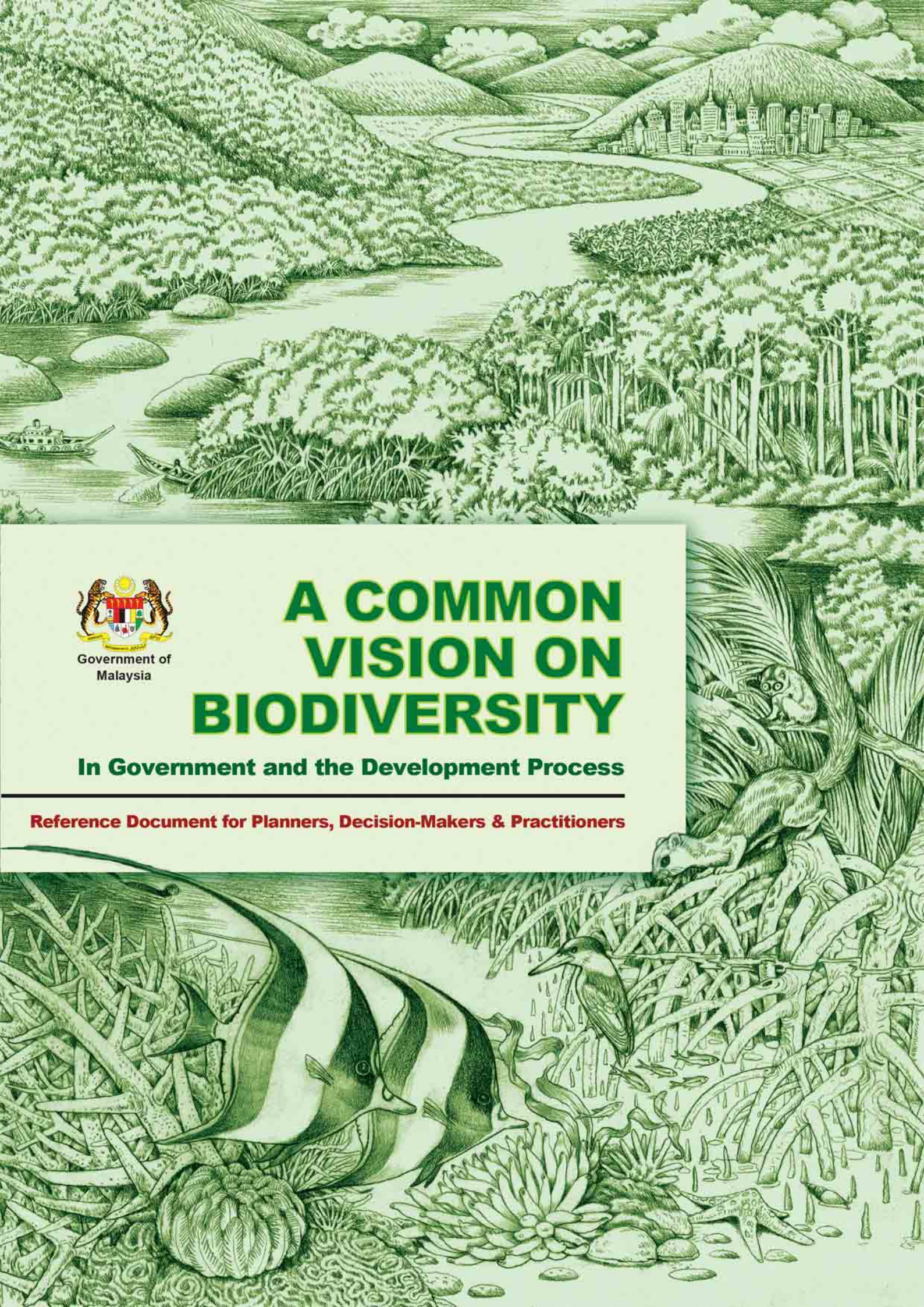

Government of Malaysia

A COMMON VISION ON BIODIVERSITY

In Government and the Development Process

Reference Document for Planners, Decision-Makers & Practitioners

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ABSTRACT

This document outlines a *Common Vision on Biodiversity* of the Ministry of Natural Resources & Environment (NRE). Targeted for planners, decision-makers and practitioners at all levels of federal, state and local government, it explains what biodiversity is, why it is important, how to maintain it and what measures are required to ensure a constant provision of ecosystem services that are essential for human well-being.

Based on the different undertakings of NRE, its line agencies and the latest guidelines and experiences with respect to biodiversity planning and management, this *Common Vision* promotes a three-pronged implementation approach and outreach strategy that consists in:

i) Strengthening the Protected Areas System

ii) Land/Seascape management for biodiversity

iii) Mainstreaming biodiversity.

To a very large extent, the Common Vision on Biodiversity responds to provisions and priorities contained in existing policies, plans and programmes, but it focuses on their implementation and the operational aspects of the pursuit of sustainable development. This Common Vision is also important because it helps to rally support within government and civil society for a shared perception of issues, priorities and the required inter-agency actions.

NRE has an overarching mandate concerning the environment, natural resources and biodiversity assets; therefore it can play a clear and unique role as an integrating *body for consultation and facilitation of synthesised data about biodiversity issues and priorities* to support federal, state and local planning levels.

The Common Vision on Biodiversity is a suitable framework for such a mainstreaming process and will support the ongoing transformation of environmental planning and management from a largely sector-based to an integrated approach, as recommended by national policy provisions.

Old male proboscis monkey (*Nasalis larvatus*)
eating a mangrove seedling in its forest habitat[1]

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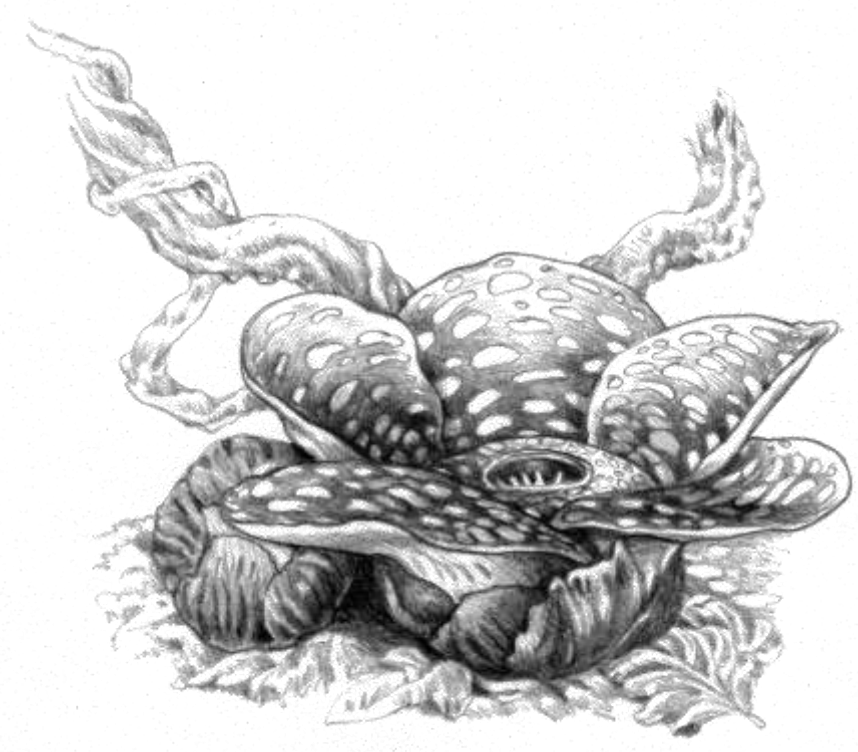
ACRONYMS AND ABBREVIATIONS

BSAP	Biodiversity Strategies and Actions Plans
CBD	Convention on Biological Diversity
CEMD	Conservation & Environmental Management Division (of NRE)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DID	Drainage and Irrigation Department
DOA	Department of Agriculture
DOE	Department of Environment
DOF	Department of Fisheries
DMPM	Department of Marine Parks Malaysia
EIA	Environmental Impact Assessment
ENRES	Environment and Natural Resource Economics Section (of EPU)
EPU	Federal Economic Planning Unit
FD	Forestry Department Peninsular Malaysia
FDD	Forest Development Division (of NRE)
FRIM	Forest Research Institute Malaysia
GAP	Good Agricultural Practices
GEF	Global Environment Facility
GIS	Geographic Information System
I&D	Irrigation & Drainage Division (of NRE)
IT	Information Technology
ICT	Information and Communication Technology
IUCN	World Conservation Union
JKR	Public Works Department
MA	Millennium Ecosystem Assessment
MACRES	Malaysian Centre for Remote Sensing (of MOSTI)
MaCGDI	Malaysian Centre for Geospatial Data Infrastructure
MEA	Multi-Lateral Environmental Agreement
MOSTE	Ministry of Science, Technology & the Environment (now NRE)
NLD	National Landscape Department
NFP	National Forestry Policy (1978/1992)
NPBD	National Policy on Biological Diversity
NPE	National Policy on the Environment
NPP	National Physical Plan (2005)
NRE	Ministry of Natural Resources and Environment
NSSD	National Strategies for Sustainable Development
PA	Protected Area (in plural PAs)
PA-PFR	The combined Protected Areas System and Permanent Forest Reserve

PAMC .....Protected Areas Management Categories
PERHILITAN.....Department of Wildlife & National Parks
PES .....Payment for Environmental Services
PFR .....Permanent Forest Reserve
PPs .....Policies and Plans
PPPs .....Policies, Plans and Programmes
SCBD.....Secretariat to CBD
SEA.....Strategic Environmental Assessment
TCPD .....Town & Country Planning Department, Peninsular Malaysia
TRP .....Town & Regional Planning Sabah
UNEP.....United Nations Environment Programme
UPEN.....State Economic Planning Unit



Rafflesia [2]

EXECUTIVE SUMMARY

Biological diversity, or 'biodiversity', encompasses genes, species, ecosystems and their interactions. It includes all plants, animals, and micro-organisms, the ecosystems to which they belong, as well as the diversity within species, between species, and of ecosystems.

Biodiversity is determined by the interaction of many factors that vary over space and time, and thus no single component of biodiversity (i.e. genes, species or ecosystems) is consistently a good indicator of the overall biodiversity, since these components can vary independently.

Biodiversity is essential for the functioning of ecosystems and supports the provision of 'ecosystem services' that affect human well-being. Ecosystem services are the benefits that people obtain from ecosystems and which ultimately affect human well-being (e.g. potable water, timber, erosion and flood control, reduced impacts of tsunamis).

For planners and decision-makers it is critical to understand that various aspects of biodiversity underpin the goods and services provided by ecosystems. Thus, it is the biodiversity itself, with its numbers; relative abundances; compositions; and interactions which provides stability and ensures that the ecosystem delivers its services at the local, state, national and regional levels. Moreover, biodiversity is important in managed as well as natural ecosystems. The decisions people make concerning biodiversity affect not only their own well-being but also that of others.

Of the twenty-four ecosystem services assessed by the Millennium Ecosystem Assessment for the last 50 years, fifteen were found to be in a state of decline (i.e. 63%), five remained steady, and only four were improving.

Human actions are fundamentally – and to a significant extent irreversibly – changing the diversity of life on Earth and most of these changes represent a loss of biodiversity. Virtually all ecosystems on the planet have been dramatically transformed by our actions – particularly within the last half a century.

The population size or range (or both) of the majority of species is declining across a range of taxonomic groups. Freshwater and marine ecosystems are relatively less studied, and overall biodiversity is poorly understood. In the case of the best studied species, biodiversity loss has been caused due to local extinction and constricted distribution. The projected extinction rates for the future are more than ten times higher than the current rate and more than 10,000 times higher than the fossil record.

On a global scale, biodiversity is eroding despite the fact that Protected Areas have increased significantly during the last 25 years. We now realise that Protected Areas cannot be managed in isolation but should be planned and managed as an integral part of a resilient surrounding land / seascape.

Considering this, the success in biodiversity conservation depends on how far the planners and decision-makers shaping the present and future landscapes can reach a shared perception of issues and priorities, and how well they can promote complementary inter-agency actions destined to favour long-term sustainable development. This document identifies the key stakeholders whose active engagement is essential in order to achieve concerted actions to promote the national policy goals of holistic, integrated, and environmentally sustainable management.

Despite the difficulties, limitations, and issues surrounding ecosystem service valuation, there

seems to be a general consensus that the value of ecosystem services often outweighs economic use and that protecting ecosystem services is, or should be, one of the most important responsibilities of today's politicians, resource managers, and society in general.

For instance, a brief review of eight Malaysian Policies and Plans of immediate relevance for the Ministry of Natural Resources & Environment (NRE) reveals many important provisions for natural resource and biodiversity assets, including (see details in Annex 1):

- Development should be environmentally sustainable
- There is a recognition that human well-being is dependent on biodiversity
- Planning and management should be integrated and holistic (as opposed to sector-based)
- Critical habitats should be protected (i.e. in terrestrial, freshwater and marine systems)
- Protected Areas should be expanded to include all habitat/ecosystems
- Planning and management should be based on river basins
- Environmental legislation should be reviewed and updated
- Biodiversity should be mainstreamed and incorporated into Policies, Plans and Programmes

At the international level, Malaysia has signed a number of important conventions established to counter the depletion of biological diversity – including the 'Convention on Biological Diversity'. Each of these conventions also contains significant provisions to guide the process.

Biodiversity transcends jurisdictional and administrative boundaries from federal to state and local levels. Therefore, its successful planning and management requires multiple stakeholders to conduct diverse and complementary interactions. Though each agency conducts important sector activities on natural resource and biodiversity assets, today holistic management is hampered by sector based legislation and administrative setup.

There is a need for a *Common Vision on Biodiversity* to ensure that the actions taken by all sectors actively contributes to integrated planning and conservation actions, in line with Malaysia's goals for environmentally sustainable development.

NRE has an overarching mandate for managing environment, natural resources and biodiversity assets and there is a clear and unique role for NRE as a mainstreaming *consultation and facilitation body for synthesised data on biodiversity issues and priorities* to support federal, regional, state and local planning levels. A Common Vision on Biodiversity is a suitable framework for such a mainstreaming process, which will support the ongoing transformation of environmental planning and management from a largely sector-based to an integrated approach as recommended by national policy provisions.

Overall, Malaysia's Common Vision for Biodiversity is based on the various undertakings of NRE, its line agencies and the latest guidelines and experiences with respect to biodiversity planning and management. It comprises a three-pronged implementation approach that consists in:

i) Strengthening the Protected Areas System

Protected Areas are fundamental to the long-term survival of biodiversity. By way of inter-agency coordination mainly, Malaysia could significantly increase the extent of its Protected Areas, by incorporating and coordinating sites already set aside for long-term conservation by various entities from Federal to State and Local levels. However, planning and management of the System will also have to comply with recognised principles and procedures (e.g. it should be representative, comprehensive and adequate; the permanence of the site must be secured; its location and extent must be known; Protected Areas Management Categories should apply).

ii) Land/seascape management for biodiversity

Protected Areas are not enough and for biodiversity to survive in the land/seascape there is an increasing need for decision-making and policy actions across multiple geographic scales and multiple ecological dimensions. Successful management of biodiversity requires multiple stakeholders to conduct diverse management interventions in order to (re)build and maintain resilient land / seascapes. The management principles and suitable interventions identified in this document will benefit terrestrial, freshwater and marine biodiversity. These principles are an excellent starting point for embarking on an operational ecosystem approach, in

full compliance with policy and plan provisions for integrated, holistic and environmentally sustainable development.

iii) Mainstreaming biodiversity.

'Mainstreaming biodiversity' means to integrate or incorporate actions related to conservation and sustainable use of biodiversity into Policies, Plans and Programmes. Since biodiversity management is complex it requires *active and effective participation of stakeholders* not only at different levels of government, but also in the large number of sectors potentially impacting the environment.

The three-pronged approach is based on provisions and priorities contained in existing Policies, Plans and Programmes. It represents *a Common Vision on Biodiversity* that will allow NRE and its line agencies to rally support for a shared perception of issues, priorities and the required inter-agency actions both from government and civil society. This support-rallying process also calls for an extensive communication and outreach programme.

In Malaysia, there is wide consensus amongst Policies, Plans and Programmes that development should be environmentally sustainable (Annex 1). Strategic Environmental Assessment (SEA) is a mainstreaming tool that helps ensure that this goal is achieved. That is why the 9th Malaysian Plan elevates it for increased application.

SEA is *a systematic process to analyse the environmental effects of policies, plans and programmes, and their alternatives*. This process should be conducted at the highest possible level in planning or decision-making before decisions are made, when major alternatives are still open. This will allow focusing on the "source" of environmental impacts rather than addressing the symptoms later on.

This paper outlines how biodiversity may be addressed in SEA and what other options exist in situations where it is not possible to use the SEA process. These additional options may be a significant complement to the overall mainstreaming efforts as well and include:

- Analysis of the effects of combined policies on biodiversity
- Incorporating biodiversity into national development and/or poverty reduction strategies
- Mainstreaming biodiversity into production sectors
- Using other tools and strategies for mainstreaming (the ecosystem / landscape approach; and financial strategies and tools).

The principles and guidelines referred to here, supported by the necessary steps to review and update the environmental legislative framework, will ensure that the national sustainable development goals for natural resources and biodiversity are accepted and integrated by planners and decision-makers within government, various production sectors and civil society.

The Common Vision will also facilitate NRE's reporting of (among others):

i) The status of biodiversity (for national and international forums)

ii) The present direction taken with respect to planning and management of natural resources and biodiversity assets.

iii) The extent to which provisions of national policies and plans, as well as international conventions, are adhered to.

White-Handed Gibbon [3]

Dipterocarpus retusus [4]

1 INTRODUCTION

This paper is for planners, decision-makers and practitioners engaged in operational natural resource and biodiversity management. It provides an overview of principles and general management guidelines and aims to contribute to a shared perception of the main issues and priorities transcending institutional boundaries. This framework will hopefully assist in strengthening complementary actions of stakeholders to natural resources and biodiversity assets.

Detailed recipes on how to go about the more technical aspects of implementation fall beyond the scope of this paper, though recommended procedures are referred to where appropriate in the text, Endnotes (p. 107) and under References (p. 49). The latter also includes a summary of key references and their relevance for planning and management of terrestrial, freshwater and marine systems (Table 4, p. 55).

This document provides an overview of biodiversity in terms of what it is, why it is important, how it ties into human well-being, and what is its value. A summary of key policies and plans of direct relevance to the Ministry of Natural Resources and Environment (NRE) is also provided with an emphasis on provisions related to natural resources and biodiversity assets (i.e. Annex 1).

The paper then proceeds to explain a suggested implementation approach which focuses on three key measures of operational conservation actions, fully based on existing policies and plans.

This document should be of interest to persons already engaged in operational planning and management of biodiversity or with an interest in the subject. An *Executive Synthesis* (NRE, 2007) has also been prepared for senior staff, who may also find the present document useful since it provides further details on background and key elements of the Common Vision.

Terms and concepts will be in single quotation marks the first time they appear in the text, to indicate that they are further explained in the Glossary (p. 57).

The term '*Protected Area*'[5] is abbreviated PA and is used here to refer to terrestrial, freshwater and marine areas. When used capitalised in this document it denotes a term in agreement with international standards (explained in the text) to be distinguished from the frequent loose use of terms such as "reserves", "protected forests" and "protected areas". "Landscape and seascape" may be referred to as simply "land/seascape" or – for brevity – as "landscape" which should be taken to include "seascape" when appropriate.

The abbreviation PA-PFR is used to denote the combined Protected Areas System and the Permanent Forest Reserve which enjoys some level of protection through gazetting.

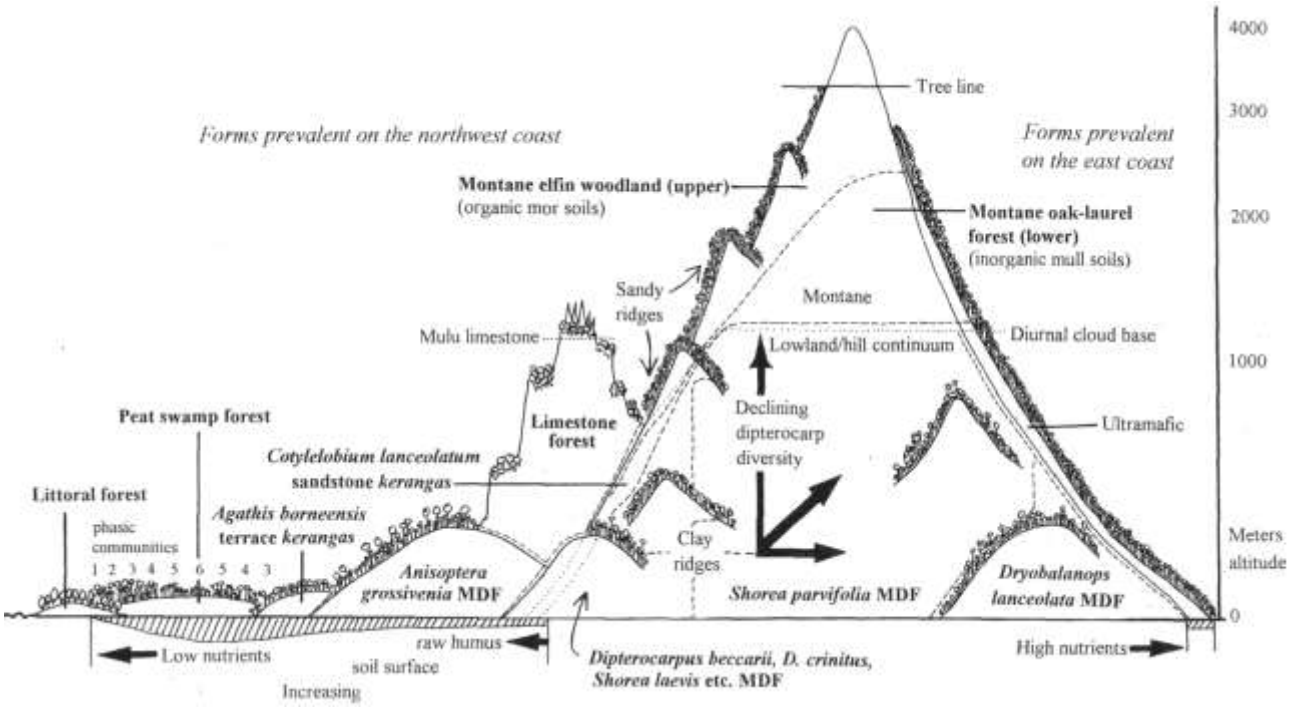


Diagram of the major floristic associations in Bornean forests [6]

2 WHAT IS BIODIVERSITY AND WHY IS IT IMPORTANT?

2.1 What is biodiversity?

Biological diversity, or 'biodiversity', is the variety of life on earth. It includes all plants, animals, micro-organisms, the ecosystems to which they belong, and the diversity within species, between species, and of ecosystems. Biodiversity also refers to the complex relationships among living things, and between living things and their environment.

Biodiversity is therefore the total sum of all life on our planet, and includes all the different species (estimated at more than ten million species), all the genetic variability within these species (estimated at between 10 - 100,000 genes per species) and all the diversity of the ecosystems formed by the different combinations of species.

2.2 Why is it important?

Biodiversity is essential for the functioning of ecosystems and supports the provision of 'ecosystem services'. Ecosystem services are the benefits that people obtain from ecosystems and that ultimately affect human well being. They are classified in four groups (**Figure 1**): provisioning; regulating; cultural; and supporting services.

Human well-being is the result of numerous factors and many of these are directly or indirectly linked to biodiversity and ecosystem services.

In general we only recognise services that have a market value such as provisioning services (e.g. timber) and some cultural services (e.g. ecotourism), but we benefit tremendously from all the other services and – indirectly – from the supporting services. In general terms, for human well-being the intensity in linkages are particularly strong for provisioning and regulating services and this with respect to *security*, *basic*

Biodiversity: Life on Earth

Provisioning Services	Regulating Services	Cultural Services
Products obtained from ecosystems	*Benefits obtained from regulation of ecosystem processes*	*Non-material benefits obtained from ecosystem*
• Food • Fresh water • Timber • Fuelwood • Fibre • Biochemicals • Genetic resources	• Climate regulation • Pest regulation • Runoff regulation • Water purification • Pollination • Erosion regulation • Tsunami regulation	• Spiritual & religious • Recreation & ecotourism • Aesthetic & inspirational • Educational • Cultural heritage • Existence values

Supporting Services

Services necessary for the production of all other ecosystem services

Soil formation | Nutrient cycling | Primary production | Provision of habitat | Oxygen production

Figure 1. Classification of main ecosystem services provided by biodiversity (based on Pereira & Cooper, 2006).

materials and *health* as shown in **Figure 2**. It should be clear that ecosystem services sustain essential components required for human existence – our well-being is intricately linked to the status of biodiversity and its web of life.

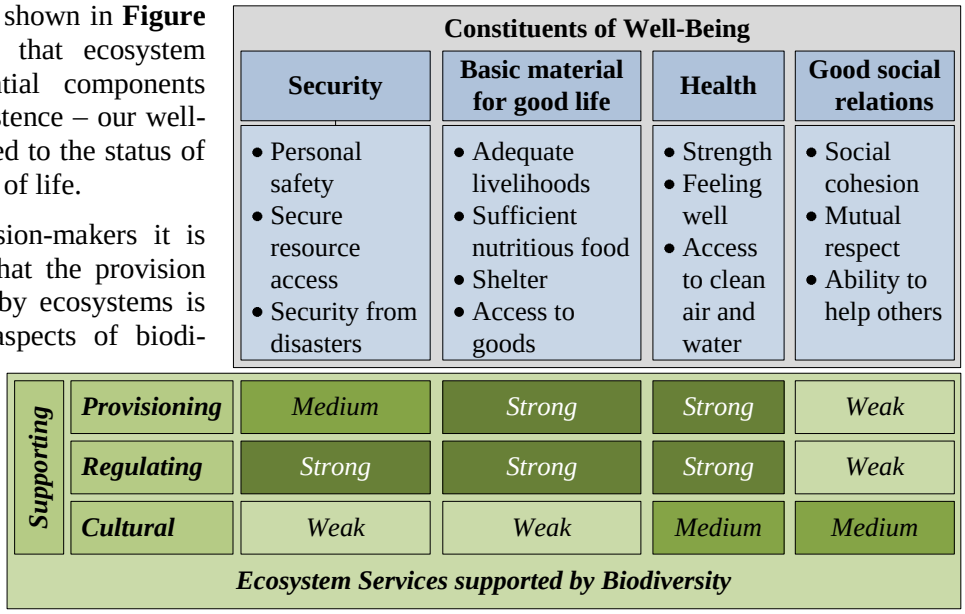


Figure 2. Intensity of linkages between ecosystem services and human well-being (derived from MA, 2005).

For planners and decision-makers it is critical to understand that the provision of goods and services by ecosystems is sustained by various aspects of biodiversity. Though there is no simple relationship between biodiversity and ecosystem services we know that as species adapt to one another and to their communities, they form 'niches' and associations. The development of more complex structures allows a greater number of species to coexist with one another. The increase in species richness and complexity acts to protect the community from environmental stresses and disasters, rendering it more stable and facilitating a continuous flow of ecosystem services.

In other words, it is biodiversity itself, with its numbers; relative abundances; compositions; and interactions, which ensures that the ecosystem delivers its services at local, state, national and regional levels.

To simplify this complexity, biodiversity is often considered in terms of genetics, species and ecosystems which – however – are not separate entities but highly inter-dependent facets of overall biodiversity. A change in one (e.g. species) has implications for the other two, the resilience of the system as a whole, and thus its ability to provide ecosystem services and support human well-being (Foley *et al.*, 2005).

Besides species diversity, genetic diversity within populations is important to allow continued adaptation to changing conditions through evolution, and ultimately, for the continued provision of ecosystem goods and services. Likewise, diversity among and between habitats, and at the landscape level, is also important in multiple ways for allowing adaptive processes to occur.

The key reasons why we should care about biodiversity may be summarised as:

- Biodiversity forms the foundation of the vast array of ecosystem services that critically contribute to human well-being
- High levels of diversity of ecosystems, species and genetics provide higher adaptability to changing conditions caused by, for instance, climate change.
- Decisions people make that influence biodiversity affect the well-being of themselves and others.
- Of the twenty-four ecosystem services assessed by the 'Millennium Ecosystem Assessment' for the last 50 years, fifteen were found to be in a state of decline (i.e. 63%), five remained steady, and only four were improving (MA, 2005).

2.3 Who is responsible for managing biodiversity?

The management of the environment and biological diversity in Malaysia is the joint responsibility of federal, state and local governments.

The Ninth Schedule of the Federal Constitution states that legislative power is shared between the Federal and State Governments, and systematically distributes it into a Federal List, a State List and a Concurrent List. However, neither the *environment* nor *biological diversity* appear in the three constitutional lists as a matter for legislation, they are instead defined within related subjects under all three lists (e.g. agriculture, forestry, land, soil, water, wildlife protection).

State governments control land and natural resources.

The National Policy on Biological Diversity considers the legislative framework insufficient and the National Policy on the Environment states that it should be reviewed and updated. In summary, present legislation is based on sectoral concerns and governed by sector agencies. [7]

This poses special challenges for managing biodiversity in terms of ecosystems, species and genetics, because these transcend sectors and operate at local, state, national and international scales.

2.4 What do policies and plans in Malaysia say about biodiversity?

Policies and Plans of immediate relevance to NRE because of their provisions for natural resources and biodiversity planning and management include:

- Vision 2020
- National Vision Policy
- Outline Perspective Plan 3
- National Policy on Biological Diversity (NPBD)
- National Environment Policy (NEP)
- National Forestry Policy
- 9th Malaysian Plan (9MP)
- National Physical Plan (NPP)

These Policies and Plans have many important provisions for natural resource and biodiversity assets and detail measures concerning: Assessment; Planning & Conservation Actions; Benefit Sharing/Equitable Access; Institution Building; Participation; Communication; Monitoring; and Legislative Framework.

Clearly, all provisions contained in these Policies/Plans are important but in this document reference is only made to the most emphasised aspects relevant for operational conservation actions (for a summary see Annex 1):

- Development should be environmentally sustainable [8]
- There is a recognition that human well-being is dependent on biodiversity [9]
- Planning and management should be integrated and holistic (as opposed to sector-based) [7]

Text Box 1. Policy and plan provisions.

The **Outline Perspective Plan 3** states that: *the National Policy on Biological Diversity will form the basis for integrating and consolidating biodiversity programmes and projects in the country*.

The **National Policy on Biological Diversity** specifically mentions to: *Ensure that all major sectoral planning and development activities incorporate considerations of biological diversity management.*

According to the **9th Malaysian Plan** the plan period will foster closer cooperation between stakeholders in addressing environmental concerns and there will be an increased application of Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA.

The **National Physical Plan** contains certain provisions for natural resources and biodiversity assets in its establishment of Environmentally Sensitive Areas. It also sets out to provide a framework for regional, state and local planning.

- Critical habitats should be protected (i.e. in terrestrial, freshwater and marine systems) [10]
- Protected Areas should be expanded to include all habitat/ecosystems [11]
- Planning and management should be based on river basins [12]
- Mainstreaming of biodiversity should be incorporated into Policies, Plans and Programmes (PPPs). [13]

2.5 What are the issues?

Human actions are fundamentally – and to a significant extent irreversibly – changing the diversity of life on Earth and most of these changes represent a loss of biodiversity. Virtually all ecosystems on the planet have been significantly transformed by our actions – particularly within the last 50 years.

There is growing evidence that critical 'ecosystem processes' are controlled by the diversity of the plant, animal, and microbial species living within a community and that their changes affect human well being and the provision of ecosystem services (as shown in **Figure 3** next page).

The primary cause of erosion of biodiversity has been widespread transformation of once highly diverse natural ecosystems into relatively species-poor managed ecosystems (Foley *et al*., 2005).

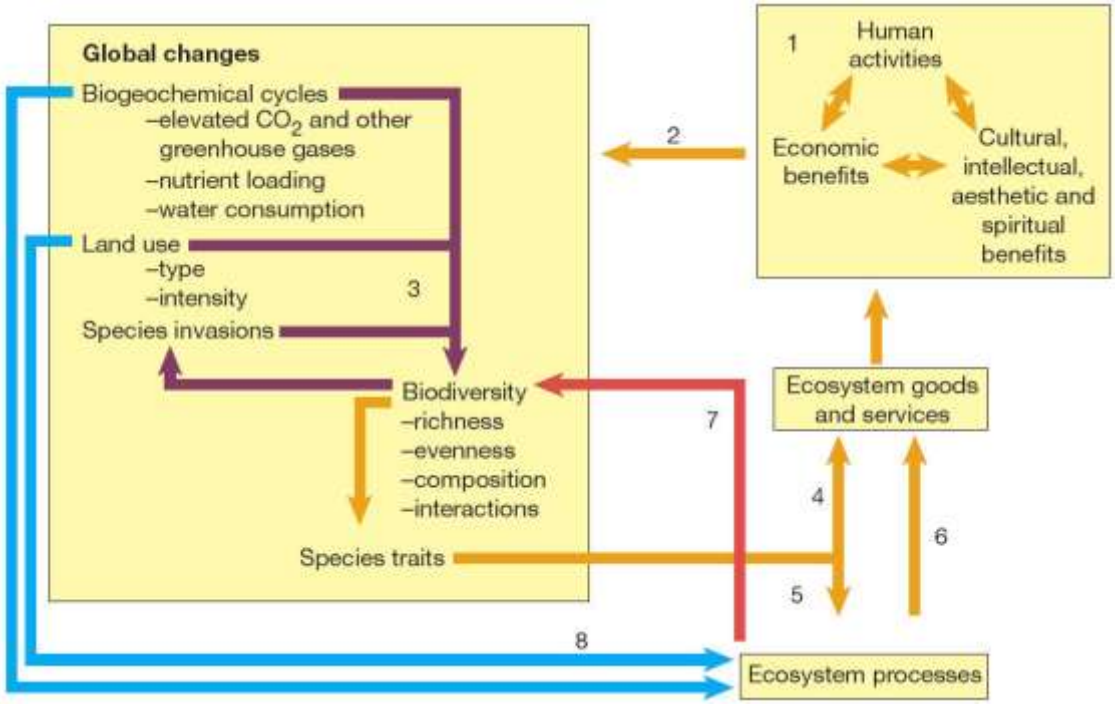


Figure 3. The role of biodiversity in global change (Chapin *et al*., 2000).

Human activities that are motivated by economic, cultural, intellectual, aesthetic and spiritual goals (1) are now causing environmental and ecological changes of global significance (2).

By a variety of mechanisms, these global changes contribute to changing biodiversity, and changing biodiversity feeds back on susceptibility to species invasions (3, purple arrows).

Changes in biodiversity, by way of changes in 'species traits', can have direct consequences on ecosystem services and, as a result, on human economic and social activities (4).

In addition, changes in biodiversity can influence ecosystem processes (5). Altered ecosystem processes can thereby influence ecosystem services that benefit humanity (6) and feedback to further alter biodiversity (7, red arrow).

Global changes may also directly affect ecosystem processes (8, blue arrows). Depending on the circumstances, the direct effects of global change may be either stronger or weaker than effects mediated by changes in diversity.

The costs of loss of biotic diversity, although traditionally considered to be outside the sphere of human welfare, must be recognized in our accounting of the costs and benefits of human activities (modified from Chapin *et al*., 2000).

Across a range of taxonomic groups, the population size or range (or both) of the majority of species is declining. Exceptions include species that have been protected in reserves, species for which particular threats (e.g. over-exploitation) were eliminated and species that tend to thrive in the modified landscapes that we have created with our activities. Marine and freshwater ecosystems are relatively less studied and overall biodiversity is poorly understood. In the case of the better-studied species, biodiversity loss has occurred in the form of local extinction and constricted distribution.

Over the past few hundred years, human activity has increased species extinction rates by as much as 1,000 times the background rates determined in the fossil record (**Figure 4** opposite page). The projected future extinction rates are more than ten times higher than the current rate (i.e. more than 10,000 times higher than the fossil record). (See also 'threatened species' in the Glossary).

Presently we can say that (IUCN, 2007a)[14]:

- 785 species have become extinct and a further 65 species now exist only in captivity.
- 16,306 species are threatened with extinction (up from 16,118 in 2006), but this may be a gross underestimate because fewer than 3% of the world's 1.9 million described species have been assessed by the 'Red List'. Of this total, 7,725 are animals.
- In major species groups, the percentage of threatened species ranges between 12% and 52%.

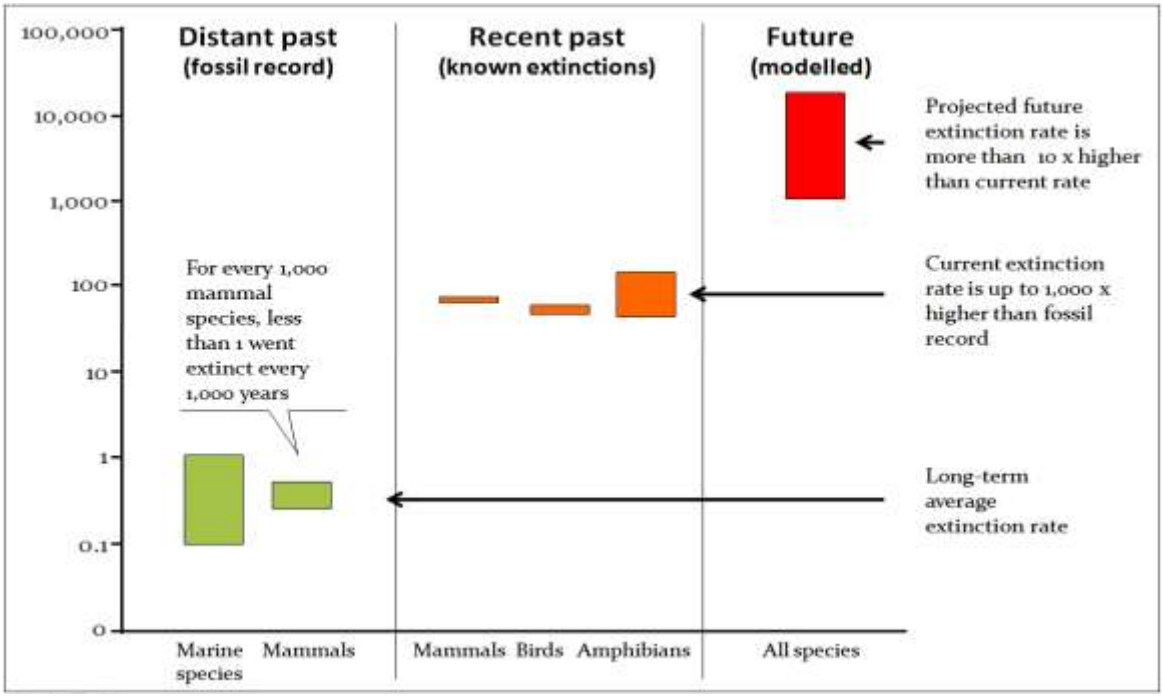


Figure 4. Species extinction rates in 1,000 species per millennium (redrawn from MA, 2005).

- About 12% of birds (1 in 8); 23% of mammals (1 in 4); one third of amphibians; and 70% of the world's assessed plants are currently threatened with extinction
- Genetic diversity has declined globally, particularly among domesticated species

In spite of Protected Areas (PAs) doubling globally from 1973 to 2003[15] extinction rates are likely to continue to increase (MA, 2005). This increase in PAs does not include marine habitats and ecosystems which are severely underrepresented in the global network.

In Peninsular Malaysia a Master Plan study for Protected Areas reported more than 10 years ago that 17.6% of mammals and 7.5% of birds were threatened (DWNP, 1996). The reason why so many mammals are threatened in Peninsular Malaysia has to do with their habitat requirements, which for the vast majority (81%) involves suitable habitat below the 600-metre contour[16]. About half the mammals require appropriate habitat below the 300-metre contour and this happens to be where habitat loss and fragmentation are most severe (see maps in Annex 3). Presently, NRE is adopting the IUCN Red List guidelines for national purposes – undoubtedly supported by the recent release of guidelines for regional, national and local threatened species listing (see IUCN, 2007b).[17]

In the IUCN Red List 2007, Malaysia has the dubious distinction of being the country with the only species declared extinct. The herb Woolly-stalked Begonia (*Begonia eiromischa*) is only known from collections made in 1886 and 1898 on Pulau Betong, Penang Island. Its habitat was cleared for farmsteads in the 1980s and extensive searches of nearby forests have failed to reveal any surviving specimens.

More recently, Wetlands International has published a report which confirms that the coast of Malaysia, particularly of Selangor and Sarawak, is very important for waterfowl. However, shorebird numbers showed a decline of 22.4% in Malaysia between 1983-1986 and 2004-2006. The most significant decline (86%) occurred on the Perak coast of the Malay Peninsula, while the west coast of Johor and the coast of Selangor showed a 40% and 26% decline, respectively. The reclamation/conversion of mangroves and mudflats for aquaculture, agriculture, industry, housing and recreational purposes is the major threat to waterfowl habitat (Wei & Ounsted, 2007).

The drivers of change affecting biodiversity *most severely* at a global scale are listed below with reference in parenthesis to the systems mainly affected (MA, 2005):[18]

- Change in land use (terrestrial and freshwater systems)
- Fragmentation and isolation (terrestrial,

freshwater)
- Habitat change (terrestrial, freshwater, coastal)
- Invasive species (islands)
- Over-exploitation (marine)
- Pollution (freshwater, coastal)

A well-managed and secure Protected Areas System *is* fundamental to the long-term survival of biodiversity. Yet biodiversity is eroding in spite of PAs having increased. Thus, an important conclusion is that we cannot save biological diversity by this measure alone – we have to manage the land / seascape to which the PAs belong.

This has led to a paradigm shift in how we plan and manage natural resources and biodiversity assets. We now realise that we must manage PAs as an integral part of the broader land / seascape. Indeed, success depends on the extent to which planners and decision-makers shaping the present and future landscape reach a shared perception of issues and priorities while promoting complementary inter-agency actions in favour of long-term sustainable development.

This view is behind the '*ecosystem approach*'[19] which looks beyond the boundaries of PAs and promotes inter-sectoral cooperation, while placing humans at the centre of conservation efforts.

Biodiversity transcends jurisdictional and administrative boundaries from federal to state and local levels, and its successful planning and management requires diverse and complementary interactions on behalf of multiple stakeholders (as further elaborated upon below). Though each agency may conduct important sector activities on natural resource and biodiversity assets, holistic management is today hampered by sector-based legislation and administrative setup.[7]

Integrated and holistic management of biodiversity should also consider (MA, 2005):

- Biodiversity loss is driven by local, state, national, regional, and global factors, so responses are needed at all scales.
- Responses need to acknowledge multiple stakeholders with different needs.
- Given certain conditions, many effective responses are available to address the issues identified.
- Responses designed to address biodiversity loss will not be sustainable or sufficient unless relevant direct and indirect drivers of change are addressed.
- Further progress in reducing biodiversity loss will come by way of greater coherence and synergies among sectoral responses and through a more systematic consideration of the trade-offs among ecosystem services or between biodiversity conservation and other needs of society.

Finally, the costs of loss of biodiversity, although traditionally considered to be outside the sphere of human well-being, must be recognized in our accounting of the costs and benefits of (proposed) activities (e.g. change of land use).

2.6 Why are Protected Areas insufficient?

Protected Areas (PAs) are fundamental to the long-term survival of biodiversity but – in spite of a marked increase in their numbers and coverage during the last 100 years[20] – biodiversity has kept eroding at an accelerated pace. However, without the increase in PAs, biodiversity would have been even worse off.

Reasons why setting aside PAs is not enough include:

- Bias in selecting locations for PAs (e.g. it is easier to allocate low-value and inhospitable areas such as highlands and mountains; though most biodiversity is typically dependent on suitable habitat in the lowlands)[16]. (See also maps in Annex 3).
- It is almost impossible to include entire ecosystems in a PA
- Not all systems are represented in the PAs established (in Malaysia several Plans/Policies stipulate that critical and representative habitats should be protected but wetlands and lowland Dipterocarp forests are as yet insufficiently covered). In particular, marine habitats beyond coral reefs are severely under-represented (e.g. estuaries, sea-grass meadows, inter-tidal mudflats)
- Several important design criteria for a Protected Areas System are not yet in place (e.g. the requirement for connectivity between habitat fragments; redundancy in site selection; the permanence of sites for PAs).

2.7 What is the value of biodiversity?

The previous Sections have shown that biodiversity is important because it supports ecosystem functions and the provision of essential ecosystem services. Not only does human well-being depend on this *web of life* but all human activity, including the global economy, is made possible thanks to the diversity of ecosystem services that nature provides.

The emerging 'ecosystem services paradigm' has enhanced our understanding of how the natural environment matters to human societies.[21] We now think of the natural environment, and the ecosystems conforming it, as natural capital—a form of capital asset that, along with physical, human, social, and intellectual capital, is one of society's fundamental assets (National Research Council, 2004).[22]

Providing biological resources and ecosystem services, biodiversity is an essential component of human development and human security. Through agriculture, forestry and fishery, biodiversity provides products which contribute significantly to national economies and employment. Ecosystem goods range from food and water to timber and fodder to genetic resources. In addition, ecosystems provide essential services including nutrient cycling, air and water purification, flood and drought mitigation and soil formation, at no cost.

Despite growing recognition of the importance of ecosystem functions and services, they are often taken for granted and overlooked in environmental decision-making. Thus, an enhanced recognition of the value of ecosystem services and potential conflicts should prevail when making choices between the conservation and restoration of some ecosystems and the continuation and expansion of human activities in others (National Research Council, 2004).

Economic valuation of ecosystem services is an evolving discipline. Both the data needed and methods used have shortcomings. Some common economic theories and practices do not apply to ecosystem valuation as well as to traditional valuations. Finally, there is a conceptual controversy about the use of ecosystem values.

Valuation of ecosystem services depends on a good understanding of those services, but it is very difficult to know what ecosystem aspects and functions are required to maintain services and to predict how provision of services will change due to human activities. This lack of information often causes values to be underestimated.

Underestimation of the economic value of ecosystem services also stems from lack of information about future uses of biodiversity and the willingness to pay of future generations for existing and prospective biodiversity uses.[23]

In general we can say that the better our ecological knowledge and understanding, the better our economic valuations will be.

There have been various attempts to measure the economic or monetary value of ecosystem services. In 1997 Costanza *et al.* published a controversial paper called "The value of the world's ecosystem services and natural capital." By extrapolating with previous and new data, they came up with a value of US$33 trillion for 17 different ecosystem services across the globe. This figure compared with a total global GNP of US$18 trillion dollars at the time.

This means that the relationship "value of ecosystem services" to "global Gross National Product" was estimated to be 1.8 to 1 – almost double the global GNP.

Though their methods and results were criticized, the paper served its purpose by bringing attention to and provoking discussion about the topic of ecosystem service valuation. Some believe such an approach to be meaningful because it helps us deal with the value of nature in an economic framework, while others consider it meaningless because, ultimately, no value can be placed on the ecosystem services that support human existence.

Humans value each ecosystem service in one or more ways, including direct use, indirect use, and non-use values (see **Figure 5** next page). The services and values in turn can be quantified using economic valuation methods, such as direct market pricing, travel cost valuations, or contingent valuation surveys.

Each method has advantages and disadvantages, and should be carefully chosen based on the specific goals and subject of the study. Questions have been raised not only about the individual methods, but also with the economic theory and the idea of economically valuing ecosystem services in general.

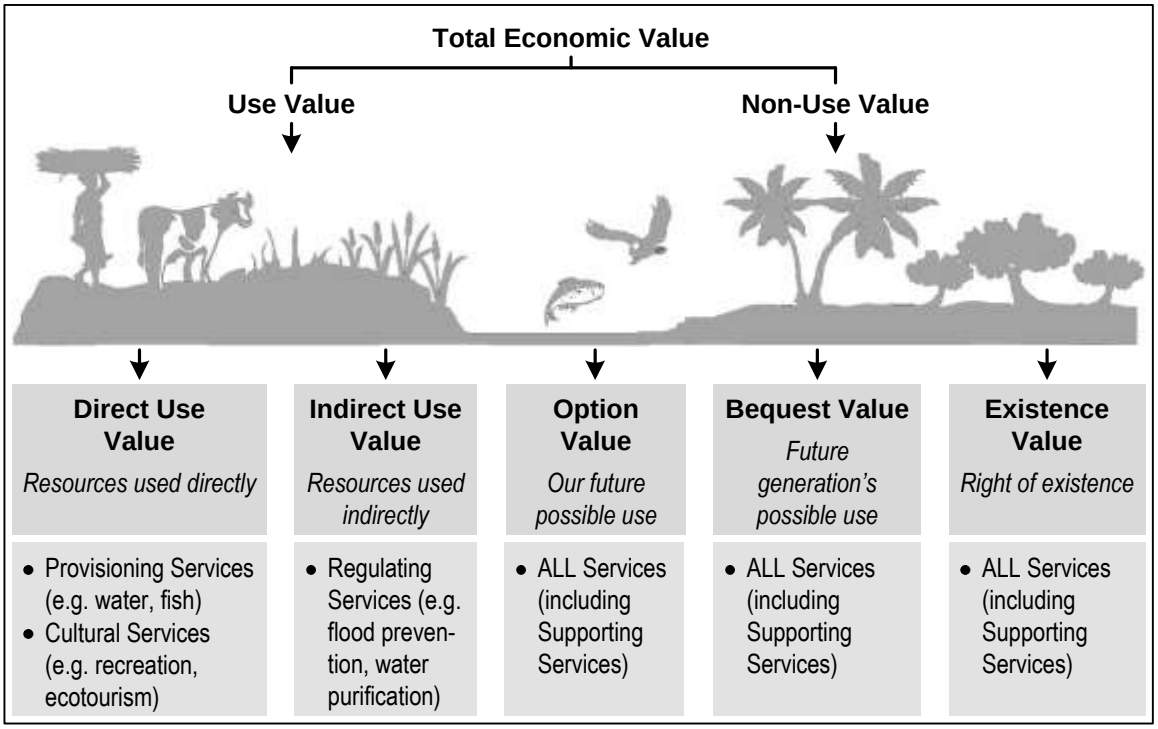


Figure 5. The total economic value of ecosystems (from Smith *et al.*, 2006).

The other main issue encountered in the valuation of ecosystems is the failure for users and policy makers to see the total flow of benefits provided by ecosystems.[24] Benefits provided by ecosystems are in general only reflected in the market values of goods and services delivered such as timber or fisheries, and reported, for example, as a proportion of the national GDP. However, non-timber forest products are seldom reflected in national accounts.

Benefits generated from ecosystems are often miss-attributed to other sectors (**Text Box 2**[25]) and some benefits can be misleading (e.g. harvest rates of, say, timber or fisheries which exceed the level of sustainable yield). Such huge benefit is generally short-term, not sustainable and may leave behind an impoverished resource which requires a significant amount of time to rehabilitate. In some cases, even that long recovery period is not an option as when *factory fishing* collapsed the stock of Newfoundland cod.[26]

Despite difficulties, limitations, and issues surrounding ecosystem service valuation, there seems to be a general consensus that the value of ecosystem services often outweighs economic use and that protecting ecosystem services is, or should be, one of the most important responsibilities of today's politicians, resource managers, and society in general (Balmford *et al.*, 2002; Carret and Loyer, 2003; Costanza *et al.*, 1997; Hawkins, 2003, 2005; Kuriyama, 1998; Pimentel

Text Box 2. Mangroves yield significantly higher direct use value for fisheries than for forestry.

Mangroves are often managed by a forestry department which registers only modest revenues from harvesting of poles and production of charcoal. Meanwhile this sophisticated ecosystem nurtures marine life and supports local and offshore users with significant economic values represented by the catch of fish, crabs, shrimps and so forth.

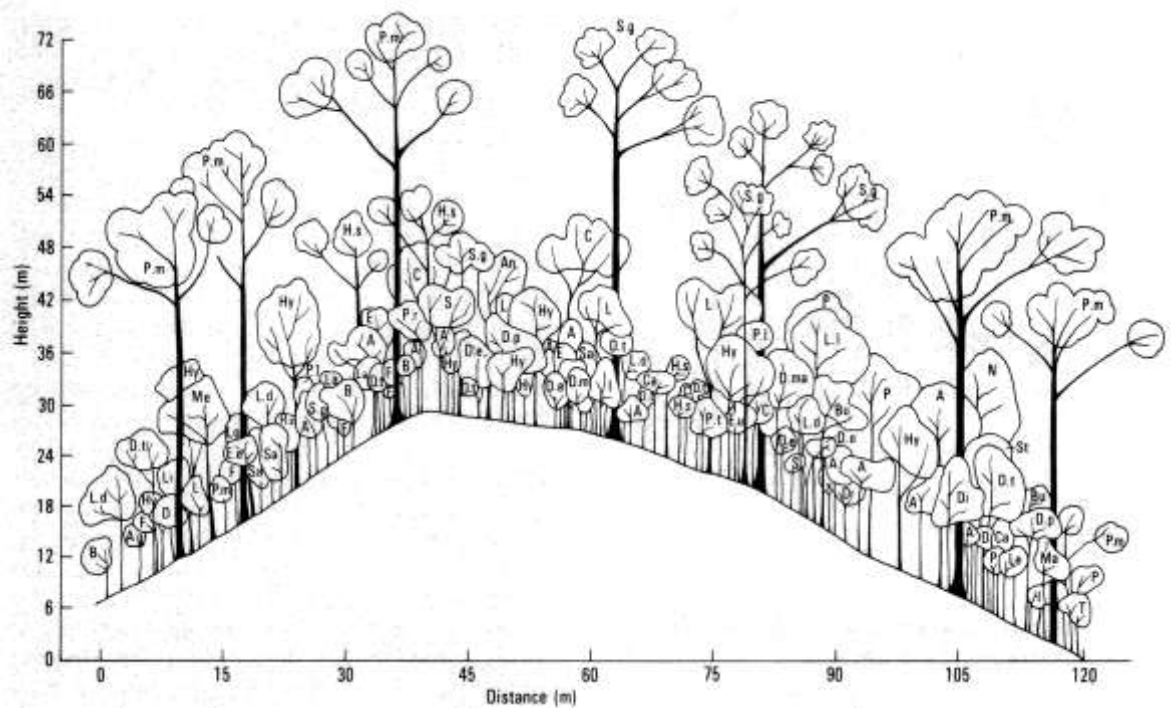
The mangroves of Johor State have been reduced by 30% during the last 25 years of the last century. In 1995 they constituted some 27,000 ha with mangrove forestry (i.e. poles, charcoal and firewood) yielding a market value of RM 1.2 million. However, this represents only 2.3% of the total market value generated from the mangroves since mangrove dependent fisheries, which employ an estimated 39,000 people, is estimated at RM 54 million annually. To this figure one would have to add the important indirect benefits of coastline stabilization, reduced impacts from tsunamis, etc. (FD/Danced, 1997).

In the Matang Mangrove Forest Reserve in Perak State revenues from forestry were more thanUS$12 million by late 1990s. By 1994, the prawn industry of the area is estimated at more than US$60 million annually. The total value of forestry and fisheries alone means that Matang mangroves are valued at an impressive US$ 1,800 per hectare per year. Elsewhere 1 km^2 of mangroves is considered capable of producing 38 tonnes of fish and shrimp that each year matures elsewhere outside the mangrove habitat (Giesen *et al.*, 2006).

et al., 1999; Salzman *et al.* 2001; World Bank, 1996).

Other relevant conclusions for values of biodiversity and ecosystem services are (MA, 2005):

- Financial markets do not capture the importance of biodiversity and natural processes as generators of ecosystem services that people depend on.
- If private decision-makers are not given incentives to value the larger social benefits of conservation, their decisions will often result in insufficient conservation actions (e.g. excessive land clearing in one site which may cause heavy sediment load in rivers and siltation of coral reefs offshore).
- Indirect values of biodiversity can be highly significant in comparison to the direct economic values derived from a particular site (e.g. economic studies of changes to biodiversity in specific locations have shown that the costs of ecosystem conversion are often significant and sometimes exceed the benefits of conversion – especially when the indirect values of biodiversity and ecosystem services are internalised).
- Conventional indicators of economic growth or growth in human well-being do not reflect appropriately the loss of capital asset represented by depletion and degradation of many ecosystem services (e.g. depleting a country's forest or fisheries will show a positive gain in GDP, despite the loss of capital assets).[27]



Lowland dipterocarp forest at Silam, Sabah
(*Parashorea malaanonan* (P.m) and *Shorea guiso* (S.g) are the dominant species) [28]

3 A COMMON VISION ON BIODIVERSITY

The continued depletion of biodiversity has led Malaysia to define a number of relevant provisions in its Policies and Plans. Prominent among these is the fact that planning and conservation actions should be integrated and holistic (as briefly discussed above and summarised in Annex 1).

Biodiversity transcends jurisdictional and administrative boundaries from federal to state and local levels, and its successful planning and management requires diverse and complementary interactions from multiple stakeholders. Though each agency conducts important sector activities concerning natural resource and biodiversity assets, the present sector-based legislation and administrative setup hamper the possibility of holistic management.

A *Common Vision on Biodiversity* aims to ensure that sector information actively contributes to integrated planning and conservation actions in line with Malaysia's goals for environmentally sustainable development.

3.1 What is the Common Vision?

The *Common Vision on Biodiversity* explains what biodiversity is, why it is important, how to maintain it and what measures are required to ensure a constant provision of ecosystem services that are essential for human well-being. Based on the different undertakings of NRE, its line agencies and the latest guidelines and experiences with respect to biodiversity planning and management, this Common Vision promotes a three-pronged implementation approach and outreach strategy that consists in:

i) Strengthening the Protected Areas System
ii) Land/Seascape management for biodiversity
iii) Mainstreaming biodiversity.

To a very large extent, the *Common Vision on Biodiversity* responds to provisions and priorities contained in existing Policies, Plans and Programmes (PPPs), but it focuses on their implementation and the operational aspects of the pursuit of sustainable development.

The *Common Vision on Biodiversity* is also important because it can be used to rally support within the government and civil society for a shared perception of issues, priorities and the required inter-agency actions.

The *Common Vision* is firmly established in existing policies, as clearly shown in Annex 2 (p. 82) where it has been related to the 96 actions contained in the National Policy of Biological Diversity. This analysis reveals that two-thirds of the defined actions are relevant to the three prongs defined above and of these actions, 44 may be considered highly relevant in the short term.

3.2 Who should implement the Common Vision?

Biodiversity supports the inter-connected terrestrial, freshwater and marine systems. Successful implementation of suitable measures depends entirely on the degree to which the following parties manage to reach consensus on priorities and required complementary actions:

Principal stakeholders

- Ministry of Natural Resources and Environment – NRE
  - Ministerial Divisions
    - Conservation & Environmental Management Division – CEMD
    - Forest Development Division – FDD
    - Irrigation & Drainage – I&D
    - Malaysian Centre for Geospatial Data Infrastructure – MaCGDI

(NRE continued)

- Line agencies
  - Forestry Department Peninsular Malaysia – FD
  - Forest Research Institute Malaysia – FRIM
  - Department of Wildlife & National Parks – PERHILITAN
  - Department of Marine Parks Malaysia – DMPM
  - Department of Environment – DOE
  - Drainage & Irrigation Department – DID
- Ministry of Agriculture
  - Department of Agriculture – DOA
  - Department of Fisheries – DOF
- Ministry of Housing & Local Government
  - Town & Country Planning Department – TCPD
  - National Landscape Department – NLD
- Ministry of Public Works
  - Department of Public Works – JKR
- Ministry of Plantation Industries & Commodities
  - Oil palm, rubber and other plantation estates
- Other key parties at federal, state and local levels
  - Departments of Forestry Sabah and Sarawak
  - Town & Country Planning Departments Sabah and Sarawak
  - State and Local Authorities

Secondary stakeholders

- Other government agencies
- Civil society

3.3 What is the role of NRE?

It is of strategic importance for NRE to promote the *Common Vision on Biodiversity* and the essential complementary contributions that its agencies can make towards national goals of environmental sustainability.

This would require NRE to act as a consultation body for synthesised, holistic data on biodiversity issues and priorities. To a large extent, this information may be compiled from line agencies, but it is essential that the existing information be complemented with overall land-use data produced on a regular basis by the Department of Agriculture (DOA).

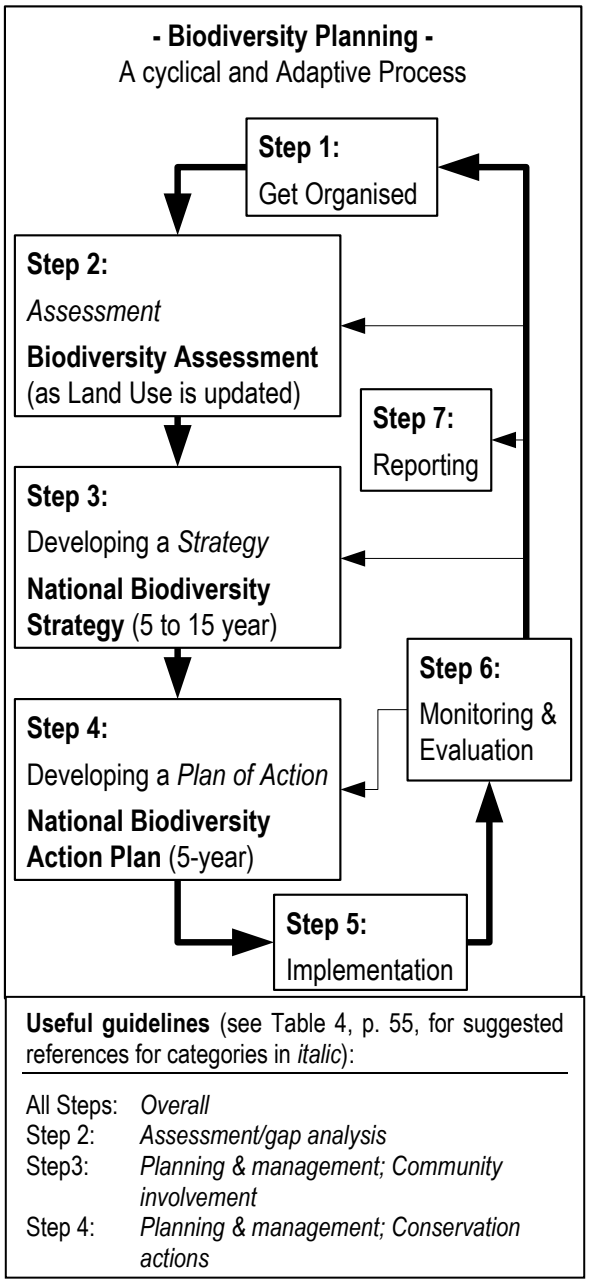


Figure 6. National biodiversity planning – basic steps and their relation to key planning tools (figure adapted from Kenton & Lanou, 1995).

The adaptive approach to biodiversity planning shown in **Figure 6** is a suitable framework for NRE to act as a consultation and facilitation body. Indeed, *Step 2* corresponds to the Country Study on Biological Diversity done by MOSTE in 1997 and *Steps 3* and *4* represent the National Policy on Biological Diversity (MOSTE, 1998). However, both require updating as part of the cyclical process shown in **Figure 6**.

These basic steps, and the process iterated as indicated, will ensure that NRE is always in a position to report on and respond to inquiry about (among others):

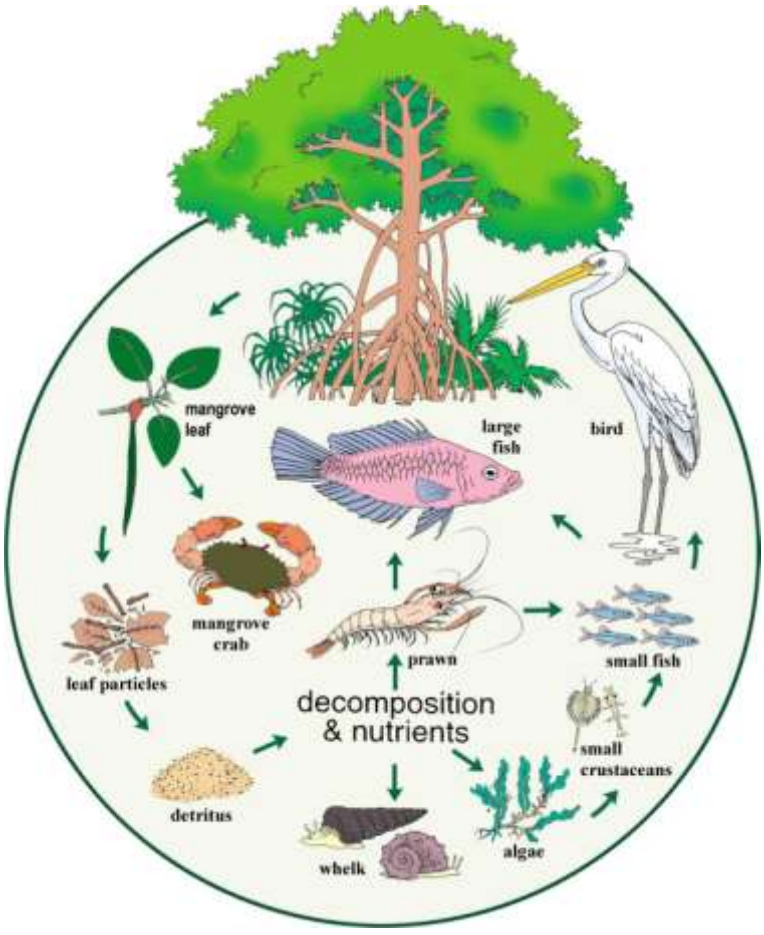
i) The status of biodiversity (for national and international reporting)

ii) The present direction taken concerning planning and management of natural resources and biodiversity assets.

iii) The extent to which provisions of national policies and plans, as well as international conventions, are adhered to.

Mobilising support for a broadly shared perception of issues, priorities and required inter-agency actions also calls for an extensive communication and outreach programme.

The following Chapters will provide further details on each of the three elements of the *Common Vision*.



Simplified food web from of the mangrove ecosystem [29]

4 STRENGTHENING THE PROTECTED AREAS SYSTEM

4.1 What is a Protected Area?

The creation of Protected Areas (PAs) *is* one of the most effective measures available for conserving biodiversity, but PAs are not meant to be islands in a sea of development. Rather, they must be part of our country's strategy for sustainable management and wise use of natural resources, and they must be set within a proper planning context.

PAs can be degraded by external pressures, but the majority of terrestrial PAs are successful at stopping land clearing, and to a lesser degree effective at mitigating logging, hunting, fires and grazing. Moreover, park effectiveness correlates with basic management activities such as enforcement, boundary demarcation, and direct compensation to local communities, suggesting that even modest increases in funding would directly increase the ability of parks to protect tropical biodiversity (Bruner *et al.* 2001).

Terrestrial and marine PAs assist in safeguarding biodiversity and thus in ensuring ecosystem services essential for human well-being (as shown in Figure 1, p. 3).

In Malaysia there is no single definition of what constitutes either a PA or a PA System but both the Convention on Biological Diversity (CBD) and the World Conservation Union (IUCN) have relevant and suitable definitions.[30]

According to CBD, a PA is a: *Geographically defined area which is designated or regulated and managed to achieve specific conservation objectives* (Article 2).

IUCN states that a PA is: *An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means* (IUCN, 1994).

In practice, however, these definitions are only marginally different and Parties to the CBD see no conflict between them as evidenced by their support for the IUCN 'Protected Areas Management Categories' during the 7th Conference of Parties in Kuala Lumpur 2004[31]. Both definitions consider Protected Areas (Bishop *et al.*, 2004):

- To be area-based concepts that might be found anywhere
- To focus on conservation objectives
- To require specific measures (dedication, designation, regulation) for the purposes of biodiversity conservation (i.e. protection and maintenance)
- To require management, delivered through legal or other effective means
- By implication, to require that some kind of management authority is in place to secure conservation.

Thus, PAs need not be limited to federal or state-sponsored reserves but may also include those managed by indigenous communities, private landowners, industrial holdings and so on.

The PAs are further classified into the six 'Management Categories' shown in **Table 1** (overleaf; see Glossary for further details of these). While each of the PA Categories has a different range of management objectives, all the classes should have one feature in common: a properly thought through Management Plan process to ensure that the optimum outcomes are achieved.

Table 1. Management Categories for Protected Areas (based on IUCN, 1994).

Management Categories	Characteristics
I	Protected Area managed mainly for science or wilderness protection
II	Protected Area managed mainly for ecosystem protection and recreation
III	Protected Area managed mainly for conservation of specific natural features (Natural Monument)
IV	Protected Area managed mainly for conservation through management intervention
V	Protected Area managed mainly for landscape/seascape conservation
VI	Protected Area managed mainly for the sustainable use of natural ecosystems (Managed Resource Protected Area)

In addition to conserving biological and cultural diversity, it is now widely recognised that many PAs also have important social and economic functions. These include protecting watersheds, soil and coastlines, providing natural products for use on a sustainable basis, and supporting tourism and recreation. Many PAs are also home to communities of people with traditional cultures and knowledge: these assets also need protection.

It is accepted as a basic principle of PA management that every area should have a 'Management Plan'. The most compelling reason for producing Management Plans is to provide benefits to the PA and those who rely upon its good management for delivery of ecosystem products and services (e.g. continuous supply of potable water). Thus, the primary product of management planning should be more effective management of a PA to guide and control its resources, the use of the area, and the development facilities needed to support its management and use[32]. A Management Plan has two main target audiences: PA management staff; and planners and decision-makers in federal, state and local governments. Many PAs in Malaysia do not yet have such a Plan and therefore no clearly defined management objectives either.

Elsewhere most PAs have multiple objectives and it has been established that there is a need to consider a wide array of social preferences and values (both for present and future generations), institutional structures and barriers, philosophical outlooks, forms of knowledge and conflicting opinions of what is important. Because all these various considerations have to be taken into account, the task of preparing Management Plans for PAs can be challenging, yet it is essential for the safeguard of the natural and cultural resources being managed (Thomas & Middleton, 2003, represents a good source on management planning of PAs).

The 9th Malaysian Plan establishes that for the plan period efforts will be intensified to protect critical habitats and, towards this end, existing Management Plans will be reviewed to further strengthen the protection of flora and fauna. Hopefully this will be accompanied by the preparation of Management Plans to guide the management of the many PAs still without a Plan.

A good management planning process which has the support of staff and local people provides the following benefits (see also **Text Box 3**):

1. Ensure that management decisions are based on a clear **understanding** of the PA, its purpose, and the important resources and values associated with it, which normally go well beyond its boundaries.

Text Box 3. Guidelines on management planning (based on Thomas & Middleton, 2003).

Successful management planning is characterised by these features:

- It is a **process**, not an event, meaning that it continues through its implementation period.
- It is concerned with the **future** by identifying concerns and future alternative courses of action, and examines the evolving chains of causes and effects likely to result from current decisions.
- It is **systematic** by using a pre-determined sequence of steps that give structure to the process and encourage a logical approach.
- It involves **value judgements** embracing what a PA is and what it should become by focusing analysis not only on the condition of the natural resource but also on people and their opinion.
- It takes a **holistic** view and takes in a wide range of issues, views and opinions such as the concept that they cannot be managed in isolation from their surrounding landscape.
- It is a **continuous** process – never static – and it must adjust to changing conditions and goals.

Suggested references for management planning are presented in Table 4, p. 55.

2. Ensure that management decisions are based on a clear **understanding** of the PA, its purpose, and the important resources and values associated with it, which normally go well beyond its boundaries.
3. Provide **guidance for managers** in the form of a framework for both day-to-day operations and long-term management. Provide **continuity** of management (e.g. briefing document for new staff which will help maintain direction and momentum).
4. Identify and define management **effectiveness** since clear Plan objectives which are well written, specific and measurable can be used to determine whether PA management is being effective or if changes are required (Hockings *et al*. 2006 is a good guide to evaluating the effectiveness of PAs).

Management planning also optimizes the use of financial and staff resources; increases accountability; and improves communication (see further details in Thomas & Middleton, 2003).

Presently, NRE with PERHILITAN, Sabah Wildlife Department and the Sarawak National Parks Division is adopting the IUCN 'Protected Areas Management Categories' definitions for Malaysia. This should reduce confusion about terminology, allow monitoring of progress towards established policy and plan objectives, and ease the burden of reporting for both national and international purposes (see **Text Box 4**).

Text Box 4. Guidelines on what areas fall outside the definition of a Protected Area.

Though practically all habitats – natural and managed – contribute to the conservation of biodiversity (see **Figure 7**) it is important to carefully apply the guidelines for what constitutes a Protected Area.

It should be noted in the Figure that Category V involves the highest extent of human modification. The maximum biodiversity conservation is offered in the Categories I to IV, and these should constitute the core of a PA System.

Nevertheless, the challenge faced by nations is to ensure that all habitats – including what falls outside Protected Areas – contribute towards maintenance of ecosystem services and national goals of sustainability.

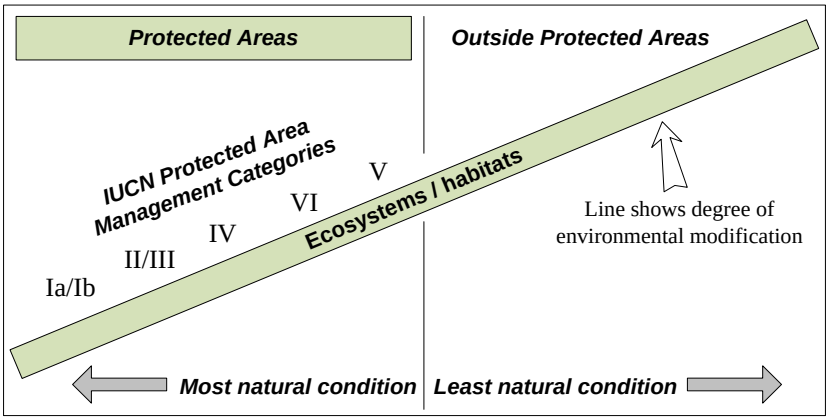


Figure 7. Protected Area Management Categories and degree of environmental modification (modified from Bishop *et al*. 2004).

The following are *not automatically* Protected Areas (based on IUCN, 1994, and Dudley & Phillips, 2006):

- Forests managed for resource protection other than biodiversity – e.g. forests set aside for watershed or drinking water protection, firebreaks, windbreaks and erosion control
- Forests managed primarily as a community resource – e.g. forests managed for non-timber forest products, fuel-wood and fodder, recreational or religious purposes
- Forests managed as a strategic resource – e.g. as an emergency supply of timber in times of conflict
- Forests with unclear primary management objectives resulting in biodiversity protection being considered as an equal or a lesser priority along with other uses
- Forests set aside by accident – e.g. woodland in the central reservation or verges of motorways, forest maintained for military or security reasons.

A well-balanced National Forest Reserve requires elements of the many types shown here. However, trying to squeeze as many uses as possible under the heading 'Protected Area' will cause confusion, artificially overestimate the achievement in biodiversity conservation targets and devalue the Protected Areas System.

Protected Areas for a New Millennium

A more fundamental question is the extent to which Categories V and VI provide adequate biodiversity conservation, which is presently being debated and may become reflected in updated guidelines to PA Categories (see also the following **Text Box 6**).

The key issue may be less the precise definitions of IUCN Categories I-VI than the proportion of a national Protected Areas network that falls into each of the Categories. When designing a Protected Areas System, a balanced network of Categories will be needed, to meet a range of ecological and social aspects of forest quality. This will, in many cases, include a minimum extent in the stricter Protected Area Categories (e.g. 10%).

Text Box 5. What is the scope for inclusion of commercial forests in the Protected Areas Management Categories?

In short, it is fairly limited and restricted to Categories V and VI and this only under the assumption that management authorities are willing to engage and delegate responsibilities to local communities which essentially carry out multiple use forestry.

First of all, areas classified according to the Protected Areas Management Categories have to comply with IUCN's definition of a Protected Area (other criteria have also been highlighted under Section 1.1 above). Of the Categories I, II, III and IV only the latter includes active management interventions but for the purposes of ensuring the maintenance of habitats and/or to meet the requirements of specific species. Of the remainder two classes, Category V is unique in its emphasis on the *interaction* between people and nature and shares with Category VI the idea of multiple use (both V and VI are the least strictly protected classes, as shown in **Figure 7**, Text Box 3 above). Whereas Category V Protected Areas are lived-in working landscapes that have been extensively modified by people over time, the definition of Category VI speaks of an "area of predominantly unmodified natural systems", which is to be managed so that at least two thirds of it remains that way. Management in such places is thus generally for long-term protection and maintenance of biodiversity, whilst at the same time providing a sustainable flow of goods and services for community needs. Therefore while both Categories put people at the heart of the approach, the degree of environmental modification in Category V Protected Areas will be significantly greater.

Category V Protected Area managed mainly for landscape / seascape conservation (quotes are from Phillips, 2002)

"In most types of Protected Areas, "forests" mean the remaining natural areas under tree cover. There will be such natural forests (old growth, ancient, pristine or virgin forests) in many Category V Protected Areas too, but other kinds of woodland and forests will also be commonplace. Examples are: woodlots, small plantations, community woodlands, hedges and copses, shelter belts, sacred groves and other people-protected woodlands, fragments of riverine or hilltop forests, tree cover maintained for soil conservation or watershed protection – and so forth. So in Category V Protected Areas, forests and trees play a complex role".

"However, forestry and woodland policies for the Protected Area as a whole will need to be broken down to reflect the many different kinds of forests and woodlands often found within a Protected Landscape and the values ascribed to them by society. These might be listed under a number of headings, according to the main functions of the treed area and appropriate policies". Commercial forests/woodlands managed primarily for renewable supplies of timber are one of many classes expected in this Category most of which offer protection and services for local communities and visitors. Phillips (2002, pp. 64, 65) specifically mentions that "forest managed to Forest Stewardship Council standards could be expected to make a contribution to Category V objectives".

Areas planned and managed according to the principles of Category V Protected Area may constitute excellent entry points for implementing the 'ecosystem approach' that the Convention on Biological Diversity considers the key mechanism for achieving its objectives and also fulfil national plan and policy provisions for holistic, integrated and sustainable development (Annex 1).

Category VI Protected Area managed mainly for the sustainable use of natural resources

Category VI was included to accommodate the need for predominantly natural areas which "*are managed to protect their biodiversity in such a way as to provide a sustainable flow of products and services for the community*". Specifically, the "*principal purpose of this Category is the management for long-term sustainable use of natural ecosystem. The key point is that the area must be managed so that the long-term protection and maintenance of its biodiversity is assured. In particular, four requirements must be met:*

- *The area must be able to fit within the overall definition of a Protected Area*
- *At least two-thirds of the area should be, and is planned to remain, in its natural state*
- *Large commercial plantations are not to be included, and*
- *A management authority must be in place*

Only if all these requirements are satisfied, can areas qualify for inclusion in this Category (IUCN, 1994, p. 9).

How about Malaysia's Permanent Forest Reserve (PFR)?

All of Malaysia's Permanent Forest Reserve (PFR) has been classified into Functional Classes (which differ between Peninsular Malaysia, Sabah and Sarawak). Much of the Classes not assigned to production may qualify as part of a Protected Areas System which would then be truly impressive at a global scale and give Malaysia full credit for areas already set aside for protection (further dealt with in Section 4.3 below). It would also allow planning holistically for a comprehensive Protected Areas System

However, this would require that state governments offer protection in perpetuity for these sites since under the National Forestry Act areas can be excised from the PFR as long as replacement areas are provided (not necessarily of the same habitat types – indeed, they don't even have to be forested at all). In addition to the requirements outlined above, its geographic location must be known so its contribution to the overall Protected Areas System can be assessed (see the following **Text Box 6**, p. 20); and its management authority should act in accordance with common guidelines for all the Protected Areas System (i.e. the aim is concerted and complementary action on behalf of multiple stakeholders and not transfer of jurisdiction).

Are there any other potential areas already set aside?

An important number of areas and extent of land has already been gazetted for watershed protection to ensure continuous production of potable water. It would seem appropriate that these and other areas from federal to state and local levels are considered for inclusion in a national Protected Areas System – provided they comply with the definitions and conditions highlighted previously.

4.2 What is a Protected Areas System?

A 'Protected Areas System' is made out of individual PAs and should cover the full range of ecosystems found in a particular country. A PA System Plan should identify the range of purposes of Protected Areas, help to balance different objectives, and ensure that national and international targets and commitments are adhered to (see Davey, 1998).[33]

It is widely considered that PAs will not survive unless they enjoy broad public support. Moreover, land use and resource management conflicts, inequities or impacts do not – of course – go away simply because an area is given protected status.

PA boundaries often reflect considerations of sovereignty, governance and tenure as much as the environment types they seek to protect. For all these reasons, the planning and management of Protected Areas must be coordinated with the use and management of other areas rather than treated in isolation. The long-term success of Protected Areas must be seen in the light of the search for more sustainable patterns of development in general.

System planning offers a practical way of putting Protected Areas management into this wider context. It is implicit in national policies and plans and, moreover, at the 7th meeting of the Parties to the Convention on Biological Diversity (CBD) in Kuala Lumpur (February 2004), 188 Parties agreed to a *Programme of Work on Protected Areas*.

This Programme aims, by 2010 (terrestrial) and 2012 (marine), to establish "comprehensive, effectively managed and ecologically-representative national and regional systems of Protected Areas". The Secretariat to CBD has published a useful action guide to facilitate implementation of this Programme of Work (see Dudley *et al.*, 2005).

The implementation of such a Programme of Work will be greatly facilitated by adopting the recommended cyclic and adaptive approach to biodiversity planning (as shown in **Figure 6**, p. 13).

4.3 What is the potential size of a Protected Areas System today?

An idea of the potential terrestrial size of a Protected Areas System may be derived by considering already gazetted areas of the Permanent Forest Reserve (PFR) and existing Protected Areas (PAs) in **Table 2**. The Table shows that PAs constitute 5.9% of Malaysia (not considering PAs double-gazetted with the PFR). Of the PFR 10.6% has been gazetted in various Functional Classes offering a high degree of protection to the habitat they contain.

At the cost of increased inter-agency collaboration[34] (for Peninsular Malaysia mainly within line agencies of NRE) the Protected Areas System could be increased almost three-fold to an estimated 16.5% of Malaysia – a truly impressive figure in the international arena which would not require any new areas to be gazetted.

Table 2. Present and potential extent of a Protected Areas System (in millions of ha; based on data from 2002; NRE 2006).

	Protected Areas (PAs)				Permanent Forest Reserve (PFR)				
Region	National / State Parks	Wildlife & Bird Santuaries	Total	% of region	Protection	Production	Total	% of region	% of land
Peninsular Malaysia	0.54 +	0.12 ++	0.66	5.0	1.90	2.80	4.70	35.7	40.7
Sabah	0.25	0.03 +++	0.28	3.8	0.59	3.00	3.59	48.7	52.5
Sarawak	0.70 *	0.30 **	1.00	8.1	1.00	5.16	6.16	50.1	58.2
Total	1.49	0.45	1.94	5.9	3.49	10.96	14.45	44.0	49.9
% of total land area	4.5	1.4	**5.9**		10.6	33.4	44.0		100.0
Potential PA System %			**5.9**		**10.6**				**16.5**

Notes:

\+ An additional 0.04 million ha is double-gazetted as PFR of Peninsular Malaysia

++ An additional 0.19 million ha is double-gazetted as PFR of Peninsular Malaysia

+++ An additional 0.13 million ha is located within the PFR of Sabah

* Includes 0.57 million ha of proposed National Parks

** Includes 0.14 million ha of proposed Wildlife Sanctuaries

Text Box 6. Systematic conservation planning (see further in Davey, 1998).

Systematic conservation planning recognises that there are constraints to the amount of land that can be set aside for biodiversity conservation. A common goal is to meet quantitative conservation objectives such as conserving a minimum of 10% of key habitats/ecosystem in the 'Protected Areas Management Categories' I, II, III and IV and 50% of the most important areas for plant diversity assured through effective conservation measures (including PAs) Note 1.

Conservation objectives (also referred to as *Targets*) are operational definitions of a decision to reach a certain level of conservation for particular biodiversity features. Such objectives provide a clear purpose for conservation planning and improve the accountability and defensibility of the process.

Systematic conservation planning involves finding the best set of potential Protected Areas (PAs) to satisfy a number of principles. Some of these characteristics are explained below (see references for a full listing):

Representativeness, Comprehensiveness & Balance This means the system should include: the highest quality examples of the full range of environment types within a country; and incorporate as well the extent to which Protected Areas provide a balanced sampling of the environment types they purport to represent. This applies particularly to the biodiversity of a country (i.e. genetics, species and habitats/ecosystems) but should also apply to features such as landform types and cultural landscapes. Often existing PAs do not sample biodiversity in any systematic way, having been created in an *ad hoc*, opportunistic fashion. The importance of these concepts is evident in Malaysia's policies and plans which state that: Protected Areas should be expanded to include all habitats and ecosystems and critical habitats should be protected (see Annex 1).

Adequacy refers to the integrity, sufficiency of spatial extent and arrangement of contributing PAs and other elements such as corridors. It also includes effective management to support viability of the environmental processes and/or species, populations and communities which make up the biodiversity of a country. A wide range of issues will have to be considered when selecting a design for a national Protected Areas System (or deciding how to make an existing System more efficient) including: habitat/area requirements of threatened or other species and their minimum population sizes; ensure connectivity between remnant vegetation patches and minimize further fragmentation and isolation of fragments; the size and shape of areas (i.e. PAs should be large with low edge-to-area ratios); natural system linkages and boundaries such as river basins and ocean currents; threats; traditional use; and cost of achieving PA status. Many of these aspects are referred to in various policies and plans in Annex 1.

Coherence and complementarity Each site should add value to the PA System both in terms of quality and quantity. There is little point in increasing the extent or number of PAs unless this brings benefits at least in proportion to the costs.

Consistency This characteristic focuses on the links between objectives and actions inherent in the 'Protected Areas Management Categories' referred to above. These Categories promote a scheme of PA types based on management objectives and the kind of management which should flow consistently from those objectives.

Cost effectiveness, efficiency and equity Deals with achieving an appropriate balance between the costs and benefits, and appropriate equity in their distribution. It also includes efficiency in terms of the minimum number and area of PAs needed to achieve System objectives. The establishment and management of PAs is done with the purpose of realising certain benefits to society – including their contributions to ensure a continuous flow of ecosystem products and services. On the other hand, society must be ensured that the PAs are effective, represent value for money and are managed in a way which is equitable in terms of their impacts on communities.

While these characteristics define the System overall, they also serve as criteria against which individual areas can be assessed for their potential and actual contribution to the System relative to other areas. In applying these criteria and selecting System components, consideration should be given to questions of irreplaceability and flexibility. In this context a gap analysis exercise may be carried out - see Dudley & Parish (2006) for an excellent guide on how to create ecologically representative Protected Areas Systems.

With respect to establishing a comprehensive Protected Areas System the immediate challenge facing Malaysia today will be to incorporate sites set aside by various entities from Federal to State and Local levels into a PA System governed by recognised common principles, standards and procedures as highlighted in this Chapter. Simultaneously efforts should go into acting on existing gaps in coverage already identified in several policies and plans (e.g. wetlands and lowland dipterocarp). This approach would be in full agreement with provisions contained in national policies which – among other things – call for integrated and holistic actions which are environmentally sustainable (Annex 1).

Note 1: Among others, Malaysia's draft *National Strategy for Plant Conservation* (NSPC) has the following *Targets*:
Target 5: At least 10% of each of the nation's ecological habitats effectively conserved (which is also a '2010 Target')
Target 6: 50% of the most important areas for plant diversity should be assured through effective conservation measures
Target 7: At least 30% of production lands managed consistent with the conservation of plant diversity
Target 8: 60% of the nation's threatened species conserved *in situ*.

In addition to the non-production classes of the PFR, a considerable extent has been gazetted as *watersheds* to ensure the continuous supply of potable water. These, as well as other state and local areas, which are not automatically Protected Areas, may become such if the necessary effort is put into it.

In particular, this requires the application of common principles and standards (see also **Text Box 6** on the opposite page) but would be an optimum and efficient way to provide a holistic platform for biodiversity planning and management, which can extend beyond the Protected Areas to the landscape as a whole, aiming to ensure a constant supply of ecosystem services. Moreover, such an approach would be in full agreement with statements and provisions contained in national policies and plans, though measures would still have to be taken to include presently under-represented ecosystems and habitat types in the PA System. Prominent among these are lowland dipterocarp forest and wetlands (Annex 1).

With respect to habitat types found below the 300-metre contour, it should be recalled that this is where about half (52%) the mammals in Peninsular Malaysia have to find suitable habitat in order to survive. As we will see in the next Chapter, this is also where most of the fragmentation and isolation of remnant vegetation has taken place.[16]

Obviously, for a Protected Area to contribute to a PA System, terms and definitions must not only be unambiguous but the constituent parts must be known in terms of their precise location, extent and what they represent (**Text Box 6**). Importantly, contributing areas must comply with the fundamental criteria of a *secured permanence of the site* in the sense that their gazettement must be inviolable. Only in this way will it be possible to assess the status of biodiversity in the present, and prioritise, plan and implement suitable actions to optimise ecosystem products and services for the future.

Kelong [2]

4.4 Building a Protected Areas System and the *ecosystem approach*

Conserving biodiversity exclusively by setting aside Protected Areas is, as highlighted above, insufficient and a Protected Areas System is most successful if it is designed and managed within the context of an '*ecosystem approach*', with due regard to the importance of corridors and interconnectivity of PAs and to external threats such as pollution, climate change, and invasive species.

The *ecosystem approach* seeks to mainstream biodiversity conservation into broader land and seascapes (see further in the next Chapter). Thus, protection takes place alongside, and hopefully in harmony with sustainable management of other land use systems and often also restoration necessary to rebuild a resilient landscape.

A conceptual presentation of a landscape approach to conserving biodiversity is shown in **Figure 8** which incorporates riparian and other corridors to maintain connectivity between habitat fragments and to sustain the integrity of aquatic systems. It can also be seen that the Protected Areas Management Categories (PAMC) is a tool for implementation of an *ecosystem approach*. However, the PAs need to be accompanied by sustainable management actions over the wider environment to ensure that ecosystem functions are not disrupted. In **Figure 8** sites under different management jurisdiction contribute to the overall PA System (e.g. gazetted water catchment, and non-production areas of the PFR).

The next Chapter has further details on the application of an ecosystem/landscape approach.

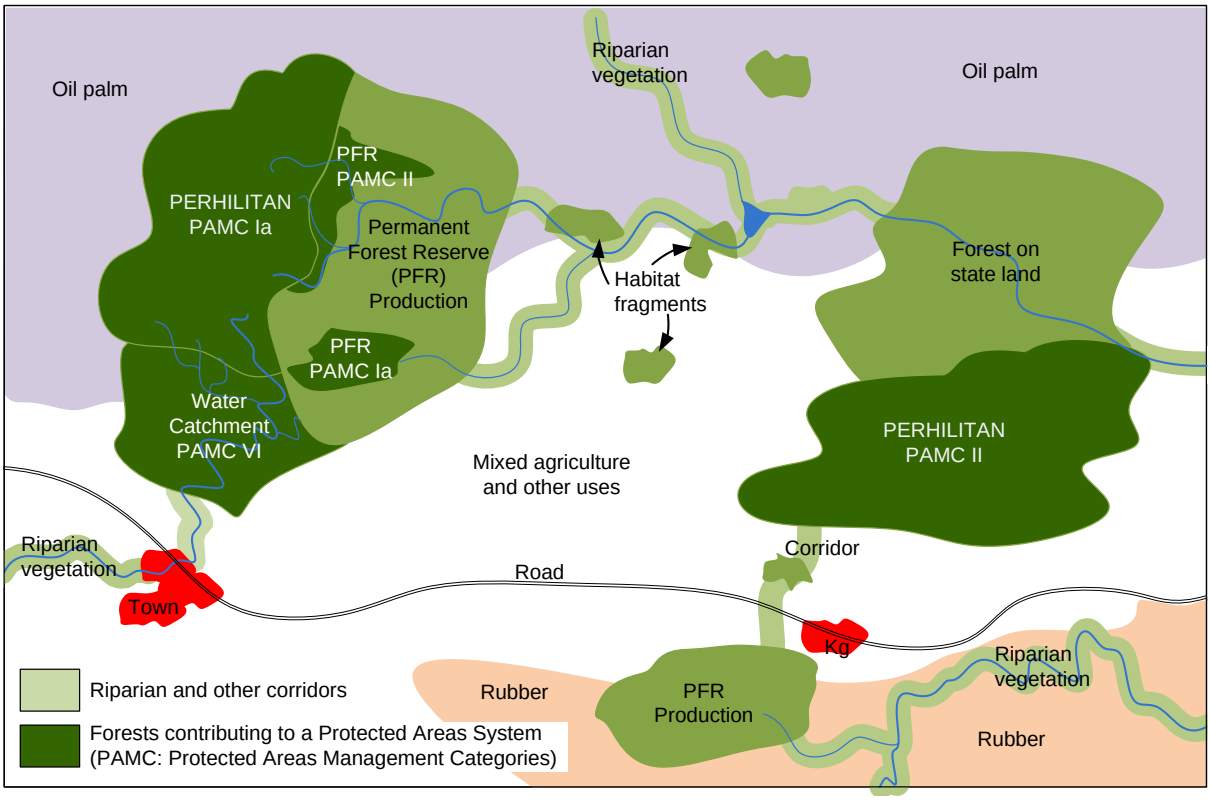


Figure 8. A landscape approach to biodiversity protection which considers areas set aside for permanent long-term protection by various agencies under a common Protected Areas System based on Protected Areas Management Categories.

5 LAND/SEASCAPE MANAGEMENT FOR BIODIVERSITY

Comprehensive long-term plans for conservation of biodiversity must include both a Protected Areas System and land/seascape-based strategies. The management of the land/seascape will influence the size and viability of populations of many (forest) species and thus biodiversity itself. The conditions of the land/seascape greatly influence 'connectivity' between habitat fragments and the movement of organisms. In addition, the landscape conditions may act as buffers improving the combined effectiveness of Protected Areas and the Permanent Forest Reserve (i.e. for terrestrial and freshwater systems).

Finally, the landscape must sustain functionally viable populations of organisms that are fundamental to the maintenance of essential ecosystem services such as nutrient cycling, seed dispersal, and plant pollination – processes that underpin the long-term productivity of ecosystems and their ability to produce goods and services that ultimately affect human well-being (as shown in Figure 1, p. 3).

5.1 Patch-corridor-matrix

Landscapes are composed of elements – the spatial components that make up the landscape. A convenient and popular model for conceptualising and representing these elements is known as the '*patch-corridor-matrix model*' (see Glossary). Under this model, the three major landscape elements are typically recognised, and the extent and configuration of these elements defines the pattern of a given the landscape (**Figure 9**).

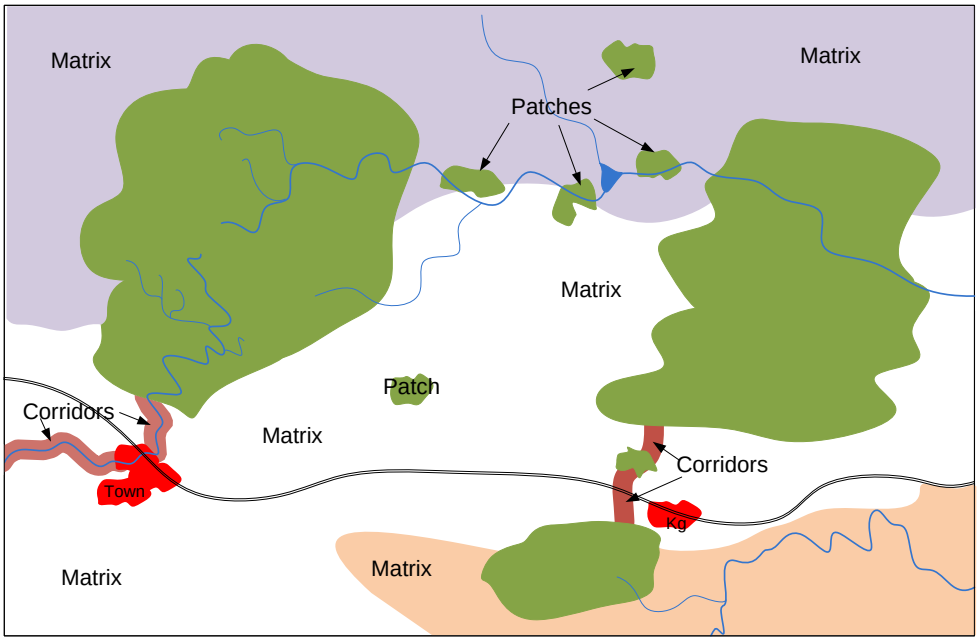


Figure 9. *Patch-corridor-matrix* model applied to a landscape with three larger areas of forest (green). The matrix includes oil palm and rubber plantations (upper part and lower right, respectively) and other land use systems such as grassland, mixed horticulture and orchards (shown in white).

In operational conservation planning the *matrix* comprises landscape areas that are not designated primarily for conservation of natural ecosystems, ecological processes, and biodiversity regardless of their current condition as natural, modified or created by man.

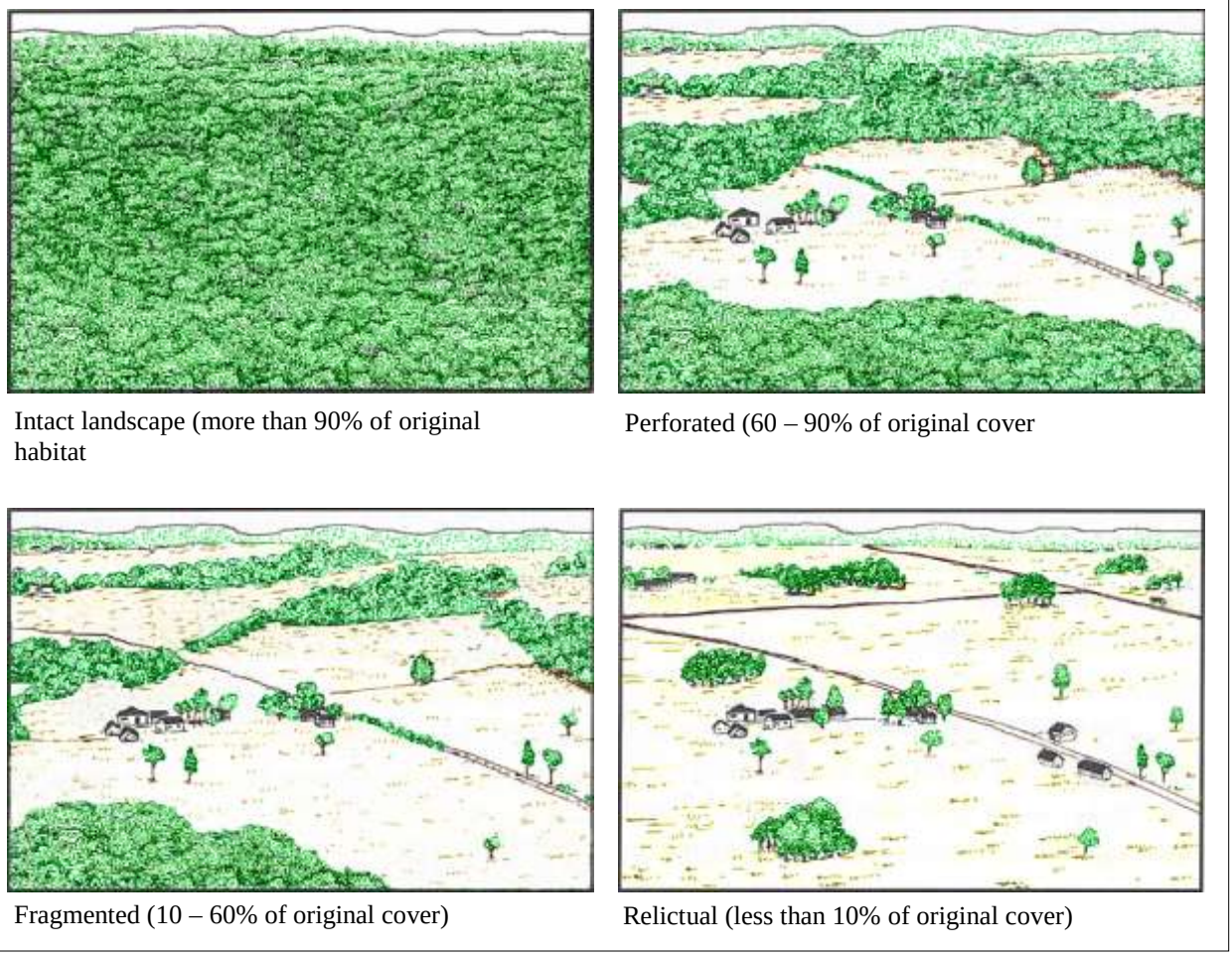


Figure 10. The process of fragmentation (redrawn from Hunter, 1996).

5.2 Understanding the effects of habitat loss and fragmentation

The greatest threat to biodiversity is loss of habitat which refers to extreme changes that make them unable to support more than a fraction of their original processes and species. This happens with land use change, physical modification of rivers and/or indiscriminate withdrawal of their water, loss of coral reefs, and damage to sea floors due to trawling. It is also caused by climate change, invasive alien species, overexploitation of species, and pollution.

Habitat loss and fragmentation have affected biodiversity in terrestrial, freshwater and marine systems. Nearly 60% of the Earth's ecosystem services are degraded or used unsustainably and actions to increase one ecosystem service often cause the degradation of other services (MA, 2005).

At landscape level the loss of habitat is often gradual with a fragmentation process which disrupts extensive habitats into increasingly isolated patches of remnant vegetation (**Figure 10**).

The landscape matrix that surrounds habitat fragments may be hospitable to some native species, or at least can be used to allow movement among fragments. However, other species require core habitat for their survival and are incapable of traversing the intervening man-made landscape of urban areas, industrial parks, highways, agricultural crops, and so forth. Under such conditions isolation typically causes inbreeding and – eventually – local extinction. Without the interconnectedness that natural habitat provides there will be no re-colonization.

A good example of the so-called "living dead" is the Dusky Leaf Monkeys found in Sungai Bukit Puteh Wildlife Reserve where the very headquarter of PERHILITAN is located.[35]

In recent decades, many studies worldwide have tried to illuminate the mechanisms underlying the loss of native biodiversity associated with fragmentation, predict which species are most sensitive to fragmentation, and suggest measures to reduce or mitigate the effects of fragmentation. Such studies have documented local extinctions, shifts in composition and abundance patterns to favour weedy species, and other forms of biotic impoverishment in fragmented landscapes. However, the complex nature of fragmentation makes it difficult to produce empirical generalisations that apply across ecosystems and scales (Noss *et al*., 2006), though it is clear that fragmentation causes general loss of biodiversity.

Despite these complications we *are* beginning to understand how fragmentation reduces native biodiversity and what sorts of policy and management actions are prudent to apply. The remainder of this Chapter provides an overview of what it takes.

5.3 Landscape matrix management

Biodiversity is important in managed as well as natural ecosystems and there are five critical roles for the landscape matrix that relate specifically to biodiversity conservation:

1. Supporting populations of species
2. Regulating the movement of species
3. Buffering sensitive areas and parts of the Protected Areas System
4. Maintaining the integrity of the aquatic system
5. Supporting ecosystem services

These five roles of the matrix are interrelated. Managing the matrix to buffer sensitive areas such as riparian zones, promotes the conservation of aquatic systems, contributes to improved connectivity for wildlife and increases the ability of the matrix to support populations of species (Lindenmayer & Franklin, 2002).

The extent to which planners and decision-makers are aware of these roles will determine the degree to which the matrix contributes positively or negatively to these functions (e.g. in **Figure 9** the lack of connectivity between the two large habitat fragments will prevent many species from crossing the intervening matrix – also compare this with the situation shown in **Figure 8**).

Supporting populations of species

The matrix can be managed to support broadly distributed populations of many species able to thrive or at least partly incorporate the matrix into their range. Such populations may to a significant degree supplement populations in the combined Protected Areas System and Permanent Forest Reserve (PA-PFR) and thus ensure their survival. Species which survive in the matrix are also the ones most likely to be found in remnant patches and they may play a crucial role in reversing localised extinctions within the PA-PFR.

Regulating the movement of species

Facilitating 'connectivity' and movement of species in the matrix may prevent populations of species in the PA-PFR from becoming isolated and fragmented. It may also allow populations to maintain or increase their demographic and genetic size, thereby enhancing chances of long-term persistence. Thus, connectivity is important because of the role of movement in shaping distribution and abundance patterns and it underpins processes such as local extinction and recolonization dynamics and influences patterns of gene flow. For plants, connectivity allows not only movement of species and populations, but also movement of spores, pollen and seeds. For animals connectivity is controlled by conditions such as appropriate vegetation cover or key structures (e.g. logs and dead trees).

A matrix that provides a high degree of connectivity is critical since habitat loss, fragmentation of remnant vegetation and increased isolation of patches are major reasons for the ongoing depletion of biodiversity.

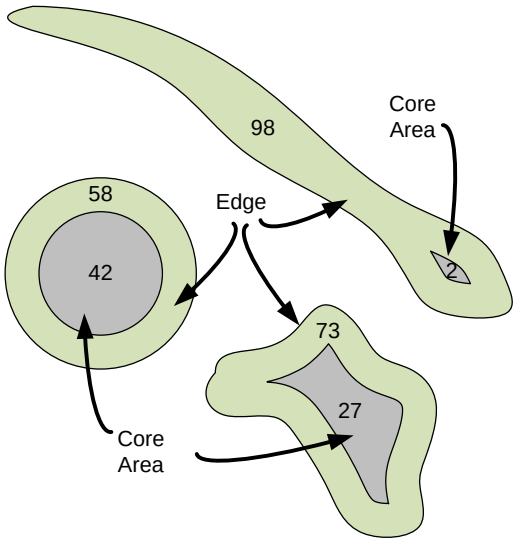


Figure 11. The importance of shape with respect to interior and edge-affected habitat (all three patches have the same area).

Buffering sensitive areas and parts of the Protected Areas System

The shape of patches significantly influences the amount of core area on which many species depend (**Figure 11**).

Examination of recent land use maps reveals that much habitat is indeed in small to medium size patches (Annex 3) and managing the matrix-to-buffer edges can substantially increase their effective area within the matrix.

The intensity of the edge interactions between a patch and the surrounding matrix is typically directly related to their level of structural contrast. Most natural edges are curvilinear, complex and soft, whereas we humans tend to make straight, simple and hard edges (**Figure 12**).

Matrix management strategies that reduce the contrast in structural and biophysical conditions between neighbouring areas can therefore significantly reduce the intensity and depth of the edge effects.

In the development of comprehensive strategies for biodiversity conservation, identification and protection of sensitive ecologically important habitats within the matrix are essential. Some of these habitats are widely distributed, such as streams and their associated riparian vegetation; and lakes and wetlands with associated littoral zones. Others such as limestone hills, rock outcrops and caves may be important for species found nowhere else (i.e. 'endemics').

Such habitats may not be adequately represented in a PA System but may constitute important small and medium sized reserves and PAs embedded within the matrix. Proper matrix management may significantly increase their contributions to overall biodiversity conservation.

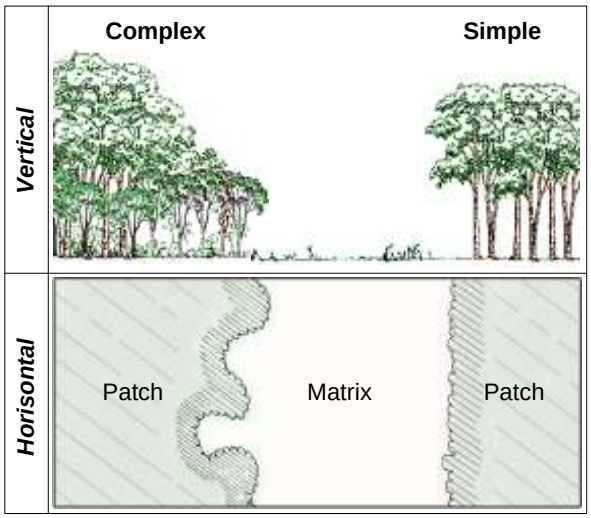


Figure 12. Low contrast edges (to the left) with high structural diversity are richer in species than high contrast borders (to the right). The matrix corresponds to urban areas, mixed agriculture and estates of oil palm and rubber.

Maintaining the integrity of the aquatic system

Aquatic features of landscapes such as streams, rivers, wetlands and lakes are critically important to biodiversity conservation and ecosystem processes.

A very large proportion of biodiversity is associated with aquatic ecosystems. However, the status of aquatic systems is significantly influenced by neighbouring land use practices.

Even so, the habitat and functional relationship between spatially adjacent terrestrial and aquatic habitats have rarely received sufficient consideration in forest management and landscape conservation planning.

Adjacent terrestrial habitats such as riparian and littoral zones should be viewed as integral components of aquatic ecosystems because of the extensive functional relationship between adjacent terrestrial and aquatic communities of species.

Maintaining and/or restoring the integrity of aquatic systems should also receive high priority

for its bearing on coastal and marine diversity. Riparian vegetation not only provides animals with movement corridors, it also stops surface run-off from heavy rainfall events, preventing sediments and waterborne pollution from reaching the rivers. Sediments and pollution are detrimental to freshwater biodiversity and have serious negative impacts on the status of marine resources (e.g. sediments shade corals and prevent them from re-establishing themselves, resulting in severely impoverished coral reef diversity, which also has an influence on offshore catch).

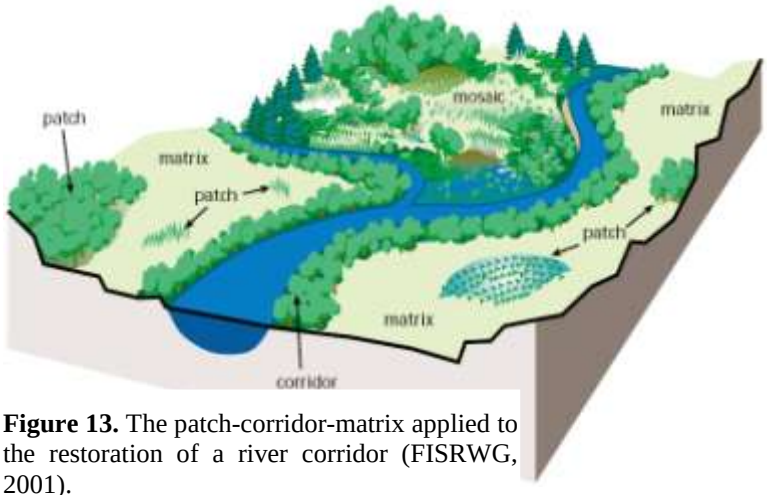


Figure 13. The patch-corridor-matrix applied to the restoration of a river corridor (FISRWG, 2001).

Support ecosystem services

The environment returns an estimated US$ 33 trillion a year in ecosystem products and services to human societies all over the planet (as discussed in Section 2.7, p. 9). In Malaysia, management practices and conditions in the Protected Areas, the Permanent Forest Reserve and the landscape matrix surrounding them determine the quality, quantity and sustainability of ecosystem services obtained.

A great variety of goods and services are derived from forest habitat. Production of wood fibre is a major income generator and in 2004 Malaysia's export earnings for timber and timber-based products was RM 19.8 billion (US$ 5.2 billion)[36]. Additional services from forests include the regulation of stream flow, soil protection, nutrient retention and cycling, and alleviation of the impact of tsunamis. Forests are also a major carbon sink which is an important ecosystem service that counters climate change.

However, many elements of biodiversity need to be conserved within the landscape matrix to sustain long-term production of wood, potable water and other ecosystem products and services.

Losses of elements of forest biodiversity may impair essential ecosystem functions. Examples include organisms that play key roles in the decomposition of organic matter, pollination, seed dispersal, biological pest control, and the formation of associations between fungi and plants[37]. Changes in biodiversity will also influence the long-term floristic composition and stand structure of forest habitat, which will have negative ramifications for the sustained production of commodities.

Landscape matrix management is important for conserving ecosystem processes by emphasising the importance of biodiversity in the matrix as well as conservation of genes, species, and populations for their own sake. The outcome is a substantial contribution to rebuilding and maintaining the resilience of landscapes which benefits terrestrial, freshwater and marine systems.

Many of the components of biodiversity that play an important role in ecosystem processes are inconspicuous invertebrates (i.e. *bugs*) which have received little attention in conservation programmes. These organisms play pivotal roles in such processes as nutrient cycling, pollination and production of clean fresh water.

Beyond species diversity, genetic diversity within populations is also important because it allows continued adaptation to changing conditions through evolution, and ultimately, for the continued provision of ecosystem goods and services. Likewise, diversity among and between habitats, and at the landscape level, is also important in multiple ways for allowing adaptive processes to occur.

High levels of diversity of ecosystems, species and genetics provide higher adaptability to changing conditions, caused for instance by climate change. As far as land/seascapes are concerned, the more diverse we keep them the more resilient they become.

Text Box 7. Many conservation issues are different for the marine system (Norse & Crowder, 2005).

Substantial differences between terrestrial and marine ecosystems, species, and, most important, the ways in which humans think about and deal with them, have important implications for strategies to protect, recover, and sustainably use marine biodiversity. The following is only a very small sample of some of the important differences (see the source for an exhaustive treatment).

Size matters

The marine realm is much larger than the terrestrial system and covers two-thirds of the planet with average depths of 3,700 metres. Most life on land and in freshwater systems thrives in a thin stratum that averages some 20 metres in thickness. Hence, the sea comprises more than 99% of the known biosphere. Many marine animals deal with the very large scale of marine systems by having one or other life history stages capable of actively or passively moving over large distances (see Figure 16, p. 31).

Conservation implication: Marine jurisdictions are small relative to the ambits of many marine species and human activities. To a greater degree than on land, key ecological processes go well beyond territorial range of authority or control both within and beyond individual nations. The mismatch of scale leads to numerous problems, including the ability of many countries to exploit marine populations while few nations exercise effective responsibility for them.

Seawater is less transparent than air

Except in ecosystems surrounding hydrothermal vents and cold seeps, essentially all production in the sea depends on sunlight used by near-shore plants, 'benthic' algae, and on a worldwide basis to a far greater degree on 'epipelagic' phytoplankton (i.e. minute, free-floating aquatic plants).

Conservation implications: It is much more difficult and expensive to do remote observation of species and ecosystems in the depths of the sea than on land. Anything that affects primary producers and higher 'trophic' levels in the shallows affects nearly all biological activity below them.

The sea is more three-dimensional

Multi-cellular marine life occurs from the sea surface to the maximum ocean depth of about 11,000 metres. Moreover, the water column is almost always stratified into distinct density layers determined by temperature and salinity, so the sea has far more three-dimensional structure than the land. Because of its greater stratification, biological communities and biogeographic patterns have greater differences at different depths. Less than 2% of the ocean's average depth is accessible to scientists using scuba, research submarines and remotely operated vehicles (the last options clearly prohibitively expensive). Indeed, it is much easier to exploit the sea's biodiversity than to study it (e.g. by trawling).

Conservation implications: Scientists, the public and decision-makers know much less about biodiversity patterns and threats in the sea. Since the precautionary principle seldom drives planning and management the burden of proof has been put on the scientists to demonstrate that human activities may harm biodiversity. The 3D nature of the sea renders 2D mapping much less useful.

Marine species have longer potential dispersal distances

Many terrestrial species have local recruitment and can be conserved within Protected Areas (PAs). When individual PAs are not large enough to support viable populations, providing connectivity between PAs and proper landscape matrix management can help species and populations with larger area requirements. A majority of marine species whose reproductive modes are known produce early life history stages ('gametes', spores or larvae) that drift in the water column for anywhere from a few minutes to more than 12 months. The potential for long-distance dispersal suggests that marine 'metapopulation' dynamics – even with infrequent recruitment episodes – can operate at a much larger spatial scale than in terrestrial systems.

Conservation implications: Connectivity works differently in the sea. Corridors of suitable benthic habitat between Protected Areas are not needed for dispersal of planktonic larvae, although they may be valuable for species that migrate as post-settlement juveniles or adults. Single PAs will not always be large enough to conserve marine populations, except those with direct development or short-lived planktonic larvae. Recruitment from the plankton depends so much on variable currents that networks of PAs arrayed at a wide range of distances will best accommodate conservation needs of different species by allowing population sources to repopulate population sinks.

Primary producer and consumer biomass are much patchier in time

On land, the primary dominant producers don't move, are large and live years if not centuries (e.g. trees). In the sea, their counterparts are planktonic, microscopic and live days to months. Phytoplankton respond much faster than plants on land to favourable environmental changes so the distribution of the sea's producers is patchier. Many species of fishes, seabirds, sea turtles and marine mammals range hundreds to thousands of kilometres, crossing desert-like waters to locate food-rich patches.

Conservation implications: The dense but often short-lived concentrations of large, valuable species make locating and killing them very lucrative (e.g. a single blue-fin tuna may be worth tens of thousands of US dollars).

The sea is geochemically downhill from the land

Rainfall washes materials deposited on the land, including nutrients and toxic matter, into streams or storm drains and eventually into estuaries and coastal waters. Almost any substance manufactured on land finds its way into the sea.

Conservation implications: Marine conservation, especially in estuaries and coastal waters, is critically affected by human activities on land. Successful marine conservation necessitates modification of activities on land (e.g. riparian vegetation will stabilise riverbanks, reduce surface run off and limit waterborne pollution from reaching the river).

Important references for planning and management of marine PAs are listed in Table 4, p. 55.

Figure 14. Envisioning the future with local people (A: the landscape today; B and C: how local people in the wet tropics of North Queensland would like their landscape to appear (from Bohnet 2004).

Impaired ecosystem processes result in reduced production of goods and services in the matrix, which has substantial social and economic costs (as referred to in Section 2.7, p. 9). In many cases, local people living in such landscapes are fully aware of what it takes to rebuild a resilient landscape to provide a sustained flow of ecosystem services. **Figure 14** shows an agricultural landscape in the wet tropics of North Queensland dominated by sugar cane (Figure 14 A). Working with the local communities it became apparent that they preferred a diversified landscape either with continued sugarcane (Figure 14 B) or without sugarcane (Figure 14 C).

In both cases, the local communities opted for future heterogeneous landscapes with a higher level of protection of biodiversity and ecosystem processes, thus balancing environmental, social and economic needs (Bohnet, 2004).

5.4 The importance of context and scale

In land/seascape planning and management, it is absolutely essential to look well beyond the boundaries of a given study area of concern (e.g. a development site), since conditions in the matrix and biodiversity planning goals have a bearing on a given area. The inverse is true as well – what happens within a given planning area can have major ecological impacts well beyond the boundaries of a given site.

The following example will illustrate the implications. Imagine a 20 ha farm which includes fields, buildings, a stream and wetlands, as well as some forest. Like many maps and plans for site development it does not include any information about the context surrounding the farm (**Figure 15** A, overleaf).

In order to assess the conservation value of this *kebun*, its context will have to be considered carefully (**Figure 15** B to D). Notice that Map A corresponds to the square in the centre of each of the Maps B to D and the scale has changed by zooming out six times. This allows depicting three different scenarios where the surrounding landscape matrix has a decisive influence on the conservation value of the *kebun* shown in (A).

In the situation depicted in **(B)** the *kebun* is one of only few farms in what appears to be a forested landscape. Nevertheless, we now know that we have to treat the aquatic system very carefully and protect its integrity, which extends downstream where another wetland area is found. Management prescriptions for site management

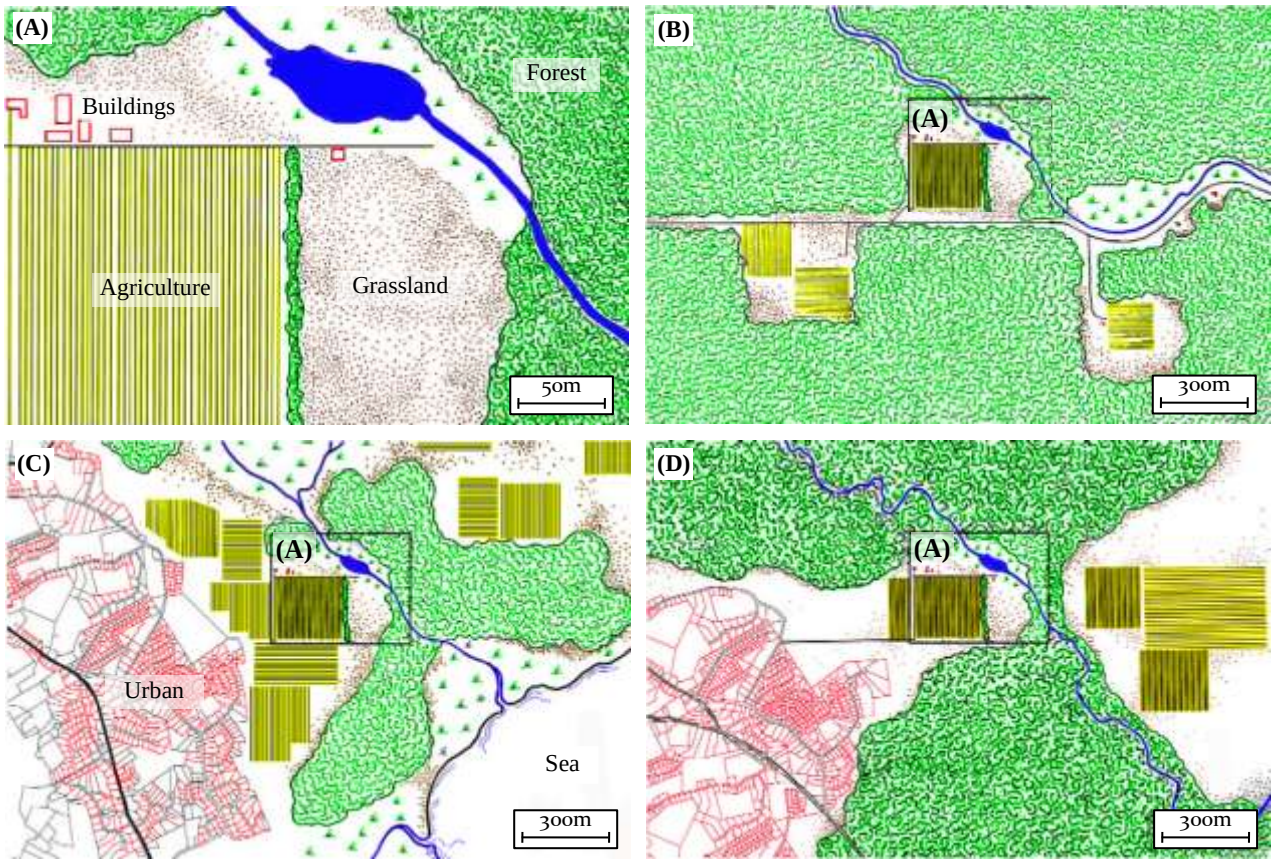


Figure 15. (A) shows a site map for a 20 ha farm (*kebun*) with agricultural land, buildings, wetland and some forest. (B) to (D) shows the same farm in different context to demonstrate that the conservation value of the farm depends entirely on where it is located with respect to other elements in the landscape (drawings from Perlman & Milder, 2005).

(development) should protect the riparian vegetation and ensure that waterborne pollutants do not reach the wetland and the river.

In the scenario shown in **(C)** the river and wetlands are particularly vulnerable as part of a complex that may provide water for urban areas. The forest in the North-western part of the *kebun* is part of a smaller fragment where the wetland vegetation provides connectivity to a larger fragment to the East. Clearing the forest in the Eastern part of the farm will threaten the integrity of the aquatic system and may cause the forest complex to become further fragmented into three patches. This again will likely have a negative impact on the littoral vegetation and the estuary. Sediments and waterborne pollutants in the river will be detrimental to any coral reefs in the coastal areas. Pollutants will also be harmful to mudflats, which are common in large estuaries and harbour a variety of organisms that feed on organic matter brought by the tides and the river runoff. The mudflats are important feeding habitats for numerous resident and migratory water birds.

In the situation shown in **(D)** the forest and wetland to the East in the *kebun* constitute the major part of connectivity between what appears to be two large forest fragments. For any authority concerned with planning and management of natural resource and biodiversity assets, it would be the highest priority to ensure that the corridor is not further severed by expanding agriculture and/or urban settlements. Indeed, reference to an even coarser scale of map showing how the whole area fits into a regional or national network for habitat connectivity would be required to fully assess the conservation value of the corridor in the *kebun*. What has already been stated with respect to maintaining the integrity of the aquatic system also applies to this case.

Hopefully these examples will help to illustrate that our actions on a given site in the landscape affect a number of processes, all of which will have a bearing on the 'ecology' of a larger region. To plan and manage for biodiversity, we have to consider various geographic scales in our assessment, planning, implementation and

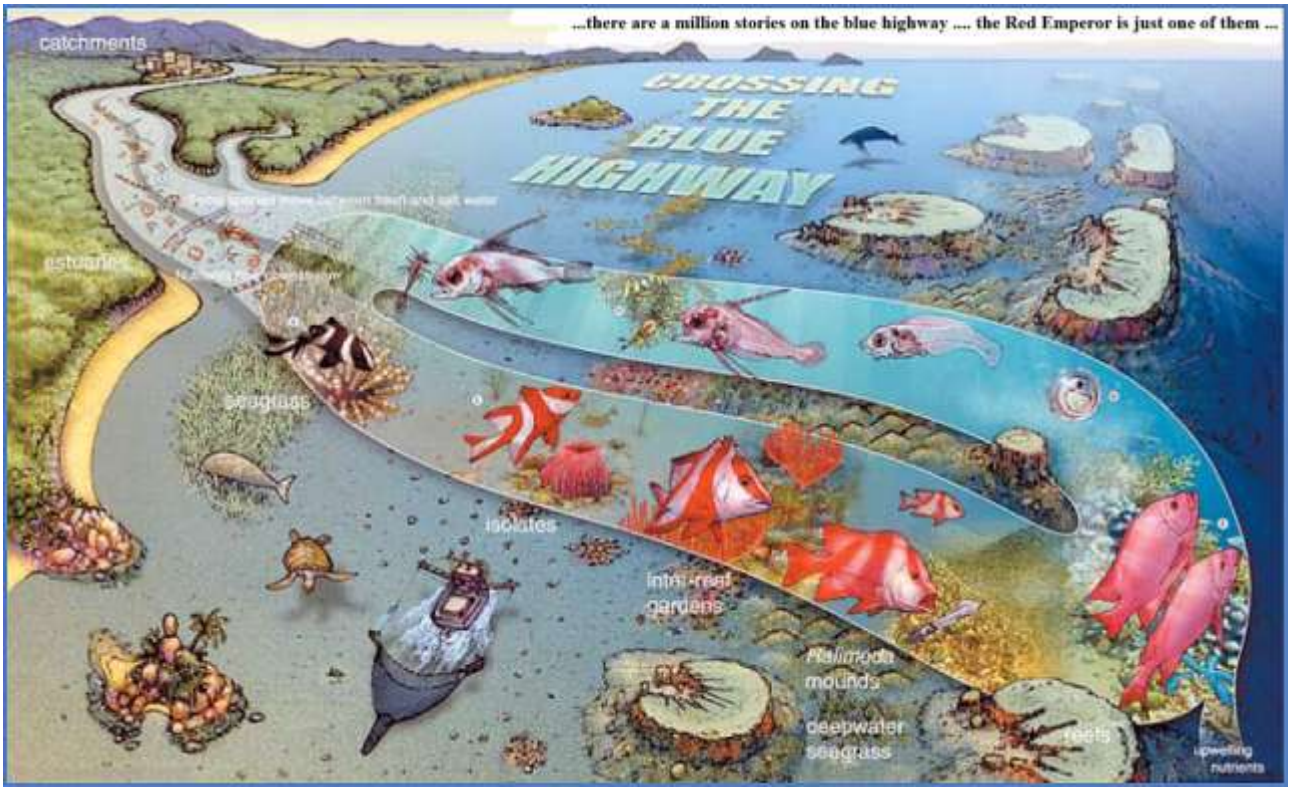


Figure 16. The Red Emperor (*Lutjanus sebae*), as much other marine life, depends on different habitats during stages in its life cycle. Adults spawn by coral reefs followed by a 'pelagic' migration towards shore and a return as juveniles from estuaries, mangroves, and sea-grass before emerging again as adults at the reef. Throughout their various stages many marine species are heavily influenced by human activities on land and at sea (drawing from Bennett 2004).

monitoring of activities which also point to the importance of engaging the key actors who operate at these various scales.

Though connectivity works differently in the sea, suitable habitats are essential for species that migrate as juveniles or adults, as exemplified by the Red Emperor in **Figure 16**.

The following Section refers to important stakeholders shaping the overall landscape.

5.5 The *ecosystem approach*

For biodiversity to survive in the landscape there is an increasing need for decision-making and policy actions across multiple geographic scales and multiple ecological dimensions. The very nature of the issue requires it: land use occurs in local places, with real-world social and economic benefits, while potentially causing ecological degradation across local, state, national and global scales (see further in Foley *et al.*, 2005).

Many of the policies and plans referred to above (and in Annex 1) establish requirement for holistic management of natural resources and biodiversity. An inherent challenge is how to promote complementary inter-agency actions to build and sustain resilient ecosystems.

The *ecosystem approach* has been conceived to meet this challenge and it is considered one of the most important principles of sustainable environmental management. There has been and is a significant ongoing experience in implementation of the *ecosystem approach* by Parties operating under the Convention on Biological Diversity. The *approach* is based on the application of appropriate scientific methodologies focused on levels of biological organisation, which encompass the essential structure, processes, functions and interactions among organisms and their environment. The Sixth Conference of the Parties to the Convention defined the *ecosystem approach* as "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way"[38]

The *ecosystem approach* incorporates three important considerations:

a. Management of living components is considered alongside economic and social issues at the ecosystem level of organisation (it is insufficient to simply focus on managing species and habitats)
b. If management of land, water, and living resources in equitable ways is to be sustainable, it must be integrated and work within the natural limits and utilise the natural functioning of ecosystems
c. Ecosystem management is a social process. There are many interested communities, which must be involved through the development of efficient and effective structures and processes for decision-making and management.

The *ecosystem approach* provides an important framework for assessing biodiversity and ecosystem services and evaluating and implementing potential responses (MA, 2005). It is also a suitable vehicle for the mainstreaming process (GEF, UNEP, CBD, 2007b).

A number of other established approaches, such as Sustainable Forest Management (i.e. as carried out by the Forestry Department), Integrated River Basin Management (DID), and Integrated Shoreline Management Plans (DID), are consistent with the ecosystem approach and support its application in various sectors and biomes.

Additionally, the ecosystem approach is well suited to take into account the trade-offs that exist in the management of ecosystems and incorporates the need for both coordination across sectors and management across scales.

The 12 principles on which the *ecosystem approach* is based are (see the Glossary for the rationale behind each of these):

1. The objectives of management of land, water and living resources are a matter of societal choice.
2. Management should be decentralized to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programmes should:
    a. Reduce those market distortions that adversely affect biological diversity;
    b. Align incentives to promote biodiversity conservation and sustainable use;
    c. Internalize costs and benefits in the given ecosystem to the extent feasible.
5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the *ecosystem approach*.
6. Ecosystems must be managed within the limits of their functioning.
7. The *ecosystem approach* should be undertaken at the appropriate spatial and temporal scales.
8. Recognizing the varying temporal scales and lag-effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognize that change is inevitable.
10. The *ecosystem approach* should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. The *ecosystem approach* should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. The *ecosystem approach* should involve all relevant sectors of society and scientific disciplines.

It would appear that the *approach* is based on the recognition that all elements of an ecosystem are linked and management needs to consider the effects of actions on every component of an ecosystem – including humans.

The Secretariat to CBD also offers operational guidance for applying the 12 principles:

i. Focus on the relationships and processes within ecosystem
ii. Enhance benefit-sharing
iii. Use adaptive management practices
iv. Carry out management actions at the scale appropriate for the issue being addressed, with decentralization to lowest level, as appropriate
v. Ensure cooperation and information sharing between sectors

The Glossary offers further details on each of these.

5.6 Inter-agency landscape management in support of biodiversity

A suitable – and probably more tangible – entry point to implementation of the *ecosystem approach* is to draw on lessons generated in conservation biology. As shown in Section 5.3 (*Landscape matrix management*) the availability of ecosystem services across the landscape may be enhanced by managing the landscape structure through strategic placement of managed and natural elements.

Management principles for achieving general biodiversity conservation at landscape level have been defined (Lindenmayer *et al*., 2006) as:

1. *Maintain connectivity*

   Connectivity is the linkage of habitats, communities and ecological processes at multiple scales. It influences key biodiversity processes such as population persistence and recovery after disturbance, the exchange of individuals and genes in a population, and the occupancy of habitat patches.

Table 3. Principles and management interventions for biodiversity conservation at landscape level with reference to key stakeholders (*Principles* and *interventions* from Lindenmayer *et al*., 2006).

How to build and maintain a resilient landscape			***Note 1***
Principles		**Management strategy/interventions**	**Key stakeholders**
1	Maintain connectivity	• Riparian and other corridors • Protection of sensitive habitats within the matrix • Vegetation retention on logged areas throughout the landscape • Careful planning of road infrastructure • Landscape reconstruction	FDs, PAs, DID, DOA, NLD, TCPD/TRP, JKR, State Authorities, large estates
2	Maintain integrity of aquatic systems	• Riparian and other corridors • Protection of sensitive habitats within the matrix • Mid-spatial-scale Protected Areas • Spatial planning of cutover sites • Increased rotation lengths • Landscape reconstruction • Careful planning of road infrastructure • Use of natural disturbance regimes as templates	Same as No. 1 plus Departments of: Marine Park Malaysia; Fisheries; and Environment
3	Maintain habitat structural complexity	• Retention of structures and organisms during regeneration harvest • Habitat creation (e.g. promotion of cavity-tree formation) • Stand management practices • Increased rotation lengths • Use of natural disturbance regimes as templates	All
4	Maintain landscape heterogeneity	• Riparian corridors • Protection of sensitive aquatic habitats • Careful planning and maintenance of road infrastructure • Midspatial scale Protected Areas within the matrix	All
5	Manage disturbances	• Ensuring that strategies are varied between different stands and landscapes (‘do not do the same thing everywhere’)	All

Note 1: FDs correspond to Forestry Departments Peninsular Malaysia, Sabah and Sarawak; PAs: PERHILITAN, Sabah Parks, Sabah Wildlife Department, Sarawak National Parks & Wildlife Division; TCPD refers to Town & Country Planning Departments in Peninsular Malaysia and Sarawak; and TRP to Town & Regional Planning Sabah. In addition to the agencies listed here, research institutions such as FRIM and various universities can contribute tremendously in making operational the management principles for terrestrial, freshwater and marine systems.

2. *Maintain integrity of aquatic systems*

   Aquatic features of forest landscapes (streams, rivers, wetlands, lakes and ponds) are critically important to biodiversity and ecosystem function (**Figure 17**). A very large proportion of terrestrial biodiversity is associated with aquatic ecosystems. The integrity of the freshwater systems has a direct bearing on the status of marine biodiversity.[39]

3. *Maintain habitat stand structural complexity*

   Attributes include: (1) unevenly aged stand; (2) large specimens and snags; (3) large logs on forest floor; (4) vertical heterogeneity (multi-layered canopy); (5) horizontal heterogeneity (e.g. gaps).

4. *Maintain landscape heterogeneity*

   Ecosystems are naturally heterogeneous (i.e. landscape gradients include topography, climate, soil type, etc.). Different species inhabit different environmental conditions in landscapes and the diversity, size, and spatial arrangement of habitat patches is important for many taxa.

5. *Manage disturbances*

   Biodiversity conservation is (likely) most successful where management interventions are similar in their effects to natural disturbances.

For each of these principles suitable management interventions have been defined and considered with respect to compliance with provisions established in Malaysia's Policies and Plans; and key stakeholders required for their successful implementation (**Table 3** previous page).

From **Table** 3 it should be clear that successful management of biodiversity at the landscape level requires multiple stakeholders to conduct diverse management interventions. However, it is encouraging that many parties share the same objectives and are already pursuing these.

For instance, the National Landscape Department promotes riparian vegetation for reasons of beautification, and these may fulfil three of the five management principles shown in **Table 3**; JKR is now considering habitat linkages such as under-passes for wildlife in their design of new road infrastructure (in collaboration with PERHILITAN several under-passes have been built as part of new road infrastructure in Terengganu). In April 2007 FRIM embarked on a UNDP-GEF-ITTO Conservation of Biodiversity Project which, among other things, will consider how setting aside un-logged areas within production forests will assist biodiversity (see Principle 3 in **Table 3**).

To some extent the challenge is to promote a cohesive and concerted approach in order to achieve a greater impact and reduce the risk of counter-productive measures.

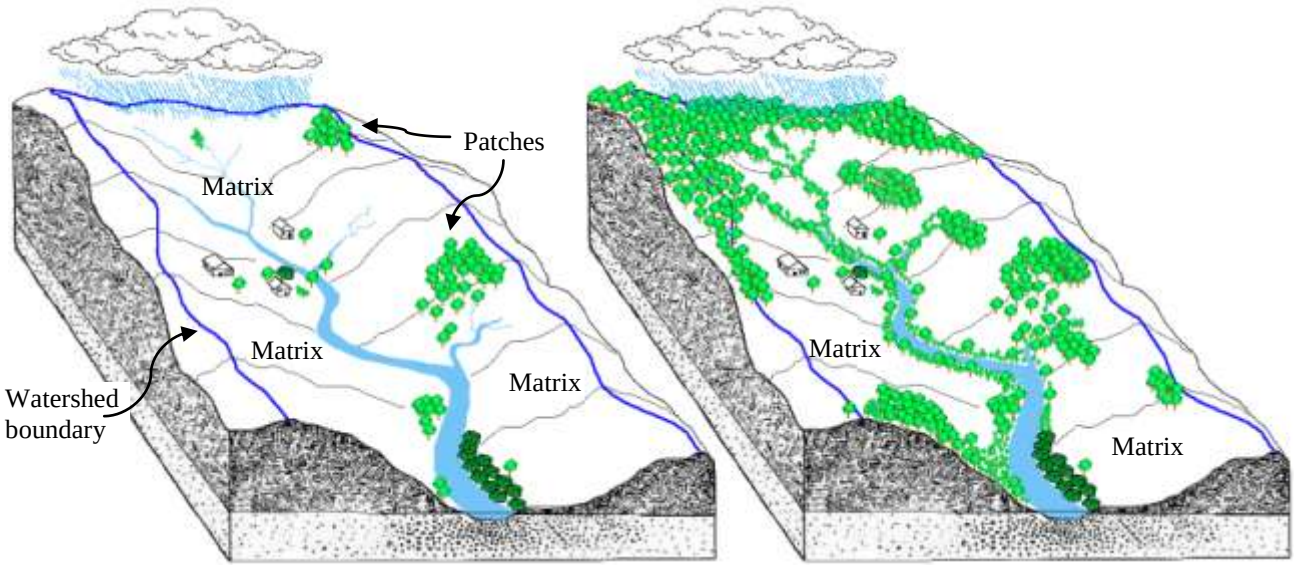


Figure 17. A watershed before and after applying both the DID's Integrated River Basin Management and the ecosystem/landscape approach. The *matrix* (white area) comprises oil palm, rubber plantations and other land use systems such as grassland, mixed horticulture and orchards. In the drawing to the right, permanent vegetation protects shallower soils on steep slopes in the upper part of the watershed (i.e. where erosion risk is highest). Riparian vegetation is also in place to protect and stablise the river banks, stop surface run off and reduce waterborne pollutants from reaching the river. The riparian vegetation also functions as corridors providing connectivity between habitat fragments.

5.7 How to get started?

To be meaningful, the *ecosystem approach* should be fully taken into account in developing and reviewing national biodiversity strategies and action plans (as shown in Figure 6, p. 13).

However, there is also a need to integrate the *ecosystem approach* into agriculture, fisheries, forestry and other production systems that have an effect on biodiversity. For management of biodiversity at land/seascape level the principles shown in **Table 3** apply for terrestrial, freshwater and – to a large extent – also marine systems. The specific management interventions shown in the Table are relevant for terrestrial and freshwater systems in particular, though some apply to marine systems as well (e.g. protecting sensitive habitats such as estuaries, inter-tidal mudflats and sea-grass meadows is relevant for three of the five principles; and creating mid-spatial scale Marine Parks of these sensitive habitats will contribute to maintain the integrity of marine systems).

Management of natural resources, according to the *ecosystem approach*, calls for increased communication and cooperation between several sectors at a range of levels (i.e. federal, state and local), involving also civil society. This might be promoted by forming inter-ministerial bodies within the Government and creating networks to share information and experiences.

It is suggested here to embark on ecosystem management by focusing on the more tangible management interventions for biodiversity conservation at landscape level presented above (Table 3) while promoting and applying the 5-point operational guidance to the ecosystem approach (Section 5.5).

Orang asli village [2]

6 WHAT IS MAINSTREAMING AND WHY IS IT IMPORTANT?

The process of making operational national priorities for natural resources and biodiversity assets is accompanied by mainstreaming biodiversity into the preparation and review of Policies, Plans and Programmes (PPPs).

Ecosystem services represent notable values for Malaysia and a policy, plan or programme may result in changes in these values. This calls strengthened mainstreaming of biodiversity into PPPs to ensure that national priorities for sustainable development are adhered to.

In the short term, the aim is to strengthen NRE's role as a facilitation and consultation body for mainstreaming biodiversity. In the medium to long term NRE may also deploy mainstreaming tools to its own PPPs.

This Chapter provides an overview of mainstreaming and its importance for achieving the goals of the main Policies and Plans briefly referred to in Annex 1. It refers to some of the tools and procedures that can be used to achieve mainstreaming of biodiversity concerns into Policy, Plans and Programmes (PPPs).

6.1 What is mainstreaming?

The previous Chapter 2 above outlined that biodiversity is important because it supports the functioning of ecosystems and the provision of essential ecosystem services. Not only does human well-being depend on this *web of life* but all human activity, including the global economy, is made possible due to the diversity of ecosystem services that nature provides.

In other words, economic performance of various production sectors, and the people depending on those sectors for their livelihoods, is intricately linked to the conservation and sustainable use of biodiversity.

The word "mainstreaming" can be used as a synonym of "inclusion". Mainstreaming means integrating or incorporating actions related to conservation and sustainable use of biodiversity into strategies relating to production sectors, such as agriculture, fisheries, forestry, tourism and mining. Mainstreaming may also refer to including biodiversity considerations in poverty reduction plans and national sustainable development plans. By mainstreaming biodiversity into PPPs, we recognize the crucial role that biodiversity plays in human well-being.

Thus, mainstreaming is about ensuring that the importance of biodiversity is fully realised by the government and that the development process flows in accordance with existing goals and objectives expressed in policies and plans.

The activities of all economic sectors impact biodiversity in some way and at some level – some may be far-reaching in both time and space. Biodiversity conservation is in the process of emerging from a sector-based approach to planning and management of environmental aspects, which does not on its own guarantee a holistic framework considering off-site or long-term implication of today's actions.

As referred to in the Chapters 2 and 5 above,

managing biodiversity requires multiple stakeholders to conduct diverse management interventions. Mainstreaming is about mobilising the necessary concerted actions according to stated priorities in Policies, Plans and Programmes.

Through mainstreaming, biodiversity concerns will be internalized into the way economic sectors, development models, policies and programmes operate. Integrating biodiversity concerns into the way sectors operate can have immediate benefits in improving environmental quality and productivity, and can also serve as a long-term safeguard for meeting Malaysia's aspirations towards sustainable development.

6.2 What does it take?

Managing biodiversity requires a shared perception of issues, priorities and suitable actions as a framework for diverse and complementary management interventions carried out by several stakeholders – this has been illustrated for biodiversity conservation at the landscape level (see previous Chapters and Table 3, p. 33).

Consequently, management of biodiversity requires the ***active and effective participation of stakeholders*** -- not only at different levels of government, but also in the large number of sectors potentially impacting the environment.

Mainstreaming, on a basic level, requires:

- *An understanding and acceptance of the importance of a healthy environment to well-functioning production sectors*. For specific sectors this entails an appreciation of their relationship and dependency on the conservation and sustainable use of biodiversity.
- *Mechanisms, the will and ability to identify win-win situations* that benefit both biodiversity and the sustainability of a specific sector. The mechanisms should bring together representatives from various sectors in order to coordinate activities and address common concerns. This may take the form of, for example, a committee, a coordinating body (such as a steering group) or an interagency (working) group.
- *An extensive strategy of communication, education and public awareness*.

More specifically, efforts to mainstream biodiversity into sector strategies need to be based on a clear understanding of how that sector:

1. Impacts biodiversity
2. Provides/makes use of ecosystem services
3. Can help reach national policy goals through sector-specific tools

Individuals involved in biodiversity planning and policy will therefore need to be familiar with the operating practices of each sector, the actual and potential impacts of that sector on biodiversity, sector management practices and their value for conservation and sustainable use of biodiversity. Many sectors have specific biodiversity-relevant knowledge in the shape of information (including traditional knowledge) and resource management techniques that can be utilised to achieve national policy goals and, in particular, the objectives of the National Policy on Biological Diversity.

Communication is a key element of sector mainstreaming. In order to promote biodiversity, a strong and clear message about the importance of biodiversity to improved sector production, livelihoods, poverty and national development is needed. This message should address the question of "why people should care about biodiversity", and should be communicated across all levels and branches of government, as well as to the general public (i.e. promote a *Common Vision on Biodiversity* as presented in this paper).

6.3 How to go about impact assessment?

Impact assessment processes are in place and applied in many countries, however biodiversity considerations are often inadequately addressed in spite of already existing tools (e.g. Slootweg *et al.*, 2006; Rajvanshi *et al.*, 2007).

Mainstreaming biodiversity would therefore require four conditions:

1. Ensuring that impact assessments (e.g. EIA, SEA) are applied in such a way that sound science and public participation provide a foundation for sustainable development.
2. Ensuring that national impact assessment procedures adequately incorporate biodiversity-relevant issues.
3. Specialists charged with impact assessment procedures require access to spatial and temporal data on features important for biodiversity.[40]

4. Findings on biodiversity status, trends, critical issues and priorities must be properly conveyed not only to planners and decision-makers but also to technical staff engaged in day-to-day operations.

While sector agencies have established their own procedures for access to (GIS) data, biodiversity assessment requires an iterative multi-disciplinary approach of analysis and synthesis of also spatial features (as shown in Figure 6 *National biodiversity planning*, p. 13). Thus, it is imperative to establish not only a mechanism which allows such assessments to take place but also a procedure to convey key findings to planners, decision-makers and stakeholders to act on (see **Text Box 8)**.

Text Box 8. Biodiversity planning and management tools.

Today knowledge-based tools for spatial planning are rarely used beyond individual sectors (e.g. location of Protected Areas in PERHILITAN; location of logging operations in PFR / forest on state land by FD; State Structure planning by TCPD). Synthesis of sector data at central level in NRE will only take place if technical staff has access to at least the results from application of GIS which greatly facilitate inter-sectoral synthesis, query and analysis, and production of outputs to support planning and decision-making.

Even though the general public today can acquire topographic sheets in 1:25,000 for all of Malaysia Note 1, government technical staff often has difficulties referring to even coarser scale data which essentially only add land use and certain administrative boundaries (i.e. PFR and PAs). Analysis of these spatial features permits generating value-added information absolutely essential for planning and management of natural resource and biodiversity assets.

Managing natural resources, landscapes and biodiversity also require efficient communication between many parties and thematic and tabular data are needed to depict and coordinate activities (i.e. where?, when?, whom?, what?); establish management status (e.g. restricted resource use; riparian and other corridors; landscape rehabilitation); and safeguards (e.g. monitoring; incorporation of location specific management objectives into National, Regional, State and Local Plans). Clearly, thematic media such as maps are a prerequisite for proper planning.

Without ensuring that at least the Malaysian Government's technical staff, planners and decision-makers have access to such data, their planning tools will be restricted to tables, figures, species lists, and so forth (i.e. essentially two-dimensional in nature with limited – if any – geographic reference).This would seem an insufficient basis, making it very difficult for them to carry out the nation's policy and plan objectives of holistic, integrated, and environmentally sustainable management.

Note 1: The topographic map Series DNMM6201/6202 in 1:25,000 and DNMM5101/5201 in 1:50,000 are both listed as unrestricted at: www.jupem.gov.my/Main.aspx?page=ProductandServices

6.4 Strategic Environmental Assessment - SEA

SEA has evolved from the convergence of EIA and the sustainable development agenda – which both figure prominently in Malaysian PPP (see Annex 1).

While there is considerable debate regarding what constitutes a SEA, it is increasingly recognised as a continuum of approaches (i.e. a family of tools), rather than a single, fixed procedure. At one end of the spectrum, SEA focuses on integrating environmental concerns into higher levels of decision-making. At the other end of the spectrum are sustainability assessments, which take into account not only the environmental effects of PPP but also their social and economic effects on current and future generations.

The term SEA is now widely used to refer to *a systematic process to analyse the environmental effects of policies, plans and programmes (PPPs), and their alternatives*. Depending on the jurisdiction or circumstances, SEA may also consider social and economic effects. Their inclusion as a matter of principle is widely supported in the literature on the field and, increasingly, SEA is seen as an entry point or stepping stone to integrated assessment or sustainability appraisal.

In 2002, the World Summit for Sustainable Development in Johannesburg urged States not only to 'take immediate steps to make progress in the formulation and elaboration of national strategies for sustainable development' (NSSD) but also to "begin their implementation by 2005." (They are in place in some countries while others

Text Box 9. How does SEA differ from EIA?

SEA aims at identifying and addressing the environmental and – increasingly – also the associated social and economic dimensions, effects and consequences of Policies, Plans and Programmes. This means that SEA occurs over a longer time period and at a greater scale than Environmental Impact Assessment (EIA). Moreover, a SEA is typically applied to an entire sector or geographical area.

EIA practice is constrained by certain limitations and weaknesses. These include structural limitations centred on the relatively late stage at which EIA is usually applied in decision-making. At this point, high-level questions about whether, where and what type of development should take place have been decided, often with little or no environmental analysis.

The relatively narrow project scope of EIA is also an ineffective means of examining broader environmental issues and this is where SEA excels by incorporating environmental considerations and alternatives directly into PPP design. This can also help to focus and streamline project EIAs, making them more consequential and reducing the time and effort involved in their preparation.

are preparing them). SEA and NSSD are related and mutually supportive instruments. In Malaysia ENRES in EPU is the focal point for the preparation of NSSDs.

In general, the evolving SEA is currently understood to be:

> A process for identifying and addressing the environmental (and also, increasingly, the associated social and economic) dimensions, effects and consequences of Policies, Plans and Programmes, and other high-level initiatives.
>
> Dalal-Clayton & Sadler, 2004.

This process should take place at the highest level possible in planning or decision-making, before decisions are made, when major alternatives are open. This will allow focusing on the "source" of environmental impacts rather than addressing the symptoms later on.

Preferably it should make a contribution to their formulation and development rather than focusing only on the impact(s) of their implementation. However, it also plays an important role during the review and updating of PPPs.

6.4.1 Why use SEA?

In Malaysia, there is wide consensus in PPPs that development should be environmentally sustainable (including Vision 2020, NVP, OPP3, NPBD, NPE, 9MP and NPP – See Annex 1). SEA is a tool that will help ensure that this goal is achieved.

The Outline Perspective Plan 3 (OPP3) emphasises a holistic and integrated approach based on NPBD, which establishes that commitments under the Convention of Biological Diversity (CBD) must be incorporated into national policies, strategies, plans and programmes. The National Policy on Biological Diversity (NPBD) dedicates all of *Strategy 6* (*Integrate Biological Diversity Considerations into Sectoral Planning Strategies)* to extensive mainstreaming of biodiversity. The National Policy on the Environment (NPE) in its Green Strategy No. 3 provide for extensive mainstreaming of biodiversity into plans at all levels. The 9th Malaysian Plan establishes that there should be an increased application of SEA, among others. Mainstreaming biodiversity is an implicit measure for incorporation of Environmental Sensitive Areas to be established under the National Physical Plan (NPP). [13]

There *is* a high potential for addressing biodiversity concerns in planning and decision-making using SEA, which is recognised by both CBD and Ramsar as an important tool for identifying, avoiding, minimising and mitigating adverse

Text Box 10. So what is SEA?

SEA is evolving and more recent definitions and the international trend take a broader, more complex and varied perspective. They see SEA as including the social (and sometimes the economic) dimension. They also promote SEA not just as a means to 'upstream' impact assessment, but also as a diagnostic tool to help integrate environmental and social (and even economic) considerations during the formulation of policies and development plans and programmes. In other words, SEA is seen as a key tool for sustainable development.

Policy-makers may have reservations about the value added by SEA. So it is necessary to be able to say clearly what it is and what it is useful for. At present there is anything but clarity. Instead, there is an expanding plethora of different acronyms, descriptions and interpretations of SEA and SEA-type approaches in use internationally. This reflects the fact that SEA is seen as a means to an end, a multi-lane route to addressing the environment and promoting sustainable development.

Dalal-Clayton & Sadler, 2004

impacts on biodiversity.[41]

At a global scale, SEA is today the most commonly used tool to mainstream environmental concerns into PPP and it is adopted by an increasing number of countries (presently more than 25), international agencies (e.g. the World Bank, OECD) and bilateral aid agencies. The European SEA Directive adopted in 2001 required all member states to be in compliance by 2004. In Asia several countries have already started using or are experimenting with SEA (Australia, China, Hong Kong, Nepal, New Zealand, Vietnam and Pakistan).

It is widely considered that SEA is at the verge of widespread adoption and the main reasons seem to be that it promotes good governance and sustainable development.

In Malaysia the Town & Country Planning Department (TCPD) Peninsular Malaysia undertook a SEA pilot project in 1999 in Kawasan Sekitar Paya Indah. Today a total of three State Structure Plans (Kedah, Perak and Selangor) and seven District Plans have made use of the SEA process. In Sabah, the State EPU (UPEN) has instituted a SEA Unit to guide its use in the planning process and SEA has successfully been applied to the Beaufort and Kuala Penyu Local Plans (with the assistance of a Danida supported component). Presently, TCPD informs that it makes use of Sustainability Assessment, which nevertheless appears within the most recent definition of SEA (as already highlighted above).

The National Workshop on SEA held in Port Dickson on 14-15 January 2007 was organised by EPU and some 75 federal and state agency representatives participated. The workshop recommended a continued implementation and institutionalisation of the SEA process and developed a preliminary SEA Action Plan. [42]

Additionally, the EPU (as part of NRE's Biodiversity Component) has initiated pilot case studies and activities to assess the suitability of SEA for mainstreaming biodiversity in Malaysia.

6.4.2 Biodiversity in SEA?

Exactly how biodiversity will be addressed in a given SEA depends on its scope, which may range from a traditional focus on the biophysical environment to the more recent, broadly sustainability-oriented SEAs which incorporate social and economic spheres as well.

The convergence of sector-based and integrated approaches is very much due to the realisation that the environment, including its biodiversity component, provides multiple goods and services which are neither sector-specific nor limited to Protected Areas only.

From a biodiversity perspective, spatial and temporal scales are of particular importance. Good examples of biodiversity considerations which require a geographical focus across multiple scales include:

- The linkage of ecosystems on a regional and global scale by migratory species.
- Land uses that increase sediment load in surface run-off will impact freshwater biodiversity and nearby coral reefs (i.e. prevents corals from re-establishing themselves contributing significantly to the reduction of marine biodiversity and the catch of coastal and offshore fishermen).
- Fragmentation and increased isolation of habitat is a major cause for loss of biodiversity that reduces the capacity of a landscape to deliver products and services. Fragmentation is better perceived at larger scales (e.g. maps with scales larger than 1:250,000) and connectivity measures to take in terms of corridors need to be planned at such levels. However, their implementation at the local level will have to consider also the overall design for linkages.

A previous Chapter (Section 2.2, p. 3) explained that biodiversity is important because it supports ecosystem services essential for human well-being. Biodiversity thus represents a range of opportunities for, and constraints to, sustainable development. To enable optimal outcomes for

Text Box 11. SEA - a family of processes and tools.

SEA comprises a family of processes and tools that, individually and collectively, are being applied to new aspects and areas, leading to continued extensions of the field that have procedural and methodological implications.

Thus, SEA is an umbrella concept that accommodates a broad range of processes for assessing the environmental and sustainability effects of options and proposals at the policy and planning level.

Dalal-Clayton & Sadler, 2004

sustainable development, recognition of these opportunities and constraints is the point of departure for informing the preparations, review and updating of PPPs at a strategic level. The question at SEA level is therefore "how does the environment affect or determine development opportunities and constraints?" This approach contrasts with the largely reactive procedure adopted in project's EIA, where the key question asked is "what will the effect of this project be on the environment? [43]

Two broad approaches can be used in SEA: the reactive cause-effect chain approach where the intervention is known and the cause-effect chain is fairly clear (comparable to EIA), and the 'bottom up' opportunities and constraints of the natural environment approach, where the environment effectively shapes the PPP. The latter is most often used in land use planning/spatial planning where interventions are potentially wide-ranging and the objective is to tailor land uses to be most suited to the natural environment.[43]

For an outline of the actual assessment framework used to address biodiversity in SEA see Annex 4 (p. 89).

6.5 What other options are there? [44]

Mainstreaming biodiversity into the preparation, review and updating of PPPs is best done using SEA (as highlighted above). However, it may not always be possible or applicable in a given situation.

In those situations, several opportunities at national, state and local levels may nevertheless significantly complement the overall mainstreaming effort, including:

- Analysis of the effects of combined policies on biodiversity
- Incorporating biodiversity into national development and/or poverty reduction strategies
- Mainstreaming biodiversity into production sectors
- Using other tools and strategies for mainstreaming

These additional options are briefly dealt with below.

6.5.1 Setting the stage for mainstreaming

The *environment* is understood as encompassing both living and non-living components (e.g. land, water, atmosphere, forest, biodiversity). Trends in the environment are usually influenced by a wide range of policy measures – in other words, the changes observed in an environmental trend are the combined effect of many policies, some of which may have direct effects on the issue in question and others indirect ones.

Policy assessment helps us understand this mechanism but has often been beyond the scope for biodiversity reporting, which has focused on describing trends and conditions. It is now finding its way into *state of the environment reporting*, since it is realised that such reporting needs to be integrated with the assessment of key driving forces and policies that cause or influence those environmental trends.

A conscious and explicit link to policies and policy performance can not only add much weight and relevance to biodiversity and state of the environment reporting but also significantly guide mainstreaming efforts.

We need to know what is happening to the environment in order to understand why it is happening. We also need to have a clear idea about the driving forces and root causes in order to determine what can be done better or to discover the potential consequences of inaction.

Assessing policies impacting the environment helps to answer (Pintér *et al.*, 2004):

- **Why is environmental change happening;** that is, how are policies affecting the state of the environment? Policies can be the driving forces behind either desirable or undesirable environmental outcomes.
- **What are we doing about environmental changes, particularly negative ones;** that is, what policies are in place to deal with the current environmental issues? Some policies may have already been formed to influence current environmental conditions, although there may be a lag time before effects are visible.

Looking at the changes from the perspective of a specific policy, the question primarily concerns the policy's effectiveness in bringing about a positive change on the trends observed. The

current thinking on how to conduct an analysis of policy mix on the environment is summarised in Annex 5 (p.99). The outlined procedure may be conducted as part of a comprehensive *state of the environment* reporting exercise or – at least to begin with – for biodiversity alone in order to set the stage for the mainstreaming effort.

6.5.2 How to mainstream biodiversity into long-term national plans?

For biodiversity to become a top priority nationally, its relevance to livelihoods, poverty and national development needs to be highlighted.

Integration of biodiversity into sustainable development policies, plans and programmes requires the participation of biodiversity specialists and practitioners in PPP development and implementation.

Such participation will raise greater awareness of biodiversity issues and priorities. It promotes an understanding of Protected Areas, the need for managing biodiversity at national, state and local levels (i.e. landscape management) and the importance of a concerted multi-stakeholder approach.

This will raise the profile of biodiversity issues at the national level and will assist in incorporating biodiversity and natural resource issues into development agendas at the state and local levels.

Strategic Environmental Assessment – SEA (dealt with above in Section 6.4) has been applied successfully to long-term policy and plan preparation/review.[45]

The long-term development Policies and Plans referred to in Annex 1 fall within this category (i.e. Vision 2020, National Vision Policy, Outline Perspective Plans).

6.5.3 How to mainstream biodiversity into medium and short-term planning tools?

Mainstreaming biodiversity into production sectors requires the identification and prioritization of "entry points" that will provide an opportunity for inclusion of biodiversity-relevant information and/or activities into sector operating processes. The main sectors' entry points are the development and updating of various sector strategies and tools.

Each sector has its own specific strategies, activities and tools for addressing issues relevant to sustainability. These tools are discussed in more detail below and include:

- Sector policies, strategies, action plans and programmes
- Industry standards, codes of conduct, guidelines and good practices
- Certification schemes
- Ecosystem approaches specific to a given sector
- Integrating biodiversity into the legal framework

Sector policies, strategies, plans and programmes

Most important sectors have their own policies, plans and programmes. Like biodiversity strategies and action plans, sector plans and programmes are usually an evolving process, requiring periodic assessment and update. These periodic updates can provide an opportunity for biodiversity specialists to become involved in the redrafting process, and for biodiversity concerns to be mainstreamed into the policies, action plans and programmes.

Even better, their preparation and updates should incorporate Strategic Environmental Assessment – SEA (see Section 6.4 above and Glossary).

Important planning tools to target include: Malaysian Plans, State Structure Plans, Local Plans and Sector Plans in general.

Text Box 12. How to promote corporate social responsibility?

Engaging the corporate sector to promote social responsibility for biodiversity is highly complementary and reinforces the mainstreaming process into government and the development process.

In June 1997, the World Conservation Union (IUCN) and the World Business Council for Sustainable Development (WBCSD) produced *Business and Biodiversity, A Guide for the Private Sector*. This report provided many insights into why businesses should be involved in the biodiversity debate and suggested how they could best participate.

EarthWatch Europe has since joined this partnership for progress between biodiversity and business communities to produce an updated *Business and Biodiversity – The Handbook for Corporate Action* (2002) (www.biodiversityeconomics.org).

Standards, codes of conduct, guidelines and good practices

Production sectors use a number of tools for achieving environmentally and socially sustainable resource management practices. These tools include standards, codes of conduct, guidelines and good practices. Mainstreaming biodiversity into these tools can be achieved through the participation of biodiversity specialists in their drafting and/or review.

Examples include guidelines prepared by several of NRE line agencies (e.g. DOE, FD), and the Good Agricultural Practices (GAP) developed by the Standard and Industrial Research Institute of Malaysia (SIRIM).

Guidelines and certification schemes under development should be targeted by NRE for enhanced mainstreaming of biodiversity. An example includes the Roundtable on Sustainable Palm Oil – RSPO – Principles and Criteria for Sustainable Palm Oil Production (RSPO, 2006) which is expected to become the basis for a certification scheme.

Certification schemes

Certification schemes go a step further than voluntary codes of conduct in demanding adherence to a set of criteria which a given operation must meet before they can use the logo or name of the scheme. It is important for mainstreaming that biodiversity specialists are involved in developing criteria for both national and international certification schemes

Certification schemes that include biodiversity in their criteria can be powerful tools for mainstreaming because they present the consumer with the choice of buying a more sustainable product. Some examples of certification schemes include those developed by the Marine Stewardship Council, the Forest Stewardship Council and the Marine Aquarium Council. There are also a number of tourism certification schemes.

Important examples include the Malaysia Timber Certification Council, which promotes sustainable forest management and provides assurance to buyers that the timber products come from sustainably managed forests. The Roundtable on Sustainable Palm Oil (RSPO) is presently considering principles, criteria, indicators and guidance for palm oil production (with Board review in November 2007) which may have a bearing on biodiversity in the landscape.

Ecosystem approaches specific to various sectors

Some sectors have their own ecosystem approaches, which can be complementary to the '*ecosystem approach*' promoted by the Convention on Biological Diversity (CBD). Two examples include Sustainable Forest Management pursued by the Forestry Department and Integrated River Basin Management carried out by the Drainage & Irrigation Department.

These and similar approaches can be very effective tools for mainstreaming biodiversity concerns into sector practices, provided they incorporate the concepts found in the principles of the CBD *ecosystem approach* (as explained in Section 5.5 and the Glossary).

Integrating biodiversity into the legal framework

None of the sectors can be addressed in isolation, and therefore biodiversity and sectors' legal frameworks should take into account, and coordinate with, each other. Traditional knowledge should also be taken into account.

It is important to highlight that the National Policy on Biological Diversity considers the legislative framework and the National Policy on the Environment states that it should be reviewed and updated.

6.5.4 How to mainstream using other strategies and tools?

Other strategies and tools for mainstreaming that are not specific to any given sector include:

- The ecosystem/landscape approach
- Financial strategies and tools

The ecosystem/landscape approach

The '*ecosystem approach*', with its provisions for societal choice, stakeholder participation, interconnectedness of ecosystems and adaptive management provides an effective guide for mainstreaming efforts (see Glossary).

By its very nature, it also provides for integration between various sectors' interests. The 12 principles, five-point 'Operational guidance' and associated implementation guide outline a method for managing human activities in a way that provides for sector integration (See Glossary and SCBD, 2006).

Initiating activities with land/seascape management for biodiversity (as was referred to above in

Section 5), may prove more tangible while still maintaining the full scope for mainstreaming of biodiversity.

Other integrated approaches, such as integrated marine and coastal zone management, river basin management, land-use planning and integrated oceans management (and SEA in general) also provide for sector integration in a way that is consistent with the *ecosystem approach*. Undertaking coastal zone management, for example, will force all sectors and other stakeholders to get together and resolve conflicts in order to develop a common vision and the associated activities required to realise that vision.

Most of these approaches are already referred to in the Policies and Plans examined in Annex 1.

Economic and financial tools

Biodiversity forms a stock of natural capital, which – if managed sustainably – can yield, in perpetuity, a wide range of direct and indirect economic benefits to human populations.

Economic concerns are of central importance to biodiversity conservation. Economic forces underlie and explain much biodiversity degradation and loss, and the application of economic instruments is useful to strengthening biodiversity conservation, sustainable use and equitable benefit sharing.

If Biodiversity Strategies and Actions Plans (BSAPs) are to be effective, they must be justifiable in economic terms. BSAPs also need to make efforts both to overcome the economic causes of biodiversity loss and to ensure that economic incentives are set in place, which encourage biodiversity conservation.

Equally, the goals and strategies specified in the national policies – and the National Policy on Biological Diversity in particular – have to be acceptable to other "economic" sectors, decision-makers and planners, if they are to integrate biodiversity concerns into their own (sector) Policies, Plans and Programmes.

Over the last decades, a range of economic tools have been developed or refined in order to quantify the total economic value of biodiversity, and to express it in monetary terms. These tools can be useful in distinguishing between short and long-term economic costs and benefits (immediate costs of conservation versus long-term gains), and may assist in answering who should pay the costs of conservation (developers versus local communities).

Economic tools can also be used to create incentives for users to change their behaviour and reduce anthropogenic impacts on the environment, biodiversity and natural resources in general.

Various tools and techniques are available to assist in the mainstreaming efforts.

Economic valuation

Increasingly, economic valuation techniques are being used to monetise the benefits of biodiversity conservation and sustainable use, to point to ways of sustainably maximising and capturing its benefits, and to better analyse the economic impacts of biodiversity conservation and the benefits and losses on different stakeholders and sectors. Calculating economic values underlines the fact that biological resources and their diversity constitute far more than a static biological reserve (as referred to in Section 2.7 *What is the value of biodiversity?* p. 9). Economic valuations provide information needed for instruments such as cost-benefit analysis which promotes more efficient use of resources.

Economic tools

Economic tools are often used to create incentives or disincentives in line with sustainable management of biodiversity and natural resources. Setting in place economic incentives provides an important source of support and encouragement for biodiversity conservation.

An incentive may be defined as a specific inducement designed and implemented to influence government bodies, business, non-governmental organisations, or local people to conserve biological diversity or to use its components in a sustainable manner. Incentive measures usually take the form of a new policy, law or economic or social programme.[46]

- *Economic tools* are introduced to support conservation and management of biodiversity by applying user pays or polluter pays principle. Some commonly used tools to raise financial support for conservation and management of biodiversity include (from Chong, 2007):

i) Entry or Exit Tax: This is a tax imposed on international visitors to a country or state at the entry points such as airports. Taxes collected are earmarked for conservation of biodiversity purposes only.

ii) Room Surcharge: Hotels in some tourist locations (such as UNESCO Heritage sites) impose room surcharges for conservation purposes. This instrument can be implemented in a selected range of hotels such as 4-star or 5-star rated hotels in a state or selected zones. The room surcharge can be implemented as a mandatory or voluntary charge. In either situation, the hotel customers are informed that the surcharge will only be used for the conservation of biodiversity.

iii) Conservation Tax: This can be implemented by imposing a tax to be paid by conservation-related goods and services sold on tourist hotels, tourist food establishments and tourist public houses. An alternative is to earmark a percentage of the current 5% government tax imposed on selected services for conservation of biodiversity.

iv) Tax Deduction Scheme: This mechanism can be introduced by the Government to promote the awareness of conservation and the ethic of giving, based on clear guidelines about the tax exemption systems and well-defined limits. For example, the Government can allow corporations or individuals to contribute 1% of their taxes for conservation purposes.

v) User Fees: These are charges implemented at entrances to or services available at protected areas for conservation and management of natural resources. User fees may also be charged at camping grounds or picnic facilities in some sites.

- *Payments for Environmental Services*

  Payments for Environmental Services (PES) are an innovative and relatively young market-based instrument for environmental protection. As a consequence, it is still early to assess the overall effectiveness and efficiency of PES schemes and to identify lessons and best practices.

  PES is based on the central principle that those who provide environmental services should be compensated for doing so and those who receive the benefits should pay for their provision. An example is *water* which provides a powerful argument for protection. This means that if particular management systems are needed in watersheds to maintain the quantity or quality of water supply downstream, users should pay for these (e.g. drinking water or hydropower companies).

  PES approaches have been most thoroughly developed in Latin America, but there is increasing interest in PES throughout the world. In Costa Rica, for example, the government has developed a nationwide PES scheme through which users such as hydropower companies can pay land users to maintain forest cover in watersheds. In Quito, Ecuador, water companies are helping to pay for the management of Protected Areas that are the source for much of the capital's drinking water.

  Payment schemes only have a chance of working when conditions are right. An ideal combination would be when particular land management regimes result in major economic benefits to a small group of users – like a water company. In these cases it is relatively easy to identify reasonable payments and to negotiate amongst the buyers (the water users) and sellers (the land users) of the environmental service. However, there are many possible complications.

  Payment for environmental services is not a panacea or a universally applicable solution to forest loss: rather it should be regarded as one of many tools in a toolbox. If used well, however, it can provide concrete support for both good forest management and forest protection.

  Actual mechanisms of PES have already been developed and OECD (2004) provides an

extensive discussion of the various applications which include:

- Carbon storage – e.g., avoided deforestation.
- Carbon sequestration – e.g., from afforestation and reforestation.
- Watershed regulation – e.g., avoided downstream effects of upstream deforestation or agro-chemical use.
- Biodiversity-friendly agricultural products (e.g., shade-grown coffee, etc.), the mechanism here usually being the payment of a price premium on the final sale of the product.
- Conservation activity via direct payment.
- Offsets (tradable development rights).

In most cases, reducing poverty is not the prime motive for the market creation. The motive is to secure environmental benefits. But as PES has evolved, even over a short period of a few decades, the issue of how PES can be managed to benefit the poor has also become important (see further details in UNDP, 2005a).

Text Box 13. Biodiversity and poverty reduction.

Malaysia's poverty rate has declined dramatically over the past 35 years. In 1970 about half of all households lived below the poverty line but the figure was reduced to 5.1% in 2002. Both the speed and magnitude of the decline has been well ahead of the Millennium Development Goal of halving poverty before 2015. In the 70s Malaysia was predominantly a rural agricultural society and poverty has been mainly a rural phenomenon. In 2002 urban and rural households living in poverty were just 2% and 11.4%, respectively. Although urban poverty is very low, the rapid urbanisation which has taken place means that the number of urban poor is now considered significant. The highest incidences are in Sabah (16%) and Kelantan (12%). Ethnic differences remain marked (poverty incidence in 2002 being 7.3 % for Bumiputera, 1.5 % for Chinese, and 1.9 % for Indians), but at a much lower level of incidence of poverty than previously. The vast majority of remaining poor households are Bumiputera, with a significant proportion of these being the Orang Asli and the indigenous communities of Sabah and Sarawak. These groups in particular have yet to benefit substantially from poverty-eradication measures (UNDP 2005b).

New categories of poor persons are emerging, partly as a result of the country's rapid economic growth and related social and demographic changes. These are likely to include, inter alia, single female-headed households and the elderly, especially those not covered by pension schemes and living in rural areas away from their families. Non-citizens who are poor and urban poor have increased. The remaining poor in Malaysia are less accessible and may not be amenable to conventional poverty-reducing programmes. Targeted and participatory approaches will be needed, including a special focus on the indigenous communities in Sabah and Sarawak, and the disadvantaged in other less developed states. The Orang Asli, who comprise several different groups, constitute about 0.5% of the total population, or 132,000 people in 2000. A sizeable proportion of Orang Asli lives below the poverty line, and face hard-core poverty. The Orang Asli have been the specific target of various anti-poverty programmes and have benefited from them. Nonetheless, the Orang Asli remain one of the country's poorest and most marginalized groups (UNDP 2005b).

The 9th Malaysian Plan reports that the 2004 figures for overall, urban and rural poverty are 5.7%, 2.5% and 11.9%, respectively, and states: *While Malaysians enjoy a much higher quality of life now than in the past, income inequality among ethnic groups and between urban and rural areas is still sizeable and has increased in recent years*. Moreover, …*poverty continued to be predominantly a rural phenomenon with 70.6 per cent of the poor residing in the rural areas.*

Rural households derive a significant proportion of their food and income from biological resources and, therefore, the availability and sustainability of biological resources is of direct relevance to poverty reduction for these communities. Additionally, a large proportion of poor people live in marginal environments and in areas with low agricultural productivity or in fragile lands. In these environments, there is a high dependency on genetic, species and ecosystem diversity to support their livelihoods. That is, aspects of biodiversity are of direct and indirect importance to food availability, health, nutrition, household development, income generation and vulnerability. Furthermore, improvements to core productive assets (including biodiversity related factors of soils, water, trees and natural vegetation) are identified by the Millennium Project Task Force 2 on Hunger as the first step of the principle strategy for reducing under-nutrition in households in such high risk environments (Balakrishna & Warner, 2003).

7 CONCLUSIONS

Biodiversity encompasses genes, species, ecosystems and their interactions. It is essential for the functioning of ecosystems and supports the provision of 'ecosystem services' that ultimately affect human well being. Ecosystem services are often grouped as: *products* (e.g. timber, potable water); *benefits* (e.g. reduced impacts from tsunamis); *non-material* (e.g. ecotourism); and *supporting* (e.g. soil formation).

For planners and decision-makers it is critical to understand that the provision of goods and services by ecosystems is sustained by various aspects of biodiversity. Biodiversity is also important in both managed and natural ecosystems. Decisions people make that influence biodiversity affect not only their own well-being but also that of others.

Of the twenty-four ecosystem services assessed by the Millennium Ecosystem Assessment in 2005 for the last 50 years, fifteen were found to be in a state of decline (i.e. 63%), five remained steady, and only four were improving. Across a range of taxonomic groups, species are declining. The projected future extinction rates are more than ten times higher than the current rate and 10,000 times higher than the fossil record.

The most severe drivers of change affecting terrestrial and freshwater biodiversity are change in land use followed by fragmentation and increased isolation of remaining habitat. For marine biodiversity, change is caused by over-exploitation and pollution, which also affect freshwater systems.

Despite difficulties, limitations, and issues surrounding ecosystem service valuation, there seems to be a general consensus that the value of ecosystem services often outweighs economic use and that protecting ecosystem services is, or should be, one of the most important responsibilities of today's politicians, resource managers, and society in general.

Malaysian Policies and Plans have many important provisions for natural resource and biodiversity assets, which include planning and management being integrated, holistic and environmentally sustainable.

Overall, Malaysia needs a Common Vision for Biodiversity. Such a Vision comprises the various undertakings of the Ministry, its line agencies and the latest guidelines and experiences with respect to biodiversity planning and management. It consists of a three-pronged implementation approach and outreach strategy that proposes:

i) Strengthening the Protected Areas System
ii) Managing biodiversity at the land / seascape level
iii) Mainstreaming biodiversity

Protected Areas are fundamental to the long-term survival of biodiversity and thus the continued provisioning of ecosystem products and services. The Protected Areas System is essentially a question of including suitable areas already gazetted and where the permanence of the site is guaranteed (e.g. water catchments gazetted to ensure long-term production of freshwater). It is not about transfer of jurisdiction but coordination of planning and management in accordance with recognised principles and procedures (e.g. it should be representative, comprehensive and adequate; its location and extent must be known; Protected Areas Management Categories apply).

Protected Areas are not enough to safeguard biodiversity and we must include measures to manage biodiversity in the land / seascape.

Managing diversity requires many stakeholders shaping the landscape today to conduct diverse management actions. Management principles and suitable interventions have been identified to (re)build and maintain landscape resilience, which benefits terrestrial, freshwater and marine biodiversity. These principles constitute an excellent starting point for embarking on an operational ecosystem approach, which is in full compliance with policy and plan provisions for integrated, holistic and environmentally sustainable development.

Mainstreaming biodiversity means to integrate or incorporate actions related to conservation and sustainable use of biodiversity into Policies, Plans and Programmes. Since biodiversity management is complex and involves many actors, it requires *active and effective participation of stakeholders* not only at different levels of government, but also in the large number of sectors potentially impacting the environment. This document identifies the various key stakeholders whose active engagement is essential to achieve concerted actions in favour of the national policy goals for environmental sustainable development.

NRE has an overarching mandate for the environment, natural resources and biodiversity assets and there is a clear and unique role for NRE to act as a mainstreaming *consultation and facilitation body for synthesised data on biodiversity issues and priorities* to support the federal, state and local planning levels. The Common Vision on Biodiversity is a suitable framework for such a mainstreaming process, supporting the ongoing transformation of environmental planning and management from a largely sector-based to an integrated approach, in line with national policy provisions.

Strategic Environmental Assessment (SEA) is a process which ensures that environmental and – increasingly – social and economic concerns are addressed at the highest level possible in planning or decision-making, before decisions are made, when major alternatives are open. This will allow focusing on the "source" of environmental impacts rather than addressing the symptoms later on.

Other mainstreaming options may significantly complement SEA or should be considered whenever it has not been possible or applicable in a given situation.

The three-pronged approach supported by an extensive communication programme corresponds to provisions and priorities contained in existing Policies, Plans and Programmes but it focuses on implementation aspects.

Promoting the *Common Vision on Biodiversity* will allow NRE and its line agencies to rally support for a shared perception of issues, priorities and required inter-agency actions within government and civil society.

Following the principles and guidelines referred to here, supported by the required steps to review and update the environmental legislative framework, will ensure that national sustainable development goals with respect to natural resources and biodiversity are accepted and integrated by planners and decision-makers in the government, various production sectors and civil society.

This will also facilitate that NRE is always in a position to report on and respond to inquiry about (among other things):

i) The status of biodiversity (for national and international reporting)
ii) The present direction taken with respect to planning and management of natural resources and biodiversity assets.
iii) The extent to which provisions of national policies and plans, as well as international conventions, are adhered to.

Pitcher plant [2]

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Squids [2]

Table 4. Selected references and their relevance for planning and management of terrestrial, freshwater and marine systems (please note that many of these papers are relevant beyond the suggested category and indicated *system*).

Categories	**Terre-strial**	**Fresh-water**	**Marine**	**Selected references** for planners and decision-makers (alfabetic order within categories)
Overall				• Hagen, RT. 1999. *A guide for countries preparing national biodiversity strategies and action plans* . Biodiversity Planning Support Programme. UNDP/GEF. http://www.undp.org/bpsp/nbsap_guidelines/docs/ (accessed 5 Nov 2007).
				• Kenton KR and Lanou SM. 1995. *National biodiversity planning: guidelines based on early experiences around the world* . World Resources Institute, United Nations Environment Programme and The World Conservation Union. Washington D. C; Nairobi; Gland, Switzerland. http://pdf.wri.org/nationalbiodiversityplanning_bw.pdf (accessed 5 Nov 2007).
Assessment / gap analysis				• Darwall WRT & Vié J-C. 2005. *Identifying important sites for conservation of freshwater biodiversity: extending the species-based approach* . Fisheries Management and Ecology, 2005, 12:287-293. http://www.iucn.org/themes/ssc/publications/freshwater/important_sites_darwallvie.pdf (accessed 4 Nov 2007).
				• Dudley N & Parish J. 2006. *Closing the Gap. Creating Ecologically Representative Protected Area Systems: A Guide to Conducting the Gap Assessments of Protected Area Systems for the Convention on Biological Diversity* . Secretariat of the Convention on Biological Diversity, Montreal. Technical Series no. 24. www.biodiv.org/programmes/outreach/awareness/ts.shtml (accessed 27 Sep 2007).
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				• Revenga & Kura (2003). *Status and trends of biodiversity of inland water ecosystems* . Secretariate of CBD. CBD Technical Series No. 11. http://www.cbd.int/doc/publications/cbd-ts-11.pdf (accessed 4 Nov 2007).
				• UNEP. 1993. *Guidelines for country studies on biological diversity* . www.biodiv.org/doc/meetings/sbstta/sbstta-01/information/sbstta-01-inf-03-en.pdf (accessed 5 Nov 2007)
Planning & management				• Belfiore S, Cicin-Sain B & Ehler C, (Eds). 2004. *Incorporating Marine Protected Areas into Integrated Coastal and Ocean Management: Principles and Guidelines* . IUCN, Gland, Switzerland and Cambridge, UK. http://www.iucn.org/themes/wcpa/pubs/pdfs/mpaicnguidelines.pdf (accessed 4 Nov 2007).
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				• Dudley N & Phillips A. 2006. *Forests and Protected Areas: Guidance on the use of the IUCN protected area management categories* . IUCN, Gland, Switzerland and Cambridge, UK. www.iucn.org/dbtw-wpd/edocs/PAG-012.pdf (accessed 24 Sep 2007).
				• GEF, UNEP, CBD. 2007a. *The biodiversity planning process: how prepare and update a National Biodiversity Strategy and Action Plan* . Module B-2. Version 1 – July 2007. GEF (BPSP), UNEP and CBD. www.cbd.int/doc/training/nbsap/b2-train-prepare-update-nbsap-en.pdf (accessed 13 Jul 2007).
				• IUCN. 1994. *Guidelines for protected area management categories* . IUCN Commission on National Parks & Protected Areas with the assistance of the World Conservation Monitoring Centre. www.iucn.org/dbtw-wpd/edocs/1994-007-En.pdf (accessed 20 Sep 2007).
				• IUCN. 2007b. *Guidelines for Application of IUCN Red List Criteria at Regional Levels Ver 3.0* . http://intranet.iucn.org/webfiles/doc/SSC/SSCwebsite/Red_List/regionalguidelinesEn.pdf
				• Kelleher G. 1999. *Guidelines for Marine Protected Areas* . IUCN, Gland, Switzerland and Cambridge, UK. www.iucn.org/dbtw-wpd/edocs/PAG-003.pdf (accessed 27 Sep 2007).
				• Phillips A. 2002. *Management guidelines for IUCN Category V Protected Areas Protected Landscapes/Seascape* . Best Practice Protected Area Guidelines Series No. 9.
				• Salm RV, Clark J & Siirila E. 2000. *Marine and Coastal Protected Areas: A guide for planners and managers* . IUCN. Washington DC. www.iucn.org/THEMES/MARINE/pdf/mpaguid2.pdf (accessed 4 Nov 2007).
				• SBCD. 2004. *Biodiversity issues for consideration in the planning, establishment and management of protected area sites and networks* . Montreal, SCBD. CBD Technical Series no. 15. http://www.cbd.int/doc/publications/cbd-ts-15.pdf (accessed 5 Nov 2007).
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				• Thomas L & Middleton J. 2003. *Guidelines for Management Planning of Protected Areas* . Best Practice Protected Area Guidelines Series No. 10. IUCN Gland, Switzerland and Cambridge. http://app.iucn.org/dbtw-wpd/edocs/PAG-010.pdf (accessed 25 Sep 2007).
				• WCPA/IUCN. 2007. *Establishing networks of marine protected areas: A guide for developing national and regional capacity for building MPA networks* . Non-technical summary report. www.iucn.org/themes/marine/pdf/establishing_mpa_networks.pdf (accessed 4 Nov 2007).
Conservation actions				• Dudley N, Mulongoy KJ, Cohen S, Stolton S, Barber CV & Gidda SB. 2005. *Towards Effective Protected Area Systems. An Action Guide to Implement the Convention on Biological Diversity Programme of Work on Protected Areas* . Secretariat of the Convention on Biological Diversity, Montreal. Technical Series No. 18. www.biodiv.org/programmes/outreach/awareness/ts.shtml (accessed 27 Sep 2007).
				• Fernández, JJG. 1998. *Guide for the preparation of action plans within the framework of the Convention on Biodiversity* . GEF, UNDP. www.undp.org/bpsp/nbsap_guidelines/docs/BSAPGUIDE_JJGFernandez.doc
Monitoring & evaluation				• Hockings M, Stolton S, Leverington F, Dudley N & Courrau J. 2006. *Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas* . 2nd edition. IUCN, Gland, Switzerland and Cambridge, UK. www.iucn.org/dbtw-wpd/edocs/PAG-014.pdf (accessed 25 Sep 2007).
				• Pomeroy RS, Parks JE & Watson LM. 2004. *How is your MPA doing? A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness* . IUCN, Gland, Switzerland and Cambridge, UK. http://www.effectivempa.noaa.gov/guidebook/doc/MEI_Guidebook_English.pdf (accessed 4 Nov 2007).
Community involvement				• Borrini-Feyerabend, G., Kothari, A. and Oviedo, G. (2004). *Indigenous and Local Communities and Protected Areas: Towards Equity and Enhanced Conservation* . IUCN, Gland, Switzerland and Cambridge, UK. http://www.iucn.org/dbtw-wpd/edocs/PAG-011.pdf (accessed 5 Nov 2007).
				• Beltrán, J. (Ed.). 2000. *Indigenous and Traditional Peoples and Protected Areas: Principles, Guidelines and Case Studies* . IUCN, Gland, Switzerland and Cambridge, UK and WWF International, Gland, Switzerland.http://www.iucn.org/dbtw-wpd/edocs/PAG-004.pdf (accessed 5 Nov 2007).

Rubber tapper [2]

GLOSSARY

2010 Target: The 2010 Biodiversity Target is an overall conservation target aiming to save biodiversity by the end of the year 2010. It was first adopted by EU Heads of State at the EU Summit in Gothenburg in June 2001. They decided that "biodiversity decline should be halted with the aim of reaching this objective by 2010".

One year later, the Convention on Biological Diversity's sixth Conference of the Parties adopted the Strategic Plan for the Convention in Decision VI/26. The Decision says "*Parties commit themselves to a more effective and coherent implementation of the three objectives of the Convention, to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth*."

The World Summit on Sustainable Development held in Johannesburg in 2002 confirmed the 2010 biodiversity target and called for "*the achievement by 2010 of a significant reduction in the current rate of loss of biological diversity*".

In 2003, Environment Ministers and Heads of delegation from 51 countries in the UNECE region adopted the Kiev Resolution on Biodiversity at the fifth Ministerial Conference "Environment for Europe" and decided to "reinforce our objective to halt the loss of biological diversity at all levels by the year 2010".

By the year 2006, the following nations have contributed extensively to establishment of individual Biodiversity Action Plans: Tanzania, New Zealand, Great Britain and the United States of America, called Species Recovery Plans in the USA.

5-Point operational guidance: See 'Ecosystem approach – Operational guidance'.

Benthic: of or relating to or happening on the bottom under a body of water (www.thefreedictionary.com). Benthic zone is the lowest level of a body of water such as an ocean or a lake. It is inhabited by organisms that live in close relationship with (if not physically attached to) the ground.

Biodiversity: The CBD defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems".

A simpler definition is: The variety of life on the planet. This includes the diversity within species, between species and of ecosystems.

CBD: See *Convention on Biological Diversity.*

CITES: The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* is an international agreement between governments, drafted as a result of a resolution adopted in 1963 at a meeting of members of the World Conservation Union (IUCN). Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival and it accords varying degrees of protection to more than 33,000 species of animals and plants.

Connectivity: Refers to the linkages of habitats, communities and ecological processes at multiple spatial and temporal scales.

Corridor: A stretch of habitat in the landscape that facilitates the movement of species. Corridors typically connect larger fragments of remnant vegetation.

Conservation biology: Is an interdisciplinary, mission-oriented science which aims to alleviate the extinction crisis and foster biological diversity, which is seen as underpinning ecosystem services. Conservation biologists include researchers and managers from fields as varied as 'ecology', genetics, evolution, biogeography, wildlife biology, forestry, captive species breeding, and restoration ecology. Scientists hope that by studying why species become extinct, they can improve the management of natural areas and endangered species in ways that will prevent further extinctions.

Convention on Biological Diversity: The Convention on Biological Diversity (CBD) is an international treaty that was adopted at the Earth Summit in Rio de Janeiro in 1992. The Convention has three main goals:

1. Conservation of biological diversity (or biodiversity);
2. Sustainable use of its components; and
3. Fair and equitable sharing of benefits arising from genetic resources.

It is often seen as the key document regarding sustainable development.

The convention recognized for the first time in international law that the conservation of biological diversity is "a common concern of humankind" and is an integral part of the development process. The agreement covers all ecosystems, species, and genetic resources. It links traditional conservation efforts to the economic goal of using biological resources sustainably. It sets principles for the fair and equitable sharing of the benefits arising from the use of genetic resources, notably those destined for commercial use. It also covers the rapidly expanding field of biotechnology through its Cartagena Protocol on Biosafety, addressing technology development and transfer, benefit-sharing and biosafety issues. Importantly, the Convention is legally binding; countries that join it ('Parties') are obliged to implement its provisions.

The convention reminds decision-makers that natural resources are not infinite and sets out a philosophy of sustainable use. While past conservation efforts were aimed at protecting particular species and habitats, the Convention recognizes that ecosystems, species and genes must be used for the benefit of humans. However, this should be done in a way and at a rate that does not lead to the long-term decline of biological diversity.

The convention also offers decision-makers guidance based on the precautionary principle that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat. The Convention acknowledges that substantial investments are required to conserve biological diversity. It argues, however, that conservation will bring us significant environmental, economic and social benefits in return.

It was opened for signature on 5 June 1992 and entered into force on 29 December 1993. Malaysia is party to the Convention.

Ecology: Is the relationship between organisms and their environment. It may also be expressed as: the scientific study of the distribution and abundance of living organisms and how the distribution and abundance are affected by interactions between the organisms and their environment.

Ecosystem: “Ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (Article 2 of the CBD).

Ecosystem approach The ecosystem approach is a strategy for the integrated management of land, water and living resources. It provides a framework for decision-making at various levels, including national policy-making and site-level management.

There has been significant experience in implementation of the ecosystem approach by Parties operating under the Convention on Biological Diversity, as well as considerable experience in the implementation of similar approaches to management under other national and international processes.

Application of the ecosystem approach involves a focus on the functional relationships and processes within ecosystems, attention to the distribution of benefits that flow from ecosystem services, the use of adaptive management practices, the need to carry out management actions at multiple scales, and inter-sectoral cooperation.

A number of other established approaches, such as sustainable forest management (e.g. as carried out by the Forestry Department), integrated river basin management (e.g. DID), and integrated marine and coastal area management (e.g. DID), are consistent with the ecosystem approach and support its application in various sectors and biomes.

The ecosystem approach is well suited to take into account the trade-offs that exist in the management of ecosystems and incorporates the need for both coordination across sectors and management across scales.

The ecosystem approach also provides a framework for designing and implementing the entire range of necessary responses, ranging from those directly addressing the needs for conservation and sustainable use of biodiversity to those necessary to address other indirect and direct drivers

that influence ecosystems.

The 12 principles on which the *ecosystem approach* is based are:

1. **The objectives of management of land, water and living resources are a matter of societal choice.**

   Rationale: Different sectors of society view ecosystems in terms of their own economic, cultural and societal needs. Indigenous peoples and other local communities living on the land are important stakeholders and their rights and interests should be recognized. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible. Ecosystems should be managed for their intrinsic values and for the tangible or intangible benefits for humans, in a fair and equitable way.

2. **Management should be decentralized to the lowest appropriate level.**

   Rationale: Decentralized systems may lead to greater efficiency, effectiveness and equity. Management should involve all stakeholders and balance local interests with the wider public interest. The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation, and use of local knowledge.

3. **Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.**

   Rationale: Management interventions in ecosystems often have unknown or unpredictable effects on other ecosystems; therefore, possible impacts need careful consideration and analysis. This may require new arrangements or ways of organization for institutions involved in decision-making to make, if necessary, appropriate compromises.

4. **Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:**

   a. **Reduce those market distortions that adversely affect biological diversity;**
   b. **Align incentives to promote biodiversity conservation and sustainable use;**
   c. **Internalize costs and benefits in the given ecosystem to the extent feasible.**

   Rationale: The greatest threat to biological diversity lies in its replacement by alternative systems of land use. This often arises through market distortions, which undervalue natural systems and populations and provide perverse incentives and subsidies to favour the conversion of land to less diverse systems.

   Often those who benefit from conservation do not pay the costs associated with conservation and, similarly, those who generate environmental costs (e.g. pollution) escape responsibility. Alignment of incentives allows those who control the resource to benefit and ensures that those who generate environmental costs will pay

5. **Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the *ecosystem approach*.**

   Rationale: Ecosystem functioning and resilience depends on a dynamic relationship within species, among species and between species and their abiotic environment, as well as the physical and chemical interactions within the environment. The conservation and, where appropriate, restoration of these interactions and processes is of greater significance for the long-term maintenance of biological diversity than simply protection of species. Ecosystems must be managed within the limits of their functioning.

6. **Ecosystems must be managed within the limits of their functioning.**

   Rationale: In considering the likelihood or ease of attaining the management objectives, attention should be given to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity. The limits to ecosystem functioning may be affected to different degrees by temporary, unpredictable or artificially maintained conditions and, accordingly, management should be appropriately cautious.

7. **The *ecosystem approach* should be undertaken at the appropriate spatial and temporal scales.**

   Rationale: The approach should be bounded by spatial and temporal scales that are appropriate to the objectives. Boundaries for management will be defined operationally by users, managers, scientists and indigenous and local peoples. Connectivity between areas should be promoted where necessary. The ecosystem approach is based upon the hierarchical

nature of biological diversity characterized by the interaction and integration of genes, species and ecosystems.

8. **Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.**

   Rationale: Ecosystem processes are characterized by varying temporal scales and lag-effects. This inherently conflicts with the tendency of humans to favour short-term gains and immediate benefits over future ones.

9. **Management must recognize that change is inevitable.**

   Rationale: Ecosystems change, including species composition and population abundance. Hence, management should adapt to the changes. Apart from their inherent dynamics of change, ecosystems are beset by a complex of uncertainties and potential "surprises" in the human, biological and environmental realms. Traditional disturbance regimes may be important for ecosystem structure and functioning, and may need to be maintained or restored. The ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision that may foreclose options, but, at the same time, consider mitigating actions to cope with long-term changes such as climate change

10. **The *ecosystem approach* should seek the appropriate balance between, and integration of, conservation and use of biological diversity.**

    Rationale: Biological diversity is critical both for its intrinsic value and because of the key role it plays in providing the ecosystem and other services upon which we all ultimately depend. There has been a tendency in the past to manage components of biological diversity either as protected or non-protected. There is a need for a shift to more flexible situations, where conservation and use are seen in context and the full range of measures is applied in a continuum from strictly protected to human-made ecosystems.

11. **The *ecosystem approach* should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.**

    Rationale: Information from all sources is critical to arriving at effective ecosystem management strategies. A much better knowledge of ecosystem functions and the impact of human use is desirable. All relevant information from any concerned area should be shared with all stakeholders and actors, taking into account, inter alia, any decision to be taken under Article 8(j) of the Convention on Biological Diversity. Assumptions behind proposed management decisions should be made explicit and checked against available knowledge and views of stakeholders.

12. **The *ecosystem approach* should involve all relevant sectors of society and scientific disciplines.**

    Rationale: Most problems of biological-diversity management are complex, with many interactions, side-effects and implications, and therefore should involve the necessary expertise and stakeholders at the local, national, regional and international level, as appropriate.

The definition (above), 12 principles and five points of 'operational guidance' (see below) were adopted by the Conference of the Parties at its 5th meeting in 2000.

The 12 principles with rationale and implementation guidelines can be found at:

www.biodiv.org/decisions/default.asp?lg=0&m=cop-07&d=11.

Ecosystem approach – Operational guidance: In applying the 12 principles of the *ecosystem approach*, the following five points are proposed by CBD as operational guidance.

1. **Focus on the relationships and processes within ecosystem**

   The many components of biodiversity control the stores and flows of energy, water and nutrients within ecosystems, and provide resistance to major perturbations. A much better knowledge of ecosystem functions and structure, and the roles of the components of biological diversity in ecosystems, is required, especially to understand: (i) ecosystem resilience and the effects of biodiversity loss (species and genetic levels) and habitat fragmentation; (ii) underlying causes of biodiversity loss; and (iii) determinants of local biological diversity in management decisions. Functional biodiversity in ecosystems provides many goods and services of economic and social importance. While there is a need to accelerate efforts to gain new knowledge about functional biodiversity, ecosystem

management has to be carried out even in the absence of such knowledge. The ecosystem approach can facilitate practical management by ecosystem managers (whether local communities or national policy makers).

2. **Enhance benefit-sharing**

   Benefits that flow from the array of functions provided by biological diversity at the ecosystem level provide the basis of human environmental security and sustainability. The ecosystem approach seeks that the benefits derived from these functions are maintained or restored. In particular, these functions should benefit the stakeholders responsible for their production and management. This requires, inter alia: capacity building, especially at the level of local communities managing biological diversity in ecosystems; the proper valuation of ecosystem goods and services; the removal of perverse incentives that devalue ecosystem goods and services; and, consistent with the provisions of the Convention on Biological Diversity, where appropriate, their replacement with local incentives for good management practices.

3. **Use adaptive management practices**

   Ecosystem processes and functions are complex and variable. Their level of uncertainty is increased by the interaction with social constructs, which need to be better understood. Therefore, ecosystem management must involve a learning process, which helps to adapt methodologies and practices to the ways in which these systems are being managed and monitored. Implementation programmes should be designed to adjust to the unexpected, rather than to act on the basis of a belief in certainties. Ecosystem management needs to recognize the diversity of social and cultural factors affecting natural-resource use. Similarly, there is a need for flexibility in policy-making and implementation. Long-term, inflexible decisions are likely to be inadequate or even destructive. Ecosystem management should be envisaged as a long-term experiment that builds on its results as it progresses. This "learning-by-doing" will also serve as an important source of information to gain knowledge of how best to monitor the results of management and evaluate whether established goals are being attained. In this respect, it would be desirable to establish or strengthen capacities of Parties for monitoring.

4. **Carry out management actions at the scale appropriate for the issue being addressed, with decentralization to lowest level, as appropriate**

   As noted in the description of the ecosystem approach, an ecosystem is a functioning unit that can operate at any scale, depending upon the problem or issue being addressed. This understanding should define the appropriate level for management decisions and actions. Often, this approach will imply decentralization to the level of local communities. Effective decentralization requires proper empowerment, which implies that the stakeholder both has the opportunity to assume responsibility and the capacity to carry out the appropriate action, and needs to be supported by enabling policy and legislative frameworks. Where common property resources are involved, the most appropriate scale for management decisions and actions would necessarily be large enough to encompass the effects of practices by all relevant stakeholders. Appropriate institutions would be required for such decision-making and, where necessary, for conflict resolution. Some problems and issues may require action at still higher levels, through, for example, trans-boundary cooperation, or even cooperation at global levels.

5. **Ensure inter-sectoral cooperation and information sharing**

   As the primary framework of action to be taken under the Convention, the ecosystem approach should be fully taken into account in developing and reviewing national biodiversity strategies and action plans. There is also a need to integrate the ecosystem approach into agriculture, fisheries, forestry and other production systems that have an effect on biodiversity. Management of natural resources, according to the ecosystem approach, calls for increased inter-sectoral communication and cooperation at a range of levels (government ministries, management agencies, etc.). This might be promoted through, for example, the formation of inter-ministerial bodies within the Government or the creation of networks for sharing information and experience.

(From www.biodiv.org/programmes/cross-cutting/ecosystem/operational.asp)

These may be complemented by the IUCN “Five steps to implementation” of the *ecosystem*

approach. www.iucn.org/dbtw-wpd/edocs/CEM-003.pdf

Ecosystem management: The IUCN's Commission for Ecosystem Management (IUCN-CEM) defines ecosystem management as "a process that integrates ecological, socio-economic, and institutional factors into comprehensive analysis and action in order to sustain and enhance the quality of the ecosystem to meet current and future needs." The core objective of ecosystem management is the sustainable, efficient and equitable use of natural resources.

Ecosystem management recognises that the inter-connectivity of ecological, socio-cultural, economic and institutional systems is fundamental to our understanding of the factors which influence environmental objectives and outcomes. It is a holistic, multi-disciplinary and integrated approach, which requires a substantial shift in the way we perceive and approach the management of both our natural and modified environments.

Ecosystem management involves viewing resources in a broader context - one that crosses bureaucratic and political boundaries to include all stakeholders in the decision process - and basing management actions on the best science available. It is considered synonymous with the '*ecosystem approach'* (see above).

See also www.iucn.org/themes/cem/ourwork/ecapproach/index.html

Ecosystem services: The findings of the Millennium Ecosystem Assessment (MA) — the largest-ever international assessment of the consequences of ecosystem change for human wellbeing — were released in March 2005. A cornerstone of the assessment is the concept of 'ecosystem services'

This term has been widely used by the scientific community and in international environmental negotiations, and is defined by the MA as the benefits that people receive from ecosystems. The term implies that the service is of value to people (in terms of economic, health, cultural or other benefits), and that the degradation or loss of the service represents a harmful impact on human wellbeing. Modern land use practices, while increasing the short-term supplies of material goods, may undermine many ecosystem services in the long run – even on regional and global scales (see Foley, *et al.*, 2005).

Ecosystem services paradigm: Is an emerging paradigm that considers biodiversity as the underpinning of ecosystem services that are ultimate responsible for human well-being. The Millennium Ecosystem Assessment (MA) is an ongoing multinational effort to track ecosystem conditions. The MA is a good example of an accountability assessment that has adopted the ecosystem services paradigm to motivate measurement.

Endemic: A species which is native to a specific limited locality (i.e. it is not found anywhere else).

Epipelagic: Of or relating to the part of the oceanic zone into which enough sunlight enters for photosynthesis to take place (www.thefreedictionary.com).

Forest Reserve: see Reserve.

Gamete: A gamete is a specialized germ cell that fuses with another gamete during fertilization (conception) in organisms that reproduce sexually (www.thefreedictionary.com).

Integrated Assessment (IA): is an analytic process that explores the dynamic linkages between baseline conditions in the ecological and socio-economic domain and main driving forces. It provides the overall basic framework and method of analysis for more specific environmental assessment approaches. SEA may make use of IA.

Integrated Environmental Assessment (IEA): uses the framework of 'Integrated Assessment' and is defined as: *the process of producing and communicating future-oriented, policy-relevant information on key interactions between the natural environment and human society.* It is championed by the Global Environment Outlook (GEO) which is the UNEP's flagship assessment and reporting process on the status and direction of the global environment (www.unep.org/geo).

Landscape models: In conservation biology two models have been used to conceptualise landscapes: (i) the patch-corridor-matrix (Forman, 1995); and (ii) the landscape continuum model (McIntyre and Hobbs, 1999).

The two models differ in their relative emphasis. In the patch-corridor-matrix model, landscapes are viewed as varying mosaics of different types of patches and corridors. In the landscape continuum model, landscapes are characterized by having different levels of vegetation cover

with a continuum or gradient of possible conditions that range from an intact cover of native vegetation through to relictual levels of cover.

The focus of the patch-corridor-matrix model is on the form or structure of landscapes, whereas the landscape continuum model emphasizes the function of a landscape across varying structural gradients of vegetation cover. Simultaneous consideration of both models is useful because it can lead to greater awareness of the range of conditions that occur in real landscapes and, in turn, the diversity of responses to such varying conditions by different biota. Both models have limitations.

In particular, landscapes are usually treated (intentionally or otherwise) in very simple terms as having two components – patches (habitat) and remaining land (non-habitat). Real landscapes are more complex than this. Such complexity matters – particularly when attempting to predict the response of species to landscape modification.

Management Categories: See 'Protected Areas Management Categories'.

Management Plan: A Management Plan for a Protected Area (PA) is a product of the planning process, documenting the management approach, the decisions made, the basis for these, and the guidance for future management. The Management Plan should cover the entire PA and how it supports ecosystem processes in the landscape also outside its boundaries. It should contain information on what is to be achieved by management and the rationale behind the management decisions made.

The Management Plan is usually accompanied by a number of other plans or related documents, which are derived from, or support it. Most prominent among these are 'Operational Plans'; Zoning Plans (shows areas to be managed in different ways); and Site Plans (may be produced for sites that require intensive management for instance around major visitor attractions).

Mainstreaming: The word "mainstreaming" can be used as a synonym of "inclusion." Mainstreaming means to integrate or incorporate actions related to conservation and sustainable use of biodiversity in strategies relating to production sectors, such as agriculture, fisheries, forestry, tourism and mining. Mainstreaming might also refer to including biodiversity considerations in poverty reduction plans and national sustainable development plans. By mainstreaming biodiversity into Policies, Plans and Programmes we recognize the crucial role that biodiversity has for human well-being.

Matrix: Comprises landscapes that are not designated primarily for conservation of natural ecosystems, ecological processes, and biodiversity regardless of their current condition (i.e. whether natural or developed).

Matrix management: The term refers to approaches to conserve biodiversity in habitat outside a Protected Areas System.

Metapopulation: A metapopulation consists of a group of spatially separated populations of the same species which interact at some level. A metapopulation is generally considered to consist of several distinct populations together with areas of suitable habitat which are currently unoccupied.

Millennium Ecosystem Assessment: The Millennium Ecosystem Assessment (MA) was launched in June 2001 and was completed in March 2005. Coordinated by UNEP, it aimed to meet assessment needs of the CBD, Convention to Combat Desertification, the Ramsar Convention, and the Convention on the Conservation of Migratory Species of Wild Animals, among others.

In 2005 it released the results of its first four-year study of the use and depredation of a variety of the planet's natural resources. The MA observed that ecosystem approaches provide an important framework for assessing biodiversity and ecosystem services, and for evaluating and implementing potential responses. The initial report warned that the world is degrading its natural resources across the board. "The harmful consequences of this degradation could grow significantly worse in the next 50 years," it continued.

www.millenniumassessment.org/en/index.aspx

Niche: "The particular area within a habitat occupied by an organism" or "the function or position of an organism or population within an ecological community".

Operational guidance: See 'Ecosystem approach – Operational guidance'

Operational Plans: Operational Plans for Protected Areas (PAs) are also often called work plans, action plans or implementation plans. They are produced to present detailed information on how/when specific management actions will be carried out. Such plans are particularly necessary for large and/or complex PAs, though most sites should prepare them. Typically, Operational Plans will have a shorter time scale than the Management Plan, for example as annual work plans.

Patch-corridor-matrix: See 'Landscape models'.

Patch: Landscapes may be considered composed of a mosaic of patches which refer to habitat fragments as the basic elements or units that make up a landscape. Patches are dynamic and occur on a variety of spatial and temporal scales. Thus, a landscape does not contain a single patch mosaic.

Pelagic: Of, relating to, or living in open oceans or seas rather than waters adjacent to land or inland waters (www.thefreedictionary.com). Pelagic stage of an organism refers to it living in the water column.

Programme of Work on Protected Areas: The seventh meeting of the Conference of Parties (COP) adopted a Programme of Work on Protected Areas. The overall purpose of this Programme is to support the establishment and maintenance by 2010 for terrestrial and by 2012 for marine areas of comprehensive, effectively managed, and ecologically representative national and regional Systems of Protected Areas. Among other things, this would contribute to achieving the three objectives of the Convention; the '2010 Target' (see above); the World Summit on Sustainable Development Plan of Implementation; and the Millennium Development Goals. The Programme of Work consists of four interlinked elements to be mutually reinforcing and cross – cutting in their implementation. They are intended to assist Parties to the CBD in establishing *national programmes of work* with targeted goals, actions, specific time frames, inputs and expected measurable outputs. See further in Dudley *et al.*, 2005 and CBD's www.cbd.int/decisions/default.aspx?m=COP-07&id=7765&lg=0 (accessed 5 Oct 2007).

Protected Area: According to the Convention on Biological Diversity a Protected Area (PA) is a: *Geographically defined area which is designated or regulated and managed to achieve specific conservation objectives* (Article 2).

IUCN states that a PA is: *An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means* (IUCN, 1994).

In practice, however, these definitions are only marginally different and both of them consider PAs:

- To be area-based concepts that might be found anywhere
- To focus on conservation objectives
- To require specific measures (dedication, designation, regulation) for the purposes of biodiversity conservation (i.e. protection and maintenance)
- To require management, delivered through legal or other effective means
- By implication, to require that some kind of management authority is in place to secure conservation.

Important references include: Thomas & Middleton (2003); Kelleher (1999). Other relevant publications are found in IUCN Best Practice Guidelines at www.iucn.org/themes/wcpa/pubs/guidelines.htm and the CBD Technical Series at www.biodiv.org/programmes/outreach/awareness/ts.shtml.

Protected Areas Management Categories: Refer to the IUCN 1994 *Guidelines for protected area management categories*. They are summarised as:

Category Ia: area managed mainly for science – an area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring

Category Ib: area managed mainly for wilderness protection – large area of unmodified or slightly modified land and/or sea, retaining its natural characteristics and influence, without permanent or significant habitation, which is protected and managed to preserve its natural condition

Category II: area managed mainly for ecosystem protection and recreation – natural area of land

and/or sea designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible

Category III: area managed mainly for conservation of specific natural features – area containing specific natural or natural/cultural feature(s) of outstanding or unique value because of their inherent rarity, representativeness or aesthetic qualities or cultural significance

Category IV: area managed mainly for conservation through management intervention – area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats to meet the requirements of specific species

Category V: area managed mainly for landscape/seascape conservation or recreation – area of land, with coast or sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area

Category VI: area managed mainly for the sustainable use of natural resources – area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while also providing a sustainable flow of natural products and services to meet community needs

A number of important principles in the Guidelines further explain the categorisation system. These include that:

- The basis of categorisation is by primary management objective
- Assignment to a category is not a commentary on effectiveness of management
- The categories system is international
- National names for protected areas may vary
- All categories are important (i.e. the system is not intended as a hierarchy), ***but***
- A gradation of human intervention is implied.

The main guidelines for the Protected Areas Management Categories are IUCN (1994); Dudley & Phillips (2006); and Phillips (2002). For PA planning and management other issues in the IUCN *Best Practice Protected Areas Guidelines Series* are also very useful (see www.iucn.org/themes/wcpa/pubs/guidelines.htm). Other relevant publications are found in the CBD Technical Series at www.biodiv.org/programmes/outreach/awareness/ts.shtml.

Protected Areas System: is constituted by individual Protected Areas (PAs) and should cover the full range of ecosystems and communities found in a particular country. A PA System Plan should identify the range of purposes of Protected Areas, help to balance different objectives, and ensure that national and international targets and commitments are adhered to.

Important references include: Davey (1998); Dudley *et al.* (2005); and Dudley & Parish (2006). Other relevant publications are found in IUCN Best Practice Guidelines at: www.iucn.org/themes/wcpa/pubs/guidelines.htm and the CBD Technical Series at: www.biodiv.org/programmes/outreach/awareness/ts.shtml.

Ramsar Convention: The Ramsar Convention is an international treaty for the conservation and sustainable utilization of wetlands, i.e. to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. The convention was developed and adopted by participating nations at a meeting in Ramsar, Iran on February 2, 1971 and came into force on December 21, 1975.

Red List: The IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List), created in 1963, is the world's most comprehensive inventory of the global conservation status of plant and animal species. The International Union for the Conservation of Nature and Natural Resources (IUCN) is the world's main authority on the conservation status of species.

The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as

help the international community to try to reduce species extinction.

Major species assessors include BirdLife International, the World Conservation Monitoring Centre, and many Specialist Groups within the IUCN's Species Survival Commission (SSC). Collectively, assessments by these organizations and groups account for nearly half the species on the Red List.

IUCN Red List is widely considered to be the most objective and authoritative system for classifying species in terms of the risk of extinction

The IUCN aims to have the category of every species re-evaluated every five years if possible, or at least every ten years. This is done in a peer-reviewed manner through IUCN Species Survival Commission (SSC) Specialist Groups, which are Red List Authorities responsible for a species, group of species or specific geographic area, or in the case of BirdLife International, an entire class (Aves). There are over 7000 extant species in the 2006 Red List which have not had their category evaluated since 1996. (http://en.wikipedia.org/wiki/IUCN_Red_List accessed 8 Sep 2007).

In the 2007 Red List corals and seaweeds have been assessed and added for the very first time.

The IUCN Categories and Criteria for evaluating extinction risk, originally intended for use at the global level, are increasingly being used at the national level as countries worldwide become increasingly interested in conserving biodiversity. To facilitate this process, the IUCN recently published guidelines for the application of the criteria at sub-global levels (see www.iucn.org/themes/ssc/redlists/regionalguidelines.htm, accessed 14 Sep 2007).

SEA: see 'Strategic Environmental Assessment'

Strategic Environmental Assessment - SEA: May be considered *an umbrella term for the assessment of the environmental (and increasingly also the social and economic) impacts/dimensions of policies, plans and programmes*.

Various definitions of SEA have been proposed as practitioners and academics have staked claims in this new territory. Amongst them, several are widely quoted in the literature or deserve attention because of their institutional weight (Dalal-Clayton and Sadler, 2004):

> *SEA is a systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations* (Sadler & Verheem, 1996)
>
> *SEA is a process directed at providing the authority responsible for policy development (the 'proponent') (during policy formulation) and the decision-maker (at the point of policy approval) with a holistic understanding of the environmental and social implications of the policy proposal, expanding the focus well beyond the issues that were the original driving force for new policy* (Brown and Therivel, 2000).

More recently (although not strictly a definition), after reviewing international experience and its own practice in SEA, the World Bank assigns the following purpose to SEA:

> *A participatory approach for upstreaming environmental and social issues to influence development planning, decision-making and implementation processes at the strategic level* (Mercier, 2004).

These definitions also illustrate how interpretation of the concept of SEA is evolving. Early definitions saw SEA as a tool extending its process and procedure upstream from the project to the strategic level, and focusing on the environmental impacts of policies, plans and programmes that are already proposed.

More recent definitions – and the international trend - take a broader, more complex and varied perspective. They see SEA as including the social (and sometimes the economic) dimension. They also promote SEA not just as a means to 'upstream' impact assessment, but as a diagnostic tool to help integrate environmental and social (and even economic) considerations during the formulation of policies and development plans and programmes. In other words, SEA is seen as a key tool for sustainable development.

Threatened species: For the past forty years, the World Conservation Union – IUCN – has been maintaining the *IUCN Red List of Threatened Species*. According to their 2004 report (*2004 IUCN Red List of Threatened Species. A Global Species Assessment*), around 844 species have been confirmed extinct since 1500, with 27 of these extinctions recorded within the last twenty years.

In 2007 there are 41,415 threatened species. 12% of birds, 23% of mammals, and 32% of amphibians are threatened with extinction. However, there is also an important gap in threatened species calculations. While 40% of vertebrates have been evaluated, there is still not enough data regarding freshwater system and ocean dwelling species, invertebrates, plants and fungi. In total, scientists have only been able to evaluate about 3% of a total estimated 1.9 million species. Given that, we can assume that the true amount of threatened species is very much higher.

The 2007 data for South and South-East Asia are presented below with data for Malaysia highlighted (from www.iucnredlist.org/info/tables/table5, accessed 14 Sep 2007):

South & Southeast Asia	Mammals	Birds	Reptiles	Amphi-bians	Fishes	Molluscs	Other Inverts	Plants	Total
Bangladesh	29	26	21	1	12	0	0	12	101
Bhutan	22	16	1	1	0	0	1	7	48
British Indian Ocean Territory	0	0	2	0	7	0	0	1	10
Brunei Darussalam	15	21	4	3	7	0	0	99	149
Cambodia	27	24	11	3	17	0	0	31	113
Disputed Territory	0	0	0	0	1	0	0	0	1
India	89	75	25	63	39	2	20	247	560
Indonesia	146	116	27	33	111	3	28	386	850
Lao People's Democratic Republic	34	22	11	4	6	0	0	21	98
Malaysia	50	40	21	46	47	19	2	686	911
Maldives	1	0	2	0	11	0	0	0	14
Myanmar	39	39	22	0	16	1	1	38	156
Nepal	32	31	6	3	0	0	0	7	79
Philippines	51	67	9	48	58	3	17	213	466
Singapore	4	13	4	0	22	0	1	54	98
Sri Lanka	21	13	8	52	31	0	52	280	457
Thailand	38	43	22	3	50	1	0	86	243
Timor-Leste	1	5	1	0	4	0	0	0	11
Viet Nam	43	38	25	15	31	0	0	146	298

Trophic: Of or involving the feeding habits or food relationship of different organisms in a food chain (www.thefreedictionary.com).

ANNEX 1: SUMMARY OF POLICY AND PLAN PROVISIONS

Oil palm worker [2]

A brief summary of key long-term policies and plans, including those which are under implementation by NRE and its line agencies, is provided below. The abridgements have been done with respect to implementation aspects of conservation and management needs of natural resources and biodiversity assets.

However, no policy exists in isolation. It is important to consider the many other, often unintended, links that exist, both among various environmental policies and between environmental and other policies.

For completeness their impact on natural resources and biodiversity should be considered when undertaking a more comprehensive assessment of policies to promote complementary inter-agency actions supporting national goals of sustainable environmental development (e.g. the National Agricultural Policy 3, 1998-2010).

A useful more comprehensive approach may make use of "analysis of policy mix and its effects" (see Annex 5).

The extent to which the policy instruments dealt with here specifically refer to individual operational conservation actions has been summarised in **Table 5** (next page).

Vision 2020

In 1991 the Malaysian government declared that it was the objective of the nation to become a developed nation by 2020. Among other things, achieving this would require a high annual growth rate over a 30-year period. However, the Vision clearly states that while meeting nine strategic challenges:

> *……we must also ensure that our valuable natural resources are not wasted. Our land must remain productive and fertile, our atmosphere clear and clean, our water unpolluted, our forest resources capable of regeneration, able to yield the needs of our national development.*

National Vision Policy 2001 - 2010

The National Vision Policy (NVP) aims to establish a united, progressive and prosperous Bangsa Malaysia. It endeavours to build a resilient, competitive and equitable society with the overriding objective of National Unity. It has defined seven critical thrusts, of which one is to pursue environmental sustainable development:

- Building a resilient nation;
- Promoting an equitable society;
- Sustaining high economic growth;
- Enhancing competitiveness;
- Developing a knowledge-based economy;
- Strengthening human resource development; and
- Pursuing environmentally sustainable development.

The NVP provides the overriding objectives for the various national initiatives over the period. The National Vision Policy is made operational through the Third Outline Perspective Plan.

Table 5. Summary of emphasis and provisions of key policies and plans.

	Provisions/Emphasis	Vision 2020	NVP	OPP3	NPBD	NPE	NFP	9MP	NPP
1	***Assessment***								
2	Insufficient data on nat. resource / BioD								
3	Marine systems				X				
4	Marine flora and fauna				X				
5	Terrestrial flora (lower plants)				X				
6	Fragmentation (human impact on wildlife displacement)				X				X
7	Survey and document BioD/Develop database				X	X			
8	Minimum sizes for species and conservation areas				X		x		
9	Identify major source of loss of BioD				X				
10	Establish trends				X	X			
11	National inventory and audit maintained / regularly updated					X			
12	Land use planning/implementation based on comprehensive assessments					X			
13	***Planning & conservation actions***								
14	Environmentally sustainable development	X	X	X	X	X		X	X
15	Integrated / holistic			X	X	X		X	
16	Recognise human well-being dependent on BioD				X	X	x	X	X
17	Insufficient attention to interactions terrestrial/marine systems				X				
18	Use/promote sust. man. practices for land, water, forest, marine, energy							X	
19	Planning/management of river basins/watersheds			X	X	x		X	X
20	Minimise land degradation (e.g. soil erosion, BioD)				X	X			
21	Ω Conservation insufficiently prioritised				X				
22	Fragmentation of habitat is critical								X
23	Provide connectivity (riparian and other corridors)								X
24	Θ Mainstream/integrate environmental concerns into PPPs			X	X	X		X	x
25	Critical habitats should be protected			X	X	x		X	
26	Aquatic systems (freshwater/marine)				X				
27	Φ Lowland habitat				X				X
28	Freshwater habitat				X			X	X
29	Mangroves				X			X	X
30	Marine				X			X	
31	Limestone/quartz hills				X				
32	Expand PAs to include all habitat/ecosystems/processes				X	x			
33	Management Plans reviewed/strengthened (existing)							X	
34	Proactive approach to regional/global issues					X			
35	***Benefit sharing / equitable access***				X	X			X
36	***Institution building***								
37	Systemic				X			X	
38	Institutions				X			X	
39	Individuals				X				
40	***Participation***								
41	Inter-agency/stakeholder							X	X
42	Private sector				X	X		X	
43	NGOs							X	x
44	Æ Involve local communities				X		X		
45	***Communication***								
46	Public awareness, education				X	X	X		
47	Dissemination system, Information sharing				X	X			
48	National, local				X	X			
49	International				X	X			
50	Dabases and information centres				X				
51	***Monitoring***								
52	Ø Monitor the status of BioD				X				
53	Acccounting/auditing/performance standards/accountability			X	X	X		X	
54	***Assessment framework (EIA, SEA)***				X			X	
55	***Legislative framework***								
56	Insufficient				X				
57	Review and update				X	X			

Abbreviations: ***9MP:*** *9th Malaysian Plan ;* ***NPE:*** *National Policy on the Environmentt;* ***NFP:*** *National Forestry Policy*
NPBD: *National Policy on Biological Diversity ;* ***NVP:*** *National Vision Policy;* ***OPP3:*** *3rd Outline Perspective Plan*

Notes: Θ OPP3: *The National Biodiversity Policy will form the basis for integrating and consolidating biodiversity programmes and projects in the country.*
NPBD: Strategy 6 has seven Actions dedicated to extensive mainstreaming of biodiversity.

Θ NPP 18: *ESAs shall be integrated in the planning and management of land use and natural resources to ensure sustainable development.*

Φ NPBD p. 10, §4 *lowland dipterocarp forest* [...] *require total protection*

Ω NPBD: p. 11 *Conservation is given low priority in existing land use policies* [...]

Æ NFP: Implementation: Agroforestry; Community forestry, recreation & tourism

Ø NFP: *Sustainable Forest Management: Regular monitoring of the areas and contents of the foreststshould be done consistently and systematically.*

Outline Perspective Plan 2001-2010

The OPP3 informs to be based on a National Vision Policy (NVP) of which one of seven key thrusts is: *pursuing environmentally sustainable development to reinforce long-term growth.*

The OPP3 is one of few policies clearly referring to other policies in specifically stating that:

> *The National Biodiversity Policy will form the basis for integrating and consolidating biodiversity programmes and projects in the country.* (181)

Additional measures to take are summarised below:

- Environment and resource issues should be dealt with in an integrated and holistic manner (based on integrated land use planning)
- Plans for integrated river basin management and integrated coastal management will be introduced
- Environmental performance measurement will be used to harness market forces and community engagement
- Sustainable forest management will continue/be intensified and multiple use forestry expanded
- Tourism expansion should be accompanied by conservation of the environment
- Environmental considerations will increasingly be integrated into development planning
- To strengthen the empirical base for environmental decision-making, steps will be taken to introduce environmental performance standards and environmental data on a sectoral and cross-sectoral basis
- The major environmental and natural resource concerns during the OPP3 period will include conservation of natural habitats and resources

The strategic thrusts of the OPP3 are meant to serve as the guiding framework for the 8th and the 9th Malaysia Plans.

National Policy on Biological Diversity 1998

In its overview the National Policy on Biological Diversity (NPBD) establishes (among others):

- Aquatic ecosystems include both freshwater and marine environments. Coral reefs and coastal mangroves have been identified as very important in terms of biological diversity. These are habitats which support diverse forms of life and are very productive.
- Very little of the lowland dipterocarp forests, the largest reservoir of genetic variation of terrestrial flora and fauna, remain and these require total protection, as do the remaining swamp and mangrove forests. Loss of these habitats still continues as most development plans relegate the notion of conservation to low priority status.
- Present conservation efforts are inadequate for reasons which include (paraphrased):
  - Important habitats are under-represented [in a Protected Areas System]
  - Conservation efforts of individual species are targeting large animals and to some extent birds. Less is done for species of plants, insects or fish (marine and freshwater).
  - Conservation is given low priority in existing land use policies resulting in competition for use of land.
  - Establishment of marine parks in Peninsular Malaysia must give attention to adjoining terrestrial components as these too have negative impacts on the marine ecosystem.
  - Common marine and terrestrial biological resources lack adequate regional and international cooperation in their conservation and management.

A number of priority issues and relevant actions are specified in the Policy under *Strategies for Effective Management.* In particular, Strategy 6 dedicates seven Actions to extensive mainstreaming of biodiversity.

Implementing agency

1. NRE (though not clearly specified)

Time frame for implementation

2. Not specified

Relation to other national policies, plans and programmes[1]

3. §22. "Having ratified the Convention on Biological Diversity on 24th June 1994, Malaysia must incorporate into the national policy the set of commitments under the treaty. The Convention reaffirms the sovereign rights of States over their biological resources and their responsibility for conserving their biological diversity and utilizing the biological resources in a sustainable manner. To achieve the above, they must develop national strategies, plans or programmes. As far as possible and where appropriate, these must be integrated into sectoral or cross-sectoral plans, programmes and policies."

Assessment

4. Develop a database on biodiversity [i.e. includes a spatial (GIS) database]
5. Determine minimum viable population sizes for species and critical minimum size of conservation areas
6. Identify major sources of biological diversity loss such as forest damage or degradation, overfishing, pollution of marine resources, development that disrupts primary forest or catchment areas, destruction of mangrove areas and coral reefs, and act to minimise these sources

Planning and conservation actions

7. Expand the network of *in-situ* conservation areas to ensure full representation of ecosystems and ecological processes therein
8. Ensure that biodiversity conservation and sustainable use is integrated into long and medium-term development plans [2]
9. Develop tools to analyse and evaluate development plans and strategies which may have impact upon biological diversity
10. Ensure EIAs accord due priority to biodiversity

Monitoring

11. Monitor the status of biological diversity
12. Develop natural resource accounting methods to promote conservation and sustainable use of biodiversity

Communication

13. Develop an effective information dissemination system (ensure efficient dissemination of relevant information and extension services to promote cross-sectoral integration in the sustainable use of biological diversity)
14. Develop national emergency response systems for major threats to biological diversity, including early warning systems, notification procedures and salvaging measures

National Policy on the Environment 2002

The National Policy on the Environment (NPE) is based upon the principles of (paraphrased):

1. Exercise respect and care for the environment in accordance with the highest moral and ethical standards
2. Conserve natural ecosystems to ensure the integrity of biodiversity and life support systems
3. Ensure continuous improvement in the productivity and quality of the environment while pursuing economic growth and human development objectives
4. Manage natural resource utilisation to sustain the resource base and prevent degradation of the environment
5. Integrate environmental concerns into planning and implementation of PPPs
6. Strengthen the role of the private sector in environmental protection and management
7. Ensure the highest commitment to environmental protection and accountability by all decision-makers in the public and private sectors as well as civil society in general

[1] In particular in terms of which other PPPs are superior and which are subordinate – an absolutely essential aspect for planners, decision-makers and technical staff charged with implementation.

[2] The Policy specifically mentions to: *ensure that biological diversity issues are incorporated in long-term and medium-term development plans (e.g. Five Year Development Plans, Outline Perspective Plans, National Development Plans)*.

8. Participate actively and effectively in regional and global efforts towards environmental conservation.

The seven *Green Strategies* of the NEP specify important priorities and actions to undertake including:

Implementing agency
15. NRE (though not clearly specified)

Time frame for implementation
16. Not specified

Relation to other national policies, plans and programmes
17. Not specified

Assessment
- National inventory and audit maintained and regularly updated… as a guide to policy formulation and decision-making.

Planning and conservation actions
- Conservation and protection include rich habitats and ecosystems.
- Land use planning and implementation based on comprehensive assessment (incl. environmentally sensitive areas).
- Special emphasis on minimising land degradation (e.g. soil erosion).
- Sustainable forestry involving local communities.
- River basin management.
- Wetlands, islands, sea grass and coral reefs managed in an environmentally sound manner.
- National natural resource accounting system implemented.
- Environmental considerations integrated into PPP and project formulation/ implementation.
- Development planning to be on regional rather than project basis considering both economic and environmental objectives.
- Actions plans, including adequate resource support, will be formulated.

Monitoring
- Appropriate environmental monitoring systems established.
- National Development Council to monitor implementation of Policy.

Communication
- Public information services.

National Forestry Policy 1978/1992

The National Forestry Policy (NFP) has evolved from the Interim Forestry Policy first formulated in 1952. The last revision in 1992 was done with an aim to address increased concerns about biodiversity and the role of local communities in forest development.

It aspires to dedicate as Permanent Forest Reserve (PFR) areas strategically located throughout the country. The PFR is to be classified and managed under the four functions: Protection; Production; Amenity; and Research & Education.

The two key objectives of the NFP are to:

- Conserve and manage the nation's forest based on the principles of sustainable management.
- Protect the environment as well as to conserve biological diversity, genetic resources, and to enhance research and education

The Policy is being implemented by the respective Forestry Departments for Peninsular Malaysia, Sabah and Sarawak. Under policy implementation it is established that *national forest management must take into account the need to conserve the flora and fauna*, though it does not give further guidance including on how to cope with fragmentation and linkages (i.e. landscape matrix management beyond administrative boundaries).

Components of the NFP are extracted below into the key operational conservation action categories.

Implementing agency

18. "The Director General of Forestry is responsible to the Federal Government for the proper and efficient management of the Nation's Permanent Forest Estate, which is achieved by providing the State Governments, through their respective State Directors of Forestry, with technical advice, assistance and training facilities. In the interest of the community and the nation, State Governments may accept technical and professional advice given by the Director General of Forestry for the implementation of the National Forestry Policy."

Time frame for implementation

19. Not specified

Relation to other national policies, plans and programmes

20. Only administration referred to

Assessment

- [It is implicit in *sustainable forest management* to conduct forest inventories, establish levels of sustainable harvests, etc. This may or may not include information on elements of biodiversity]

Planning and conservation actions

- To provide for the preservation of biological diversity and the conservation of areas with unique species of the flora and fauna
- To set aside sufficient areas of land as Protection Forest, Production Forest, Amenity Forest, and Research and Education Forest as Permanent Forest Estate.

Inter-agency

- [International co-operation will be fostered to achieve better understanding of forest management and development]

Monitoring

- Regular monitoring of the areas and contents of the forests should be done consistently and systematically

Communication

- Promoting public awareness in forestry

9th Malaysian Plan 2006-2010

In the 9th Plan environmental stewardship is to continue in line with the Ninth Principle of *Islam Hadhari* to ensure a balanced sustainable development.

In the Plan period, fostering of closer cooperation between stakeholders in addressing environmental concerns will take place, together with an increased application of EIA and SEA.

Steps will be taken to identify and adopt actions to promote sustainable natural resource management practices in relation to land, water, forest, energy and marine resources. These efforts will enhance protection of the environment and conservation of natural resources and contribute towards improving the quality of life.

The strategic thrusts for addressing environmental and natural resources issues will, among others, focus on utilising resources sustainably and conserving critical habitats. The conservation and sustainable use of forest products, watersheds and water catchments will be emphasised to promote sustainable forest management.

The application of a spatial development approach, which integrates environmentally sustainable development concepts and methodologies, will be promoted. An Integrated Coastal Zone Management Policy will be adopted to promote conservation and preservation of marine and coastal resources.

During the period, the promotion of sustainable natural resource management practices in relation to land, water, forest, energy and marine resources, will be intensified.

Implementing agencies
21. EPU, Ministry of Finance, Bank Negara Malaysia, Department of Statistics, Inter-Agency Planning Groups.

22. Implementation Coordination Unit together with EPU and respective ministries and agencies.

Time frame for implementation
23. 2006-2010

Relation to other national policies, plans and programmes
24. Contains linkages to previous Plan

Assessment [of the Plan]
- [not specifically mentioned but a prerequisite for measures summarised below]

Planning and conservation actions
- Sustainable resource use.
- Efforts will be intensified to protect critical habitats. Towards this end, existing management plans will be reviewed to further strengthen the protection of threatened flora and fauna.
- Steps will be taken to identify and adopt actions promoting sustainable natural resource management practices in relation to land, water, forest, energy and marine resources.
- Greater focus on preventive measures, conservation efforts and sustainable management.
- The application of the spatial development approach, which integrates environmentally sustainable development concepts and methodologies, will be promoted.
- Emphasis will be placed on maintaining and enhancing the ecosystem functions of river systems through the restoration and maintenance of highland catchments, wetlands, river buffers and riparian zones.
- The conservation and sustainable use of forest products, watersheds and water catchments will be emphasised to promote sustainable forest management.
- Increased application of EIA and SEA.

Inter-agency
- Closer collaboration between stakeholders.
- NRE and its 10 agencies have a key role in promoting environmental stewardship and maintaining the balance between development needs and the environment. Together with the Ministry of Housing and Local Government, it will ensure that the environment is taken into account in land use planning and development. FD and PERHILITAN will be the frontline agencies in the conservation of biodiversity. Civil society will complement the efforts.
- Connectivity may be supported by the National Landscape Policy providing *green lung reserves* [along] *rivers* and other landscape features.

Monitoring
- Plan implementation monitored by a high-level Implementation Committee. Evaluation framework to be drawn up by EPU.

Communication
- [not specifically mentioned]

National Physical Plan 2005

The National Physical Plan (NPP) aims to establish *an efficient, equitable and sustainable national spatial framework to guide the overall development of the country towards achieving developed nation status by 2020*.

The Plan defines 10 principles to adhere to which include: (4) Protect national heritage areas and locations; and (8) Avoid disrupting ecological stability.

In agreement with global consensus (e.g. CBD), the Plan clearly states that *fragmentation is one of the major threats to the conservation and maintenance of biodiversity and ecosystem* (Chapter 5.6).

The Plan lists a total of 36 *policies* of which six include reference to natural resources and biodiversity

assets:

18: Environmentally Sensitive Areas (ESA) shall be integrated in the planning and management of land use and natural resources to ensure sustainable development.
19: A Central Forest Spine (CFS) shall be established to form the backbone of the Environmentally Sensitive Area network.
20: Sensitive coastal ecosystems shall be protected and used in a sustainable manner.
21: Land development in the highlands shall be strictly controlled to safeguard human safety and environmental quality.
22: All surface and ground water resources are strategic assets to be safeguarded and used optimally.
34: Land utilised for main drains, streams and rivers shall be designated as drainage or river reserves.

The NPP sees area-based conservation as the means to achieve sustainable development: *Environmentally Sensitive Areas (ESA)* [which] *shall be integrated in the planning and management of land use and natural resources to ensure sustainable development*. They are shown in **Table 6** together with their general management guidelines (also defined in the NPP).

Table 6. Definition of ESAs and their management prescriptions.

Environmentally Sensitive Areas	**Definition**	**Management prescription**
ESA 1	All PAs, potential PAs, wetlands, turtle landing sites, catchment areas of existing and proposed dams and areas with contours above 1,000 metres above mean sea level (a.m.s.l)	No development, agriculture or logging shall be permitted except for low-impact nature tourism, research and education.
ESA 2	All other forests, wildlife corridors, buffer zones around ESA Rank 1 areas and areas with contours between 300-1,000 metres a.m.s.l.	No development or agriculture. Sustainable logging and low impact nature tourism may be permitted subject to local constraints.
ESA 3	All marine park islands, buffer zones around ESA Rank 2 areas, catchment areas for water intakes, areas for groundwater extraction (well fields), areas with erosion risk greater than 150 ton/ha./year, areas experiencing critical or significant coastal erosion and areas between 150-300 metres a.m.s.l.	Controlled development where the type and intensity of the development shall be strictly controlled depending on the nature of the constraints.

A *Central Forest Spine* (CFS) shall be established to form the backbone of the Environmentally Sensitive Area network. Sensitive coastal ecosystems shall be protected and used in a sustainable manner. Land development in the highlands shall be strictly controlled to safeguard human safety and environmental quality. Land utilised for main drains, streams and rivers shall be designated as drainage or river reserves.

The National Physical Plan establishes that Structure and Local Plans shall refine and delineate the ESAs; and the PA network shall be enlarged to include full representation of diversity of natural ecosystems (particularly the lowland dipterocarp forest and wetlands).

Finally, the NPP reinforces the National Forestry Act by stating that *PFR that have been degazetted for development shall be simultaneously replaced with forests that are of similar quality and size* (IP8, Point VIII).

The summary of the NPP is as follows:

Implementing agencies

- The Federal Department of Town and Country Planning (DTCP) has technical leadership. Otherwise, "all Federal and State Agencies" will implement.
- 1.5 "The NPP is currently confined to Peninsular Malaysia..."

Time frame for implementation

- 2005-2020

- The Plan is to be reviewed every fifth year simultaneously with the Five-Year Plans.

Relation to other national policies, plans and programmes

- Under *Implementation Mechanism* the recommendations include: "(ii) Once the NPP is approved the various federal and state agencies need to translate these policies into programmes and projects and include them in the subsequent FYMP" [FYMP: Five-year Malaysian Plans]
- *National Development Planning Framework:* "At the national level, development planning will be guided by the FYMP, the NPP and the sector policies that emanate from Cabinet, the respective Ministries and Sector Councils."

Assessment

- "Studies shall be undertaken to determine the possibility of re-establishing the integrity and connectivity of forests and wetlands through the implementation of the linkages between […]four major forest complexes" [essentially forest excluding lowland and coastal habitats] (5.6, IP9)

Planning and conservation actions

- The Central Forest Spine (CFS) shall be established and gazetted under the National Forestry Act.
- "Management plans, guidelines and operational procedures shall be formulated to regulate the functions and uses of the [Central Forest Spine]."
- Integrated River Basin Management should be used.
- "Rivers shall be used as connecting corridors to maintain the integrity and connectivity of forest ecosystems. Structure Plans and Local Plans shall incorporate the concept of using the rivers and forests as the backbone for developing the country's network of linear recreational areas and for maintaining ecological balance."
- Sensitive coastal ecosystems (various measures) (IP10)
- "All islands within marine parks should be designated as ESA Rank 3 as minimum requirement, and development should be controlled accordingly to help safeguard the marine parks. Subject to further studies, some marine park islands will be designated ESA Rank 1 or 2."
- Other sensitive coastal ecosystems shall continue to be identified in the Structure Plans.
- Structure Plans and Local Plans shall refine and delineate the ESAs.
- The PA network shall be enlarged to include full representation of diversity of natural ecosystems (particularly the lowland dipterocarp forest and wetlands)
- ESAs shall be integrated in the planning and management of land use and natural resources to ensure sustainable development.

Inter-agency

- The DTCP has technical leadership and ensures coordination. "Some of the key ministries that play an important role in spatial planning are the Ministry of Housing and Local Government, Ministry of Natural Resources and Environment, Ministry of Rural and Regional Development, Ministry of Works, Ministry of Transport and the Ministry of Agriculture and Agro-based Industry. It is important that these Ministries should be represented in the [National Physical Planning Council] NPPC" which is "the main policy council for spatial planning". There should also be linkages to many national types of council.
- All NRE line agencies are proposed to be members of a National Physical Planning Committee under the NPPC.
- The proposed organisational structure has direct linkages to State Planning Committees and Local Planning Authorities.

Monitoring

- Project implementation and monitoring will take place under the National Development Council.
- Monitoring will be done of the application of NPP *policies* (indicators are suggested) and conformity between the NPP and Structure Plans (particularly land use changes, preservation and conservation of ESAs)

Communication

- "In addition to the NPP, the NPPC may also issue planning guidelines similar to the Planning Policy Guidelines (United Kingdom) to the various states from time to time."

Mah-Meri mask [2]

ANNEX 2: RELATING THE THREE-PRONGED APPROACH TO THE NATIONAL POLICY ON BIOLOGICAL DIVERSITY

Table 7. Actions of the National Policy on Biological Diversity related to *a Common Vision* (notice that only relevant Actions are listed and, due to limitations of space, some paragraphs are incomplete).

No.	National Policy on Biological Diversity Strategies Activities directly relevant for *a Common Vision* (i.e. 66 out of 96 activities)			Protected Areas System *	Ecosystem/ landscape approach	Mainstrea-ming of BioD
	1	**Improve scientific knowledge base**				
1		1	Undertake and intensify biological resource inventories and systematic studies to document species diversity.			
2		6	Develop a database of biological diversity and an effective information dissemination system.			
3		7	Establish an inventory of traditional knowledge on the use of species and genetic diversity.			
4		8	Evaluate the economic contributions of biological diversity to the value of goods and services in the national economy.			
5		9	Monitor the status of the components of biological diversity.			
6		10	Survey and document exotic species and populations which threaten biological diversity.			
7		11	Undertake research to develop methodologies and techniques for recovery and rehabilitation of degraded land, inter alia, through reintroduction of appropriate species.			
	2	**Enhance sustainable utilisation of components of biological diversity**				
8		2	Develop natural resource accounting methods that promote conservation and sustainable use of biological diversity.			
9		3	Ensure the development of sectoral and cross-sectoral policies, plans and programmes which integrate considerations of biological diversity conservation and sustainable use.			
10		4	Ensure sectors performing Environmental Impact Assessments (EIAs) accord due priority to biological diversity.			
11		5	Undertake research and monitoring of the impacts of resource utilisation on biological diversity.			
12		6	Provide incentives to encourage conservation of biological diversity and sustainable use of its components.			
13		7	Ensure efficient dissemination of relevant information, together with appropriate extension services, to assist various sectors to conserve and sustainably use biological resources.			
14		8	Facilitate participation of local communities in traditional sustainable use of biological resources.			
15		9	Ensure fair distribution to the nation and local communities of benefits arising from the use of biological resources.			
	4	**Strengthen institutional framework for biological diversity management**				
17		2	Establish a national centre for BioD with the task of coordination of programmes, implementation, M&E, priority setting and information management. In the interim period, a technical working committee should be established to initiate and undertake this task. This committee could set up task forces to address relevant issues on biological			
18		3	The participation of the private sector and NGOs should be included where appropriate.			
19		4	Identify, reinforce or establish biological diversity programmes and facilities in existing institutions.			
20		5	Establish or strengthen resource management units at state and local GO levels and promote implementation mechanisms between federal, state and local governments.			
	5	**Strengthen and integrate conservation programmes**				
21		1	Expand the network of in-situ conservation areas to ensure full representation of ecosystems and all ecological processes therein.			
22		2	Strengthen capacity and role of ex-situ facilities in conservation activities and research, with a view to complementing in-situ conservation.			
23		3	Expand ex-situ conservation centres to cater for threatened species, for breeding and selection and as repositories for germplasm i.e. genebanks, botanical and zoological gardens and arboreta.			
24		4	Ensure public involvement in planning and management of protected areas, taking into consideration the involvement of local communities.			
25		5	Develop mechanism for ensuring compatibility between conservation and sustainable development.			
26		6	Determine minimum viable population sizes for species and critical minimum size of conservation areas.			
	6	**Integrate biological diversity considerations into sectoral planning strategies**				
27		1	Ensure biological diversity conservation is a factor in planning and impact assessment of sectoral and cross-sectoral development programmes.			
28		2	Study the impact of national and state policies and priorities on conservation and sustainable use of biological diversity.			
29		3	Develop tools to analyse and evaluate development plans and strategies which may have impact upon biological diversity.			
30		4	Review current sectoral policies, plans and programmes to determine the extent to which use of biological resources reflect conservation needs and recommend appropriate measures therein.			
31		5	Ensure that biological diversity issues are incorporated in long/medium-term development plans (e.g. Five Year Development Plans, Outline Perspective Plans, National Development Plans).			
32		6	Ensure efficient dissemination of relevant information and extension services to promote cross- sectoral integration in the sustainable use of biological diversity.			
33		7	Ensure that biological diversity conservation is a major factor in the management of our biological resources.			
	7	**Enhance skill, capabilities and competence**				
34		1	Identify critical skill requirements and undertake programmes to develop the human resource base in the appropriate areas.			
35		2	Utilise research institutes and universities to build up competence in relevant areas.			
36		3	Enhance research, planning and management capabilities through collaborative programmes amongst local			
37		4	Provide reward structures and design reward mechanisms to strengthen appropriate fields for education to achieve conservation and sustainable use of biological diversity.			
38		5	Develop or reorientate education and training programmes with specific reference to conservation and sustainable			
39		6	Develop training programmes for public participation in biological diversity conservation.			

* Covering terrestrial, freshwater and marine biodiversity.

Relevant

Highly relevant (for the immediate furture) - 44 out of a total of 66

Table 7. Actions of the National Policy on Biological Diversity related to *a Common Vision* (*Continued*).

National Policy on Biological Diversity **Strategies** Activities directly relevant for *a Common Vision* (i.e. 66 out of 96 activities)		Protected Areas System *	Ecosystem/ landscape approach	Mainstrea-ming of BioD
8	**Encourage private sector participation**			
	3 Provide incentives to the private sector to undertake activities in conservation and sustainable utilization of biological resources.			
	4 Encourage the establishment of consortia to complement government and public efforts in the conservation of biological diversity.			
9	**Review legislation to reflect biological diversity needs**			
	1 Identify existing legislation pertaining to biological diversity and review their adequacy.			
	a) commitments under the Convention on Biological Diversity and Agenda 21			
	b) regulating and managing biological resources including the introduction and implementation of codes of practice for collectors			
	f) management of threatened or endangered species and populations			
	3 Review Environmental Impact Assessment (EIA) and other related legislation to strengthen requirements for assessing direct or indirect biological diversity loss or degradation			
	4 Improve the effectiveness of existing legal mechanisms by creating awareness of conservation regulation and by			
	5 Review existing state and federal legislation pertaining to biological diversity in order to promote uniform			
10	**Minimise impacts of human activities on biological diversity**			
	1 Identify major sources of biological diversity loss such as forest damage or degradation, overfishing, pollution of marine resources, development that disrupts primary forest or catchment areas, destruction of mangrove areas and			
	2 Develop methods of evaluating the long-term hazards, as well as the viability of populations and ecosystems, due to development.			
	3 Develop national emergency response systems for major threats to biological diversity, including early warning systems, notification procedures and salvaging measures.			
	4 Ensure effective enforcement for the compliance of mitigation and rehabilitation measures in all activities that present potential dangers to biological diversity.			
	5 Rehabilitate degraded habitats where biological diversity has been reduced in particular those within conservation areas and their adjacent areas.			
	7 Adopt measures to alleviate the impact of human activities on the displacement of wildlife.			
12	**Enhance institutional and public awareness**			
	1 Increase awareness within the civil service at both federal, state and local government levels as well as in professional bodies and the private sector through courses and training programmes.			
	2 Enhance mass media coverage of biological diversity issues.			
	3 Incorporate the study of biological diversity and related fields into the curricula of schools and institutions of higher learning.			
	4 Promote and support the biological diversity activities of nature clubs and societies.			
	5 Incorporate the notion of conservation of biological diversity and sustainable use of its components as an element of environmental awareness and training programmes.			
	6 Recognise the role of NGOs in the conservation and sustainable utilisation of biological diversity.			
13	**Promote international cooperation and collaboration**			
	4 Promote regional collaboration in biological diversity, in particular on transboundary issues e.g. establishment of transfrontier national parks, and the effects of pollution on biological diversity.			
14	**Exchange of information**			
	1 Identify and review existing mechanisms to facilitate the exchange of information relevant to the conservation and sustainable use of biological diversity.			
	a) information centres and networks to disseminate relevant information prepared by government, research and educational institutions, industry, non-governmental organizations (NGOs) and individuals			
	b) central directories of relevant data sets, information centres and networks			
	c) establishing and enhancing relevant databases and data management capabilities			
15	**Establish funding mechanisms**			
	1 Review current funding options relating to biological diversity and identify the potential for reallocation of resources for implementation of the strategies of the NPBD.			
	2 Seek new and additional incentives, funding sources and mechanisms, at both the national and international levels, for the implementation of the strategies. Funding sources should include government, non-governmental			
	3 Establish trust funds for the conservation and management of biological diversity.			

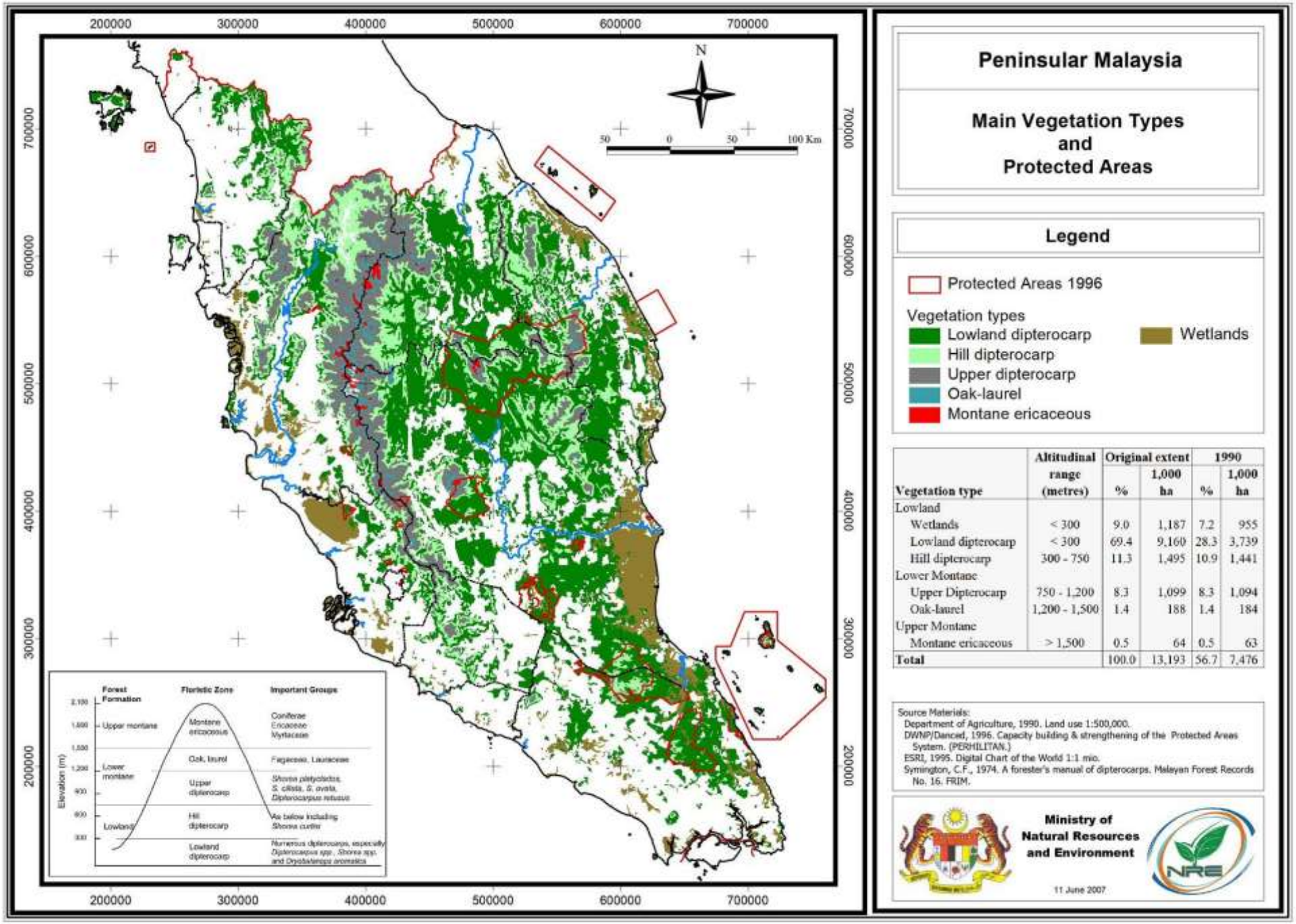
* Covering terrestrial, freshwater and marine biodiversity.

Relevant
Highly relevant (for the immediate furture) - 44 out of a total of 66

Rainforest patch [2]

ANNEX 3: GENERALISED HABITAT TYPES AND EXTENT IN PENINSULAR MALAYSIA – 1990

(Protected Areas as of 1996; and habitat extent according to the requirements of mammals)



Peninsular Malaysia

Main Vegetation Types and Protected Areas

Legend

- Protected Areas 1996

Vegetation types

- Lowland dipterocarp
- Hill dipterocarp
- Upper dipterocarp
- Oak-laurel
- Montane ericaceous
- Wetlands

Vegetation type	Altitudinal range (metres)	Original extent %	Original extent 1,000 ha	1990 %	1990 1,000 ha
Lowland					
Wetlands	< 300	9.0	1,187	7.2	955
Lowland dipterocarp	< 300	69.4	9,160	28.3	3,739
Hill dipterocarp	300 - 750	11.3	1,495	10.9	1,441
Lower Montane					
Upper Dipterocarp	750 - 1,200	8.3	1,099	8.3	1,094
Oak-laurel	1,200 - 1,500	1.4	188	1.4	184
Upper Montane					
Montane ericaceous	> 1,500	0.5	64	0.5	63
Total		100.0	13,193	56.7	7,476

Source Materials:
Department of Agriculture, 1990. Land use 1:500,000.
DWNP/Dancad, 1996. Capacity building & strengthening of the Protected Areas System. (PERHILITAN.)
ESRI, 1995. Digital Chart of the World 1:1 mio.
Symington, C.F., 1974. A forester's manual of dipterocarps. Malayan Forest Records No. 16. FRIM.

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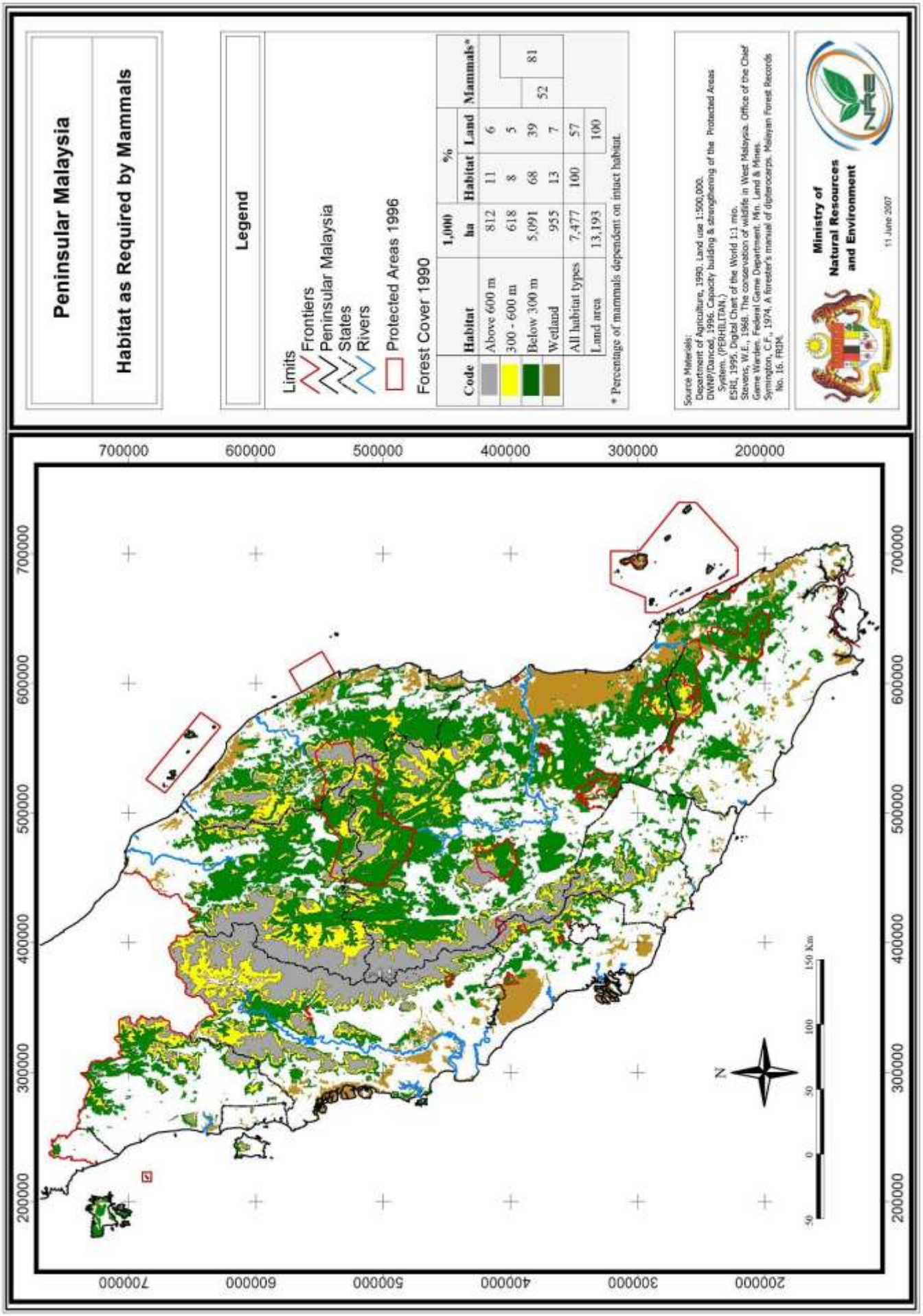
11 June 2007


Peninsular Malaysia
Habitat as Required by Mammals
Legend
Limits
Frontiers
Peninsular Malaysia
States
Rivers
Protected Areas 1996
Forest Cover 1990
Code
Habitat
1,000 ha
% Habitat
% Land
Mammals*
Above 600 m
812
11
6
300 - 600 m
618
8
5
Below 300 m
5,091
68
39
52
81
Wetland
955
13
7
All habitat types
7,477
100
57
Land area
13,193
100
* Percentage of mammals dependent on intact habitat.
Source Materials:
Department of Agriculture, 1990. Land use 1:500,000.
DWNP/Danced, 1996. Capacity building & strengthening of the Protected Areas System. (PEMELITAN.)
ESRI, 1995. Digital Chart of the World 1:1 mio.
Stevens, W.E., 1968. The conservation of wildlife in West Malaysia. Office of the Chief Game Warden, Federal Game Department, Min. Land & Mines.
Symington, C.F., 1974. A forester's manual of dipterocarps. Malayan Forest Records No. 16. FRIM.
Ministry of Natural Resources and Environment
11 June 2007
700000
600000
500000
400000
300000
200000
N
150 Km
100
50
0
50

White-bellied sea-eagle [47]

ANNEX 4: ASSESSMENT FRAMEWORK FOR BIODIVERSITY IN SEA

Cover art to *A Common Vision on Biodiversity* representing aspects and linkages of terrestrial, freshwater and marine systems [2]

The following is an extract from Slootweg *et al.* (2006) *Biodiversity in EIA and SEA. Background Document to CBD Decision VIII/28: Voluntary guidelines on biodiversity-inclusive impact assessment* (see References for all details and web link to the document). For more details, please refer to the source.

BIODIVERSITY IN SEA

The most important features of how biodiversity is interpreted in SEA are:

1) *Ecosystem services*: Biodiversity provides for ecosystem services which represent tremendous value to society and can be linked to stakeholders (e.g. provisioning of: *products* such as fresh clean water and timber; *regulation* of soil erosion and minimising impacts of tsunamis). Such stakeholders can be involved in the SEA process.
2) *Direct drivers of change*[3] are human interventions (activities) resulting in biophysical and social effects with known impacts on biodiversity and associated ecosystem services.
3) *Indirect drivers of change*[3] are societal changes, which may under certain conditions influence direct drivers of change, ultimately leading to impacts on ecosystem services.
4) *Aspects of biodiversity*: To determine impacts on ecosystem services, one has to assess whether the ecosystems providing these services are significantly influenced by the policy, plan or programme (PPP) under study. Such changes can best be assessed in terms of changes in composition (what is there), changes in structure (how is it organised in time and space), or changes in key processes (what physical, biological or human processes govern creation and/or maintenance of ecosystems).
5) For planning and management purposes, biodiversity may be considered in terms of: genetic, species, and ecosystem diversity. In general, the ecosystem level is the most suitable level to address biodiversity in SEA. However, situations with a need to address lower levels exist (e.g. fragmentation and increased isolation of habitat leads to inbreeding of species not able to cross the intervening man-made landscape of urban/industrial areas, roads, agriculture, and so forth).

BIODIVERSITY "TRIGGERS" FOR SEA

To be able to make a judgement as to whether a PPP has potential biodiversity impacts, two elements are of overriding importance: (i) affected area and ecosystem services linked to this area; and (ii) type of planned activities that can act as *driver of change* in ecosystem services.

When any one or a combination of the conditions below apply to a PPP, special attention to biodiversity is required in the SEA of this policy, plan or programme.

- **Important ecosystem services**. When an area - subject to a policy, plan or programme - is known to provide one or more important ecosystem services, these services and their stakeholders should be taken into account in an SEA. Geographical delineation of an area provides the most important biodiversity information as it is possible to identify the ecosystems and land-use practices in the area, and identify ecosystem services provided by these ecosystems or land-use types. For each ecosystem service, stakeholder(s) can be identified who preferably are invited to participate in the SEA process. Area-related policies and legislation can be taken into account.

[3] Understanding the factors that cause changes in ecosystems and ecosystem services is essential to the design of interventions that enhance positive and minimize negative impacts. Such factors are called *drivers of change* and can be natural or human induced.

- **Interventions acting as *direct* drivers of change** (see **Text Box 14**). If a proposed intervention is known to produce or contribute to one or more drivers of change with known impact on ecosystem services, special attention to biodiversity is triggered. If the intervention area of the PPP has not yet been geographically defined (e.g. in the case of a sector policy), the SEA can only define biodiversity impacts in conditional terms: impacts are expected to occur in case the PPP will affect certain types of ecosystems providing important ecosystem services. If the intervention area is known it is possible to link drivers of change to ecosystem services and its stakeholders.

Text Box 14. What are *direct drivers* of change (from Slootweg *et al.*, 2006).

Direct drivers of change are human interventions (activities) resulting in biophysical and social/economic effects with known impacts on biodiversity and associated ecosystem services.

Biophysical changes known to act as a potential driver of change comprise:

- Land conversion: the existing habitat is completely removed and replaced by some other form of land use or cover. This is the most important cause of loss of ecosystem services.
- Fragmentation by linear infrastructure: roads, railways, canals, dikes, power lines, etc. affects ecosystem structure by cutting habitats into smaller parts, leading to isolation of populations. A similar effect is created by isolation through surrounding land conversion. Increased isolation of habitat fragments is a serious reason for concern.
- Extraction of living organisms is usually selective since only a few species are of value, and leads to changes in species composition of ecosystems, potentially upsetting the entire system. Forestry and fisheries are common examples.
- Extraction of minerals, ores and water can significantly disturb the area where such extractions take place, often with significant downstream and/or cumulative effects.
- Wastes (emissions, effluents, solid waste), or other chemical, thermal, radiation or noise inputs: human activities can result in liquid, solid or gaseous wastes affecting air, water or land quality. Point sources (chimneys, drains, underground injections) as well as diffuse emission (agriculture, traffic) have a wide area of impact as the pollutants are carried away by wind, water or percolation. The range of potential impacts on biodiversity is very broad.
- Disturbance of ecosystem composition, structure or key processes: Appendix 2 of the EIA guidelines of Slootweg *et al.* (2006) contains an overview of how human activities can affect these aspects of biodiversity.

Some social changes can also be considered to be direct drivers of change as they are known to lead to one of the above-mentioned biophysical changes (non-exhaustive):

- Population changes due to permanent (settlement / resettlement), temporary (temporary workers), seasonal in-migration (tourism) or opportunistic in-migration (job-seekers) usually lead to land occupancy (= land conversion), pollution and disturbance, harvest of living organisms, and introduction of non-native species (especially in relatively undisturbed areas).
- Conversion or diversification of economic activities: especially in economic sectors related to land and water, diversification will lead to intensified land use and water use, including the use of pesticides and fertilizers, increased extraction of water, introduction of new crop varieties (and the consequent loss of traditional varieties). Change from subsistence farming to cash crops is an example. Changes to traditional rights or access to biodiversity goods and / or services falls within this category.
- Conversion or diversification of land-use: for example, the enhancement of extensive cattle raising includes conversion of natural grassland to managed pastures, application of fertilizers, genetic change of livestock, increased grazing density. Change to the status, use or management of protected areas is another example.
- Enhanced transport infrastructure and services, and/or enhanced (rural) accessibility; opening up of rural areas will create an influx of people into formerly inaccessible areas.
- Marginalisation and exclusion of (groups of) rural people: landless rural poor are forced to put marginal lands into economic use for short term benefit. Such areas may include erosion sensitive soils, where the protective service provided by natural vegetation is destroyed by unsustainable farming practices. Deforestation and land degradation are a result of such practices, created by non-equitable sharing of benefits derived from natural resources.

- **Interventions acting as *indirect* drivers of change** (see **Text Box 15**). When a PPP leads to activities acting as indirect driver of change (e.g. for a trade policy, a poverty reduction strategy, or a tax **measure**), it becomes more complex to identify potential impacts on ecosystem services. In broad terms, biodiversity attention is needed in SEA when the PPP is expected to significantly affect the way in which a society:
  - Consumes products derived from living organisms, or products that depend on ecosystem services for their production
  - Occupies areas of land and water
  - Exploits its natural resources and ecosystem services.

Text Box 15. What are *indirect drivers of change* (from Slootweg *et al.*, 2006).

Indirect drivers of change are societal changes, which may under certain conditions influence direct drivers of change, ultimately leading to impacts on ecosystem services

The performance of ecosystem services is influenced by drivers of change. In the Millennium Ecosystem Assessment (MA) conceptual framework, a "driver" is any factor that changes an aspect of an ecosystem. A direct driver unequivocally influences ecosystem processes and can therefore be identified and measured to differing degrees of accuracy. In the case of activities that have no obvious biophysical consequences it becomes more complex to define impacts on ecosystem services. The MA conceptual framework provides a structured way of addressing such situations.

Activities without direct biophysical consequences exert their influence through indirect drivers of change. These operate more diffusely, often by altering one or more direct drivers, and its influence is established by understanding its effect on a direct driver.

Indirect drivers of change can be:

- Demographic: e.g. population size and rate of change over time (birth and death rates), age and gender structure, household distribution by size and composition, migration pattern, level of educational attainment;
- Economic (macro): e.g. global economic growth and its distribution by country;
- Socio-political: e.g. democratisation and participation in decision making, decentralisation, conflict resolution mechanisms, privatisation;
- Scientific and technological processes: e.g. rates of investment in R&D, rate of adoption of new technologies, changes in productivity and extractive capabilities, access to and dissemination of information;
- Cultural and religious values: values, beliefs and norms influences behaviour with regard to the environment

Actors can have influence on some drivers (endogenous driver), but others may be beyond the control of a particular actor or decision-maker (exogenous drivers).

THE ASSESSMENT FRAMEWORK

The conceptual framework for assessment is shown in **Figure 18** with pathways of activities to impacts. It positions the *biodiversity triggers*, i.e. (1) affected ecosystem services, and activities producing direct (2) or indirect (3) drivers of change in ecosystem services.

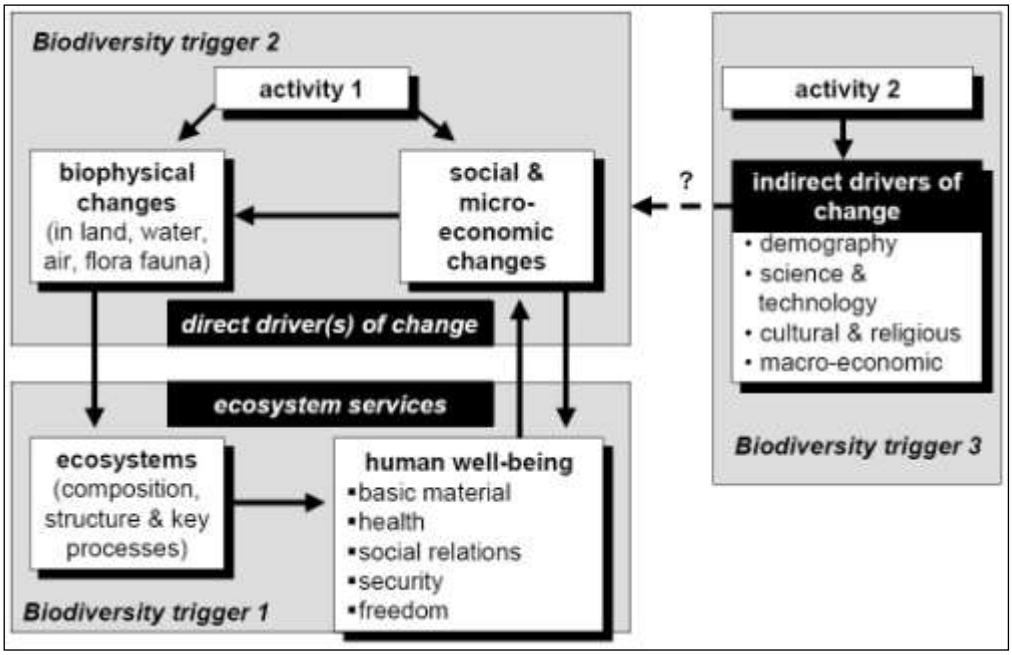


Figure 18. Assessment framework for biodiversity in SEA (from Slootweg *et al.*, 2006).

Activities resulting from a policy, plan or programme lead to biophysical changes and/or social/economic changes (Activity 1 in **Figure 18**). Social/economic changes influence human well-being directly, but some of these changes may in turn also lead to biophysical changes (for example in-migration of people leads to occupation of land). Within their spatial and temporal range of influence, biophysical changes may influence the composition or structure of ecosystems, or influence key processes maintaining these ecosystems. Activities resulting in this type of biophysical changes are referred to as *direct drivers of change*. The ecosystem services provided by influenced ecosystems may be affected, thus affecting groups in society who depend on these services for their well-being. People may respond to changes in the value of ecosystem services and act accordingly, thus leading to new social/economic changes. Good participatory scoping and application of the best available scientific and local knowledge results in the identification of most relevant impacts and associated cause effects chains that need further study in the SEA.

Identifying impacts on ecosystem services resulting from *indirect drivers of change* (Activity 2 in **Figure 18**) is a much more challenging task. As the Figure shows, the links between *indirect* and *direct drivers* of change have not yet been fully established. The scenario development under the Millennium Ecosystem Assessment[4] provides further elaboration of the linkages between indirect and direct drivers of change in biodiversity.

[4] For more details on the Millennium Ecosystem Assessment, see www.millenniumassessment.org/en/index.aspx

IDENTIFYING POTENTIAL BIODIVERSITY IMPACTS THROUGH BIODIVERSITY TRIGGERS

Trigger 1: **Area influenced by the PPP provides important ecosystem services**

Focus: Area oriented PPPs without precisely defined activities. Biodiversity can be described in terms of ecosystem services providing goods and services for the development and/or well-being of people and society. The maintenance of biodiversity (for future generations or because biodiversity is considered to have an intrinsic value) is often emphasised as a special ecosystem service, described in terms of conservation status of ecosystem, habitats and species, possibly supported by legal protection mechanisms.

This trigger is often associated with: the 'bottom up' opportunities and constraints of the natural environment approach, as may be used in land use planning/spatial planning where interventions are potentially wide-ranging and the objective is to tailor those land uses in terms of the best fit to the natural environment.

Summary of procedure:

- Identify ecosystems and land-use types in the area to which the PPP applies (human land-use can be considered as an attempt by humankind to maximise one or few specific ecosystem services, for example soil productivity in agriculture, often at the cost of other services). Identify and map ecosystem services provided by these ecosystems or land-use types.
- Identify which groups in society have a stake in each ecosystem service; invite such stakeholders to participate in the SEA process. Identification and valuation of ecosystem services is an iterative process initiated by experts (ecologists, natural resources specialists) but with stakeholders playing an equally important role.
- For absent stakeholders (future generations), identify important protected and non-protected biodiversity representative for species, habitats and/or key ecological and evolutionary processes (for example by applying systematic biodiversity planning or similar approaches).
- Ecosystem services identified by experts but without actual stakeholders can in this approach be regarded as development opportunity. Similarly, ecosystem services with conflicting stakeholders may indicate overexploitation of this service representing a problem that needs to be addressed.

Trigger 2: **The PPP is concerned with interventions producing direct drivers of change.**

Focus: As explained earlier, interventions resulting from a PPP can directly or through social economic changes lead to biophysical changes that affect ecosystems and services provided by these ecosystems. Impacts on ecosystem services can only be defined as potential impacts, since the location of the intervention or the area where its influence is noticed may not be known.

This trigger is often associated with PPPs without predefined geographical area of intervention, such as sectoral policies, or PPPs producing social/economic drivers of change which cannot be geographically demarcated.

Summary of procedure:

- Identify drivers of change, i.e. activities leading to biophysical changes known to affect biodiversity (see **Text Box 14**).
- Within the administrative boundaries (province, state, country) to which the policy, plan or programme applies, identify ecosystems sensitive to the expected biophysical changes. Within these administrative boundaries sensitive ecosystem can be identified. The SEA needs to develop a mechanism to avoid, mitigate or compensate potential negative

impacts to these ecosystems including the identification of less damaging alternatives.

***Triggers 1 & 2 combined:* PPP concerns activities producing direct drivers of change in an area with important ecosystem services**

Focus: Knowledge of the nature of interventions and the area of influence allows relatively detailed assessment of potential impacts by defining changes in composition or structure of ecosystems, or changes in key processes maintaining ecosystems and associated ecosystem services.

This combination of triggers is often associated with: SEAs, carried out for programmes (resembling complex, large-scale EIAs). Examples are detailed spatial plans, programme level location and routing alternatives, technology alternatives.

Summary of procedure:

The procedure is a combination of both earlier described procedures for Trigger 1 and 2, but the combination allows for greater detail in defining expected impacts:

- Identify direct drivers of change and define their spatial and temporal range of influence.
- Identify ecosystems lying within this range of influence (in some cases species or genetic level information may be needed).
- Describe effects of identified drivers of change on identified ecosystems in terms of changes in composition or structure of biodiversity, or changes in key processes responsible for the creation or maintenance of biodiversity.
- If a driver of change significantly affects either one composition, or structure, or a key process, there is a very high probability that ecosystems services provided by the ecosystem will be significantly affected.
- Identify stakeholders of these ecosystem services and invite these to participate in the process. Take into account the absent (future) stakeholders.

***Trigger 3:* PPP is concerned with interventions producing indirect drivers of change**

An example of such a trigger would be trade liberalisation in the agricultural sector and the effects this might have on biodiversity. A study carried out within the framework of the CBD synthesised existing approaches and assessment frameworks.[5]

Baseline conditions, trends and characteristics of the production and socio-economic systems determine whether indirect consequences will actually affect biodiversity. This SEA works with a combination of economic modelling studies, empirical evidence from literature, case study analysis and causal chain analysis. Biodiversity impact is described in very broad terms, mainly as changes in surface area and species richness. Grouping of countries with relatively similar characteristics provides some further detail. Per group of countries a case study country is studied more in-depth. The difficulty in the identification of biodiversity-related impact lies in the definition of impact mechanism.

More research and case material is needed to elaborate this biodiversity trigger. The MA methodology is potentially valuable to identify linkages between indirect and direct drivers of change. The scenarios working group of the MA considered the possible evolution of ecosystem services during the twenty-first century by developing four global scenarios exploring plausible future changes in drivers, ecosystems, ecosystem services, and human well-being. The reports on global and sub-global assessments may also provide suitable material.

[5] See UNEP/CBD/COP/7/INF/15 at www.cbd.int/doc/meetings/cop/cop-07/information/cop-07-inf-15-en.pdf

Figure 19 (below) provides a summary overview of the way in which potential biodiversity impacts of a PPP can be identified. It starts with the identification of potential biodiversity triggers in the PPP to be analysed, including: (i) an area with valued ecosystem services; (ii) activities affecting direct drivers of change; (iii) activities affecting indirect drivers of change; or a combination of (i) and (ii) where activities with known drivers of change influence a known area with valued ecosystem services. If one of these triggers is present in the PPP, the flow chart shows the type of information that can and should be obtained in the SEA process. The link between indirect and direct drivers of change is characterised by complex interactions, many of which are presently subject to intense research efforts worldwide.

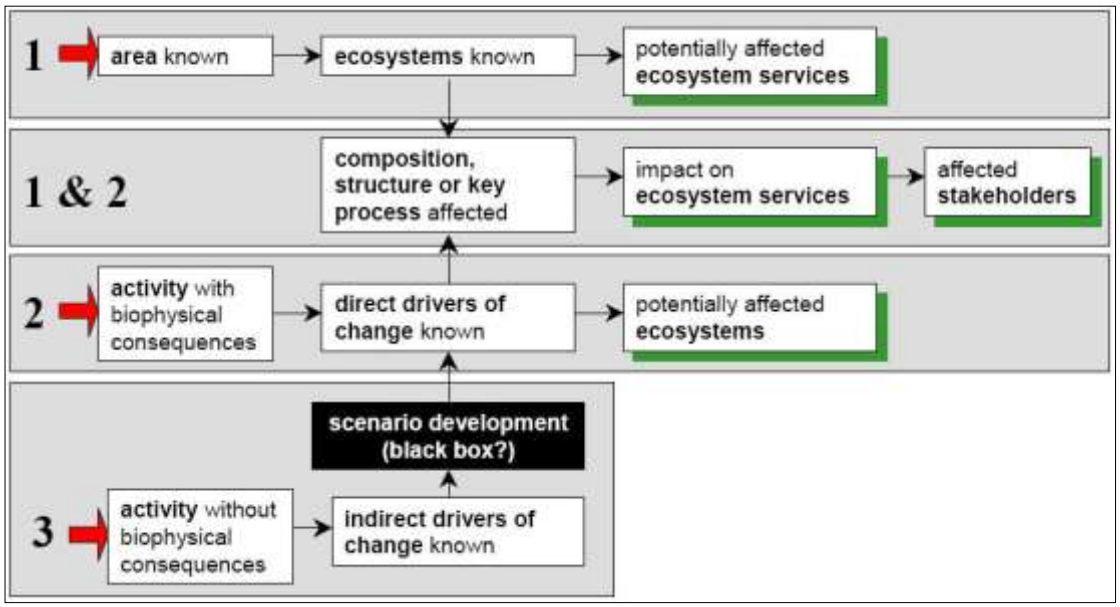


Figure 19. Overview of procedure to define biodiversity impacts starting with one or a combination of "triggers" – numbered 1 to 3 (from Slootweg *et al.*, 2006).

A summary of the conditions under which SEA should place particular attention to biodiversity issues and how they should be addressed is presented in **Table 8** on the next page.

Table 8. Summary of when and how to address biodiversity in SEA (from Stoolweg *et al.*, 2006).

Biodiversity triggers in Policy, Plan or Programme	**When is biodiversity attention needed?**	**How to address biodiversity issues?**
Trigger 1 Area known to provide important ecosystem services	*Does the PPP influence:* • Important ecosystem services, both protected (formal) or non-protected (stakeholder values) • Areas with legal and/or international status • Important biodiversity to be maintained for future generations	*Area focus* Systematic conservation planning for non-protected biodiversity Ecosystem services mapping Link ecosystem services to stakeholders Invite stakeholders for consultation
Trigger 2 PPP affecting direct drivers of change (i.e. biophysical and non-biophysical interventions with biophysical consequences known to affect ecosystem services)	*Does the PPP lead to:* • Biophysical changes known to significantly affect ecosystem services (e.g. land conversion, fragmentation, emissions, introductions, extraction, etc.) • Non-biophysical changes with known biophysical consequences (e.g. relocation/migration of people, migrant labour, change in land use practices, enhanced accessibility, marginalisation)	*Focus on direct drivers of change and potentially affected ecosystem* Identify drivers of change, i.e. biophysical changes known to affect biodiversity Within administrative boundaries to which the PPP applies, identify ecosystems sensitive to expected biophysical changes
Combined triggers 1 & 2 Interventions with known direct drivers of change affecting area with known ecosystem services	Combination of triggers 1 and 2 above	*Knowledge of intervention and area of influence allows prediction of impacts on composition or structure of biodiversity or on key processes maintaining biodiversity* Focus on direct drivers of change, i.e. biophysical changes known to affect biodiversity. Define spatial and temporal influence. Identify ecosystems within range of influence Define impacts of drivers of change on composition, structure, or key processes Describe affected ecosystems services and link services to stakeholders Invite stakeholders into SEA process Take into account the absent (future) stakeholders
Trigger 3 PPP affecting indirect drivers of change, but without direct biophysical consequences	*Are indirect drivers of change affecting the way in which society:* • Produces or consumes goods? • Occupies land and water? • Exploits ecosystem services?	*More research and case material needed* The Millennium Ecosystem Assessment methodology is potentially valuable to identify linkages between indirect and direct drivers of change

ANNEX 5: ANALYSIS OF POLICIES AND THEIR COMBINED EFFECTS ON THE ENVIRONMENT

Iban dance [2]

I ANALYSIS OF POLICY MIX AND ITS EFFECTS ON THE ENVIRONMENT

This Annex outlines an approach used by UNEP to incorporate integrated policy assessment into the state of the environment reporting process thus pointing out key leverage points to decision-makers. The focus of this approach is on the *environment* (i.e. living and non-living components) where *biodiversity* is one element together with *land*; *forest*; *water*; *atmosphere*; *marine and coastal environment*; and *urban and industrial environment*. Nevertheless, it would seem highly relevant for establishing synergies and identifying gaps in existing policies and plans thus setting the scene for mainstreaming of biodiversity.

Policy assessment has often been beyond the scope for biodiversity and *state of the environment* reporting which have both focused on describing trends and conditions. It is now realised that such reporting needs to be integrated with the assessment of key driving forces and policies that cause or influence those environmental trends. A conscious and explicit link to policies and policy performance can add much weight and relevance to biodiversity and state of the environment reporting.[6]

It should be noted that some level of policy analysis and assessment is integrated into most SEA processes, especially in terms of assessing the sustainability, compatibility, and consistency of policies at vertical and horizontal levels.

We need to know what is happening to the environment to answer why it is happening. We also need to have a clear idea about the driving forces and root causes to begin addressing what can be done better or to discover the potential consequences of inaction.

Text Box 16. What is a *policy*?

In general, "a policy" is an overall direction that provides inspiration and guidance for decision-making and action. It has been defined as:

A set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them within a specified situation where these decisions should, in principle, be within the power of these actors to achieve.

Jenkins, 1978

Course of action or principle adopted or proposed by a government, party, business or individual Concise Oxford Dictionary, 1995

It would seem that both definitions consider *policy* to be more of a process rather than simply a matter of choice.

Assessing environmental policies helps to answer:[7]

- **Why is environmental change happening;** that is, how are policies affecting the state of the environment? Policies can be the driving forces behind either desirable or undesirable environmental outcomes.
- **What are we doing about environmental changes, particularly negative ones;** that is, what policies are in place to deal with the current environmental issues? Some policies may have already been formed to influence current environmental conditions, although there may be a lag time before effects are visible. There may also be policy gaps and/or inadequate implementation of existing policies.

Environment and biodiversity trends are usually influenced by a wide range of policy measures – in other words the changes observed in an environmental trend are the combined effect of many policies, some of which may have direct effects on the issue in question and others indirect ones. Looking at the changes from the perspective of a specific policy, the question primarily concerns the policy's effectiveness in bringing about a positive change on the trends observed. Therefore, to identify the underlying policies that drive environmental trends, analysts need to understand both the *effects* of policies and policy *effectiveness*.

[6] "Integrated Environmental Assessment" based on the Global Environment Outlook (GEO) approach of UNEP is defined as: *the process of producing and communicating future-oriented, policy-relevant information on key interactions between the natural environment and human society*. Suggested procedures will be included in the forthcoming *GEO Resource Book: A training manual on integrated environmental assessment and reporting.* See *Module 5 Overview: Integrated Analysis of Environmental Trends and Policies* in UNEP/IISD, 2007.

[7] The remainder of this Annex is based on Pintér *et al.*, 2004. More details may be found also in Pintér *et al.*, 2000.

- **Effects** refer to the actual impacts of a policy mix on the environment.

  For example: greenhouse gas emissions in a given country may be influenced by a series of policies, including:

  - Subsidies to the fossil energy sector;
  - Measures to facilitate the introduction of energy conservation technology either at the supply or the demand side;
  - Regulatory policies aimed at reducing methane emissions from agriculture;
  - Incentives to phase in renewable energy production;
  - Etc.

- **Effectiveness** of a policy refers to weighing the actual policy impact against the goal or desired performance of a single policy. Policy is meant to guide or influence human activities to achieve particular desired outcomes. But what actually occurs in the environment does not necessarily follow the policy intent.

  For example: countries that are signatory to the Kyoto Protocol adopted national, time-bound targets for reducing greenhouse gas emissions compared with baseline values. Looking at current trends from the perspective of a given policy instrument, retrospective analysis would need to reveal (a) the contribution of a given policy to the observed changes in emissions; and (b) any other intended or unintended major effects the policy may have had on socio-economic and environmental issues of concern.

I.I EFFECTS OF POLICY MIX

This type of integrated approach to analyse the effects of a policy mix on the environment involves a number of steps related to discovering what is happening and why.

1. First, it determines the actual status or condition of the environmental issue in question. This should answer the first question: What is happening?
2. The analysis then tries to uncover policies that may have links to the issue. This step and the following ones address the question: Why are the changes happening?
3. The next step is to scan for any policy gaps/conflicts the effects on the issue may reveal; identification of policy gaps may identify opportunities for introducing policy measures not yet in force or in the context of the given issue.
4. The process includes a search for links with other sectors and an analysis of potential multiple benefits
5. Finally, a summary of the overall effect of policies can be drawn from the integrated analysis.

The first step in assessing a policy mix and its effects on the environment is to determine the status of the environmental issue. Integrated Environmental Assessment seeks to link the issue status with policies that may have influenced the condition or trend.

The second step in assessing a policy mix and its effects is to identify the myriad of policies related to the issue in question. A key message is that integrated environmental assessment needs to incorporate scanning the whole system for policy linkages. The reason for this is that the intentional or unintentional consequences of policies are often dispersed over space, sectors of the economy, and environmental media. They can also be delayed in time. The consequences of policies can be incremental and cumulative, or conflicting with other policies and may represent root causes of biodiversity and environmental problems.

A conceptual model based on the Pressure-State-Response framework (also used in the Millennium Ecosystem Assessment) is used to uncover the web of these interrelated links to policies implicated in a given environmental issue (e.g. why is the number of threatened species increasing?).

It is clear from this work that **no policy exists in isolation**. It is important to consider the many other unintended links that exist, both among various environmental policies and between environmental and other types of policies.

The third step in assessing the policy mix and its effects is to scan for policy gaps and conflicts. Having assessed the policies that already exist, a scan should reveal:

- Relevant policies that could affect the environmental issue but that are not in place
- Existing policies that haven't been implemented
- Malfunctioning policies -- that is policies originally designed to deal with the environmental issue in question, but not having the desired effect, or producing significant unintended negative effects.
- Conflicting policies.

One way to find policy gaps is to look at the sequence of policies identified and the stage at which each one has an impact on the environmental issue.

A policy review matrix is a useful tool that can help identify policy gaps (**Table 9**).

Table 9. Using a policy review matrix to identify critical policy gaps (modified from Pintér et al, 2004).

Policies / Sectors	International mechanisms	National sustainable development policies / plans	Financial and fiscal policies	Legal instruments	Economic instruments	Awareness raising & education policies	Voluntary standards & instruments	Social policies
Land								
Forest								
Water								
Atmosphere								
Biodiversity	+	+	?	-	?	?	+	?
Marine & coastal environment								
Urban & industrial environment								

Name of policy / plan
Implementing agency
Date since policy is in effect

The fourth step in an analysis of the policy mix and its effects is to search for cross-sectoral linkages.

The matrix shown in **Table 9** should be useful to also summarise the existing environmental policies for national and state levels. It also links policies with specific issues of concern.

The fifth and last step of the analysis should put the results of all steps together for an overall descriptive summary of the effect of the policy mix on the environment.

I.II ANALYSIS OF SPECIFIC POLICIES AND THEIR EFFECTIVENESS

Integrated Environmental Assessment not only looks at the Effects of a policy mix, but also at Effectiveness. In other words, it also assesses the actual performance of policies as measured against the planned or desirable goals listed in a policy statement. The assessment of policy performance can only be conducted on a single policy at a time.

There are a number of steps in the analysis of the effectiveness of specific policies:

1. Identification of priority policies
2. Identification of performance criteria associated with the policy
3. Selection of policy specific indicators
4. Policy effectiveness analysis in light of expected and actual performance

Figure 20 illustrates the general process a policy intent goes through before it is analysed for effectiveness and how the performance analysis feeds back to influence the original policy.

A policy intent or goal adopted by a government (whether related to the economy, the environment, or society) is formulated into a policy statement. The policy is then taken up, interpreted, and applied to the target group. Its character and strength are influenced by the degree of understanding with which it is applied and the vigour with which it is enforced.

Once enacted, the policy will affect the target, in this case the environment, and potentially other spheres as well, such as socioeconomic aspects related to the issue. Analysis of the policy's effectiveness will determine to what extent it is having the desired result and could lead to policy revisions to improve its performance.

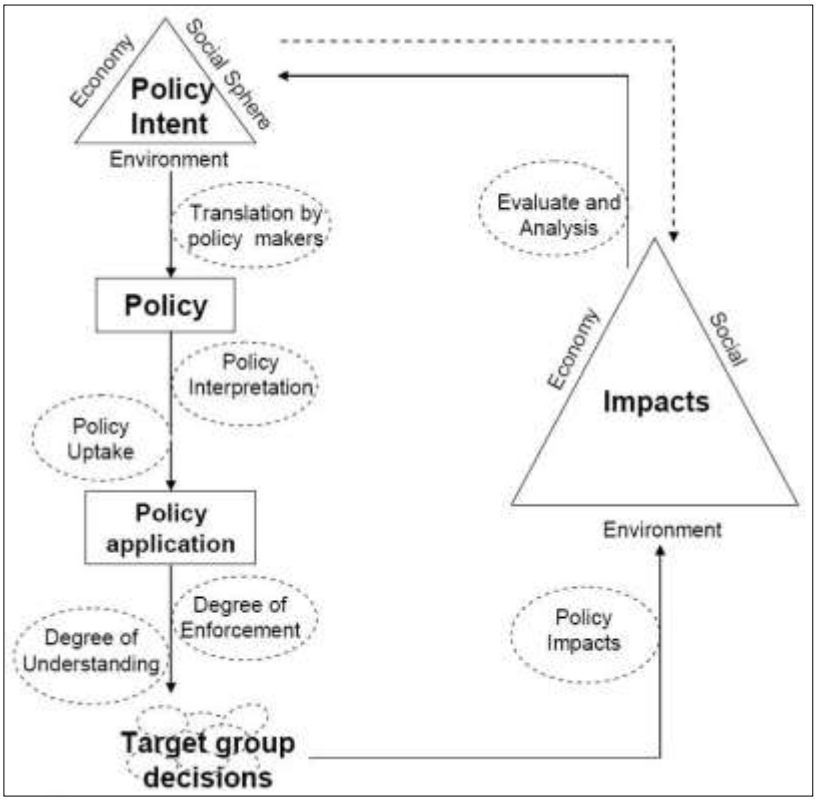


Figure 20. General diagram of the policy cycle (from Pintér et al, 2004).

1 Identifying priorities

The first step in assessing policy effectiveness is to identify which policies have most significance for the specific environmental issue being examined. These will be the ones to assess for effectiveness.

This is a list of the criteria for selecting priority policies to include in the analysis:

- Is the policy relevant for the public and decision-makers?
- Is the link between the policy and key environmental priorities identified in the State of the Environment report?
- Does the policy affect the health, income, and well-being of a large number of people? (stipulating the use of non-leaded fuels, for example)
- Is the policy an important response to deal with an environmental situation that is
    - physically severe (a polluted drinking water source)
    - changing rapidly (soil erosion after flooding)
    - irreversible (species loss)
- Does the policy relate to the country's international obligations? (controlling chemicals that destroy the ozone layer)
- Is there the potential for the policy to cause disruption or conflict?
- Does the policy potentially offer easy and feasible solutions?
- Is the policy a unique initiative suitable to the region?

2 Identification of performance criteria associated with the policy

Performance criteria provide the basis for determining whether the results of a policy can be considered a success or a failure. Once a manageable number of high-priority policies have been identified, the next step is to determine criteria that help evaluate their performance from an environmental and sustainable development perspective.

- Ideally, performance criteria and requirement for evaluation are built into policies.
- However policies are usually designed without clearly defined and specific performance criteria or with criteria unrelated to environmental performance. (This is often so for economic policies related to taxation, trade, or investment. Although these may have very significant links to environmental issues -- in fact they may be the key drivers of environmental change -- their built-in evaluation criteria are usually limited to economic performance. This makes their evaluation particularly challenging from an environmental and sustainable development perspective.)
- Performance criteria range from general and descriptive measures to more specific and quantitative ones.
- Performance criteria provide a basis for comparison between the planned or desirable performance of a policy and its actual performance.

Performance criteria can be based on a number of considerations and influenced by scientific and political factors. In the rather common case of criteria not being available, the analyst is left with the task of either adopting a more descriptive policy analysis, or selecting second-best or proxy criteria. Selecting criteria can be based on or informed by the following:

Benchmarks: The policy's performance is compared with a documented best-case performance related to the same variable within another entity or jurisdiction. *Example: highest percentage of households connected to sewage system in a comparable entity in the same jurisdiction.*

Thresholds: The value of a key variable that will elicit a fundamental and irreversible change in the behaviour of a system. The policy is evaluated based on its role in making the system move toward or away from the threshold in any given period. *Example: maximum sustainable yield of a fishery*.

Principle: A broadly defined and often formally accepted rule. If the definition of the principle does not include a relevant performance measure, the evaluator should seek a mandate to identify one as part of the evaluation. *Example: the policy should contribute to the increase of environmental literacy.*

Standards: Nationally and/or internationally accepted properties for procedures or environmental qualities. The policy is successful if it helps keep performance within specified limits. *Example: water quality standards for a variety of uses.*

Policy-specific targets: Determined in a political process taking past performance and desirable outcomes into account. *Example: development assistance shall be 0.4 per cent of national GNP.*

Targets specified in legal agreements: Determined in a legal process taking past performance and desirable outcomes into account. *Example: percent reduction in greenhouse gas emissions by target date.*

3 Selection of policy-specific indicators

Once the priority policies for assessment have been identified and the performance criteria chosen, certain measures must be decided upon that indicate to what degree the performance criteria is being achieved.

Take the example of a policy mandating periodic water quality monitoring with the goal of ensuring a safe standard of water quality (i.e. standards are performance criteria). One indicator that helps to measure whether water quality monitoring is being carried out adequately would be data on the number of water quality monitoring stations.

4 Analysis of policy effectiveness in light of expected and actual performance

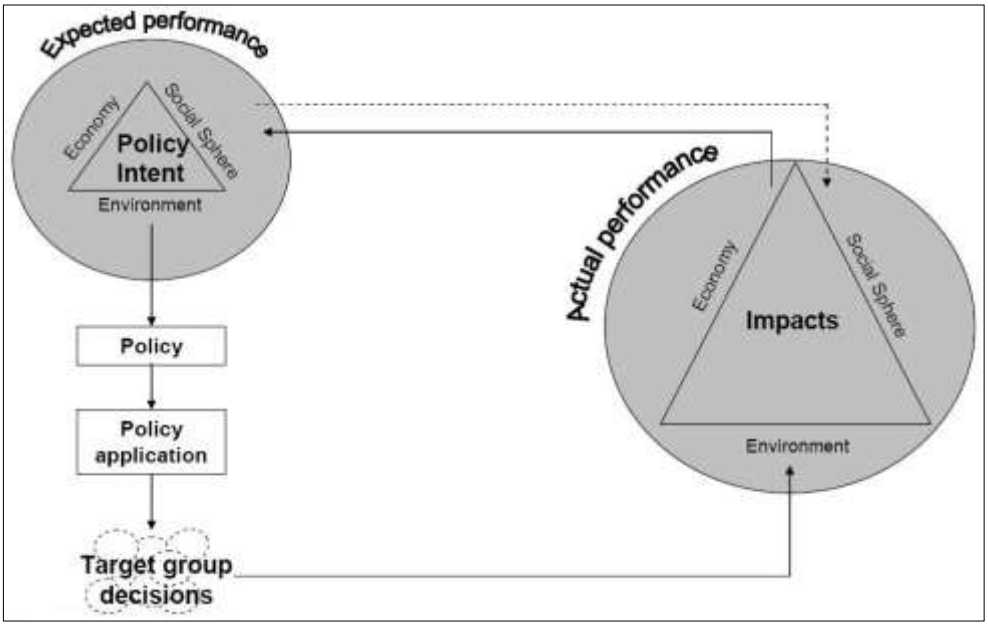


Figure 21. Analysis of policy effectiveness in light of expected and actual performance (from Pintér et al, 2004).

The final step is to compare actual performance with the results expected or desired by the policy intent (as illustrated in **Figure 21**).

ENDNOTES

[1] Brunei: by Priscilla Barret; reprinted with permission from *Expedition to Borneo*, Long Rider's Guild Classic Travel Books (2007) by permission of D. W. Macdonald.

[2] The Yew Kiang.

[3] Artist Teh Yew Kiang. From DWNP/Danced, 1996.

[4] Wikipedia http://en.wikipedia.org/wiki/Dipterocarp

[5] 'Protected Area' is in this document abbreviated PA and – in plural – PAs, to distinguish the term from the political party PAS – *Parti Islam Semalaysia*. For the same reasons, a Protected Areas System is abbreviated as PA System.

[6] From Ashton, 1995.

[7] Among other considerations

The National Policy on Biological Diversity (NPBD) states:

- p. 14: "There is no single comprehensive legislation in Malaysia which relates to biological diversity conservation and management as a whole. Much of the legislation is sector-based."

The National Policy on the Environment states:

- §5.1, p. 29: "All policy-making mechanisms in government for addressing issues related to environment and development will be streamlined and coordinated for effective and efficient implementation, monitoring and feedback".
- §5.2, p. 29: "Environment-related legislation and standards shall be reviewed regularly and revised where necessary to ensure the continued effectiveness and coordination of laws. Particular attention will be paid to effective enforcement.
- §5.3, p. 30: "Ministries and government agencies will be encouraged to establish mechanisms to ensure that environmental considerations are integrated into their development projects and activities".

The 3rd Outline Perspective Plan 2001-2010

- §1.80 "During the OPP3 period, emphasis will be placed on addressing environmental and resource issues in an integrated and holistic manner..."
- §1.81 "…The National Biodiversity Policy will form the basis for integrating and consolidating biodiversity programmes and projects in the country…."

[8] Vision 2020: "…we must also ensure that our valuable natural resources are not wasted. Our land must remain productive and fertile, our atmosphere clear and clean, our water unpolluted, our forest resources capable of regeneration, able to yield the needs of our national development.*"*

National Vision Policy (NVP) 2001 – 2010: It has defined seven critical thrusts, of which one is "pursuing environmentally sustainable development to reinforce long-term growth." (OPP3, Chapter 1.14).

OPP3 (2001-2010): informs to be based on NVP (i.e. "pursuing environmentally sustainable development"). The OPP3 is one of few policies clearly referring to other policies in specifically stating that: §181 "The National Biodiversity Policy will form the basis for integrating and consolidating biodiversity programmes and projects in the country.*"*

National Policy on Biological Diversity (1998): has the policy statement: "To conserve Malaysia's biological diversity and to ensure that its components are utilised in a sustainable manner for the continued progress and socio-economic development of the nation." A number of provisions set out how to go about it.

National Policy on the Environment (2002): is based upon eight principles which are all related to environmentally sustainable development.

9th Malaysian Plan (2006-2010): Chapter 22.02, p. 453: "For the Ninth Plan, in line with the ninth principle of *Islam Hadhari* [i.e. "Safeguarding the environment"], environmental stewardship will continue to be promoted to ensure that the balance between development needs and the environment is maintained. Greater focus will be placed on preventive measures to mitigate negative environmental effects at source, intensifying conservation efforts and sustainably managing natural resources."

National Physical Plan (2005): Objective (ii): "To optimise utilisation of land and natural resources for sustainable development".

[9] National Policy on Biological Diversity, p. 6, §17- §20; National Policy on the Environment, p. 5; 9th

Malaysian Plan: §22.02; National Physical Plan: Objective IV, P4.

[10] OPP3: §1.80 "… These approaches will, among others, be geared towards addressing the challenges of providing access to clean water, providing adequate food without excessive use of chemicals, using more organic fertilizers, providing energy services without environmental degradation, developing healthy urban environments, and conserving critical natural habitats and resources."

National Policy on Biological Diversity (1998): (§4, p. 10) "Very little of the lowland dipterocarp forests, the largest reservoir of genetic variation of terrestrial flora and fauna, remain and these require total protection, as do the remaining swamp and mangrove forests."

National Policy on the Environment (2002):

"Second Principle – Conservation of Nature's Vitality and Diversity: Conserve natural ecosystems to ensure integrity of biodiversity and life support systems"

"Green Strategy 2 – Effective Management of Natural Resources and the Environment."

§2.1 "A national inventory and audit of environment and natural resources will be maintained and regularly updated, with particular emphasis on depletion and renewability, to serve as a guide to policy formulation and decision-making. Appropriate environmental monitoring systems shall be established to facilitate the evaluation of programmes and projects".

With §2.1 in place it will be fairly straightforward to achieve the following paragraph.

§2.2 "Natural resource areas, particularly those containing biologically rich habitats and ecosystems will be established and maintained as zones for the conservation and protection of indigenous flora and fauna and genetic resources"

9th Malaysian Plan (2006-2010):

§22.20 "…The strategic thrusts for addressing environmental and natural resources issues will focus on [here only referring to two out of six thrusts]:

- Promoting a healthy living environment
- Utilising resources sustainably and conserving critical habitats"

§22.30 "*Biodiversity*. Efforts will be intensified to protect critical habitats. Towards this end, existing management plans will be reviewed to further strengthen the protection of threatened flora and fauna…"

National Physical Plan (2005): Chapter 5.6: "Although these PA already comprise various habitats/ecosystems, the distribution of reserves reveals that some habitats/ecosystems are seriously under-represented, namely wetlands and lowland dipterocarp forests. Moreover, despite these PA being gazetted, there are provisions that allow degazettement for short-term economic uses".

NPP20: "Sensitive coastal ecosystems shall be protected and used in a sustainable manner".

[11] National Policy on Biological Diversity (1998):

Strategy 5, Action 1: "Expand the network of in-situ conservation areas to ensure full representation of ecosystems and all ecological processes therein."

National Policy on the Environment (2002): See comments under Endnote which (paraphrased) state that "conservation and protection" should include "rich habitats and ecosystems".

National Physical Plan (2005): NPP18, IP8: Environmental Sensitive Areas (measures): (v) "The Protected Areas (PA) network shall be enlarged to include a full representation of the diversity of natural ecosystems, particularly the lowland dipterocarp forests and wetlands…."

[12] OPP3: §1.81 "…Steps will be taken to formulate integrated river basin management plans to improve water quality and supply as well as manage water resources. To ensure sustainability of coastal resources, integrated coastal management plans will be introduced in all states."

National Policy on Biological Diversity (1998):

Strategy 10, Action 1: "Identify major sources of biological diversity loss such as forest damage or degradation, overfishing, pollution of marine resources, development that disrupts primary forest or catchment areas, destruction of mangrove areas and coral reefs, and act to minimise these sources."

National Policy on the Environment (2002): §2.7 "For river basin management and related development projects, specific procedures for planning, including beneficial-use classification, coordination, and monitoring measures, shall be incorporated to ensure sustainability."

9th Malaysian Plan (2006-2010):

§22.22 "*Water Quality*. The utilisation of the integrated river basin management (IRBM) approach will be intensified to improve river and groundwater quality…"

National Physical Plan (2005):

NPP30, IP14: Water Resources and Water-Stressed Areas (Measures): (iii) "Integrated Water Resource Management (IWRM) and Integrated River Basin Management (IRBM) are to be adopted as input of land use planning".

Chapter 2.3 Principles, P8 Avoid disrupting ecological stability: "…. Water resource management based on

the concept of Integrated River Basin Management (IRBM) should be exercised".

[13] OPP3:

§1.80 "During the OPP3 period, emphasis will be placed on addressing environmental and resource issues in an integrated and holistic manner. …"

§1.81 "…The National Biodiversity Policy will form the basis for integrating and consolidating biodiversity programmes and projects in the country…"

National Policy on Biological Diversity (1998):

§22, p.15. "Having ratified the Convention on Biological Diversity on 24th June 1994, Malaysia must incorporate into the national policy the set of commitments under the treaty. The Convention reaffirms the sovereign rights of States over their biological resources and their responsibility for conserving their biological diversity and utilizing the biological resources in a sustainable manner. To achieve the above, they must develop national strategies, plans or programmes. As far as possible and where appropriate, these must be integrated into sectoral or cross-sectoral plans, programmes and policies."

Strategy 6: Integrate Biological Diversity Considerations Into Sectoral Planning Strategies: "Ensure that all major sectoral planning and development activities incorporate considerations of biological diversity management."

Strategy 2, Action 3: "Ensure the development of sectoral and cross-sectoral policies, plans and programmes which integrate considerations of biological diversity conservation and sustainable use".

Strategy 6, Actions 1 to 7: Include extensive provisions for cross-sectoral integration; analysis of plan/strategy on biodiversity; review of sector PPPs; incorporation of biodiversity into long-term and medium-term plans; efficient dissemination of relevant information; etc.

National Policy on the Environment (2002):

"Green Strategy 3 – Integrated Development Planning and Implementation: Environmental considerations will be integrated into all stages of development, programme planning and implementation and all aspects of policy making."

§3.1 to §3.5: Include extensive provisions for integrated development planning by mainstreaming of biodiversity and environment into plans at all levels. It also states that "a national natural resource accounting system will be devised and implemented to ensure a balanced perspective of the role of environment and natural resources in relation to overall development plans and strategies". Moreover, "environmental considerations will be integrated into policies, programmes, plans and project formulation as well as implementation, through a comprehensive assessment process, taking into account social, ecological and health effects." Finally, it establishes the also important need to make linkages to different spatial scales to ensure that both economic as well as environmental protection objectives are met.

9th Malaysian Plan (2006-2010): §22.02 "…Emphasis will be given to the fostering of closer cooperation between stakeholders in addressing environmental concerns. Environmental planning tools such as environmental impact assessments (EIA), strategic environmental assessments (SEA), cost-benefit analysis, market-based instruments and environmental auditing will be increasingly applied in evaluating and mitigating environmental impacts of development activities."

National Physical Plan (2005): implicit measure to take for Environmental Sensitive Areas.

[14] "This year's IUCN Red List shows that the invaluable efforts made so far to protect species are not enough. The rate of biodiversity loss is increasing and we need to act now to significantly reduce it and stave off this global extinction crisis. This can be done, but only with a concerted effort by all levels of society." Marton-Lefèvre, Director General of IUCN quoted in ScienceDaily (www.sciencedaily.com, accessed 10 Sep 07).

[15] A recent assessment of Protected Areas in Malaysia has not been done, though DWNP (1996) compiled information for Peninsular Malaysia.

[16] In 1968 the Federal Game Department established that 81% of mammals are dependent on intact habitat below 600 metres. A little more than half those mammals do not go to higher altitudes than 300 m and are dependent on intact habitat below that level (Stevens, 1968). Today, this is the area witnessing the highest fragmentations levels of habitat.

[17] Miller *et al.*, 2007 evaluated the application of these guidelines surveying 180 CBD country focal points. About three quarters had developed national threatened species lists and of these a clear majority already applied the IUCN criteria or planned to do so. Of the countries that have or will develop a threatened species list, 82% incorporated their list or the IUCN criteria into national conservation strategies. Most of the problems national assessors faced when applying the IUCN criteria arose when these were applied without the IUCN Regional Guidelines (IUCN, 2007b) and when assessors were confused about the purpose of the IUCN criteria and/or lacked training in their proper use.

[18] The Ministry is in the process of assessing biodiversity status for – initially – Peninsular Malaysia, later the

country as a whole. Together with establishing trends and status for each of the drivers of change listed, 'threatened species' are an important indicator for assessing the state of biodiversity. See Glossary.

19 The '*ecosystem approach'*, endorsed by the Parties to the Convention on Biological Diversity at its fifth meeting in Nairobi, Kenya (May 2000), is designed to balance conservation, sustainable use and equitable benefit sharing of genetic resources.

20 Protected Areas are fundamental in any country's strategy to preserve biodiversity. Globally, they have doubled in area in the 25 years from 1978 to 2003 (i.e. from almost 8 to 16 million square kilometres, WCMC, 2004). They have also increased in Malaysia though how much is pending an update of the *Master Plan* (DWNP 1996) listing in Table 6, p. 24 updated (i.e. is from August 1996).

21 Universities are now developing undergraduate and graduate courses related to collaborative conservation and the emerging ecosystem services paradigm (see for instance International Society for Ecological Economics, Newsletter July 2007, p. 17, at www.ecoeco.org/pdf/Newsletter_2007_July.pdf). Research programmes are also taking on ecosystem services as a prerequisite for resilient forest ecosystems that take into account the knowledge and needs of different users (www.mistra.org/download/18.70949694112f07101bc800030958/Mistra+Future+Forest+Call.pdf).

22 Only recently have ecologists begun to think in terms of ecosystem services and their determinants, while economists have likewise only very recently begun to incorporate the factors affecting ecosystem services into their valuations of these.

23 For example, when the natural resources such as forest reserves are getting scarcer within the vicinity of urban areas, people would be willing to pay a higher value on the resources for recreation since it costs more to enjoy similar benefits provided by forest reserves located much farther way.

24 For more details see Chapter 4 in Pagiola et. al. 2004.

25 Another example is the water regulating benefit of wetlands which often results in higher profits to water-demanding sectors.

26 As when "factory fishing" not only collapsed the stock of Newfoundland cod but bottom trawls also laid to waste the entire seafloor environment much marine life require to survive. These disruptions allowed opportunistic creatures to move in. In some areas small skates and dogfish (a small shark species) appear to have taken over the cod's niche in the ecosystem and crustaceans – once held at bay by cod – underwent incredible population explosions as the cod stock collapsed (www.emagazine.com/view/?507).

27 Apparently an assessment of reduced capital assets by timber exports was done by WWF Malaysia in the mid 1990s.

28 From Fox JED. 1972. *The natural vegetation of Sabah and natural regeneration of the dipterocarp forests.* PhD thesis. University of Wales.

29 Artist Teh Yew Kiang. From FD/Danced, 1997.

30 Malaysia is a Party to CBD and a member of IUCN.

31 The IUCN Categories were adopted during the 7th Conference of Parties in Kuala Lumpur 2004 with the following text as part of the CBD Programme on Protected Areas: *The CBD Conference of the Parties: Recognises the value of a single international classification system for protected areas and the benefit of providing information that is comparable across countries and regions and therefore welcomes the on-going efforts of the IUCN WCPA to refine the IUCN system of categories and encourages Parties, other Governments and relevant organisations to assign protected area management categories to their protected areas, providing information consistent with the refined IUCN categories for reporting purposes*." (see www.cbd.int/convention/cops.shtml).

32 Management Plans for PAs are a requirement of the ASEAN Agreement on Nature & Natural Resources (1985). More recently, Parties to CBD agreed that by 2012 all Protected Areas should be effectively managed *using participatory and science-based site planning processes that incorporate clear biodiversity objectives, targets, management strategies and monitoring programmes, drawing upon existing methodologies and a long-term management plan with active stakeholder involvement* (see www.cbd.int/doc/decisions/COP-07-dec-en.pdf).

33 The System Plan may be prepared as part of the Biodiversity Assessment (i.e. the last was done by MOSTE, 1997). The *steps* resulting in a Biodiversity Strategy and a National Biodiversity Action Plan were in Malaysia combined into the National Policy on Biological Diversity (MOSTE, 1998). Today both the Assessment and the Policy require updating – see references in Figure 6, p. 17, as well as GEF/UNEP/CBD, 2007a.

[34] Assuming present staff manages these areas in accordance with the concept of a 'Protected Area', 'Protected Areas Management Categories' and other guidelines for Protected Areas management (listed under the two subjects in the Glossary).

[35] The Dusky Leaf Monkey (*Trachypithecus obscures*) is in the IUCN 2007 Red List considered in the Lower Risk category. The example illustrates the point that many species are becoming increasingly isolated as part of the ongoing fragmentation process of remnant vegetation in the landscape (see maps in Annex 3). Another example is represented by Long Tailed Macaques in Bukit Nenas in downtown Kuala Lumpur.

[36] In 2005 the timber industry contributed about 2.9% of Malaysia's Gross Domestic Product and 5% of its total export earnings. Additionally, it provides added income and employment opportunities through downstream processing and the development of value-added products for the domestic and export markets. www.ceicdata.com/google/Malaysia_Timber.htm accessed 24 October 2007.

[37] This is called *mycorrhiza* and it is the result of a mutual beneficial association between a fungus and a plant at root level. Among the many important benefits is efficient nutrient cycling on poor soils which otherwise supports highly diverse tropical rainforest.

[38] In CBD COP Decision V/6, Annex A, Section 1 (www.cbd.int/doc/meetings/esa/ecosys-01/other/ecosys-01-dec-cop-05-06-en.pdf) and further elaborated upon in Decision VI/12 (www.cbd.int/doc/meetings/esa/ecosys-01/other/ecosys-01-dec-cop-06-12-en.pdf).

[39] Today practically all chemicals produced on land have found their way into the marine systems – in large part through the drainage of rivers into the sea. Riparian vegetation help to reduce not only sediment load in the rivers but also waterborne pollution.

[40] *Spatial and temporal* data essentially refer to the importance of establishing not only the present status of biodiversity which is multi-scaled in nature (i.e. local planning decisions have to consider overall issues such as requirements for connectivity), but also what has happened to it over time. This trend setting is important since it tells us what took place in the past and what may happen in the future – particularly since many biophysical processes operate on very long time scales (e.g. forest (re)growth, genetic erosion, soil formation and evolutionary processes).

[41] CBD Decision VIII/28 and Ramsar Resolution VII.16 (www.cbd.int/doc/decisions/COP-08-dec-en.pdf and www.ramsar.org/res/key_res_vii.16e.htm, respectively).

[42] The SEA Action Plan may be downloaded from: http://biodcomponent.bravehost.com/Docs/SEA-Action_Plan,_National_SEA_Workshop,_Port_Dickson_0702.pdf

[43] Slootweg *et al.* (2006).

[44] Section is based on the GEF, UNEP, CBD (2007) document on *Mainstreaming biodiversity into* sectoral *and cross-sectoral strategies, plans and programmes*.

[45] See for instance SEA cases 5.1 to 5.3 in Dalal-Clayton & Sadler (2004). They correspond to: *Slovak Energy Policy* (pp. 190); *Framework SEA of the Polish National Development Plan 2004 – 2006* (pp. 194); and *SEA of Energy Policy of the Czech Republic* (pp. 199). Several countries apply SEA to long-term national policies and plans including Australia and Canada. As far as the EU is concerned policies are not part of the EU SEA Directive (2004) but several countries have their own systems in place (e.g. Denmark, Finland, Netherlands and UK).

[46] For example, providing subsidy on monthly public transit pass is an incentive to use public transit while imposing a pick-hour tariff for cars driving into restrictive zones in a city is a disincentive for private car use. Both schemes aim to discourage office workers drive to workplace to reduce traffic congestion at pick hours.

[47] Thomas Sui. From FD/Danced, 1999.

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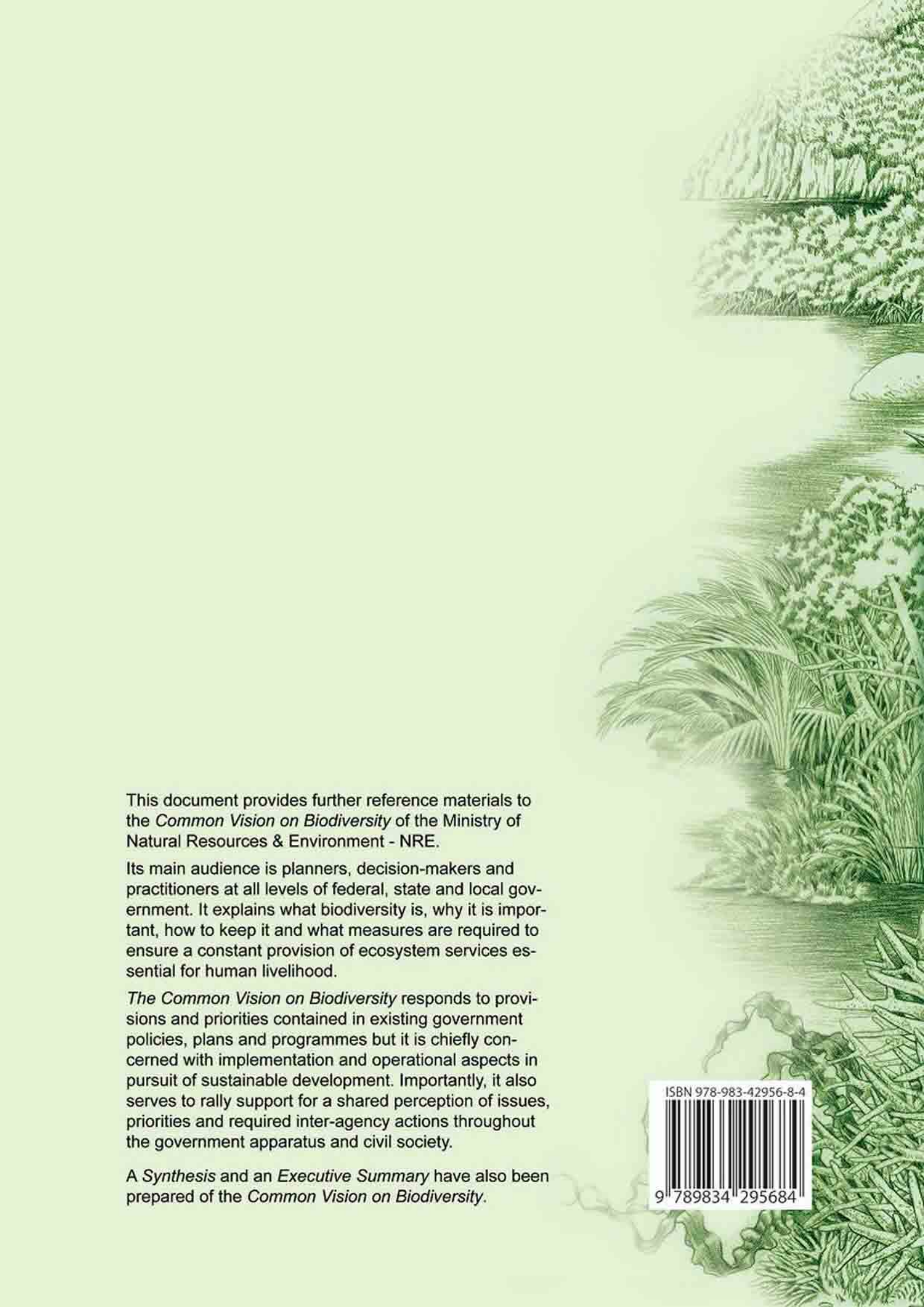

This document provides further reference materials to the *Common Vision on Biodiversity* of the Ministry of Natural Resources & Environment - NRE.

Its main audience is planners, decision-makers and practitioners at all levels of federal, state and local government. It explains what biodiversity is, why it is important, how to keep it and what measures are required to ensure a constant provision of ecosystem services essential for human livelihood.

The Common Vision on Biodiversity responds to provisions and priorities contained in existing government policies, plans and programmes but it is chiefly concerned with implementation and operational aspects in pursuit of sustainable development. Importantly, it also serves to rally support for a shared perception of issues, priorities and required inter-agency actions throughout the government apparatus and civil society.

A *Synthesis* and an *Executive Summary* have also been prepared of the *Common Vision on Biodiversity*.

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