Areas of Significant Hazard if Developed Because of Storms, Erosion and Floods: the areas should be left untouched.

5. Mangrove Forests With Dense Young Growth: These young mangroves are important in maintaining ecological balance in the mangrove ecosystem and needed for river bank and shore protection, wildlife sanctuaries and for education and research purposes.

6. Mangrove forests on Small Islands: The zone is conserved as a major ecological component of the island ecosystem.

Examples of legislative measures and other controls concerning the conservation and protection the well-being of the Philippine mangroves are:

Government legislation holds owners of fishponds responsible for planting trees extending up to 20 metres from the edge of riverbanks and creeks. Another example requires that a buffer strip of at least 40m-wide along rivers, lakes and other inland bodies of water and a belt of not less then 100m in areas facing bays inland bodies of water or the sea are retained and excluded from fishpond development. Further, 20 or more seed trees per hectare with a diameter of 20 cm or more should be left undamaged in well scattered pattern and strategic locations after clear-cutting (Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986: 206).

Other than the management of the existing mangrove forests, the government also took action towards the reforestation or afforestation of denuded areas. The largest mangrove afforestation initiated by the BFD is the Sulu Mangrove Afforestation Project covering an area of 4,636.4 ha in 1981 (Technical Staff 1986:207). In addition, amelioration of denuded mangroves in selected areas of the country is being undertaken by the Forest

Research Institution through various projects with its supervision. Philippine reforestation/afforestation is also run through the local people. The Central Visayas Region,in particular, has replanted areas in Cebu, Bohol and Negros Occidental.

MALAYSIA

In the case of Malaysia, evidence shows that much of her mangrove forests has been badly neglected and under-managed. Also, research has been discontinuous and given low priority (Manan 1983:3). To date, only in the Matang mangrove has been extensively carried out, but it is considered the best management in the world (Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:499).

The Matang mangrove is located in the North Western coast of Peninsular Malaysia along the Straits of Malacca. The forest is composed of 17 forest reserves consisting of 108 compartments. The total area is estimated to be 40,711 ha about 85 per cent of which is considered to be productive forest.

A working plan for the Matang mangrove was initiated or has been managed by the Forest Department of Perak since its reservation in 1902 (Manan and Khan 1984:142). The objectives of the plan are:

-to produce a sustained yield of quality greenwood for charcoal processing to meet local demand as well as for export.

-to produce quality poles for local consumption and export.

-to conserve and protect the coastal zones from erosion by the strong waves and wind.

-to produce cheap firewood, fishing stakes and structural materials for the local communities.

-to provide and preserve the breeding ground or source of nutrition and protection for high-protein sea food.

-to preserve sufficient forest for research and training in mangrove forestry.

In the Matang management, various silvicultural procedures were actually tried in the past. However, the present system is that the productive forest has been categorised according to three periodic blocks each of which consists of about 115,83 ha having crops in the 21-30, 11-20, and 1-10 years of age respectively designated as Period 1, Period 2 and Period 3. Each coupe will be about 30 years old at the harvesting time. Apart from that, during the first felling, 7 trees per hectare are retained as standards or seed trees. A 3m-wide strip of trees along river banks or along the coast is maintained to prevent erosion and to assist in natural regeneration (Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:499).

Other than the Matang mangrove, the minimum girth method is adopted in the mangrove management in the regions of Sabah and Sarawak. Nevertheless, measures in both regions are different. In Sarawak the rotation is 20 years

with a minimum girth limit of 23 cm while in Sabah the minimum girth limit is 20 cm for charcoal coupes and 10 cm for firewood and fishing stakes coupes and the rotation period is 20 to 25 years (P.K. Chai and K.K. Lai quoted in Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:500). Further, in even-aged and even-sized mangroves in Sabah, 48 trees per hectare and a 10m-wide buffer strip along waterways are retained (T.C. Liew quoted in Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:500).

Although the Matang mangrove is under a well plan, illegal utilization is unavoidably confronting the management. The resource is often stolen by fishermen for fishing stakes, and the problem remains persistent.

So far, there has been a minimal attempt to preserve and conserve the forest in Malaysia. However, there are at present several on-going research projects undertaken by several institutions including the Forest Research Institution, the University Pertanian Malaysia and the Universiti Sains Malaysia. These projects cover a wide range of topics including growth studies and silvicultural techniques and the results are expected to be useful in further management of the resource.

THAILAND

Based on available information, the management

of mangrove forest on a sustained yield basis in Thailand has been undertaken since prior to 1961. Before 1961, the management system was that an entire area was divided into 10 coupes of approximately equal area. Each year a coupe was harvested. Trees of 10 cm-diameter and above were cut but licensees were required to leave 30-40 trees per rai or 0.16 ha.

From 1961-1965, the system was modified slightly to increase the period of rotation to 15 years. Recently, the system has been changed to clear felling in alternate strips while the rotation period is increased to 30 years and the felling cycle to 15 years. Each coupe is grouped into 40 m-wide strips. These strips are aligned at 45 degree to the river to enable dispersal and establishment of water-borne seedlings. Alternate strips are cut every 15 years. The uncut strips are supposed to regenerate the clear-felled areas (Umali, Eusebio, Teroro, Chan, Ibrahim and Ong 1986:498-499).

Despite adopting the system, it has been found that a number of mangrove forest areas continue to decline. However, the Thai government is aware of the decrease and has called for the recognition of the important of more management and conservation. On 15 December, 1987, the cabinet took another step forward on mangrove management by declaring 3 different-purposed zones of the resource (Kongsangchai 1988:9-10 and Kongsangchai 1989:15-18). The

zones are:

Preservation Zone

Mangrove areas falling into this category are which:

-have a property of nursery and breeding ground for economic-valued marine life.

-serve as natural parks, recreation and tourist places and wildlife sanctuaries/conserves/parks.

-are located not less than 20 metres from the river banks or at least 75 metres from shorelines.

-have historical and archaeological significance.

-serve for scientific studies and researches.

This area, occupying approximately the total area of 266,737 rai or 42,677.92 ha, is declared to be strictly untouchable for the purpose of environmental and ecological maintenance.

Conservation Zone

The zone covers an area of all managed mangrove forests and plantations which have a total estimated area of 1,248,056 rai or 199,688.96 ha. The area has no purpose other than forest production on a sustained yield basis.

Development Zone

The area mainly occupies the denuded and unproductive mangroves which are estimated to be about 813,006 rai or 130,080.96 ha. Development activity such as agriculture, industry, human settlement, commercial centre, port and other uses is acceptable in this zone, but three regulations have been introduced to keep these activities harmless to the environment as much as possible. The regulations are:

-any activity has to be strictly implemented according to the standard methods of forest conservation.

-when approving any development activity, the environmental and ecological loss as well as benefits need to be taken into account.

-to apply to utilize this zone of mangrove forest, developers or project managers are required to follow the procedures indicated in related laws.

To fulfil these purposes, 34 management units have been assigned to supervise the management. Each management unit is responsible to control concessionaries, area protection, and improvement including research.

Apart from the zoning plan, a reforestation plan is also being undertaken in abandoned mangrove forests in Thailand. In 1988, the total area of approximately 49,970 rai, or 7,995.2 ha, was planted by the Royal Forest Department. This Asian Development Bank Project started in 1988. The total replanted area of 21,200 ha is expected (Kongsangchai 1988:10).

However, in some respects, the prospects for effective sustainable management of mangrove forest in Thailand looks bleak. Of particular concern in the last 5 years has been the prawn farming boom. A large number of mangrove forest areas has been used for prawn farming as well as other uses. Sadly, some areas declared for the purpose of preservation and conservation have been invaded and utilized illegally. For instance, evidence from the Daily News newspaper (unavailable date) reveals that not less than 85,106.25 rai or 13,617 ha, or about 34 per cent of the total area (249,331.25 rai or 39,893 ha) in Trang Province has already disappeared. Part of the lost area was recorded in the preserved areas. One reason for this mismanagement was due to the unclear property rights.

Matichon Newspaper (30 August 1990 P. 24), released other evidence of illegal invasion in preserved areas located at an adjoining point between Khanom, Thongnien and Khuanthong districts of Nakhonsrithammarat Province. Private investors in cooperation with some of government officials were responsible for this wrong-doing. About 11,275 rai, or 1,804 ha, of the preserved areas was transferred to housing areas, and commercial centres. Moreover, a huge pile of mangrove wood, logged from the approximate area of 60 rai, or 9.6 ha, was found in the area. The wood was ready to be burnt for charcoal.

RECOMMENDATIONS ON THE MANGROVE SUSTAINABLE DEVELOPMENT

Mangrove management on the basis of sustainable development has been already adopted in Southeast Asia, though to different degrees. Nevertheless, these countries have started to develop their own methods, subject to their ecological and socio-economic differences. These differences make impossible to formulate a single universal or precise guideline on mangrove sustainable development. The five recommendations which follow are based on the information reported in the previous section.

EDUCATION ON THE VALUES OF MANGROVE FOREST

It is apparent that any form of mangrove management must look for cooperation from people at all level, i.e. local people, the private sector and government bodies. Hence, a basic requirement for the management is their better understanding of the value of the resource. This research indicates that overexploitation of mangrove forest is partly due to a lack of the knowledge. Therefore, it is recommended that the awareness of the significance of mangroves should be publically promoted for the whole society.

LAWS, REGULATIONS AND OTHER MEASURES AND ROLE OF GOVERNMENT AGENCIES

As it is reported in Thailand and Malaysia, a

common threat to the sustainable management of mangroves is illegal utilization, particularly invasion into preserved mangrove forests. Sadly, some government officials have been involved in this abuse. This shows loopholes in the existing laws or other measures, and the under-function or misfunction of government bodies. Therefore, to mitigate the problem, governments may have to revise those measures as well as the laws concerning land ownership and then issue more strict and workable ones.

For the government agencies, they need to perform their tasks honestly and seriously. National government may have to provide adequate well-trained officials.

RESEARCH AND STUDIES ON MANGROVES, AND PLANS AND PROJECTS ON SUSTAINABLE DEVELOPMENT

The definition of wise management primarily depends upon ecological and local socio-economic conditions. Hence, in each country, more research and studies, both for scientific understanding and for the sustainable management of the resource, are recommended so that sounder management decisions can be made. More plan and projects on mangrove management should be set up and implemented.

DEVELOPMENT PROJECT MANAGEMENT

Before approving any development project in mangrove forest, it is important to consider environmental impacts of the proposed activities at the initial stage of project planning, i.e. project appraisal. Though the assessment of impacts is difficult, there has been so far a number of methods or techniques mostly developed by economists such as Bidding Games, Trade-off games and so on (Hufschmidt, James, Meister, Bower and Dixon 1983:232-254). These techniques should be brought into practice and at the implementing stage, a systematic monitoring programme should be established.

POPULATION GROWTH

A crucial factor which directly affects the achievement of the sustainable management of mangrove forest
is population growth. More people means more need from the resource. Therefore, governments should put much attention to the problem of population growth when dealing with the sustainable development

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CHAPTER 6: CONCLUSION

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CONCLUSION

The world environment is in danger. Some environmental resources have already been extinguished, and many remaining ones are threatened. Resource are inescapably running out and in many areas the environment is being degraded. This has resulted in the philosophy of sustainable development and the hope that further depletion of natural resources will be prevented. Desirable development must be pursued by both developed and developing countries, but much attention is given to the developing world where socio-economic development is substantially dependent upon natural resources. Moreover, problems of rapid population growth and poverty have intensified resource depletion.

It has been shown that developing nations in Southeast Asia are aware of their environmental problem. These countries have introduced environmental policies and management practices on the sustainable development basis, and a number of plans/programmes/strategies for protection and conservation the environment have been included in their National Development Plans. Further, government institutions and agencies have been established to look after natural resources. At the management level, national governments have issued laws, regulations and other

measures to prevent or at least control the misuse and overexploitation of their resources. An useful technique like environmental impact assessment (EIA) has also been adopted in this region, though to a small extent. The technique can provide information on the environmental impacts of a given development project so that the better decision making should follow before the project is implemented.

Mangrove forests are important to Southeast Asia countries. Benefits gained from this resource are enormous particularly in ecological matters such as a nursery and breeding ground of many commercial fishes, a buffer against sea, land erosion protection and so on. Sadly, these uses are not yet generally recognised. Hence, a large area of mangroves has been degraded for a number of years which has let to its rapid decline.

The briefly review of the Philippines, Malaysia and Thailand shows that governments in these countries are aware of mangrove depletion and have developed their own approaches and methods towards its protection and conservation with legislative measures and controls of mangrove utilization, declaration of multi-purposed mangrove zones, establishment of government agencies' tasks on mangrove protection and conservation, and mangrove replantation plans and projects.

The sustainable development of mangrove forests in Southeast Asia, however, is under pressure, particularly from illegal activities such as mangrove wood stealing and invasion. Unexpectedly and sadly, government officials have been involved in these activities in Thailand. Sustainability will require better laws and strict law enforcement. Government agencies and officials must be required to properly perform their responsibilities, and more manpower is also needed for the task.

In addition, measures are needed to increase public awareness of mangrove significance; more research and studies, both in terms of scientific knowledge and sustainable development of mangrove forest are needed. The issue of population growth must also be taken into account since this factor directly affects the sustained yield of mangroves, especially in local mangrove communities where livelihood relies on the exploitation of the resource.

It is hoped that this research project will be useful to those interested in mangrove management, and lead to further research on the sustainable development of mangroves.

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