CLIMATE CHANGE AND BIO-DIVERSITY IN MALAYSIA: RESEARCH, DEVELOPMENT AND POLICY ISSUES IN SUSTAINABLE FORESTRY

by

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EXECUTIVE SUMMARY

An important goal of Vision 2020 is to ensure that Malaysia will properly utilize its valuable resources. The land must remain productive and fertile, the atmosphere clear and clean, the water unpolluted, the forest resources capable of regeneration, able to yield to the needs of the nation's development.

With more than half the country clad in forests, Malaysia practices sustainable forest management that will not put at risk environmental stability and ecological balance. However, over the last three decades, Malaysia's natural forest was reduced by about 20%, mainly in conversion to the agro-based industries as the vehicles of our industrial development and continues to be a substantial contributor to the economy of the country. Such development inevitably has caused Malaysia to emit GHG – the primary component of global warming: in the year 2004 it emitted 7.5tCO_2 per capita (3.0tCO_2 in 1990); captured 0.6% of the world total (0.2% in 1990), and ranked number 26 in the world overall.

The ratification of UNFCCC and Kyoto Protocol signifies the commitment of Malaysia in addressing the problems of climate change and sets the stage for further works on the issues. Malaysia's best practices approach to carbon conservation and sequestration, and carbon substitution has been able to curb the rate of increase in atmospheric CO_2. In Malaysia, a temperature increase of above 2^oC may induce: increase mean annual rainfall of up to 15%; increase evapo-transpiration of about 20 -25%; increase demand of water for irrigation and domestic use by 15%; sea level rise of 40 -100cm flooding the low lying coastal area of up to 2.5km further inland; reduce productivity of lowland crops, such as rice, rubber and oil palm by about 15 - 20%; and destroy mangrove and estuarine habitats.

This paper identifies Malaysia's strategic directions and way forward in relation to climate change and biodiversity issues under the aegis of sustainable forestry. Malaysia has stated that the primary priority in the fight against climate change should be the reduction of emissions at source and that sinks should play only a transitional role and thus, be included as an activity for the short term. Malaysia continues to emphasize the importance of sustainable management of

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existing sinks and reservoirs, in line with the commitments of the UNFCCC. On the other hand, LULUCF) activities should promote the long-term sustainable management of forests.

As a result of Stern Report 2006, which identified deforestation as the second major sources of GHG emissions driving climate change and global warming, a number of countries proposed a mechanism to compensate countries for reducing deforestation and degradation and conserving intact forest areas. CDM and REDD are mechanisms intended to reduce emissions: the CDM accomplishes this through afforestation and reforestation, and REDD through reducing deforestation rates and managing forest degradation in ways that minimize GHG emissions. As a matter of principle, Malaysia supports global efforts to curb deforestation and to provide incentives for reducing deforestation and degradation, but such approach will be adopted with a clear and fair mechanism that will address the issues of leakage, permanence and additionality, and that recognizes the socio-economic impacts to Malaysia with relatively large areas of forests.

Among the key initiatives taken by the Malaysia government in the fight against global warming had been in the fields of renewable energy: bio-fuels, tax incentives for energy conservation and energy saving initiatives, and carbon trading. Additionally, a series of strategic roles and directions which may be research & development and policy oriented are worth the consideration by the appropriate Malaysian authority, including business corporations. A total of 7 strategic climate change and biodiversity directions related to sustainable forestry are identified at the national level and 4 at international level with their impacts and effectiveness in terms of ***Emission Reduction Effectiveness (ERE)***. Having specific Climate Change Policy and Biodiversity Policy are for the better, but clarifying roles of sustainable forestry practices with respect to these policies is more than welcome.

1. INTRODUCTION

Climate change represents a significant issue confronting the global community in recent years. This sentiment was reinforced by the landmark 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) - a legally binding document requiring commitments by industrialized countries to reduce their collective emissions of greenhouse gases (GHG) by 5.2 % compared to the year 1990. However, the language of the Kyoto Protocol may be interpreted in different ways, particularly, the question of whether and which carbon forestry projects can receive credit under the Joint Implementation (JI) or Clean Development Mechanism (CDM). This is a pressing issue indeed because the roles of tropical forests in climate change are profound. IPCC report estimates that in the last decade, anthropogenic emissions totaled 7.1 $\pm$ 1.1GtC per year. Forests in general account for about 80 % of the annual CO_2 exchange and can sequester between 1.1 to 1.8 GtC per annum in 50 years, representing 20% to 25% of carbon emitted each year by combustion of fossil fuels (Makundi *et al*. 1998). Emissions from deforestation in the 1990s are estimated at 5.8 $GtCO_2$/year (IPCC 2007-WG III). Carbon forestry projects in tropical forests are also among the most cost-effective means of achieving climate change mitigation.

Malaysia also recognizes the immense importance of the forest resource in providing environmental protection, particularly those related to climate change. In this regard the issue of deforestation and forest degradation being addressed under the UNFCCC is relevant and important for Malaysia. Malaysia has ratified both the UNFCCC in July 1994 and Kyoto Protocol (KP) in September 2002. The ratifications of UNFCCC and KP signify the commitments of Malaysia in addressing the problems of climate change and set the stage for further works on the issues. Malaysia's best practices approach to forest management has been able to conserve biological resources and carbon stocks by avoiding the deforestation and forest degradation. The historic Langkawi Declaration on Environment at CHOGM 1989 - followed by the initiative "Greening the Earth" at Kuala Lumpur Declaration in April1992 – and reaffirmed at Rio 1992 UNCED and again at Copenhagen 2009 COP 15 ensures that Malaysia commits to maintain a minimum of 50% of its land area with natural forest cover.

This paper compiles important information and data, and aims to identify Malaysia's strategic direction and way forward in relation to climate change and biodiversity issues under the aegis of sustainable forestry.

2. EXISTING GREENHOUSE GAS INVENTORY

While Malaysia reported net emissions in the INC (1994), Malaysia is a net sink based on more accurate and expanded calculations in the NC2 (2000). The following information, which is self-explanatory, provides a snapshot view of Malaysia's greenhouse gases, GHG (FRIM 2009):

Figure 1A: Greenhouse gas emission by sectors, INC (1994)

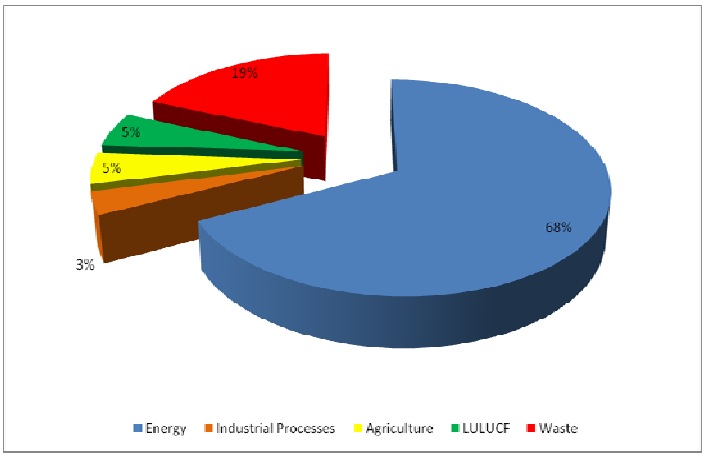


Figure 1B: Greenhouse gas emission by sectors, NC2 (2000)

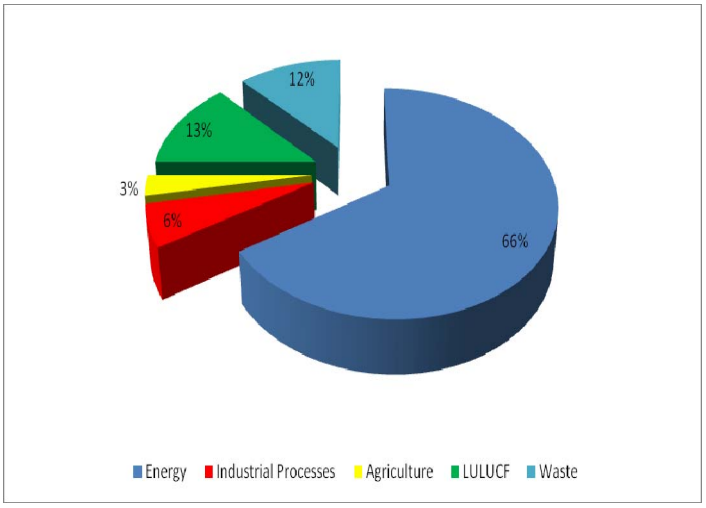
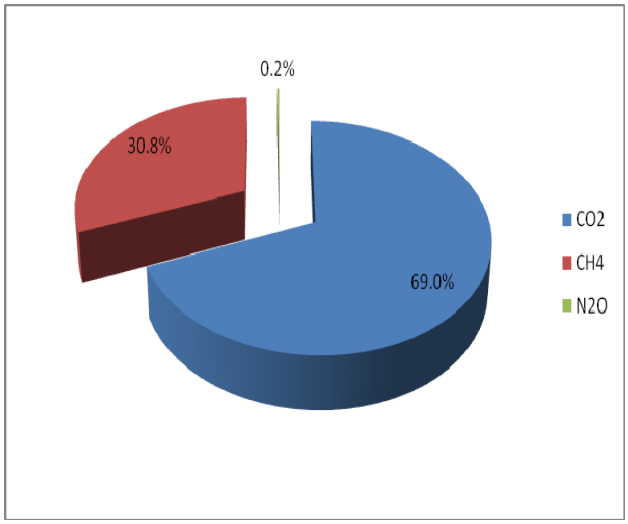
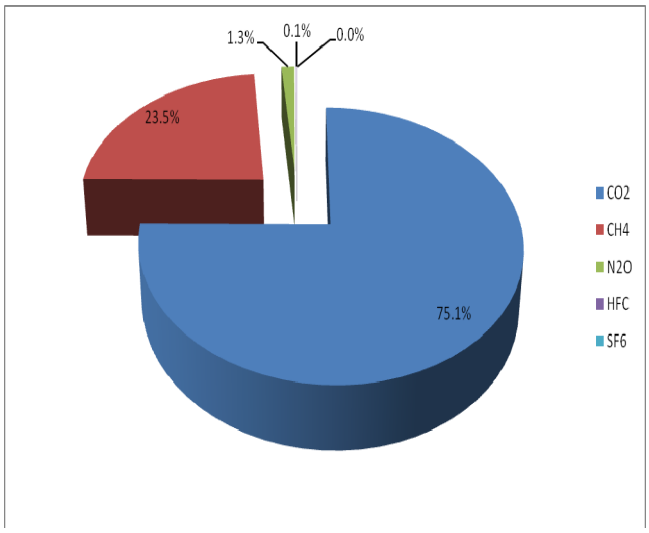


Figure 1C: Emissions according to greenhouse gas for INC (1994)



Note: (i) **The Initial National Communication (INC)** was submitted in July 2000, comprising the national inventory, impacts of climate change on the nation and programs of relevance to climate change (*see Malaysia: Initial National Communication to UNFCCC, Ministry of Science, Technology and the Environment, 2000*);

Figure 1D: Emissions according to greenhouse gas for NC2 (2000)



Note: ii) The preliminary results of **Second National Communication (NC2)** indicated that the total carbon stock of Malaysian forests amounted to about 92,000,000tC. The total Carbon released due to conversion and forest harvesting activities was 26,000,000tC. After accounting for emission from land conversion, the amount of carbon sequestration or carbon uptake by forest vegetation was 390,000,000tC. It is noted that Malaysian forests and other woody biomass contributed to about 4% of the tropical forests sink.

Note: (iii) The global average of CO_2 emissions for Non-Annex 1 (NA1) countries based on the INC is 63% of their total emissions, amounting to 7.4 billion tCO_2equivalent (UNFCCC 2005);

(iv) The global average of CH_4 emissions for NA1 countries based on the INC is 26% of their total emissions (UNFCCC 2005); and

(v) Due to the relatively low emissions from the Agriculture sector, Malaysia's total N_2O emission is very much lower than the global average of 11% for NA1 countries in the INC.

Table 1: CO_2 emission for Malaysia

	Unit	(INC) 1994	(NC2) 2000	%increase
GDP	RM million	261,951	356,401	36%
Population	'000	20.112	24.495	22%
CO_2 emission	'000 t	84.4	167.5	**98%**
CO_2 equivalent	'000 t	144.3	223	**55%**
CO_2 emission per GDP	tonne/RM	0.32	0.47	**47%**
CO_2 equivalent per GDP	tonne/RM	0.55	0.62	**13%**
CO_2 emission per capita	tonne/capita	4.2	6.8	**62%**
CO_2 equivalent per capita	tonne/capita	7.2	9.1	**26%**

[+]Source: Population projections based on the adjusted 2000 Population Census: http://www.statistics.gov.my/

Table 2: Greenhouse gas emissions trends for years 2000, 2005 and 2007

Sector	Emissions/ removal (Mt CO_2 e)		
	2000	**2005**	**2007**
Energy	147	204.3	217.0
Industrial Processes	14.1	15.6[#]	17.1[#]
Agriculture	6.0	6.6[#]	7.2[#]
LULUCF*	29.6	25.3	19.7
Waste	26.4	27.4	31.9
Total emissions	**223.1**	**279.2**	**292.9**
Total sink	**-249.8**	**-240.5**	**-247**
Net total (after subtracting sink)	**-26.7**	**38.7**	**45.9**

[#]Projected at 10% annual increase.

Figure 1E: Malaysia and leading CO2 producers in 2004

3. GLOBAL WARMING: IMPACTS, IMPLICATIONS, AND WHAT CAN BE DONE?

The 1995 Intergovernmental Panel on Climate Change (IPCC) assessment concluded that rising atmospheric concentrations of major GHG may lead to increase in global temperatures and other environmental changes. Based on data estimating GHG emissions for the period from 1980 -1990, the IPCC projected that emissions of GHG could lead to a 1^{o} to 3.5^{o}C rise in global mean surface air temperature by the year 2100 – an increase which would surpass the cumulative change in global temperature over the past 10,000 years.

The world is warming. ***Sea level is rising***. The results are that: a few islands in the Pacific Oceans will sink by the next three to four decades; flooding of many low lying regions; and displacing, e.g. 16% of Egypt's population (Note: Please see p.98: Frequently Asked Question 1.3 and p.111: Frequently Asked Question 5.1 for description on *What is the Greenhouse Effect?* and *Is Sea Level Rising?* respectively of IPCC 2007-WG I).

Glaciers are melting. Climatic zones are shifting. The results may be cattle grazing in what is now the Sahara Desert, and crops growing in arid parts of Central Asia (Miller and Pearce 1989).

The impacts and consequences of a continued global warming will be felt by every individual of society and the environment:

1. temperature change (rise) is likely to be difficult for most of the world's population, where already, in many cases, existing conditions allow for only marginal existence for both people and ecosystem;

2. impacts of rise in temperature are many fold and are known to affect, among others:
    - agricultural activity and productivity;
    - water availability;
    - human health and habitation;
    - natural ecosystems, such as due to rise in sea level, which are known to cause loss of land, erosion, flooding, and penetration of salt water into drinking and agricultural water supplies.

3. implications to forestry can be predicted to include:
    - problems in preservation of species diversity in national parks and forest reserves due to changing rainfall and temperature patterns;
    - the risk of diseases and insect infestation intensified;
    - large changes in forest composition may occur, with canopy forests may suffer substantial decline;
    - monoculture plantations may be increasingly risky since local climate may become unsuitable for some species planted today;
    - any changes in rainfall and water availability are likely to affect the distribution of species, more so in tropical forests;
    - mangrove and estuarine habitats are likely to be destroyed, thus affecting fishery production;
    - in Malaysia, a temperature increase of 3-4^{o}C may induce: increase mean annual rainfall of up to 15%; increase evapo-transpiration of about 20 - 25%; increase demand of water for irrigation and domestic use by 15%; sea level rise of 40 -100cm flooding the low lying coastal area of up to 2.5km further inland; reduce productivity of lowland crops, such as rice, rubber and oil palm by about 15 - 20%; and destroy mangrove and estuarine habitats.

What can be done? There is little choice. It is important that objective assessments be made on the current CO_2 emission situation and the following solutions should be addressed in relation to:

1. stabilizing and reducing CO_2 emission by
    - increasing sharply the efficiency of fossil-fuel consumption, especially in developed country;
    - reducing wasteful utilization of fossil-fuel. Already the international conference on "The Changing Atmosphere: Implications for Global Security" had called for an initial reduction of global CO_2 emission by 20% by the year 2005;
    - developing non-fossil energy technologies on a priority basis.

2. enhancing CO_2 fixation by
    - promoting a large scale international effort to halt uneconomic and unnecessary landuse conversion, deforestation , and forest degradation;
    - promoting global reforestation (and afforestation) programmes, rehabilitation of wastelands and degraded lands.

The conclusions of many conferences or meetings (see Wan Razali 1994) have universally pointed out to the need for early action to stop the climate rise. The findings of the 4th Assessment Report of the IPCC that warming of the climate system is unequivocal, and that delay in reducing emissions significantly constrains opportunities to achieve lower stabilization levels and increases the risk of more severe climate change impacts (UNFCCC 2008a: Bali Action Plan: Decision -/CP13).

4. EXISTING BIODIVERSITY CONSERVATION MEASURES

In Malaysia, many populations of forest species are on the decline mainly as a result of land use changes and forest harvesting activities. These activities have changed in form and severity with the passage of time. Land use changes were extensive in the 1960s to early 1980s, when much of the lowland natural forests and landscapes were converted to plantation agriculture and development. The 70%+ of the land area under natural forest cover shrank to about 63% by 1972 (Forestry & Forest Industries Development Malaysia 1973), further declined to 61% in 1988 to 59% in 1992 to 58% in 1995 and to 57% in 1996 (Anon 2009). The declining trend seemed to stabilize from the year 2000 and by the year 2010 the total land area under natural forest cover remains around 19 million ha, close to the 1994 figure.

Therefore, over the period 1970 to 2000, natural forest - the storehouse of biodiversity - was reduced by about 20% in the whole of Malaysia, mainly in conversion to the cash crops, oil palm and rubber. Consequently, scientists estimated that 170 of 8500 flowering plants (2%) were found to be extinct (Sunday Times 15 October 2000). There

is no need to be apologetic about this as the agro-based industries were the backbone of our industrial development in the recent past and continue to be a substantial contributor to the economy of the country. Nevertheless, we have reached a time in our development path where we could be more sensitive to the needs of nature and ensure that any further reduction in the extent of our forested land should only be after the most careful of considerations (Wan Razali 2008).

Almost all biodiversity conservation measures for Malaysian natural forests are in the form of habitat conservation, especially via the legally established Protected Areas. These areas comprise National and State Parks, Wildlife Sanctuaries, protected areas within the Permanent Reserved Forests (PRFs) and Marine Parks. Recent initiatives include the Trans-boundary Biodiversity Conservation Areas of Lanjak-Entimau Wildlife Sanctuary in Sarawak & Betung Kerihun National Park in Kalimantan and Pulong Tau National Park in Sarawak & Kayan Mentarang National Park in Kalimantan. The Heart of Borneo Initiative, spanning across *ca*. 220,000 km^2 in Malaysia, Indonesia and Brunei seeks to re-establish forest connectivity and corridors particularly for protected areas which are fragmented due to forest degradation and land use changes (Chua et al. 2010).

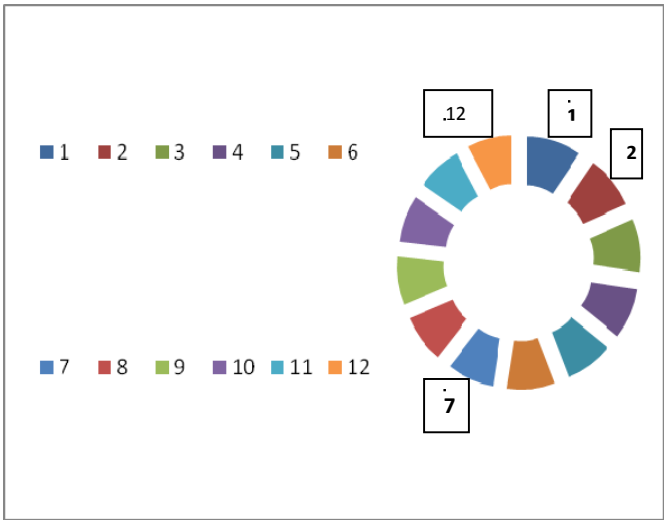
Many environment related legislations have been enacted to protect the country's environment. The National Parks Act 1980 indirectly protects plant populations through habitat protection. Other legislations that have strong elements to protect flora biodiversity include the National Forestry Policy 1978 (amended 1992), the National Policy on Biological Diversity 1998, the National Agriculture Policy 3 (1998 – 2020), the National Physical Plan (2005 – 2010) and International Trade in Endangered Species Act 2008, to name a few. The National Physical Plan (NPP), as provided for via the Town and Country Planning Act 1976, aims to prioritize land and natural resources for sustainable development. There are six policies that have direct reference to natural resources and biodiversity assets. The Environmentally Sensitive Areas (ESA) shall be integrated in the planning and management of land use and natural resources. The Central Forest Spine (CFS) that is established to anchor the ESA includes the mountain backbone of Peninsular Malaysia, where biodiversities are found.

The states of Sarawak and Sabah have their own separate biodiversity legislations with regulatory and administrative mechanisms to protect biodiversity conservation. These include their Forest Enactments/ Ordinances and Parks Enactments/ Ordinances, and Sabah Biodiversity Enactment 2000 and Sarawak Biodiversity Regulations 2004.

The following general information, which is again self-explanatory, provides a snapshot view of Malaysia's biodiversity of the status: Endemic, Endangered, Critically

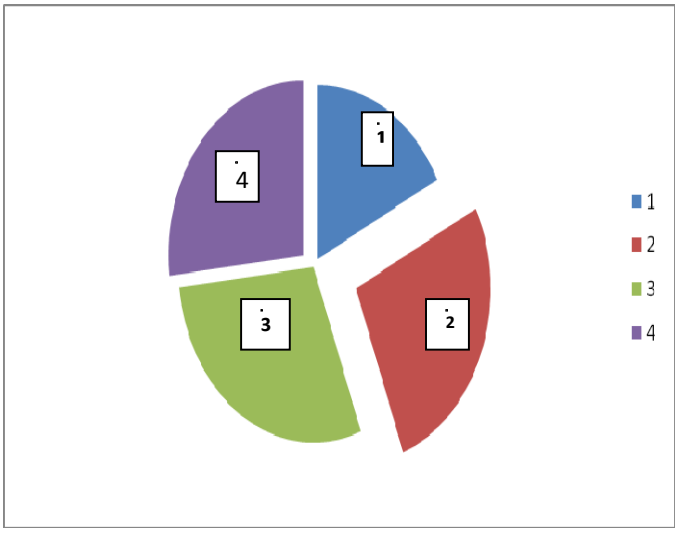
Endangered, and Vulnerable (Sunday Times 15 October 2000, L.G. Saw: pers. comm. 2000, Chua *et al*. 2010).

Figure 2A: National Biodiversity Index (NBI) of 12 biologically diverse countries



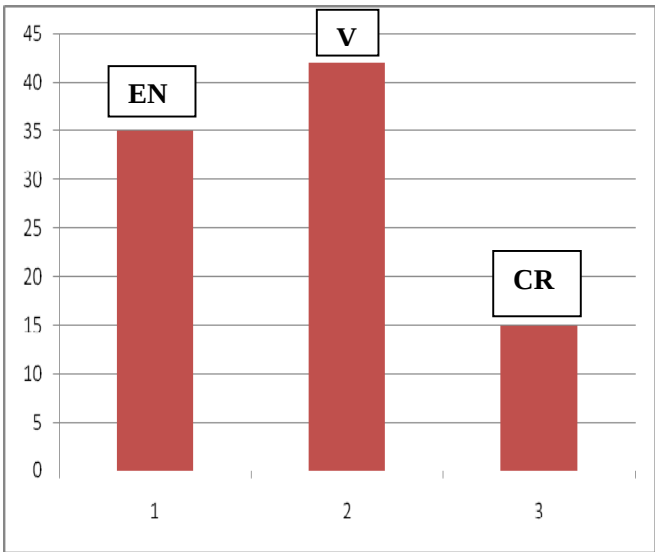
No.	Country	NBI
1.	Indonesia	1.000
2.	Colombia	0.935
3.	Mexico	0.928
4.	China	0.893
5.	Brazil	0.877
6.	Ecuador	0.873
7.	Australia	0.853
8.	Venezuela	0.850
9.	Peru	0.843
10.	Costa Rica	0.820
11.	Madagascar	0.813
12.	Malaysia	0.809

Figure 2B: Tree/ Palm species endemism



No.	Endemism
1.	**26% 0f 2830 tree species in Pen. Malaysia.**
2.	**20-40% of 3500 tree species in Sabah & Sarawak**
3.	**43% of 212 palm species in Pen. Malaysia**
4	**40% of 290 palm species in Sabah & Sarawak.**

Figure 2C: Dipterocarps in Peninsular Malaysia: Number of taxa threatened



No.	Threatened Category
1.	**35 taxa ENDANGERED (EN)** of which 10 endemic to Pen. Malaysia
2.	**42 taxa VULNERABLE (V)** of which 6 endemic to Pen. Malaysia
3.	**15 taxa CRITICALLY ENDANGERED (CR)** of which 6 endemic to Pen. Malaysia

[Note: Peninsular Malaysia has 155 species (worldwide 500 species) comprising 165 taxa of which 34 taxa are endemic; 90 taxa share their range with Sabah & Sarawak; 41 taxa extend their distribution to Sumatra & Philippines].

5. STATUS OF (TROPICAL) SUSTAINABLE FORESTRY

Some time ago Centre for International Forestry Research (CIFOR) in Indonesia surveyed its Policy Experts (POLEX) recipients to find out which publications they thought had influenced forest policies the most. Number two in the list was Poore *et al*.'s 1989 report **"NoTimber Without Trees",** commissioned by the International Tropical Timber Organization (ITTO). That study had shown only a tiny share of tropical forests used for timber was managed on a sustainable basis.

Now ITTO has issued a new report called "**Status of Tropical Forest Management 2005**", which looks at what has been achieved since the 1989 Poore *et al*. report (survey done in 1988) published almost two decades ago. It found major progress, but not as much as one might hope. Back then Poore *et al*. had trouble finding even one million hectares of natural forests that were managed on a sustainable basis to produce timber. In contrast, the new report identified at least 25 million hectares that fit the bill. India and Malaysia alone account for 40% of that. Most of the rest is in Bolivia, Brazil, Congo, Gabon, Indonesia, and Papua New Guinea, which each have between one and three of the 25 million hectares. By 2006 Malaysia, Bolivia, Gabon, Brazil, and Guatemala have about 10 million hectares that have been independently certified by third party certifiers such as SGS, SCS, Rainforest Alliance, and UK Soil Association, accredited by Forest Stewardship Council (FSC).

By July 2010 Malaysia alone had 10 FMUs (Forest Management Units) - covering an area of 4.94 million ha (34%) of the total PRFs - certified via the Malaysian Timber Certification Council (MTCC) Certification Scheme, 4 FMUs (forest concessions) via the FSC Certification Scheme, which involve more than 4.6 million hectares of natural and plantation forests (including rubber plantations). Malaysia had exported about 396,000 cubic meter of certified processed timber to 22 countries worldwide.

Things have also advanced on other fronts. There is greater consensus these days about which criteria and indicators should be used to assess if a forest is managed on a sustainable manner and more information is available about forests in general. Many more forests have management plans and there are a lot more plantations and protected areas. Still, according to the ITTO new report, only about 7% of the 352 million hectares of the natural forests that tropical countries have slated to produce timber on a sustainable basis are truly being used that way. Many FMUs with management plans don't actually follow them and much of the tropical timber on the market comes from illegal sources. What is more important and needed is that timber producer countries are seriously embarked on the path or process of sustainable forestry with tangible results visible. More so with a new dimension of much debated issues - the climate change and biodiversity conservation.

6. MALAYSIA'S COMMITMENTS TO FORESTRY AND CLIMATE CHANGE INSTRUMENTS, INCLUDING CDM, REDUCED EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION (REDD)

Objectives for managing forest lands generally include: sustainable forest management, industrial wood (and fuel wood) production, protection of non-timber natural resources (e.g. biodiversity, water, and soil), recreation, rehabilitation of damaged ecosystems, etc. Carbon conservation and sequestration resulting from managing for these objectives will be an added benefit. Forest management practices that meet the objectives given above can be grouped broadly into three categories based on how they are viewed to curb the rate of increase in atmospheric CO_2 (Brown 1996): **(i) *Management for Carbon Conservation, (ii) Carbon Sequestration (or Storage), and (iii) Carbon Substitution***:

Management for Carbon Conservation mainly prevent carbon emission by maintaining existing (and increasing) carbon pools in forests as much as possible through controlling deforestation, protecting forests in reserves, controlling anthropogenic disturbances, and changing harvesting regimes. Sustainable management practices, such as extending harvesting cycles, reducing damage and

negative impacts to remaining trees and soil respectively (e.g. reduce or low impact logging), and reducing logging waste, ensure that a large fraction of carbon is conserved.

The idea is analogous to "*Compensated Conservation*" when financial incentives are made available through a proposed *"Stabilization Fund"* (27th SBSTA, Bali 2007). This approach recognizes countries with large tracts of forests and low or stabilized deforestation rates that practices sustainable forestry as having reduced emissions from deforestation and thereby contributed to mitigating climate change. Malaysia is in favor of this approach, through an informal stance, but will have to address it from various perspectives (e.g. meeting Annex 1 commitment; incentive mechanism - market or non-market based; project demonstration that can attract funding; and future arrangement of REDD in reducing emissions (e.g. REDD+ to be negotiated to replace the KP that ends in 2012). Malaysia firmly believes that any carbon saving as a result of early action projects could be used under a future market or other related mechanism.

Carbon Storage management increases the amount of carbon in vegetation and soil of forest ecosystems, and this include the following practices: increasing forests area – natural and plantation, protecting forests from degradation, assisting regeneration - either assisted or natural, and extending the lifetime of wood products. Sequestering carbon by storage management is only a short term option - though the process may take place over a several decades depending on the attainment of maximum carbon density of such forests, producing a finite carbon sequestration potential beyond which little additional carbon can be accumulated.

Carbon Substitution involves accelerating the transfer of forest biomass carbon into products such as construction materials and fuel, rather than using fossil-fuel-based energy and products and cement-based products. This approach involves extending the use of forests for wood products and fuels obtained either from establishing new forests or plantations, or increasing the growth of existing forests through silvicultural interventions. Over long time periods (> 50 years), the displacement of fossil fuels either directly, or through production of low-energy-intensive wood products, is likely to be more effective in reducing carbon emissions than physical storage of carbon in forests or forests products.

At the 11th Session of the Conference of Parties (COP), Agenda 6: "*Reducing Emissions from Deforestation in developing countries (RED)*", Parties were invited to submit to the secretariat their views on issues relating to this agenda, focusing on relevant scientific, technical and methodological issues, and the exchange of relevant information and experiences, including policy approaches and positive incentives. The

COP also invited Parties to submit recommendations on any further process to consider the issues. Malaysia took the following stance:

> "*Malaysia has stated in previous submissions that the primary priority in the fight against climate change should be the reduction of emissions at source and that sinks should play only a transitional role and thus, be included as an activity for the short term. Malaysia continues to emphasize the greater importance of sustainable management of existing sinks and reservoirs, this being amongst the commitments of the UNFCCC, while Land Use, Land Use Change and Forestry (LULUCF) activities should promote the long-term sustainable management of forests and their resources....."*

Malaysia's best practices approach to forest management has been able to conserve biological resources and carbon stocks by avoiding the deforestation and forest degradation. This is illustrated by the fact that the area of Malaysian forest under the PRF has not changed substantially in the last 10 years. The historic Langkawi Declaration on Environment at CHOGM 1989 - followed by the initiative "Greening the Earth" at Kuala Lumpur Declaration in April1992- ensures that Malaysia commits to maintain a minimum of 50% of its land area with natural forest cover, and at UNCED Summit in Rio, June 1992 and again at COP 15 Copenhagen, December 2009 urged the world governments to undertake similar initiatives. Then the National Policy on Biological Diversity in 1998 compliments the Government's commitment to preserving the environment and reduces impacts of climate change. Malaysia also supported any opportunities, though limited, for carbon credit under afforestation and reforestation activities of the CDM[2].

Malaysia supports global efforts to curb deforestation and provides incentives for reducing deforestation and forest degradation. However, a conservative and cautious approach will be adopted to ensure that a clear and fair mechanism is developed that will address the issues dealing with leakage, permanence and additionality that recognizes the socio-economic impacts to developing tropical countries with relatively large areas of forests and where forestry is an important economic sector. A more balanced consideration of the drivers of deforestation/ forest degradation in the past and present would provide a better assessment of the situation.

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[2] "***Clean Development Mechanism*" (CDM)** is an international instrument, developed under the UNFCCC, to facilitate and regulate Joint Implementation type agreements between Annex I and non-Annex I countries. The types of activities that could be financed through CDM must be consistent with the objectives of UNFCCC and could include forestry programs (and projects) that are either CO_2 emission offset/reduction or carbon sinks.

Reducing emissions from tropical deforestation/ forest degradation can take any of the following three avenues:

1. totally setting aside and protecting forested land with any degree of forest cover,

2. ensuring that minimal forest degradation occurs in permanent production forests (no land-use change) through sustainable forestry practices, and

3. conducting deforestation activities (involving a land-use change) in a manner that is environmentally sensitive and reduces or minimizes emissions:

In the late1980s to early 1990s (i.e. prior to UNCED (1992) Rio, UNFCCC and KP) there were almost similar initiatives to save tropical forests from deforestation and degradation, but without cross referring to the issues of climate change and/or biodiversity conservation at that time: ***CONSERVATION BANKING; SWAPPING DEBT FOR NATURE****;* and ***TROPICAL / NATIONAL FOREST ACTION PLAN*** (TFAP/ NFAP), but they were short lived for many reasons.

Among other key initiatives taken by the Malaysia government in the fight against global warming has been in the fields of **renewable energy**:

1. The policy of Renewable Energy (RE) as the fifth fuel has been formulated by the Malaysian government to diversify the traditional sources of fuel, including renewal energy such as biomass, biogas, and municipal waste, solar and mini hydro. The Government has also established ***Small Renewable Energy Programme (SREP)*** to promote the use of renewable energy for power production. Companies that undertake renewal energy from biomass have been provided tax incentives. New sources of energy such as solar and wind will be developed, emphasizing on cost-effective technology and strengthening capacity building;
2. The development of bio-fuel using palm oil has been undertaken in line with the initiative to make Malaysia a world leader and hub for palm oil. Malaysia remains cognizant of the perception by some that increased production of palm oil bio-fuel will jeopardize the edible oil industry and act as yet another driver of deforestation and emissions, particularly from peat soils. Malaysia reassures the world that Life Cycle Assessment (LCA) of the various oil palm products is currently ongoing to determine the true impacts of producing renewable bio-fuel from oil palms;

3. In 2008, the Malaysian government proposed several improvements in tax incentives, including increasing Investment Tax Allowance on expenditures for energy conservation and energy saving initiatives; and
4. Malaysia supports the CDM under the KP which gives certificate of ***Certified Emission Reductions (CERs)*** that can be traded. To encourage companies to participate in CDM, incomes derived from trading of CER certificates will be given tax exemption in 2008. As of July 2007, 28 projects have been given Host Country Approval and 16 projects are registered with CDM Executive Board. The expected amount of CER generated from these projects is about 1.8 million tCO_2 equivalent per year.

However, national actions alone are inadequate to cope with the climate change. Hence, a series of international initiatives are also undertaken by the Malaysian government, such as:

5. Malaysia advocates "decentralized groupings" to generate momentum in view of time constraint for the post-Kyoto framework to be effective and successful. Such decentralized groupings ***include ASIA PACIFIC ECONOMIC COOPERATION (APEC), THE ASIA-PACIFIC PARTNERSHIP ON CLEAN DEVELOPMENT AND CLIMATE,*** and ***THE G8 SUMMIT.*** The decentralized groupings can help speed up the development of proposals which would then have to be brought to the UNFCCC for its agreement and notification;

6. Malaysia had suggested ***"Personal Carbon Rationing"*** in line with the equity principle of equal shares for everyone. As part of a global agreement, per capita rationing would ensure that people would only be able to pollute up to their equal rations and beyond that, they would have to buy credits from those who have not utilized their rations fully. The whole idea of personal carbon rationing is to ensure that people adjust their life styles to less carbon intensive ways;

7. CLIMATE CHANGE & BIODIVERSITY: MATRIX OF POTENTIAL RESEARCH & DEVELOPMENT AND POLICIES IN SUSTAINABLE FORESTRY

Malaysia appears not to be lacking in development strategies and implementation plans in forestry, and of studies, reviews and meetings undertaken to assess the research needs in the region. Most of these sector policies and strategies and research appraisal relate to the conditions required to develop action plans to promote sustainable and successful forest management practices.

Today, forests management practices are more challenging to foresters than before as they are expected not only to produce wood but also non-wood products, to protect ecosystem services, to provide social and recreational needs, and to manage environment and biodiversity issues.

The following strategic roles and/or directions which may be research & development and policy oriented are worth the consideration by the appropriate Malaysian authority, including business corporations (designated by B2B), as shown in the matrix below at national and international levels respectively. Their impacts and effectiveness can be categorized either as low (L), medium (M) or high (M) in terms ***of Emission Reduction Effectiveness (ERE)***[3]***.*** Category of action required is also identified with each strategic role or direction.

A. NATIONAL LEVEL

1. Develop or improve formal methodologies to calculate baselines, to monitor carbon stocks, and to determine real and measurable increase in forest carbon stocks in line with the national accounting approach preferred by other key parties and negotiating groups as indicated at the COP13 Bali on REDD;

Category of Action Required	**Comments/Status of Implementation**
• **R&D Implementation**	• **Improves compliance to international agreements on Climate Change.** • **Improves capacity building nationally.** • **Improves ERE.**

2. Initiate pilot sustainable forestry projects involving CO_2 emission reduction and/or carbon sinks in forest development, conservation, preservation, and protection on a large scale in line with the resolutions of UNCED and WSSD as show case to the world, with the view of marketing CERs. This will allow Malaysia to address baseline issues, e.g. formulation of general criteria to define additionality, estimate leakage and permanence, and improve technical methodologies to quantify CO_2 sequestration through sustainable forestry practices; to estimate emissions from peatland fires and drainage.

[3] ERE includes ease of implementation, feasibility and simplicity of enforcement, applicability in many locations, and other factors contributing to overall magnitude of realized savings, where applicable.

Category of Action Required	Comments/Status of Implementation
• **Policy Decision.** • **R&D Implementation.**	• **Improves Sustainable Forestry/ SFM practices.** • **High ERE.**

3. Develop a National Center of Excellence, either new or consolidate from existing centers, in R&D in climate change and bio-diversity policy relevant, and also charge this center as a CDM (Forestry)/ REDD/ Biodiversity Clearinghouse Secretariat for Malaysia that is market driven with the role of the government limited to authorizing permits and certification;

Category of Action Required	Comments/Status of Implementation
• **Policy Decision.** • **R&D Implementation.**	• **Improves public relation nationally and internationally.** • **R&D more organized and focused.**

4. Ensure that the practice of sustainable forestry in the country is strictly adhered to, backed up by all necessary legislations, adequate control and acceptable standards of operation that guards the environment, and to be independently audited and certified by a third party assessor. Sustainable forestry practices must include elements of environmental acceptability, social equity/ responsibility, economic efficiency/ viability based on certain national and/or international index;

Category of Action Required	Comments/Status of Implementation
• **Sustainable Forestry/ Forest Management Decision**	• **Enhanced SFM practices** • **Develop an INDEX to describe the status of forest health & viability (analogous to Index for river cleanliness and air pollution in Malaysia).** • **High ERE.**

5. The Government must further enhance the establishment of PFRs whose future are guaranteed and highlighted as a part of overall landuse policy and NPP. The objectives of PFRs must include descriptions on climate change mitigation or carbon offsets or carbon sinks, and biodiversity status, etc associated with the commitments under all conventions and protocols signed by Malaysia, e.g. UNFCCC, KP, UNCBD, Vienna Convention on protection of ozone layers, Montreal Protocol, etc;

Category of Action Required	**Comments/Status of Implementation**
• **Forest Policy Decision**	• **Policy improvement.** • **Include descriptions on Climate Change Adaptation and Mitigation and Biodiversity status into the existing National Forest Policy 1978.** • **High ERE.**

6. Create several improvements in tax incentives, including increasing Investment Tax Allowance (ITA) on expenditures for energy conservation and energy saving initiatives; Encourage companies to participate in CDM, and incomes derived from trading of CER certificates will be given tax exemption for a certain period of time: (B2B);

Category of Action Required	**Comments/Status of Implementation**
• **Trade and Business Decision**	• **Needs Government supports.** • **Extend the tax exemption until end of first commitment period i.e. year 2012.** • **High ERE**

7. Ensure and allocate sufficient government incomes derived from harvesting of timbers to finance increasing costs of reforestation, afforestation, and other practices of sustainable forestry, as current trend of financial investment ploughed back into the forests development is minimal, averaging less than 1% of Gross National Product (GNP);

Category of Action Required	Comments/Status of Implementation
• **Implementation Decision**	• **Improves Sustainable Forestry/ SFM practices.** • **Improves ERE.**

National actions alone are inadequate to cope with the climate change. All the more important, the Copenhagen Accord (UNFCCC 2009) recognized the crucial role of forests in addressing climate change via REDD+ (the plus sign extends the roles of conservation, enhancement of forest carbon stock & sustainable management of forest or sustainable forestry practices) through the mobilization of financial resources from developed countries. Hence, a series of international initiatives must be undertaken by the Malaysian government, such as:

B. INTERNATIONAL LEVEL

8. Malaysia should take the opportunity of the available financial resources to support capacity-building, provide technical assistance, and facilitate the transfer of technology to improve data collection, estimation of emissions from deforestation and forest degradation, monitoring and reporting, and address the institutional needs to estimate and reduce emissions from deforestation and forest degradation – REDD (Kanninen *et al*. (2007), UNFCCC 2008b). The Copenhagen Accord (UNFCCC 2009) has pledged the additional resources of US$30 billion, covering the period 2010-2012, and another US$100 billion a year by 2020 to address the needs of developing countries to mitigate the climate change issues;

Category of Action Required	Comments/Status of Implementation
• **Policy Decision.** • **R&D Implementation**	• **Needs Government endorsement.** • **Improves capacity-building, provides technical assistance, and facilitates the transfer of technology.** • **Improves ERE**

9. Malaysia has to think through the key issues for the post-Kyoto Protocol framework from various perspectives (i.e. fairness, effectiveness, carbon market mechanism, and implementability) and guided by *the principle of common but differentiated responsibilities, the polluter pays principle, and the precautionary principle*. This is in reference to GHGs under the UNFCCC and KP whereby the recommended stabilization at even below 450ppm (compare with 280ppm pre-industrial to 308ppm in the year 2005 to a projected 540ppm - 970ppm in the year 2100) would be already far too difficult for countries to undertake physically, economically, environmentally, and socially*;*

Category of Action Required	**Comments/Status of Implementation**
• **Policy Decision.** • **R&D Implementation.**	• **Needs Government involvement.** • **Anticipating key issues of post- Kyoto Protocol.**

10. Malaysia may wish to consider proposing or leading a timber organization to control and manage an ***equitable tropical timber pricing*** internationally – just like what OPEC does to manage or influence petroleum price. This will prevent "trade escalating practices", i.e. no or low tariff on unprocessed or primary processed timbers, but high tariff on secondary or tertiary processed timber products when exported, making the latter less competitive. The compelling reason for the increase in tropical hardwood utilization is that they are comparatively cheap, above and beyond its beauty and high quality. Trade escalating practices will prevent Malaysia and other producer countries from "over-harvesting" the resources, and hence a saving to carbon and biodiversity reservoirs (B2B);

Category of Action Required	**Comments/Status of Implementation**
• **Trade Decision.**	• **Needs Government supports.** • **Improves ERE.**

11. Malaysia should adopt a more aggressive, proactive and pragmatic approach to project the country's image on climate change & biodiversity issues at the international level, e.g. via a national website or via an international advertisement), linking its National Forest Policies to these issues. A case in point is the strategic BIOTECHCORP's advertisement on national TVs involving the Prime Minister, Deputy Prime Minister, Minister of MOSTI, and CEO of BIOTECHCORP;

Category of Action Required	**Comments/Status of Implementation**
• **Policy Decision.**	• **Improves public relation nationally & internationally.** • **Innovative program.**

8. CONCLUSIONS AND WAYS FORWARD

A conclusion and way forward at this juncture when dealing with climate change and biodiversity issues is to ask a basic question:

> ***"What can public and private decision makers learn from a wide-ranging look at the social sciences and the issue of human choice and climate change that illuminates the evaluation of policy goals, implementation strategies, and choices about paths forward?"***

At present, most likely proposed policies, roles and strategic directions, and action plans are heavily focused on the development and implementation of inter-governmental agreements on immediate emissions reductions and biodiversity conservation. In the spirit of cognitive and analytical pluralism, Malaysia should also look beyond the present policy priorities to see if there are adjustments and changes, either partially or wholly, by considering the following ten suggestions for policymakers to public and private decision makings (see Rayner and Malone 1998 for detail discussion):

1. *"view the issue of climate change holistically, not just as the problem of emission reductions;*

2. *recognize that, for climate change and biodiversity policymaking, institutional limits to global sustainability are at least as important as environmental limits;*

3. *prepare for the likelihood that social, economic, and technological change will be more rapid and have greater direct impacts on human populations than climate change and biodiversity conservation;*

4. *recognize the limits of rational planning;*

5. *employ the full range of analytical perspective and decision aids from the natural and social sciences and the humanities in climate change and biodiversity policymaking;*

6. *design policy instruments from real world conditions rather than try to make the world conform to a particular policy model;*

7. *incorporate climate change and biodiversity concerns into other immediate issues, such as employment, defense, economic development, and public health;*

8. *take a regional and local approach to climate and biodiversity policy making and implementation;*

9. *direct resources into identifying vulnerability and promoting resilience, especially where the impacts will be the largest; and*

10. *use a pluralistic approach to decision making."*

Having specific Climate Change Policy and Biodiversity Policy are for the better, but clarifying roles or strategic directions of sustainable forestry practices with respect to these policies is more than welcome.

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