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Inter-University
Environmental Debate

■ **Noor Baizzura Azizan,** Department of Environment

In collaboration with the Malaysian Universities Debate Council (MADUM), Dewan Bahasa dan Pustaka and the Ministry of Education, the Department of Environment organized the 15th Inter-University Environmental Debate at Universiti Teknologi Malaysia (UTM), Skudai, Johor from 23rd-28th of July 2005. Eighteen teams from 17 institutions of higher learning from all over Malaysia participated in this event.

Six preliminary rounds were held and the top eight teams were selected to compete in the quarter-finals and subsequently only four teams qualified for the semi-finals. Eventually two teams entered the finals.

In the finals of the 2005 Environmental Debate held at the Dewan Sultan Iskandar, Universiti Teknologi Malaysia was between International Islamic University of Malaysia (UIAM) and Universiti Pendidikan Sultan Idris (UPSI). UIAM was represented by Mohamad Khairulnizam Bakeri, Mohd Daud Mat Din, Shamsul Qamar Abd. Rani and Adira Adnan (reserve). UPSI was represented by Mohd Fairuz Md Alin, Mohd Hafiz Hamdan, Faizatul Azlinda Ahmad Fuad and Mohamad Mat Derus (reserve).

UIAM emerged the winner of the 2005 Environmental Debate and received the Minister of Natural Resources and Environment Trophy, together with a prize of RM8,000.00

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Inside this Issue

Conserving Natural Resources

Dato' Hajah Rosnani Ibarahim
Director-General
Department of Environment
Malaysia

Here in Malaysia and around the world, scientists and researchers have brought to our attention the dire need to ensure sustainable development. Nature and the environment are not inexhaustible and mankind's conduct towards both these central pillars of our existence on Earth has been largely characterised by carelessness and wanton disregard. Surely we must appreciate that Nature took aeons to shape the forests, seas, mountains and plains and the animals and plants that live in and of it. Nature has moved with infinite slowness and surefootedness through the many periods of its history to bring out the great changes that we collectively call 'Life on Earth'.

We are told that Mankind's tenure on Earth is like a mere minute in a 24-hour day! The age of trilobites began some 600 million years ago. The dinosaurs lived for 140 million years. The civilization of man is at least 12,000 years old. And yet in that one minute of the day, we have caused untold wreckage and havoc. The evidence of this is unmistakably visible, measurable and quantifiable. Can we all collectively make amends to save the day?

There are many parts to this frightening story of wreckage and havoc – the greenhouse effect, the depletion of ozone, acid rain, contamination of water resources and the extinction of plant and animal species. One can of course argue that Nature itself is a wrecker. A meteorite slams into Earth; the weather is altered, the climate changes, the ice advances, stars explode, genetic imbalances occur and new species emerge. The point we make is clear: all that is called Nature is characterised by its separation from human society. Blur the separation beyond the point of no return and we may kill Nature and ourselves. We must therefore henceforth proceed with our daily lives and economic organisation and arrangements in a manner that ensures the survival of Mother Earth.

Take for example the use of fossil fuels. When we drill into an oilfield, we tap into a vast reservoir of organic matter that has been in storage for millenniums. In effect, we 'unbury' it. When we burn it, carbon is released into the atmosphere in the form of carbon dioxide. In the course of a hundred years, our various engines and fires have released a considerable amount of carbon. There has always been a certain amount of carbon dioxide in the atmosphere, and it has always trapped a certain amount of sunlight to warm the earth. A little 'greenhouse effect' is vital for life on earth. We have increased the amount of carbon dioxide in the air by about 25% in the last century. We have substantially altered the earth's atmosphere with all the resultant woes – climate changes, global warming, rise of sea level and perhaps, the unleashing of Katrina.

Closer home, Malaysians may have yet to truly appreciate Mother Nature's gifts and bounty, primarily our tropical rainforests. To appreciate it, we must make a quick journey into geological time. Several hundred million years ago, all the continents that we know today were huddled together in one great landmass. Primitive palmlike plants called cycads were the main vegetation. A 180 million years ago, this landmass began to break apart. And then 125 million years ago, the first flowering plants emerged. Mammals well adapted to this new plant life increased in numbers and diversity. Many of the families of animals and plants that make up the tropical rainforests were well established 45 million years ago and these forests extended over much of the world. Changes in climate and topography then pushed the rainforest into a narrower belt around the equator. The Malaysian rainforests are rich in species and in endemic plants and animals. Our rainforests are an 'elite' refugia or sanctuary for the primordial rainforests of aeons ago.

Every Malaysian school child should be made aware that some of the richest rainforests are found here occasioned by the fact that our climate has remained stable and favourable to life – tropical and moist – for millions of years. Our rainforests, common with other rainforests in Southeast Asia and South America, are distinguished not only by the shear quantity of life that they support but by the diversity of that life. It is estimated that a tropical rainforest contains 20 to 86 species of trees per acre compared to a temperate forest of 4 tree species per acre. One square mile of rainforest in Colombia is found to have as much as 1100 species of plants. In addition a high proportion of these plant species and many animals are endemic to our area – that is, they live nowhere else. Papua New Guinea has 320 endemic species of birds. There are over 90 mammalian species in Phillipines that are endemic to that country. Sixteen per cent of all bird species in the world are found in Indonesia. So compared with the plants and animals of temperate forests, most tropical forest species are rare. Indeed we live in a veritable garden, unsurpassed in its beauty!

As we destroy these forests, million of species of plants and animals, the vast majority of which are completely unknown to science, lose their habitats. Seventy percent of the three thousand plants identified by the US National Cancer Institute, as having anti-cancer properties are rainforest species. Nature destroyed can never be restored. This is the real deal. Many people, here and abroad regard the warnings of ecologists about the consequences of destroying tropical rainforests as speculative and alarmist. Nothing can be further from the truth.

Not only is the wild harvest of our forest virtually free, the forest itself is vital for our existence on Earth. The most intelligent species on Earth should surely live up to its name and ensure the Earth is made safe and sustainable for all. We must protect Nature and its resources to ensure our survival as a species. ■

Malaysia-Revolving Fund Committee (RFC) Malacca Straits Oil Combat Exercise 2005

Oil spills are a major threat to the marine environment and could damage the growth of marine related industries in the region. A spill that originates in one littoral state could affect the neighbouring countries fueled by strong currents and winds across political boundaries. Hence close cooperation among the states to effectively combat spills is most desired.

A mechanism has been established to manage the Revolving Fund for the Straits of Malacca and Singapore. Malaysia, Indonesia and Singapore are successfully cooperating to deal with any oil spill in the Straits and other related issues arising from such spills.

The 2005 Oil Combat exercise which was held in the waters off Pulau Kukup, Johor from the 26th - 28th of July 2005 aimed to put to test operational aspects of the National Oil Spill Contingency Plan.

The exercise was funded by the Government of Malaysia and the Revolving Fund Committee (RFC) and involved participants from Indonesia, Singapore and Malaysia.

The objectives of the exercise were:

- To test and review the preparedness and actions drawn up by the National Oil Spill Contingency Plan
- To test the Johor State Beach Cleanup Plan
- To test Standard Operating Procedures (SOP) for the Control of Oil Spills in the Straits of Malacca and Singapore

Conference on Women and the Environment

On 23 August 2005, the Department of Environment organized a conference on Women and the Environment under the theme, "Women – the Catalyst for Environmental Excellence".

The conference was officiated by Y. Bhg. Dato Hajjah Jamilah Haji Anu, wife of the Honourable Minister of Natural Resources and Environment.

The objectives of the conference were:

- To enhance involvement of women towards environment excellence
- To inculcate good environmental habits in the family and community

- To strengthen women's role in decision making, for environmental management and development.
- To promote interaction and cooperation

The conference came about after the successful first conference held in 2003. A total of 500 participants attended the conference. The highlight of the event was the Environmental Products Exhibition which saw participation from over 34 entrepreneurs exhibiting home-made environmental-friendly products.

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and certificate of participation. Runners-up, UPSI received a cash prize worth RM5,000.00 and certificate of participation. The two other teams which qualified for the semi-finals, Universiti Teknologi Malaysia (UTM) and Universiti Teknologi Mara (UiTM), each received RM1,000.00 and certificates of participation.

Mohamad Khairulnizam Bakeri from UIAM who was adjudged the Best Debater received the Director-General of Environment Trophy and cash prize worth RM1,500.00. The prize giving ceremony was graced by Y.B. Dato Sri Haji Adenan bin Haji Satem, the Minister of Natural Resources and Environment.

Participating Universities

- Universiti Teknologi Malaysia (UTM)
- Universiti Islam Antarabangsa Malaysia (UIAM)
- Universiti Malaya (UM)
- Universiti Malaysia Sabah (UMS)
- Universiti Teknologi MARA (UiTM)
- Universiti Utara Malaysia (UUM)
- Universiti Sains Malaysia (USM)
- Universiti Kebangsaan Malaysia (UKM)
- Universiti Pendidikan Sultan Idris (UPSI)
- Universiti Putra Malaysia (UPM)
- Kolej Universiti Sains dan Teknologi Malaysia (KUSTEM)
- Kolej Universiti Islam Malaysia (KUIM)
- Kolej Universiti Teknologi Tun Hussein Onn (KUiTTHO)
- Kolej Universiti Kejuruteraan Utara Malaysia (KUKUM)
- Kolej Universiti Kejuruteraan dan Teknologi Malaysia (KUKTEM)
- Kolej Universiti Teknikal Kebangsaan Malaysia (KUTKM)
- Universiti Multimedia Cyberjaya (MMU)

Biodiversity and Habitat Degradation

- **Prof Dato' Dr Abdul Latiff Mohamad,** Universiti Kebangsaan Malaysia,
- **Assoc Prof Dr Faridah Hanum Ibrahim,** Universiti Putra Malaysia

Biodiversity means different things to different people. To the general public, it means the variety of flora and fauna and the various habitats that house them. However, to the biologists, it simply means the variety of ecosystems and the range of types and variability of animals, plants and microorganisms within them. It is not a fixed entity, but is constantly changing with time and ecological and evolutionary processes; it is increased by new genetic variations that get incorporated into the organisms, changed by mutation and reduced by losses, and reduced by extinction of species and habitat degradation.

Definitions and Measuring Standards

It has become a common practice to define biodiversity in terms of ecosystem, species and gene diversity, corresponding to three fundamental and hierarchically related levels of biological organisation, in that the genes are contained within the cells of individuals that constitute species, and species are the main biotic components of an ecosystem (Groombridge, 1992). This concept emphasises the interrelatedness of the biological world and abiotic factors. In general terms, it covers the terrestrial, aquatic and marine environments.

Ecosystem or community diversity is often evaluated through measures of diversity of the component species of flora and fauna at a local level and then largely in terms of types of vegetation. It relates to the variety of habitats, biotic communities and ecological processes in the biospheres. Malaysia has at least 19 distinct natural ecosystems containing up to about 7% of the world's species (Whitmore, 1975). One can visualize the diversity of ecosystems if one traverses from the deep sea of the South China Sea to the shallow waters of the Straits of Malacca, to the mangrove swamp forests, and the beach vegetation that line our shores.

The inland ecosystems consists of freshwater and peat swamp forests, the limestone hill forests, the ultra-basic forests and the lowland dipterocarp forests which are home to our timbers, rattans, bamboos, small and large mammals, reptiles, amphibians and insects. As one climbs the elevation, one encounters the hill dipterocarp forests to about 750 m above sea level, and ultimately to the montane forests of Gunung Tahan and Gunung Kinabalu. However, it is important to take note that the diversity of species decreases with elevation.

Species diversity, on the other hand could be measured by species richness, which is the number of species in a site or habitat. For example, it could be shown by the presence of about 814 species of trees measuring 1 cm diameter at breast height in a 50-ha plot at Pasoh Forest Reserve, Negeri Sembilan (Kochummen *et al.*, 1990), or by about 92 species of trees of 5 cm and above diameter at breast height in one hectare of forest at Ulu Muda Forest Reserve, Kedah (Faridah-Hanum *et al.*, 1999). Discussion of species diversity is typically presented in terms of number of species in a particular taxonomic group. For example, there are 20 species of Rafflesia in the world (Nais, 2001) or there is a total of 79 species of frogs known from the three national parks in Sabah, namely Kinabalu National Park, Crocker Range National Park and Tawai Hills Park (Inger *et al.*, 2000). Both approaches reflect the richness of species diversity.

Lastly, genetic diversity, represents the heritable variation within and between populations of species. Unfortunately, studies on genetic diversity either of a population or species are still at infancy stage in Malaysia.

Conflicting Demands of Development

Of the total land area in Peninsular Malaysia, forests account for more than 18.4 million ha or about 56% and the more productive dipterocarp forests account for about 86.5% of the total forested areas. The peat swamp forests and the mangrove swamp forest constitute about 10.3% and 3.3%, respectively.

In the last three decades, the pace of socio-economic development in the country has been tremendous given the aims of restructuring society, eradicating poverty and achieving an industrial nation status by the year 2020, among others. These development

activities have resulted in equally significant landuse changes, forest fragmentation and habitat degradation throughout the country. Much of the lowland dipterocarp forests where there were once enormous amounts of timbers has been lost to FELDA,

RISDA, FELCRA schemes and other state development agencies such as KETENGAH, KEJORA, KESEDAR etc. Once there were pristine forests in these areas and now they are occupied by rubber and oil palm estates, including new settlements. Similarly, the percentage of mangrove swamp forests and peat swamp forests were depleted significantly over the last 20 years due to forest conversion to other landuse such as construction of coastal resorts, marinas, aquaculture projects, and oil palm estates. Similar trends are believed to be occuring in limestone hill forests, hill dipterocarp forests and lower montane forests. The limestone hill forests were lost to quarries, the hill dipterocarp and lower montane forests are watershed forests and are also exploited for economic gains. However, one wonders in years to come whether we would have adequate areas to be declared as totally protected areas such as National Parks, Wildlife Sanctuaries and State Parks for biodiversity conservation or otherwise.

The species is the most commonly used basic unit of biodiversity. The level of knowledge varies widely between the different groups of animals, plants and microorganisms as some are better studied than others. At least we now know that there are about 2,830 species of trees in Peninsular Malaysia out of more than 8,200 species of

plants (Ng, 1978;1989; Turner, 1995; Whitmore, 1972; 1973). As for ferns, a total of 1157 species was enumerated for Malaysia (Parris & Latiff, 1997). A great deal of Malaysian flora and fauna diversity remains to be studied and documented, especially from areas where they are less accessible. At the same time, much of the species diversity in the protected areas, especially the National Park, are yet to be documented. The irony is that most of these species-rich areas are also identified for development purposes, especially for new townships, industrial areas, agro-forestry estates and other infrastructures. Once physical developments occur, habitats are affected and in many cases

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Natural Resources: Definitions & Concepts

■ **Rosta Harun,** Universiti Putra Malaysia

Natural Resources are commodities that are considered valuable in their relatively unmodified form. A commodity is generally considered a natural resource when the primary activities associated with it are extraction and purification, as opposed to creation. Farming is not a natural resource, while mining, oil extraction, fishing and forestry are considered as natural resources industries. A resource is expected to produce something of economic value for its owner.

There are two types of natural resources that can be classified as renewable resources and non-renewable resources. Renewable resources are generally living resources, which can renew themselves at approximately the rate at which they are extracted, if they are not harvested. Natural resources are natural capital converted to commodity inputs to infrastructural processes. They include soil, timber, oil, minerals, and other goods taken more or less as they are from the Earth.

Non- living renewable natural resources include soil, as well as water, wind, tides and solar radiation. Both, extraction of the basic resource and refining it into a purer directly usable form (e.g. metals, refined oils), are generally considered natural resource activities, even though the latter may not necessarily occur near the former.

Living things depend on natural resources. They have to consume the resources wisely and sustainably. Several concepts in natural resources that will be discussed are renewable resources and non-renewable resources. Renewable resources are resources that can be replaced by human effort but as to whether it is renewable forever depends on the management of the resources. Soil, air, water and the food chain are important renewable resources. Soil, as an ecosystem, can give a good crop if it possesses these features: a good supply of nutrients and nutrient-holding capacity, allows infiltration, good water capacity holding and resists evaporative water loss, a porous structure that permits good aeration, pH neutral and has low salt content. If soil is mismanaged, topsoil loss can be a serious repercussion. The most pervasive and damaging force in top soil loss is erosion where soil and humus particles are picked up and carried away by water and wind.

Water is a vital resource, which absolutely fundamental to life. Much of the water used in homes and industries is for washing and flushing away undesired materials, while the water used in electrical power production is for removing waste heat and increasing the efficiency of the process. Human beings take fresh water from whatever source they can. However, the major sources of fresh water are surface water and groundwater.

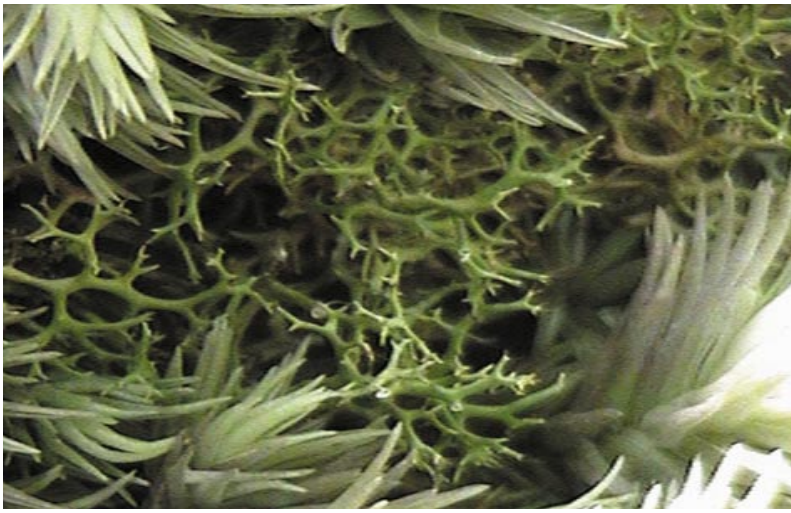
Another concept of a natural resource that must be taken into account is the food web. A group of plants and/or animal is related to each other by the fact that one group feeds or depends for food on another group. The food web consists of producers and consumers. There are many producers and fewer consumers.

In order to maintain our natural resources, conservation and preservation should be major considerations in all our activities, be it industrial or recreational. The aim of conservation is to manage or regulate use so that it does not exceed the capacity of the system to renew itself while preservation seeks to ensure continuity, regardless of potential utility. ■

The Forest as an **Ecosystem**

Dato Hj. Shaharuddin Mohamad Ismail, Forestry Peninsular Malaysia

When we talk about an 'ecosystem', we are actually relating a community of living organisms with the nonliving parts of their surroundings. Living organisms include plants, animals, fungi, bacteria and other microorganisms while water, soil, sunlight and air make up the nonliving parts of the ecosystem. In essence, we are referring to the interaction between plants, animals and their geophysical environment. There are various types of ecosystems which vary from deserts, grasslands, tundra, boreal, coniferous forests, coral reefs, mangroves to the evergreen tropical rainforest. Ecosystems interact within and between levels. For example, crabs and prawns are associated with the mangroves, the honey bees with the Tualang tree and tiger with dense forests.



Tropical Rainforest Ecosystems

As Malaysia is a tropical country located near the Equator, with a stable climate of constant rainfall and even temperature changes from day to night, the prevailing wet and humid conditions favour a luxuriant growth of tropical rainforest which harbour an immense richness and diversity of plant and animal life. The characteristics of the tropical rainforest ecosystem changes as we move away from the Equator. As the amount of rainfall gets less and conditions become drier up to three months, the forests become deciduous in nature. However, in the tropical rainforest, the vegetation is rather dense and contains various species compared to other forms of ecosystem elsewhere in the world. The different types of vegetation compete among each other to capture as much sunlight as possible for photosynthetic activities. In the process, the interior of the forest becomes dark and very little sunlight reaches the forest floor.

The canopy of the tropical rainforest is dominated by big and tall trees that form the emergent layer of the forests, capturing much of the available sunlight. These trees are mainly dominated by members of the dipterocarp family, for example keruing (*Dipterocarpus costulatus and D. crinitus*), chengal (*Neobalanocarpus heimii*) and meranti (*Shorea acuminata, S. macroptera* and *S. leprosula*), and by those of a few other families such as jelutong (*Dyera costulata*) and kempas (*Koompassia malaccensis*). Below, the younger trees of the above-mentioned species await the opportunity of graduating to achieve a similar level as the the bigger trees die or are harvested. Apart from trees, there are other type of plants such as fruit trees, palms and ferns that will never reach the emergent canopy layer. It must be realised that the different layers of vegetation is also home for differ-

ent kind of animals and plants, thus, maintaining a complex biodiversity unique to the tropical forests.

There is a great richness of plant life forms and animal species in the tropical rainforest. The plants and animals coexist in the forests and are interdependent on each other for their survival. Many animal species are dependent on plants for their food and in return, the plants benefit from the animals as they are an important agent of pollination for dispersal of fruits and seeds for their regeneration.

Tropical Forest as Air Conditioners

Tropical rainforest can be considered as huge air-conditioners. During the process of photosynthesis their massive foliage absorbs carbon dioxide and releases oxygen to the atmosphere. The forest intercept rainfall, preventing massive erosion of the topsoil, and release the water into rivers and waterways in a more subdued form. It acts as a huge sponge that absorbs, retains and slowly releases water back to the rivers and waterways. Thus, the forest ecosystem plays an important role in regulating water supply for the country. It also provides timber and non-timber products such as wild fruits, bamboo, rattan, honey and others. In addition, the forest is a depository for medicinal plants and a reservoir of biological diversity.

Forest Reserves

Despite the rapid developments taking place in the country, the State Forestry Departments have managed to maintain and conserve 19.54 million hectares or about 59.5% of the total land area under forest cover. Of this, a total of 14.39 million hectares (43.8%) have been gazetted as permanent reserved forest (PRF). However, if we were to consider other tree crops such as oil palm, rubber, cocoa and coconut plantation, then the total area under tree cover would be 76.3% of the total land area. As such, Malaysia should be considered to be one of the 'greenest' countries in the world. In addition, Malaysia has also designated 1.63 million hacteres of her forest as national parks and 770,000 hacteres of wildlife and bird sanctuaries which means that we have 2.40 million hectares of totally protected forest. Furthermore, a total of 3.21 million ha has been designated as protected forest within the PRF which include among others water catchment areas, amenity forest, soil protection forest, education forest, research forest and virgin jungle reserves. In this regard, Malaysia actually has 5.36 million ha of its forested land being totally protected by law for the conservation of biological diversity, representing 27.5% of its total forested area or 16.3% of its land area. This is much higher than the recommended figure of 10% by IUCN.

In Malaysia, the forestry sector through the timber-based industry continues to play an important role in the socio-economic development of the country. It is one of the major contributors to the country's export earnings and provides 337,000 employment opportunities. The export earnings from the industry have over the years experienced an upward trend, reaching as high as RM19.7 billion in the year 2004, representing 3.5 % of the country's total export revenue for that year.

Forestry Ecotourism

Currently there are 125 forest recreational areas throughout Peninsular Malaysia. These recreational areas provide a place for outdoor recreational activities such as forest trekking, camping, appreciating nature, caving and mountaineering. On the average, 3 million (17% of the total population in Peninsular Malaysia) visit these areas annually. We have a good number of foreign tourists visiting the recreational forests. With increasing urbanisation and the accompanying pressures of living in towns and cities, retreats into the forests and visits to ecotourism sites will see a tremendous increase as people, both locals and foreigners seek to harmonize their lives with nature.

Ecotourism: Balancing the Impacts on Environment

Assoc Prof Dr Ahmad Shuib
Universiti Putra Malaysia

Ecotourism is closely linked to biodiversity and the attractions created by a rich and varied environment. Because of this link, ecotourism can also cause loss of biodiversity when land and resources are strained by excessive use, and when impacts on vegetation, wildlife, mountain, marine and coastal environments and water resources exceed the carrying capacity. This loss of biodiversity in fact means loss of ecotourism potential. Ecotourism development can put pressure on natural resources when it increases consumption in areas where resources are already scarce.

Sustainable development of ecotourism resources imply that any action taken to develop natural resources to attract tourists will not exert pressure or cause imbalance to the ecological system in such a manner that it leads to destruction of the stable ecological system or the major landscape characteristics, cultures, or the livelihood of the local communities.

Ecotourism Contributes towards Conservation of Natural Resources and the Environment

Ecotourism can contribute directly to the conservation of sensitive areas and habitat. Revenue from park-entrance fees and similar sources can be allocated specifically to pay for the protection and management of environmentally sensitive areas. Special fees for park operations or conservation activities can be collected from tourists or tour operators. World Travel and Tour estimates that the Malaysian travel and tourism industry contributes RM20.55 bil (5.7%) to total GDP and opened up 529 000 new employment opportunities accounting for 5.54% of total employment in 2002. If the indirect impacts are taken into account, it is estimated that the relative contribution to GDP and employment will rise to 15.33% and 13.39%, respectively.

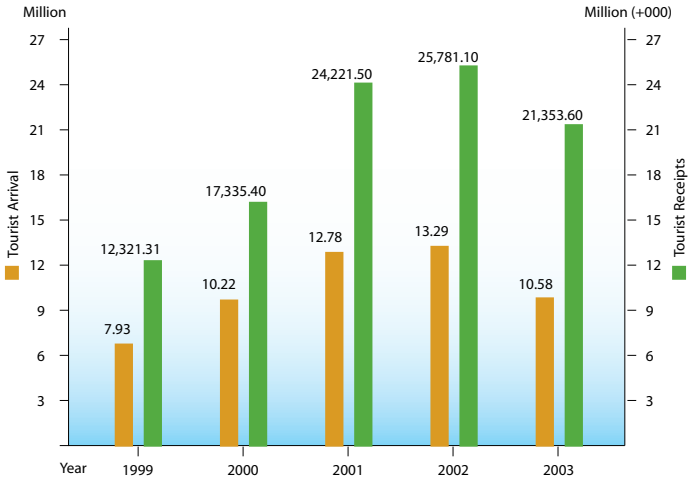


Figure1 : Tourist Arrival and Tourist Receipts

Contributions to government revenues

Some governments collect money in more far-reaching and indirect ways that are not linked to specific parks or conservation areas. User fees, income taxes, taxes on sales or rental of recreation equipment, and license fees for activities such as hunting and fishing can provide governments with the funds needed to manage natural resources. Such funds can be used for overall conservation programs and activities, such as park ranger salaries and park maintenance. As shown in Figure 1, the tourism industry contributed more than RM21 billion to GDP in 2003.

Improved environmental management and planning

Sound environmental management of ecotourism facilities especially hotels can increase the benefits to natural areas. But this requires careful planning for controlled development, based on analysis of the environmental resources of the area. Planning helps to make choices between conflicting uses, or to find ways to make them compatible.

Raising environmental awareness

Ecotourism has the potential to increase public appreciation of the environment and to spread awareness of environmental problems when it brings people into closer contact with nature and the environment. This confrontation may heighten awareness on the value of nature and lead to environmentally conscious behavior and activities to preserve the environment.

Ecotourism can significantly contribute to environmental protection, conservation and restoration of biological diversity and sustainable use of natural resources. Because of their attractiveness, pristine sites and natural areas are identified as valuable and the need to sustain its attraction can lead to creation of national parks and wildlife parks.

Means of Solving Conflicts

Regulatory measures help offset negative impacts; for instance, controls on the number of tourist activities and movement of visitors within protected areas can limit impacts on the ecosystem and help

maintain the integrity and vitality of the site. Such limits can also reduce the negative impacts on resources. Limits should be established after an in-depth analysis of the maximum sustainable visitor capacity is done.

Communities located near major ecotourism attraction sites, should have the opportunity to participate in tourism related attractions. These communities can provide hotels, restaurants, shops, transportation and guide services and other tourist facilities and services. They can also be employed in management and operation of these attractions. Concrete financial benefits are obviously an important part of such partnership. Most importantly, local communities must have a say on the extend and kind of tourism developments that take place in their areas.

This new partnership should be based on a commitment to hire local residents as managers in protected areas and ecotourism operations. In addition, programs for providing credit for rural enterprises should be initiated or expanded so that more local entrepreneurs can develop ecotourism-related businesses. It could also mean offering 'on-the-job' training and scholarships to tourism and park management schools, leasing rather than buying land from local residents, and purchasing more goods and services for ecotourists locally.

Some Negative Effects of Ecotourism Development

One of the most critical natural resources is water, especially fresh water. In many tourist destinations, water resources are generally overused and poorly managed for hotels, swimming pools, golf courses and personal use by tourists. This can result in water shortages, degradation of water supplies, as well as generate greater volume of waste water. Ecotourism can create great pressure on local resources like energy, food, and other raw materials that may already be in short supply. Greater extraction and transport of these resources exacerbate the physical impacts associated with their exploitation. The seasonal characteristic of the ecotourism industry results in ecotourism sites having several times more inhabitants in the high season compared to the low season. A high demand is placed upon these resources to meet the high expectations tourists often have for proper heating, hot water, etc.

Local communities are significantly vulnerable to the deleterious impacts of ecotourism development, particularly indigenous cultures as they directly experience the socio-cultural impacts of ecotourism. Disruption to established activity patterns, anti-social behaviour, crime and over-crowding caused by ecotourism development can also have a negative impact on local lifestyles and the quality of life of both indigenous and non-indigenous communities. Nonetheless, ecotourism has the potential to create support for conservation objectives, in both the host community and visitors alike, through establishing and sustaining relationships between the ecotourism industry, local communities, and protected areas. ■

Community-Based Ecotourism

■ **Dr. Ahmad Puad Mat Som,** Universiti Sains Malaysia
■ **Dr. Wong Kong Yew,** Universiti Putra Malaysia

Ecotourism is an amalgam of interests arising out of environmental, economic and social concerns. Over the last twenty years, it has assumed a global presence and has been acknowledged as a potential tool to improve sustainability by modifying human social behaviour in regard to environmental conservation. In other words, ecotourism incorporates a strong commitment to nature and a sense of social responsibility.

There are examples of successful ecotourism ventures, which are making a real and significant contribution to conservation of the natural resources as well as the development of impoverished communities. Active involvement of communities in the planning process and in operations management is vital in order to achieve the development and conservation goals of ecotourism. However, these activities are extremely rare because they have generally been peripheral to tourism planning and management especially in developing countries.

A piece of research, which is exploratory in nature, has been conducted in an attempt to examine the contribution of ecotourism to local community's livelihoods in rural areas in Malaysia, by exploring local opportunities and limitations in the industry as well as evaluating the current practice and the potential for community participation in the planning process. In general, the study found that the level of local involvement in ecotourism in Malaysia is low because there are operational, structural and cultural limitations to community participation in tourism development process. The study also found that active local participation in planning is compounded by the technocratic planning system and highly centralised government structure.

Therefore, this study suggests that the realisation of community ecotourism in Malaysia must overcome these two major impediments before it can successfully take place. As ecotourism research is relatively new and limited in Malaysia, the outcome of this study is believed to have expanded the existing body of knowledge on community participation in ecotourism and planning and has provided valuable insights into the practicality of this approach in Malaysia. Judging from this study, it seems that ecotourism is currently still at the very early and fragile stage in its development. The overall concepts and principles of ecotourism are continually beset by larger-scale interests seeking to divert or co-opt them for other purposes. While there certainly appears to be an opportunity to provide the tourist with a degree of ecotourism experience on a bigger scale, caution needs to be exercised in promoting such areas as true ecotourism sites.

One of the unfortunate realities of ecotourism is that there is little evidence that it is less intrusive than other types of tourism development, despite its altruistic intentions. In many localities around the world, local initiatives are chipping away at the conditions or circumstances that continue to plague ecotoursim development. It is within the local arena that such change must occur. ■

Business Enterprises and Environmental Responsibility

■ **Assoc Prof Dr Tai Shzee Yew,** Universiti Putra Malaysia ■ **Assoc Prof Dr Kusairi Mohd. Noh,** Universiti Putra Malaysia

Few would disagree that the accelerated pace of development since the mid 19th century has been due to the birth of the modern corporation. There is no question that this innovation, together with the factory-based method of production, have led to rapid industrial progress and prosperity and to the growth of urban centers and the growth of population.

This rapid growth has resulted in visible negative impacts on the underlying natural system supporting the production – forest, fisheries, soils, and the general environment. Reducing the impact on the environment can be achieved by (i) decreasing the population, (ii) decreasing affluence, or (iii) changing technology. The first option is basically infeasible. The second is even not desirable as poverty is directly correlated to larger population. Greater affluence is needed to stabilise population and increase standard of living. Thus the only option is to change technology. The first two options can be considered as societal issues but the third concerning the technology of production is definitely within the domain of business.

At the birth of the industrial revolution, natural resources were plentiful and there were fewer people. It was natural for business to emphasise labour productivity and to substitute more man-made capital for labour. The contributions of natural resources to production, while critical, were not taken into account by industries. It does not appear in the company's balance sheet as the case for man-made capital. This mind set has been referred to as industrial capitalism.

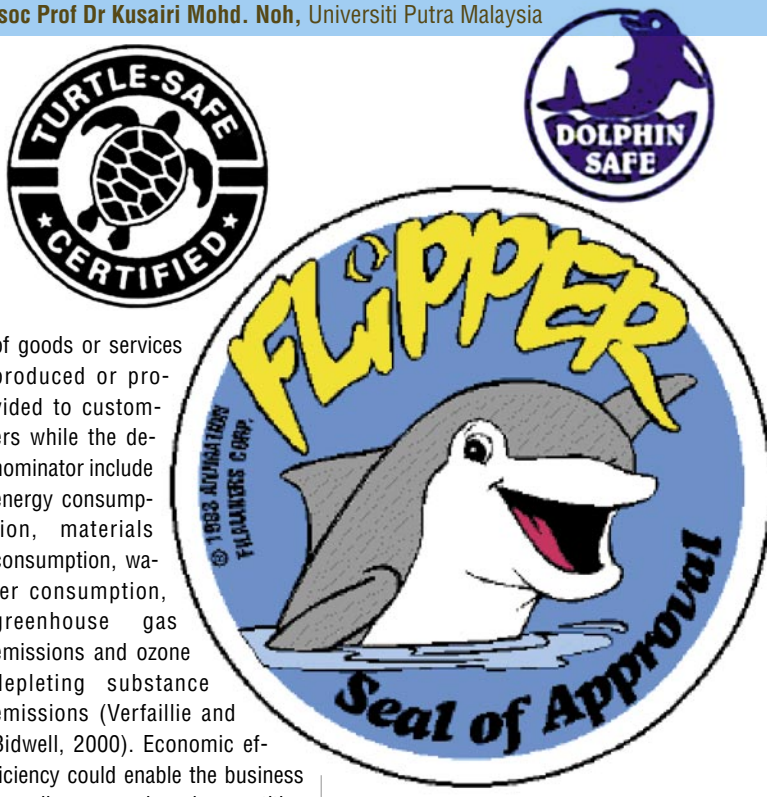
However, as the pace of industrialism grows, the capacity of the irreplaceable natural resources to support industrial production diminishes and industrial capitalism is increasingly becoming unsustainable. As natural capital is becoming scarce and people more abundant, a shift in emphasis is therefore required – from labor productivity (the scarce resource in the past) to that of natural resource productivity (the current scarce resource). This new focus of business has been referred to as natural capitalism – the incorporation of natural systems into the industrial economy.

Natural Capitalism

Eco-efficiency

There are four principles associated with natural capitalism. The first and most obvious is to increase the eco-efficiency of production – to increase the productivity of natural resources. The prefix eco refers to both economy and ecology (environment), two of the three components essential to sustainability (the third being social). It has three broad objectives: reducing the consumption of resources, reducing the impact on nature and increasing product or service value.

Eco-efficiency is defined as the ratio of product or service value to environmental influence. The generally applicable measures for the numerator include quantity of goods or services produced or provided to customers while the denominator include energy consumption, materials consumption, water consumption, greenhouse gas emissions and ozone depleting substance emissions (Verfaillie and Bidwell, 2000). Economic efficiency could enable the business to realise economic and competitive opportunities from environmental improvement. There need not be a trade-off between the economy and ecology.



Biomimicry

Secondly, natural capitalism emphasises production along biological lines with no wastes and harmful emissions. As an example, to redesign production to eliminate pollution could be more profitable than treating pollution as a result of production. Production should be redesigned to use more renewable rather than nonrenewable resources.

Economic Solutions

Thirdly, the business model should be altered from that of providing goods to that of delivering flows of services and value. As an example, rather than sell photocopying machines a business could provide a "copying service". The machines should be more efficient and more durable. They could be redesigned to consist of modular parts or components that could be reconditioned and reassembled into new machines when needed instead of having to replace obsolete machines.

Reinvest in nature

Finally, society needs to reinvest in restoring, sustaining and even expanding the stock of natural resources, the really scarce capital in the economy.

Standards for Corporate Responsibility

Of late, there is increasing receptivity by corporations towards social issues in general – beyond economic and ecological matters. Although the basic aim of a corpo-

Lists of recommended practices

1. The company mission includes and promotes the pursuit of "sustainable development," defined by the UN World Commission on Environment and Development as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs."
2. The company strives for continuous improvement in efficiency with which it uses all forms of energy and materials; in reducing its consumption of water and other natural resources; and in its emissions of hazardous substances.
3. The company creates explicit programs and mechanisms for monitoring its energy, water, and materials use and corresponding emissions into the environment, and communicates to its stakeholders about its progress and strategies for improvement.
4. The company develops a company-wide Environmental Management System that translates its environmental mission and policy statements into an action plan, with objectives and procedures for evaluating progress.
5. The company includes environmental factors and audits in its performance evaluation systems for individuals and business units.
6. The company designs products, services, processes, and facilities to minimize adverse environmental impacts.
7. Wherever possible, the company quantifies the environmental impacts of its products and services and makes continuous improvements in reducing or eliminating any adverse impacts throughout their entire life cycle.
8. The company is committed to using and producing recycled and recyclable materials, increasing the durability of products, and minimizing packaging.
9. The company gives preference to purchasing environmentally superior products and office materials.
10. The company tries to transfer successful environmental techniques and technologies to all its divisions and locations.
11. The company seeks out suppliers, distributors, and business partners that meet equivalent environmental and social standards as the company sets for its own products and services.
12. The company shares the savings from environmental impact reductions with employees.
13. The company offsets carbon emissions with equivalent carbon-fixing, such as tree-planting.

Source: Goodell (1999) p55-56.

Measurable indicators of performance

1. Independently verified environmental disclosure report
2. Progress towards zero emissions
3. Reductions in waste
4. Process changes adopted to reduce waste, emissions, and energy consumption; and costs
5. Or savings associated with those changes
6. Level of emissions, expenditures for pollution prevention, amounts of materials that are recycled and/or diverted from the waste stream, and amounts of energy consumed and conserved, by major type
7. Funds committed for research and development on more effective pollution prevention and control and energy conservation
8. Number of complaints, suits, and final judgments for environmental infractions
9. Evidence of effective environmental site-selection criteria for facilities
10. Number and percentage of facilities which are certified to ISO 14001 and continuous improvement of environmental performance
11. Degree of integration of environmental impacts into daily management decisions

Source: Goodell (1999) p57.

ration is to increase the economic value of the firm – to produce goods and services worth more than total costs – social issues are no longer viewed as extraneous to the firm as they can impact its financial performance. There are numerous examples where ignoring broader social issues can compromise economic values. The socially responsible business believes that employees perform better when they are treated fairly; the firm performs better when the quality of life in the surrounding community is better (less crime, adequate education and health care, healthy environment); the firm that is mindful of the environmental impacts (reduce waste, increase resource efficiency) achieves better quality products and services and faces lower regulatory compliant costs; company's reputation will be an important factor in continuing customer and general stakeholder support.

Realising the importance of enterprise sustainability and the increasing social obligation of enterprises the Social Venture Network (SVN) has developed a set of standards for business responsibility encompassing nine interrelated topics. It consists of three general topics – ethics, accountability and governance – and six topics related to each stakeholder group – investors, employees, business partners, customers, community and environment. Our focus here will be on standards for the environment.

According to SVN the company should "strive to protect and restore the environment and promote sustainable development with products, processes, services, and other activities" and it must be "committed to minimising the use of energy and natural resources and decreasing waste and harmful emissions". Furthermore, it must "integrate these considerations into day-to-day management decisions".

The standards list 13 "recommended practices" by which an enterprise can improve performance in relation to the standards. These include stating a company environmental mission expressing the pursuit of sustainable development; continuous monitoring and improvement in efficiency in the use of energy and materials; water and other natural resources; reduction in emissions of hazardous substances; to developing an Environmental Management System (See Box).

The SVN also lists ten measurable indicators of performance useful in the implementation of the standards. These include: independently verified environmental disclosure report on levels of wastes, emissions and energy consumption; and expenditures, costs or savings associated with measures taken to improve these (See Box).

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Creatures of the Hydrothermal Vents
Life in 400°C Water?

Prof Dr Mohd. Ibrahim bin Hj Mohamed
Universiti Putra Malaysia

Can you imagine living in an environment where the temperature ranges from 80°C to 400°C, is full of highly toxic metals, hydrogen sulfide and is pitch dark? At a depth of 2,500m, the pressure exerted is 250kg for every 1 sq ft, enough to crush a military tank. The answer is amazingly yes! This environment at the bottom of the sea is teeming with living organisms and may be the most productive ecosystem on earth yet.

This is precisely the environment found in the deep sea thermal vents found in the centre of the Pacific and Atlantic Oceans. Hydrothermal vents, are geysers on the ocean floor. They form along mid-ocean ridges, the volcanic undersea mountain ranges where new seafloor is created. Vents form where earth's crustal plates are slowly spreading apart. As cracks form between these spreading crustal plates, seawater seeps deep into the earth's hot molten core, a mile or two down. As the water is super heated to temperatures well in excess of 400°C, and is enriched with minerals leached from the rocks, the water gushes out of the crack of the crustal plates to form a vent.

As the vents burst out into the ocean, the temperature may be as high as 400°C (750°F). Yet this water does not boil because it is under so much pressure from the weight of the ocean. At the top of the hydrothermal vents are chimneys formed from the cooling and precipitation of the super hot vent water on meeting the surrounding deep ocean water, typically 2° C just above freezing. The hottest vents called " black smokers" spew mostly iron and sulphides that combine to form iron monosulphide giving it a characteristic black colour. "White smokers" release cooler water and often contain compounds of barium, calcium and silicon which are white in colour.

The chemicals contained in the vent fluids amazingly support a thriving ecosystem on the ocean floor. This ecosystem is completely independent of the sun's energy. Microbes, some symbiotic, combine vent chemicals with oxygen and use the mounds and the surrounding bare lava, and live on the energy harnessed by the microbes.

Residents of Hydrothermal Vents

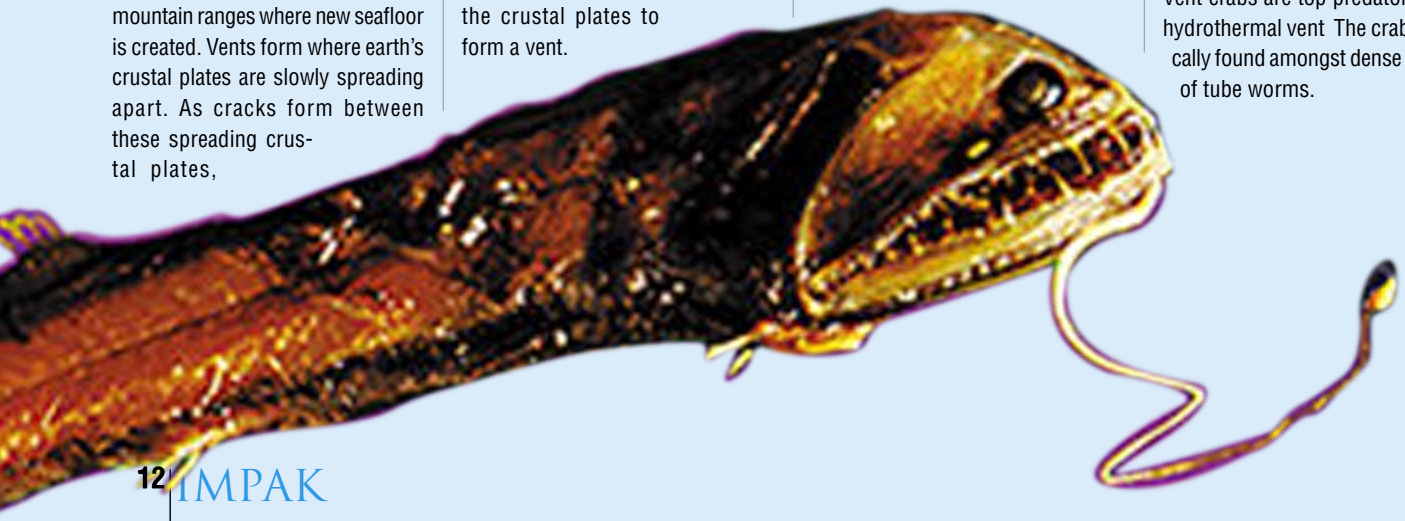
Since their discovery in 1977, these hydrothermal vents are like oases, providing habitat for many creatures not found anywhere else in the world. To date more than 300 new species have been identified.

Tubeworms

Among the variety of sea creatures and living organisms of the hydrothermal vents include the tubeworms. Resembling water hoses, they may grow to about 3 meters long.

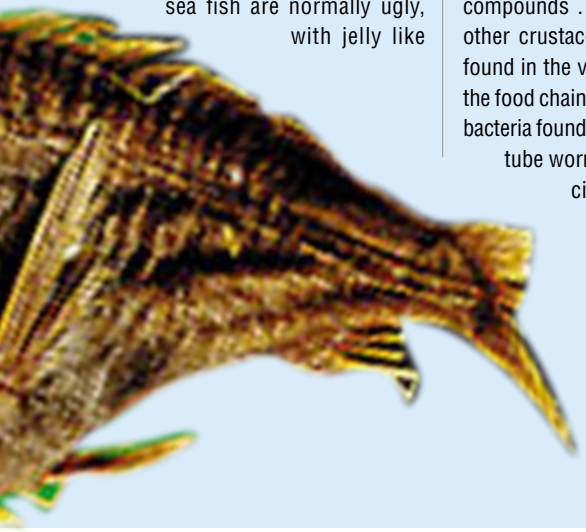
Crabs

Vent crabs are top predators at the hydrothermal vent The crab is typically found amongst dense clusters of tube worms.



Pompeii Worms
The worms, found in coral reef-like structures, are the most heat tolerant animals on earth.

Deep Sea Fish
Other than the snake-like zoarcid or eelpout commonly found in vent sites, few deep sea fish live in hydrothermal vent sites. Deep sea fish are normally ugly, with jelly like flesh with a big mouth and sharp teeth and bodily extensions to reduce the effect of high pressure on their body.



Other organisms found in the hydrothermal vents include the white deep sea shrimps also devoid of eyes but with a sensor on their head to detect temperature and chemical compounds . Jericho worms, and other crustaceans have also been found in the vent area. The base of the food chain of the vent area is the bacteria found in billions within each tube worm, clam or other species. Chemosynthetic bacteria use energy stored in sulfur compounds to power the conversion of CO_2 to organic compounds

Scientific Research

Aside from the potential food sources available to human beings from this very productive ecosystem never before thought to exist, these heat resistant organisms are opening a whole new research area in developing heat stable enzymes for genetic engineering and culturing bacteria to breakdown toxic waste. The discovery that unusual life inhabits vent sites, may light the way to the development of new drugs, industrial processes and other products useful to mankind.

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continued from page 5

degraded to the level it impoverishes the biodiversity that exists in those areas. There are many such examples in the country: the Kalabakan Forest Reseves in Sabah, Bukit Cerakah areas in Selangor, mangrove swamp forest around Kukup, Johor, to cite a few.

Importance of Biodiversity

Biodiversity is an asset of the future for any advancements and progress in a knowledge-based economy such as biotechnology. It also promises the discovery of many plant products for pharmaceutical industries that could serve as cures for some of the human illnesses and sufferings and most important of all, it ensures the constant supply of clean air and water, and safeguards our beautiful and pristine rural and urban landscape for sustainable development.

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Sustaining Ecosystems

■ Kamsiah Md Ali

Vast Genetic Treasure on Sea Beds

Vast genetic resources – "blue gold" on the international deep sea floor – need protection from unfettered commercial exploitation, warns a news report from the Japan-based United Nations University Institute for Advanced Studies (UNU-IAS). Known as "extremophiles," the genetic make-up of organisms of the deep that live in extreme conditions of pressure, temperature and toxicity are drawing enormous interest from scientists and companies bioprospecting for possible pharmaceutical or industrial applications. Already several valuable products have been created and there is growing recognition for the potential of deep sea genes to advance human welfare.

The new report, *Bioprospecting of Genetic Resources in the Deep Seabed*, cites rising concern about the absence of clear rules governing access to and the sharing of benefits derived from the "global commons" of the sea beds and the potential for severe, perhaps permanent damage to these unique and sensitive ecosystem, which include seamounts, cold seeps and hydrothermal vents – the latter considered as nurseries for life on Earth. The report further says that deep sea expeditions are increasingly frequent, their focus shifting from geological and geophysical study to ecological, biological, physiological and bioprospecting. While most research is still purely scientific, the report predicts that the promise of important new products will lead to an increase in commercial exploration.

The report says regional agreements could be used as first steps towards a comprehensive international regime to protect the deep seabed from over-exploitation. It also suggests adoption by the UN General Assembly of guidelines on deep seabed bioprospecting until a binding regime is developed. The guidelines could facilitate co-operation and co-ordination between states and, drawing on existing global and regional instruments, include measures on conservation, sustainable use and the sharing of benefits.

Source: *http://www.ias.unu.edu/binaries2/DeepSeaBioprospecting_newsrelease.doc*

The Value of the World's Ecosystem Services and Natural Capital

CV and other techniques were used in a ground-breaking study on valuing ecosystem services by Costanza *et al.* (1997) that was published in a British journal (*Nature*, 387) This study calculated the value of gas regulation, climate regulation, disturbance regulation, water regulation, water supply, erosion control and sediment retention, soil formation, nutrient cycling, waste treatment, pollination and genetic resources--in addition to wildlife, recreation and aesthetic values.

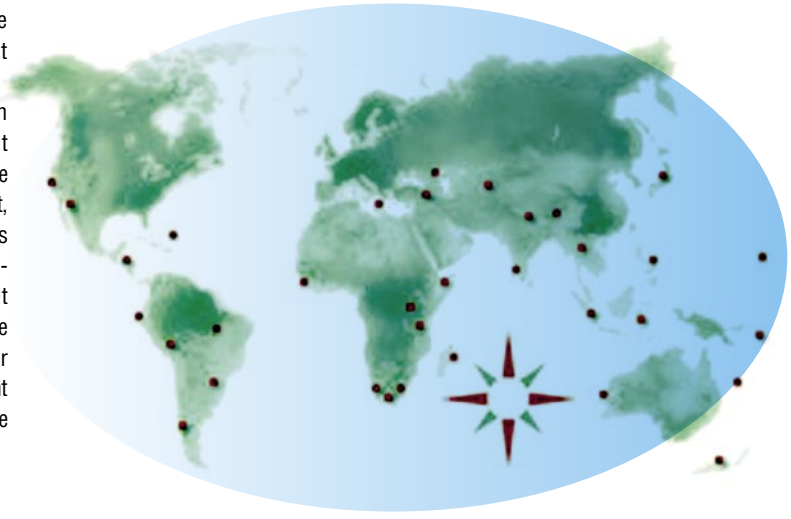
The researchers came up with annual per hectare values and total global values for all ecosystems: open oceans; coastal estuaries, seagrass/algae beds, coral reefs and shelf; tropical and temperate/boreal forests; grass and rangelands; wetland tidal marshes, swamps and floodplains; lakes and rivers; tundra; desert; ice/rock. The global total was over USD33 trillion per year. The per hectare temperate/boreal forest value was USD277 (USD112 per acre per year).

Source: Robert Costanza, Ralph d'Arge, Rudolf de Groot, Stephen Farber, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin. Nature (387): 253-26. 15 May 1997. Available at *http://www.nature.com/nature/index.html*

Biodiversity Hotspots

The most remarkable places on earth are the most threatened. These are the hotspots – the richest and most threathened reservoirs of plant and animal life on Earth.

Hotspots are defined according to their vegetation. According to British ecologist Norman Myers (1988), a hotspot has to contain at least 0.5 percent of the world's 300,000 plant species as endemics. Plants are important because vegetation is what determines the primary productivity of an ecosystem. Most, but not all, of the hotspots are in tropical areas; many are in developing countries where populations rely on species-rich ecosystem for food, firewood, cropland, and income from timber. In Madagascar, for example, about 85 percent of the plants and animals are found nowhere else in the world, but its people are also among the world's poorest and rely on slash and burn agriculture for subsistence farming. Other hotspots are in wealthy countries and face different pressures: The islands of Hawaii have many unique plants and animals that are threatened by introduced species and land development.



Source: *http://www.biodiversityhotspots.org/xp/Hotspots*
http://www.enviroliteracy.org/subcategory.php/202.html

Oil spills: What is the Long-Term Damage?

The long-term effect of an oil spill is the subject much debated among scientists. Some argue that animals and birds are harmed for many more years even after the event, but others believe wildlife are more resilient. According to some scientists, otters and other animals are still suffering nearly 12 years after the Exxon Valdez oil spill in Alaska. It was not the world's largest oil spill but is widely regarded as the worst in terms of damage to the environment. The tanker went aground in Prince William Sound in March 1989, spilling an estimated 42 million litres of crude oil - enough to fill 125 Olympic-sized swimming pools!

According to some estimates the spill killed 250,000 sea birds, 2,800 sea otters, 300 harbour seals, 250 bald eagles, up to 22 killer whales, billions of salmon and herring eggs. According to some researchers, the population has still not recovered. The oil, which affected 1,300 miles of rugged coast,

penetrated deep into the cobble beaches, especially in areas sheltered from the winter storms that can help clean the beaches. Human efforts and natural degradation did remove most of the oil, but some areas still have oil under the surface. But according to Dr Paul Kingston, from the Centre for Marine Diversity and Biotechnology at Heriot-Watt University, Edinburgh, the problems are minimal. "It can be argued that you can measure the long-term effects but you really have to search…It's difficult to distinguish between what's caused by the oil and what is caused by natural changes." In any spill, the oil itself does not stay around long enough for it to do long-term harm, he argued. Dr Kingston also argued that oil can break down "very quickly" in a food chain, and the amount passed on reduces as it moves up the chain.

According to Greenpeace scientist Paul Horseman, the impact of an oil spill can partly depend on the nature of the coastline and the weather. Oil is easier to get off rocky coasts than soft marsh of an estuary. In colder regions the fuel can stay around longer than it would in hot regions because it cannot evaporate so quickly. The type of oil will also make a difference. Crude oil has a suffocating, toxic effect and is like a heavy tar. Gasoline is generally more toxic but evaporates fairly quickly.

Source: http://news.bbc.co.uk/2/hi/americas/1134510.stm

Learning *Biodiversity Conservation* the Fun Way

Who says learning biodiversity is not fun? Recently, a workshop entitled "Teaching Wildlife Topics to Undergraduates" was held at University Kebangsaan Malaysia to guide teachers, trainers, and bioconservation practioners the "fun way" to teach bioconservation topics. The workshop was organized by Jabatan PERHILITAN, the Network of Conservation Educators and Practitioners (NCEP) and the Wildlife Conservation Society (WCS). The participants were taught how to deliver "lectures" interactively.

"Trainers, do you know that your students can retain this much?"

10% of what they hear…
20% of what they read…
30% of what they see…
90% of what they do…

To jazz up biodiversity conservation training, experts recommend active teaching techniques.

Active learning is characterized by LISTENING, READING, WRITING, DISCUSSING, and ACTING. In these ways students can:

- absorb information better
- engage in higher thinking level (analyze, synthesize, and evaluate)
- improve interpersonal communication
- encourage team-work

One way to capture your audience in active teaching is by giving short introductory lectures followed by brainstorming exercises in small groups. Brainstorming what students know about a topic, for example, "The Importance of Biodiversity?" Working in small groups gives the opportunity for students to interact with and learn from each other. Small group work encourages active participation of those who shy away from speaking in a large group. The size of the group varies, depending on the number of students. Students can also enhance learning and develop decision-making, conflict management, and communication skills.

With a sufficient budget, field trips are a great option. Field trips allow first-hand observation and experience and discussion with people working in conservation-related fields. Before the group goes out, plan activities so that it fullfills the field trip objectives. Inform the group what to expect and introduce any new concepts or skills relevant to the field trip to enable them to get the most out of it.

By adopting a few of these techniques, the trainers will engage students with different learning styles and give them the "hands-on" experience they need to prepare them to become effective professionals.

Activity Highlights (Year 2005) Department of Environment, Malaysia

DATE	PLACE	EVENT
AUGUST		
11-12	Kuala Lumpur	7th Meeting of the ASEAN Working Group on Coastal and Marine Environment
16	Jakarta, Indonesia	Malaysia-Indonesia Joint Meeting on Cloud Seeding
22	Pekan Baru, Sumatera, Indonesia	Launching of Cloud Seeding Operation
23	Putrajaya	Conference on Women and the Environment
27	Putrajaya	Study Tour by Delegation from Ministry of Environment and Natural Resources, Sri Lanka
29-30	Singapore	3rd Working Group Meeting of Malaysia Singapore Joint Committee on the Environment (MSJCE)
30	Putrajaya	Joint Committee Meeting on Social and Community Development of South Africa
SEPTEMBER		
8	Jakarta, Indonesia	ASEAN Experts Panel Meeting on Fire and Haze Assessment and Coordination
19	Kuching, Sarawak	20th Meeting of Malaysia-Singapore Joint Committee on the Environment (MSJCE)
26-30	Rome, Italy	Rotterdam Convention on the Prior Informed Consent Procedures for Certain Hazardous Chemicals and Pesticides in International Trade Open-Ended Ad-Hoc Working Group on Article 17-Non Compliance
		Second Meeting of Conference of Parties Rotterdam Convention on the Prior Informed Consent Procedures for Certain Hazardous Chemicals and Pesticides

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