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Climate Change and Global Warming

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The Threat of Global Warming – Is the Earth Getting Warmer?

Scientific evidence of human interference with the climate first emerged in the international public arena in 1979 at the First World Climate Conference. As public awareness of environmental issues continued to increase in the 1980s, governments grew even more concerned about climate issues. In 1988 the United Nations General Assembly adopted a resolution urging "protection of global climate for present and future generations of mankind." In the same year, the governing bodies of the World Meteorological Organisation and of the United Nations Environment Programme created a new

body, the Intergovernmental Panel on Climate Change (IPCC), to oversee and assess scientific information on the subject. In 1990 the IPCC issued its First Assessment Report which confirmed that the threat of climate change was real.

There is now an abundance of studies and reports on international and scientific findings which have emerged with the consensus that our world is getting warmer. This warming phenomenon actually demonstrated that the increase in temperature was not constant, but rather consisted of warming and cooling cycles at intervals of several decades since the past 150 years; with the long term trend being one of net global warming.

However, there will always be uncertainty in understanding a system as complex as the world's climate. Evidence of this climate change comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from incidents such as increases in average global sea levels, retreating glaciers and changes to many physical and biological systems. Studies show that human activities are the likely cause of this warming which has led to changes in the Earth's climate.

The Issue of Climate Change

When we speak of climate change, we are referring to changes in the climate of the Earth as a whole. The rate and magnitude of global climate changes over the long term have many implications on the natural ecosystems. The Earth is naturally warmed by rays (or radiation) from the sun which passes through the Earth's atmosphere and is reflected out to space again. The atmosphere is made up of layers of gases, some of which are called 'greenhouse gases'. They are mostly natural and make up a kind of thermal blanket over the Earth. This lets some of the rays back out of the atmosphere, keeping the Earth at the right temperature for animals, plants and humans to survive $(60^{\circ}F/16^{\circ}C)$. Thus some global warming is good; however, if extra greenhouse gases are generated, the thermal blanket gets thicker and too much heat is kept in the Earth's atmosphere.



As human societies adopt increasingly sophisticated and mechanised lifestyles, the amount of heat-trapping gases in the atmosphere increases. By increasing the amount of these gases, humankind has enhanced the warming capability of the natural greenhouse effect. It is the human-induced enhanced greenhouse effect that causes environmental concern. It has the potential to warm the planet at a rate that has never been experienced in human history.

The issue of climate change is more than a warming trend. The increasing temperatures will eventually lead to changes in many aspects of weather such as wind patterns, the amount and type of precipitation, and greater frequency of severe weather events that may be expected to occur. These occurrences and consequences of global warming could *Continued on page 3*

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From the desk of the Director General

Global Warming and Climate Change



As we all know, the 'Greenhouse Effect' refers to the natural phenomenon that keeps Mother Earth in a temperature range that allows life in all forms to exist and flourish. The enormous energy of the sun warms the Earth's surface and its atmosphere (more specifically, the lower layers called the troposphere). As this plentiful energy radiates back towards space as heat, a good portion is absorbed by a delicately held balance of heattrapping gases in the atmosphere. Among the main gases are carbon dioxide and methane. These gases, in effect, create an insulating layer. Like so much of the marvels of nature, in the right quantities and in the right ratios, these gases miraculously serve to foster life on Earth. Conversely, their imbalance spells doom.

With the temperature control of the 'Greenhouse Effect', the Earth has an average surface temperature of about 15°C. At about this temperature no matter what are our problems, life on Earth has all the potential to be fruitful and sweet! The rise in the Earth's temperature resulting from an increase in heat-trapping gases in the atmosphere called Global Warming has all the potential to make our lives, nasty, plain and simple. Since pre-industrial times, the atmospheric concentration of carbon dioxide has increased by 31%. Over the same period atmospheric methane has risen by 150%, from 700 ppb to 1,745 ppb, mostly a result of agricultural activities like rice-growing and cattle rearing. Scientists the world over are concerned that the pace of global warming is being accelerated alarmingly by human activities which add ever increasingly large amounts of heat-trapping gases to the atmosphere. Of these activities, anthropogenic in nature, deforestation and the burning of fossil fuels top the list. And with global warming comes climate change - the doom and gloom twins of our imperiled existence on Earth. And what is the evidence for this?

Plenty of evidence. They fall into two categories - fingerprints and harbingers. The former are direct manifestations of a widespread and long term trend towards warmer global temperatures. For instance the warming over the last fifty years is nearly twice that for the last hundred years. Eleven of the last twelve (1995-2006) rank among the twelve warmest years in the instrumental record of global surface temperature (1850). Other evidence is heat waves and periods of unusually warm weather, ocean warming, sea level rise and coastal flooding, glaciers melting and the warming up of Arctic and the Antarctic.

In the latter category of harbingers are events that are likely to become more frequent and widespread with continued warming.

These include the spread of disease; earlier spring arrival; plant and animal range shifts and population changes; coral reef bleaching; downpours; heavy snowfalls and flooding; and droughts and fires.

Alarmed, in 1988, the United Nations Environment Programme and the World Meteorological Organisation set up the Intergovernmental Panel on Climate Change (IPCC) to examine the most current information on global warming and climate change. More than 1,250 authors and 2,500 scientific expert reviewers from more than 130 countries contributed to the panel's most recent report, "Climate Change 2007: The Fourth Assessment Report". This report recently issued the most comprehensive and up-to-date evaluation of global warming. As the new benchmark, it serves as the basis for international climate negotiations. And that must be left to the politicians and world leaders but we as individuals can also contribute significantly to reducing global warming.

We can and we must re-examine our lifestyles and our patterns of consumption. We can for a start look at the car that we drive. It is perhaps the most important personal climate decision we can make. Surely gas-guzzlers are out. When we replace our appliances, be it refrigerators, freezers, furnaces, air conditioners and water heaters, we should purchase those brands which have energy saving logos. We should unplug electrical devices when not in use. We can change to energy saving bulbs and lights. We must think before we drive, especially when we have more than one vehicle - use the energy efficient one for minor chores and errands. We should buy wood and furniture from companies, industries and countries that support sustainable programmes. We can participate in 'plant a tree' programmes. Above all we can let our policy makers know that we as individuals are concerned and care deeply about global warming to safeguard Earth for future generations.

Individual life exists because the Earth lives! Surely the time has come to usher in an Age of Environmental Enlightenment!

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

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have far-reaching and unpredictable environmental, social and economic consequences.

Studies have shown that carbon dioxide levels have increased from 280 ppm in year 1750 to over 379 ppm today. These increasing greenhouse gases are causing temperatures to rise, leading to the Earth's surface being warmed by approximately 0.6 degrees centigrade over the twentieth century. Scientists project that the average global surface temperatures will continue to increase to between 1.4 degrees centigrade and 5.8 degrees centigrade above 1990 levels, by 2100.

Efforts to Reduce the Causes of Climate Change

The scientific understanding of climate change is now sufficiently clear to justify nations to take prompt action. It is vital that all nations identify cost-effective steps that they can take now, to contribute to substantial and long-term reduction in net global greenhouse gas emissions. Action taken now to reduce significantly the build-up of greenhouse gases in the atmosphere will hopefully lessen the magnitude and rate of climate change.

As the United Nations Framework Convention on Climate Change (UNFCCC) recognises, a lack of full scientific certainty about some aspects of climate change is not a reason for delaying an immediate response that will, at a reasonable cost, prevent dangerous anthropogenic interference with the climate system. As nations and economies develop over the next 25 years, world primary energy demand is estimated to increase by almost 60%. Fossil fuels, which are responsible for the majority of carbon dioxide emissions produced by human activities, provide valuable resources for many nations and are projected to provide 85% of this demand.

Minimising the amount of this carbon dioxide reaching the atmosphere presents a huge challenge. There are many potentially costeffective technological options which are at various stages of research and development that could contribute to the stabilising of greenhouse gas concentrations. However, barriers to their broad deployment still need to be overcome. Carbon dioxide can remain in the atmosphere for many decades. Even with possible lowered emission rates, it is anticipated that we will still be experiencing the impacts of climate change throughout the 21st century and beyond. Failure to implement significant reductions in net greenhouse gas emissions now will make the task much harder in the future.



Source: Climate change 1995. The science of climate change, contribution of working group 1 to the Second Assessment Report of the Inter Governmental Panel on Climate Change, UNEP and WMO, Cambridge University Press, 1995; Sea level rise over the last century, adapted from Gonritz, Lebedeff and Hansen, 1967.

Consequences of Climate Change

Even if greenhouse gas emissions were stabilised instantly at today's level, the climate would still continue to change as it adapts to the increased emission of recent decades. Further changes in climate are therefore unavoidable. Hence, nations must prepare for them. The projected changes in climate will have both beneficial and adverse effects at the regional level, for example on water resources, agriculture, natural ecosystems and human health. The larger and faster the changes in climate, the more likely it is that adverse effects will dominate. Increasing temperatures are likely to increase the frequency and severity of weather events such as heat waves and heavy rainfall. Increasing temperatures could lead to large scale effects such as melting of large ice sheets, with major impacts on low-lying regions throughout the world.

The IPCC estimates that the combined effects of ice melting and sea water expansion from ocean warming are projected to cause the global mean sea-level to rise by between 0.1 and 0.9 metres between 1990 and 2100. For a country like Bangladesh, a 0.5 metre sea-level rise would place about 6 million people at risk from flooding.

Conclusion

Developing and poor countries that lack the infrastructure or resources to respond to the impacts of climate change will be particularly affected. Many of the world's poorest people are likely to suffer the most from the effects of climate change. It is anticipated that long-term global efforts to create a more healthy, prosperous and sustainable world may be severely hindered by changes in the climate.

Malaysia too must also take prompt action to reduce the causes of climate change, to adapt to its impacts and ensure that the

issue is included in all relevant national and international strategies. Different sectors in the country must work together and commit to working with the government to help develop and implement the national response to the challenge of climate change. Even though the developed nations have been responsible for much of the past greenhouse

gas emissions, developing countries like ours must not be indifferent and complacent in meeting the challenges of adaptation and mitigation.

Immediate actions that could be taken include:

- 1. Acknowledge that the threat of climate change is clear and increasing.
- Launch a national study to explore scientifically informed targets for atmospheric greenhouse gas concentrations, and their associated emission scenarios.
- Identify cost-effective steps that can be taken now to contribute to substantial and long-term reduction in net global greenhouse gas emissions.
- 4. Work towards building a scientific and technological capacity best suited to our circumstances, enabling development of innovative solutions to mitigate and adapt to the adverse effects of climate change.
- Develop and deploy clean energy technologies and approaches to energy efficiency.
- 6. Mobilise the enhancement of research and development efforts, which can better inform climate change decisions.

Thus, the task of devising and implementing strategies to adapt to the consequences of climate change will require concerted collaborative inputs from a wide range of experts, including physical and natural scientists, engineers, social scientists, medical scientists, those in the humanities, business leaders and economists. It is pertinent that we all recognise that delayed action will increase the risk of adverse environmental effects and will likely incur a greater cost in the future.

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Climate Change and Extreme Weather: Intergovernmental Panel on Climate Change (IPCC) Findings_____

Definitions of Climate Change and Global Warming

The United Nation Framework Convention on Climate Change (UNFCCC) defines climate change as a change of climate, which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods. Thus, the UNFCCC makes a distinction between 'climate change' attributable to human activity altering the atmospheric composition and 'climate variability' attributable to natural causes.

IPCC uses climate change to refer to any change in climate over time, whether due to natural variability or a result of human activity.

Global warming is defined as "The view that the Earth's temperature is being increased, in part due to emissions of greenhouse gases associated with human activities such as burning fossil fuels, biomass burning, cement manufacture, cow and sheep rearing, deforestation and other land-use changes" (IPIECA¹).

Many scientists have interpreted the increase in climate variability and extreme weather events as signals of the impacts of climate change due to global warming. The world temperatures have been rising since the start of the Industrial Age. Science has shown that rising temperatures were due in part to build-up of greenhouse gases (GHGs) as a result of fastpaced economic development in developed and developing countries. Rising temperatures have also led to melting polar ice that, in turn, have led to rising sea levels. This article highlights some of the facts from the scientific findings of the IPCC Fourth Assessment Report, which was released in February 2007. The emphasis is on climate change and extreme weather issues.

Extreme Weather and Climate Events

Over the past few years, parts of the world have seen large variability in climate. The winter of early 2006 saw extremely cold conditions in Asia, Russia and parts of Eastern Europe. However, the winter conditions of late 2006/2007 saw Asia and Siberia experiencing an extremely warm winter. Heat waves have also become more common in the temperate countries during summer and El Nino has become a more common feature the past few decades. Parts of the world have also been subjected to an increase in severe weather phenomena over the past few years such as Hurricane Katrina in the United States and Typhoon Durian, which caused much devastation to the Philippines in late 2006. Malaysia has also seen an increase in the number of extreme weather episodes over the past few years, some on a scale not experienced before. It saw devastating monsoon floods affecting the state of Perlis and Kedah in December 2005 and Johor, Pahang, Sabah and Sarawak in December 2006 and January 2007.

In the context of global warming, extreme weather and climate events including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones have been reported to have significant changes in intensity, areas and frequency of occurrence (Table 1 on page 6). More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics. The frequency of heavy precipitation events has increased over most land areas.

Future Climate Change

To estimate the climate of the future, climate models are used. They simulate Earth's climate system with physically based mathematical equations, which are solved numerically in a supercomputer. These equations reflect the interaction of the different components of the climate system and their internal variability. The climate system consists of the subsystems atmosphere, the oceans (hydrosphere), the ice and snow cover (cryosphere), vegetation (biosphere), the land surfaces (pedosphere) as well as the lithosphere. In order to estimate the future climate and its uncertainty, multiple model runs with different plausible pathways are carried out by a number of research groups. However, the vast amount of computing resources needed to carry out these climate calculations limit the number of available climate projections.

Climate Scenarios

Global atmospheric concentration of the greenhouse gases: CO_2 , CH_4 and N_2O have

increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values, determined from ice cores, spanning many thousands of years. The global atmospheric concentration of CO_2 has increased from a pre-industrial value of about 280 ppm to 379 ppm over the last 650,000 years (180-300 ppm).

To obtain a realistic estimate of the possible climate evolution in future, one has not only to know the internal dynamics of the climate system, but also the future development of the greenhouse gas concentration. To estimate the human induced effect, so called scenarios have been developed, which are based on different plausible pathways for the future development of population growths, income, standard of living, energy consumption and energy sources. These scenarios correspond to different emissions of greenhouse gases (CO₂, CH₄, O₃, N₂O, NO_x, CFCs) and their concentrations in the atmosphere.

These scenarios have been compiled by a group of experts of the Intergovernmental Panel on Climate Change (IPCC), which published 35 Emission-scenarios based on different story lines, which are called 'SRES-Scenarios'. These scenarios can be categorised into four groups and are represented by four 'marker' scenarios.

The A1 scenarios describe a world with a large economic growth. World population will have peaked by the middle of this century and gradually declined thereafter. New and efficient technologies will be introduced world-wide, regional differences in income and living standard will even out. This group can be differentiated into three sub-groups according to the technology used to provide energy: A1FI places emphasis on fossil fuel, A1T on non-fossil fuel, and A1B on a mixture of different energy sources.

The A2-scenarios describe a heterogeneous world. The main assumption is regional independence and the continuation of regional differences. World population increases steadily during the next 100 years. The economical development, the living standard and income are regionally quite different and technological progress proceeds slowly.

The B1-scenarios assume, similar to the A1-scenarios, a world population, which

stabilises during the next century. Economic development proceeds in the direction of a serviceoriented society with a reduced usage of natural resources and the introduction of clean and efficient technologies. The emphasis is on global and sustainable solutions.

The B2-scenarios anticipate a development, in which regionally different sustainable solutions of economical, ecological and social problems are found. The world's population rises uncurbed, but slower than in the A2 scenario.

Economic development is slower than in the other scenarios. As economic issues become less important, more diverse technological development emerges. The emphasis is on environmental conservation and social justice, but on a regional scale.

The IPCC 2007 study focussed its attention on three cases: a low case (B1), a medium case (A1B) and a high case (A2).

Summary of Policymakers of Working Group I of the IPCC Fourth Assessment Report, formally approved in February, 2007.

- Global surface temperature during the past 100 years (1906-2005) has risen by 0.74°C, larger than the corresponding temperature rise for 1901-2000 given in the TAR (The Third Assessment Report, 2001) of 0.6°C.
- 2. The warming over the last 50 years is nearly twice that for the last 100 years.
- 3. Eleven of the last twelve years (1995-2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850).

Climate projections

Based on the scenarios, it is estimated that the global mean near-surface temperature will rise by the year 2100 between 1.1 and 2.9° C with a best estimate of 1.8° C for the low B1 scenario, with 1.7 to 4.4° C with a best estimate of 2.8° C for the medium A1B scenario and by 2.0 to 5.4° C with a best estimate of 3.4° C for the high A2 scenario (Fig. 1).

The pattern of warming (Fig. 2) shows the highest temperature rises over land and in most high northern latitudes, and a reduced warming in parts of the North Atlantic and the Southern Ocean.



Fig. 1: Multi-model means of surface warming relative to 1980-1999 for the scenarios A2, A1B and B1. Numbers indicate the number of models which have been run for a given scenario. The gray bars at right indicate the best estimate (solid line within each bar) and the likely range assessed for the SRES marker scenarios (IPCC, 2007).

The snow and ice-coverage will decrease in both hemispheres. It is likely that future tropical cyclones will become more intense. The storm tracks of the mid-latitudes are suggested to move further poleward. This is connected with a shift in the main precipitation areas (Fig. 3). It will lead to a decrease in precipitation in the subtropics, particularly during the months of winter in the northern hemisphere, and to an increase in precipitation in the mid to high latitudes. In summer in the northern hemisphere, the

subtropics will exhibit a decrease in precipitation as well with the exception of the monsoon region of East Asia, where it increases.



Fig. 2: Projected global average temperature changes for the early and late 21st century relative to the period 1980 – 1999, as calculated by multi-model averages for a low (B1), a medium (A1B) and a high SRES scenario for the decades 2020-2039 (left) and 2090-2099 (right) (IPCC, 2007).





Table 1: Assessment of human influence on the trend, and projections of extreme weather events (after IPCC, 2007).

| Phenomenon and direction of trend | Likelihood that trend occurred in late 20th century (typically post 1960) | Likelihood of a human contribution to observed trend | Likelihood of future trends based on projections for 21st century using SRES scenarios |
|--|--|--|--|
| Warmer and fewer cold days and nights over most land areas | Very likely | Likely | Virtually certain |
| Warmer and more frequent hot days and nights over most land areas | Very likely | Likely (nights) | Virtually certain |
| Warm spells / heat waves with frequency increasing over most land areas | Likely | More likely than not | Very likely |
| Heavy precipitation events with frequency (or proportion of total rainfall from heavy falls) increasing over most areas | Likely | More likely than not | Very likely |
| Area affected by droughts increases | <i>Likely</i> in many regions since 1970s | More likely than not | Likely |
| Increasing intense tropical cyclone activity | <i>Likely</i> in some regions since 1970 | More likely than not | Likely |
| Increased incidence of extreme high sea levels (excludes tsunamis) | Likely | More likely than not | Likely |

Climate Variability and Change and Extreme Weather Events

Climate change and climate variability have a common and different meaning. Climate change refers to a statistically significant variation in either state of climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcing, or to persistent anthropogenic changes in composition of the atmosphere or in land use. Climate variability refers to variations in the mean state and other statistics such as standard deviations, the occurrence of extremes etc. of climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external forcing).

Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely (>90% probability) due to the observed increase in anthropogenic greenhouse gas concentrations, with a higher confidence level than the TAR'S conclusion that "most of observed warming over the last 50 years likely (>66% probability) has been due to the increase in greenhouse gas concentration."

It is very likely that hot extreme, heat waves and heavy precipitation will continue to become more frequent and future tropical cyclones will become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical sea surface temperature. There is less confidence in projections of a global decrease in numbers of tropical cyclones (see Table 1). Areas affected by droughts will likely increase and incidence of extreme high sea level (excluding tsunamis) will be likely.

As a regional response to global warming, climate changes in the East Asian region have been observed.

There are a number of phenomena (the number of warm days, warm spells and heat waves, heavy precipitation events, areas affected by drought, the number of intense tropical cyclones and of extreme high sea level events) which already now show a trend (Table 1). These trends will persist and become stronger in the climate of the future.

Concluding Remarks

The climate will be warmer in future, independent of the scenario assumed. However, the degree of this warming, particularly during the latter half of the century, is determined by the strength of the scenario pathway followed.

IPCC scientists have interpreted the increase in climate variability and extreme weather events as signals of the impacts of climate change due to global warming. Whether these increases are due to global warming as a result of anthropogenic activities of mankind, or due to long term natural variability of the climate itself, it is clear we need to take further steps to better prepare ourselves against the impacts of such changes.

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> Source Research Division, Malaysian Meteorological Department Email: wanazli@met.gov.my

Deforestation: A Cause of Global Warming?_

"We do not inherit the forests from our forefathers; we merely borrow them from our children"- Canadian Forestry Society

Lately, the issue of global warming has become a major worldwide concern. Although it entered the domain of public awareness during the extraordinarily hot summer of 1988, the best possible solution to be implemented is still undergoing extensive scientific discussion, experimental work and political debate.

Global warming is a keyword that represents an increase in the average temperatures of the Earth's atmosphere. If no action is taken, the greenhouse effect could lead to a rise in average global temperatures of between 1.5 and 4.5°C as early as the year 2030. Such increases will make the world warmer than it has been for more than 100,000 years. A 2-degree Celsius rise could mean 2 billion people will face water shortage by 2050. According to a *New Straits Times* report (NST: 5 June 2007), Malaysia will face a 1-degree Celsius rise in temperature in the next 20 years.

It is generally believed that global warming is caused by burning fossil fuels. According to the Food and Agriculture Organization of United Nations (FAO), between 25 and 30% of the greenhouse gases released into the atmosphere each year – 1.6 billion tonnes – is caused by deforestation. Trees are 50% carbon. When they are burned, the CO₂ they store escapes back into the air. According to FAO figures, some 13 million hectares of forests worldwide are lost every year, almost entirely in the tropics. Deforestation remains high in Africa, Latin America and South-east Asia (Table 1).

The biggest driver of deforestation is agriculture. Farmers cut forests to provide more land for planting crops or grazing livestock. Often, many small farmers will each clear a few acres of land to feed their families by cutting down trees and burning them in a process known as 'slash and burn' agriculture. Logging operations, which provide the world's wood and paper products, also cut countless trees each year. Loggers, some of them acting illegally, also build roads to access more and more remote forests – which leads to further deforestation.

Deforestation will drive climate change. Forest soils are moist, but without protection from sunblocking tree cover, they quickly dry out. Trees also help perpetuate the water cycle by returning water vapour back into the atmosphere. Without trees to Table 1: Global carbon reservoirs

| Carbon Reservoir | Size (Gigatonnes) |
|----------------------|----------------------|
| Atmosphere | 750 |
| Forests | 610 |
| Surface oceans | 1,580 |
| Deep ocean | 38,100 |
| Fossil fuels | 5,000 |
| Coal | 4000 |
| Oil | 500 |
| Natural gas | 500 |
| Source: Kasting 1998 | |

fill these roles, many former forest lands can quickly become barren deserts. Removing trees deprives the forest of portions of its canopy, which blocks the sun's rays during the day and holds in heat at night. This disruption leads to more extreme temperature swings that can be harmful to plants and animals. Trees also play a critical role in absorbing the greenhouse gases that fuel global warming. Fewer forests mean larger amounts of greenhouse gases entering the atmosphere – and increased speed and severity of global warming. Figure 1 shows the role of forests as a carbon sink.

Experts, including participants from 46 developing countries, met in Rome, August last year to address this issue in a workshop organised by the United Nations Framework Convention on Climate Change (UNFCCC) and hosted by FAO. The developing countries showed their readiness to act on deforestation. Increasing agricultural productivity so as to reduce the need for conversion of forests into farmland seems to be a workable solution. However, most developing countries are currently facing acute employment problems and are seriously in need

of financial and technical aid to help them to conserve their forests. Such incentives could come in the form of carbon

credits worked out under the Kyoto Protocol, which governs greenhouse gas emissions from industrial sources in developed countries. It could also come directly under the Climate Change Framework Convention, or from bilateral agreements between donors and developing countries on a country-wide forest conservation projects. There is no guaranteed solution to deforestation. One may talk of reforestation. Although replanting the forests that have been destroyed seems like a good idea, it actually does no good. New trees may not be of the same species as the original stand. The lost of floral and fauna from the forest cannot be recovered at any price.

The only way to ensure that we will not encounter any of the consequences of deforestation is to stop destroying the forests all together. There is a need to stop cutting down all trees, no matter what the needs are. However, as this is totally impractical as of now, the only solution will be using forest products in moderation and wisely. However this idea of moderation needs to be put into practice immediately. The sad fact is that once the forests are gone, they are gone for ever. We cannot fix the damage that we have caused.

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Figure 1: Forest as a carbon sink.

Planning for an Amenable Biophysical Climate in Cities

One of the most profound ways in which man is altering the climate which affect him and his activity is through the building of cities. On the average, cities are warmer and 'drier' than their surrounding countryside. Thus while global warming with all its climatic ramifications, is now a priority public concern, at the local level, urban warming is increasingly posing a problem. This is becoming more urgent especially when the number of urban conurbations and large metropolises is on the rise, in addition to the already general rise of temperature at the global level.

In an urban setting, man, through his activities, has altered the climate in various ways. First, urbanisation changes the physical surface of the land; second, urban man and his activities produce a significant amount of heat which is important climatically; and finally, by their functions, cities introduce great qualities of pollutants into the air.

Under the situation, the entire energy balance of the area is transformed from that of essentially a rural surface to one which is greatly modified with far reaching consequences. It ultimately results in a set of climate changes which is entirely different from its rural counterpart. Table 1 shows the average annual magnitude of climate change for a large city. Although some of these changes may not appear to be very significant on an annual basis, they could be quite pronounced under certain conditions for shorter periods.

Table 1: Climage changes resulting from urbanisation. Average changes are expressed in percent of rural conditions

| Parameter | Annual changes |
|--------------------------|----------------|
| Solar Radiation | -22 % |
| Air Temperature | +1 % |
| Relative Humidity | -6 % |
| Visibility (Frequency) | -25 % |
| Fog (Frequency) | +60 % |
| Wind Speed | -25 % |
| Cloudiness (Frequency) | +8 % |
| Rainfall (Amount) | +14 % |
| Thunderstorm (Frequency) |) +16 % |
| Air Pollution (Volume) | +>1000% |

Urban Climatology in Malaysia

Probably the single most important aspect which has been extensively examined in the study of urban climate in Malaysia is the changing form and intensity of the 'heat island' effect. Observations indicate that as with other cities, the Kuala Lumpur built-up area is generally warmer than its surrounding rural countryside. This is best seen at night. Comparisons of daily temperatures between the city and Subang Airport indicate that the number of days with positive anomalies was in excess of 75%. In fact, during the relatively drier months of February to July inclusive, 92% of the days in the city centre recorded positive anomalies (Sham, 1980). On the average, the mean annual temperature difference between the city and Subang Airport was approximately $+1.0^{\circ}$ C in favour of the former. The corresponding figure for minimum temperatures was 1.5° C - 2.0° C.

The effect of urbanisation is not only confined to horizontal temperatures but also to those in the vertical direction with far-reaching consequences. Overseas studies (Oke, 1974; 1979) have shown that the thermal influence of a large city commonly extends up to 200 - 300 metres and even to 500 metres and more. When the warm air is advected by the wind, an urban 'plume' in the downwind region is formed; in calm conditions, an urban "dome"



Figure 1. Schematic presentation of the form of the air layer modified by a city; a) With steady regional airflow; b) in calm conditions (After Oke 1976).

may be created (Figure 1). Under the latter condition at night, the city can even create its own circulation with wind blowing from the cooler surrounding area into the warm city centre bringing with it a plume from the outskirts into the city centre. In both areas, however, these modified urban air layers are invariably being capped by an elevated inversion inhibiting upward dispersion of pollutants.

Observations from Subang Airport indicate that on the average, mixing depths of 900 metres and less account for approximately 83% of the afternoon values while 87% of the morning mixing depths are less than 500 metres (Sham, 1979). The study by the Universiti Putra Malaysia group indicates that the mixing depth is shallow at night and early morning ranging between near-zero to less than 100 metres and increases gradually to 1,000 metres during the afternoon with strong insulation. It was noted also that radiation inversion tends to be intense at night and early morning. This is far below the critical limits of 500 metres (morning) and 1,500 metres (afternoon) suggested by the US National Air Pollution Potential Forecasting

Program (NAPPFP) (US National Meteorological Center 1967). The greater the ventilation, the more pollutants are likely to be dispersed and diluted and the smaller is the pollution hazard. On the other hand, the smaller the ventilation, the less pollutants are likely to be dispersed, and the greater is the pollution hazard.

Planning and Management Implications

One obvious management implication of the studies carried out so far concerns air pollution potential and its relevance to emission standards to be adopted. Data obtained so far indicate that the dispersive capability of the atmosphere here is very restricted and comparatively less efficient than even that of Los Angeles, a city well-known for its pollution. Given this situation,

> it may be unwise for Malaysia and other low-latitude countries to adopt emission standards which have been largely based on those of the mid-latitude in order to compensate for the high pollution potential in the former.

One mitigating strategy, in this case, will be to reduce the intensity and size of the heat island as much as possible. And one way to do this is through the judicious planting of shade trees.

Apart from their visual and aesthetic values, trees have a number of functions in urban ecology (Table 2). In the first place, trees shade the ground surface from insulation and reduce effective radiation thereby lowering surface temperatures. Trees also cool air around them through evapotranspiration. About 95% of the diurnal water loss occurs during daytime. Transfer of water vapour to the atmosphere is the initiating process in the movement of water from the soil via the plant. In the evapotranspiration processes, heat energy is used up. In tropical areas, it is estimated that about 85% of the incoming solar radiation in rural areas is used for evapotranspiration (Chang, 1965). In terms of urban ecosystems, this means that excess heat load is reduced should there be sufficient evapotranspiration taking place.

Ideally, it would be desirable to have as much of the urban area covered with trees or urban forests but this may not always be feasible or even acceptable. One alternative is to create as many small city parks as possible. While this may fall short of the effect produced by large tracks or urban forest, it will nevertheless ameliorate the situation. Studies indicate that air temperature in the afternoon is substantially lower in the urban parks than it is in the adjacent open area. Similarly the effects of small parks upon other meteorological parameters and comfort indices generally indicate substantial improvement within the park areas in contrast to those outside in the city streets and adjacent car parks (Sham, 1986).

In Kuala Lumpur, a number of small 'vacant' lots can be converted into these mini parks. If they are properly managed throughout the urban area, mini parks can help not only to moderate afternoon temperatures but also to maintain a certain amount of ventilation and help prevent flash floods by reducing the rate of runoff. heat island effects, air pollution and flash flood incidence.

Several overseas studies (e.g. Akbari *et al.*, 1990; Bretz and Rosenfeld, 1992) have shown that when combined with high-albedo surfaces, shade trees contribute significantly to urban heat-island reduction. In fact, Akbari *et al.* (1990) argue that light-coloured surfaces may even be more effective than trees in moderating heat island, and cost less especially if colour changes are incorporated into routine maintenance schedules. Apart from that, the moderating effect of light-coloured surfaces is immediate; a tree may take a few years before it is large enough to produce significant energy savings.

The effects of light-coloured surfaces are twofold; first, 'direct' energy savings by an individual

Table 2: Major functions of trees in tropical urban ecology

- **1.** Providing buffer and protecting soil surface from intense rainfall minimising surface runoff, erosion and sediment load and flooding.
- **2.** Filtering air pollutants and aerosols and reducing their levels in cities.
- **3.** Acting as bio-indicators of incidence and extent of acid rain.
- **4.** Reducing noise pollution by absorbing, intercepting or deflecting sound waves.
- 5. Providing habitat for wildlife, birds and insects.
- **6.** Purifying air by absorbing CO_2 and releasing O_2 for respiration by living organisms including man.
- **7.** Conserving soil moisture and releasing it gradually into drainage systems and the atmosphere (evapotranspiration). The latter acts as nature's air conditioners.
- **8.** Moderating air temperatures through shading.

While much has been said about the advantages of the mini parks, these, however, are no substitutes for the larger urban forest. The term 'urban forest' refers to the more natural, lower maintenance, less cared for and self-sustaining woodlands that are characteristic of the green tropical forest. This is in contrast to the more formal layout of shrubs and flowers and the more maintained green areas that are usually associated with the term 'garden city'. Perhaps for Kuala Lumpur, and indeed for many tropical cities, the 'garden cities' concept may need to be tempered with 'urban forests'. There are several reasons for this. Economically, it is becoming increasingly more expensive to develop, manage and maintain the formal gardens and landscapes that require special and constant care including supplemental watering during dry spells, weekly mowing of grass, trimming, pruning and shaping of shrubs.

An urban forest, if properly planned and managed, will create a plant ecology of its own. It will require least care once established and yet offers a more functional option in mitigating building through changing the albedo of its roof and outside walls; and second, 'indirect' effects on climate which are conducive to energy savings. When albedo is altered on a large scale such that it reduces ambient temperatures, the energy savings of buildings, in fact, are achieved as a result of albedo modification. In other words, energy savings become possible because in a cooler environment, less power is required to cool a building. Further savings can be achieved by using high-albedo materials on major urban surfaces. Much of the discussion has been generally on heat island reduction (and cost savings) through greening and whitening of cities, such principles can also be usefully applied to individual buildings.

Concluding Remarks

Generally it is observed that although there are gaps in our knowledge and understanding of urban climate in the humid tropics, enough is known to enable us to apply some of these findings in the planning and management of the urban environment. While recognising that the temperate regions where much more research on urban climate has been accomplished, most of the results from the latter could be transferred to the former without much error.

Any rational assessment of sites for urban development, be it for new towns, for redevelopment or for extension of existing urban areas, atmospheric input as part of the biophysical inventory must precede the formulation of detailed plans. Sensible use of a proper data base should ensure that the most favourable aspects of the atmospheric environments are fully exploited and the negative features avoided. It is argued that in order to plan for an amenable biophysical climate in an urban environment, a planner should, other than taking into account existing atmospheric conditions, based on his knowledge of urban climatology and air pollution in the future, anticipate the kind of better atmospheric environment which would prevail after urban development. By doing so, he is better able to recommend steps that need to be taken to ameliorate the negative aspects of an urban environment and to exploit fully the positive aspects.

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Linking Climate Change to Energy Efficiency_____

Climate Change and Global Warming are intrinstically linked. Imperceptible changes in the world's surface temperature are able to change the amount of precipitation and its properties such as height of clouds and consequently the amount of rain falling in various locations. Areas which were previously wet might get less rain and other areas more. Places might get colder or warmer than usual. Seasons might get longer or shorter, causing undesirable effects such as flooding and drought.

A slight (1-2°C) rise in ocean temperature will cause corals to stress and bleach. This makes them less resistant to attack from the crown-of-thorns starfish, which can destroy large tracts of coral gardens. Corals are not only beautiful underwater gardens, but are a nursery and haven for various marine creatures. Without corals, already decimated fish stocks will plummet and many communities which rely on fish as a source of protein would suffer.

The increase in atmospheric temperature has caused many glaciers to recede tremendously. The Arctic ice cap is melting, causing the threat of flooding to low lying islands. Meanwhile desertification increased the size of the Sahara desert by 41,000 square kilometres in the 1980s.

Causes and Sources

As in the definition, the causes are human activities. To be more exact, they are caused by human activities that release greenhouse gases into the atmosphere – carbon dioxide (CO_2) , methane (CH_4) , nitrogen oxides (NO_x) , sulphur oxides (SO_x) and others. Some of these gases are more harmful than others. For example, methane is four times more harmful than carbon dioxide in warming up the Earth's atmosphere.

The main sources of CO_2 emissions today are fuel combustion, be it the burning of firewood to cook meals and heat homes or the burning of fossil fuels to power automobiles and other engines as well as for generating electricity. With millions of tonnes of oil burned to generate electricity supply for industries, buildings and homes daily, massive amounts of CO_2 are released into the atmosphere.

Alternative Energy Sources

Since electricity generation and transportation has been identified as the main culprits in greenhouse gas generation, what alternatives exist to replace the current practices? To date, a few alternatives have been developed to replace fossil fuels in generating energy for transportation and power generation; yet they are still a long way off from completely replacing the current technology. Renewable energy options such as solar, wind, mini-hydro and fuel cells are still being developed and tested.

Methane (CH₄) is released from places with rotting vegetation such as dump-sites, water reservoirs

and livestock. It is a gas which is produced by anaerobic fermentation of organic materials. The gas is flammable and can be utilised as an alternative fuel to generate electricity.

Link to Energy Efficiency

Completely replacing fossil fuels and current technology is not easy. New technologies are increasingly incorporated into existing appliances to make them more energy efficient. One example is the Toyota Prius, a hybrid car that combines a conventional petrol engine and an electric generator which makes it extremely energy efficient with the ability to travel 100 kilometres on 4.9 liters. But for the moment, completely replacing existing technology is not a viable option.

The demand for electricity supply in large towns and cities is tremendous. This demand is mainly for industrial and commercial uses such as manufacturing, office and shopping complexes. Reducing electricity demand would

Resources and Government Bodies

Ministry of Energy, Water and Communications (MEWC)

This Ministry formulates policies and regulates services for the Energy, Water and Telecommunication sectors. Its main thrust is to facilitate and regulate the growth of industries in these sectors to ensure the availability of high quality, efficient and safe services at a reasonable price to consumers throughout the country. **Website: http://www.ktak.gov.my/**

Energy Commission

The Energy Commission has documented its mission as "To balance the needs of consumers and providers of energy to ensure safe and reliable supply at reasonable prices; protect public interest; foster economic development and competitive markets in an environmentally sound manner." Among the projects it has implemented is setting up the Energy Star rating for refrigerators. The Commission also actively runs activities to create awareness on Energy Efficiency. Website:http://www.st.gov.my

website.iitip.//www.st.gov.

National Energy Centre

National Energy Centre is a not-for-profit company whose role is to fulfill the need for a national energy research centre that will co-ordinate various activities, specifically energy planning and research, energy efficiency, technological research, development and demonstration (R,D&D) undertaken in the energy sector. Website:http://www.ptm.org.my mean a reduction in combustion of fossil fuels in the power plants. Reducing transport fuels too reduces the amount of carbon and other pollutants that is released into the atmosphere.

For each tonne of fuel oil used, 3.24 tonnes of CO_2 is released into the atmosphere. Coal releases 2.43 tonnes, while the least polluting is natural gas at 2.13 tonnes CO_2 per tonne utilised.

According to The Energy and Environment Data Reference Bank, Malaysians generate 5.81 tonnes of CO_2 per person per year. In comparison, an Indonesian generates only 1.45 tonnes, Thais 3.11 tonnes and Filipinos 0.89 tonnes per annum. Singapore, a highly developed nation, generates more CO_2 at 27.89 tonnes of CO_2 per capita.

Energy Efficiency (EE) Practices

In the home

Although domestic consumption accounts for less than 20% of energy consumption in Malaysia, it is still a sizeable amount. The hot and humid climate and increasing affluence have led to greater use of air-conditioning in homes. Rapid development reduces the number of trees and increases the number of built surfaces in many towns and cities. Surfaces paved with tar and concrete retain the day's heat, making nights insufferably warm in many areas. More shade trees and grassy areas would help reduce the amount of heat retained by these surfaces. There is a real need for cooler neighbourhoods which have more greenery and better designed houses. Many houses are built without much consideration being put into its cooling needs, causing it to be unbearably warm. Certain materials absorb heat in the day, releasing them at night. A well designed house would shade the areas exposed to sun and allow good air movement, keeping it well-ventilated and cool, even on hot days.

Industries

Industries consume 60% of the total energy used in Malaysia. This is made up of 40% primary energy and 55% of the electricity consumed in the country. The bulk of this energy is used to power various machines for production purposes, cooling and lighting for facilities and chilling for perishable goods. As factories run heavy-duty machines for long hours, their energy consumption is understandably high. To reduce this cost, factories may utilise various ways to reduce consumption in their plants. Engineering solutions such as usage of high energy-efficient machinery and study of the processes, demand and schedules would be most energy efficient. Quite often, processes can be rescheduled to reduce wastage and increase productivity. Gadgets such as frequency regulators are popular in reducing the electricity bill. This should be

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How Would Climate Change Affect Corporations

The News Straits Times reported on 3 May 2007 that by 2025 Malaysia can expect higher temperatures which will cause heat waves, flooding, droughts, tropical storms and surges in sea levels that will become more frequent, more widespread and more intense. Recently the "unusual" storm that hit Penang is a good example.

How has the corporate world responded to the call of cutting back on emissions and energy consumption as mitigating measures against climate change and global warming? Newsweek magazine for the month of April carried a special report on living with climate change, quoting that global warming is changing the Earth and forcing businesses to evolve like never before. Inevitably some firms will wind up as a result of harsh physical and regulatory shifts, but others will prosper.

The Stern Review published last year predicted that by the end of this century, continued global warming could slash global gross domestic product by as much as 20%. In order for businesses to stay alive, they have to change the way they do business.

Last year, a US coalition of investors, environmental groups and other public interest organisations working with companies to address sustainability challenges such as global climate change (CERES) issued a report. According to this report, businesses need to act as the risks associated with climate change can be detrimental to the company. Risks that arise as a result of the current climate change phenomena are as follows:

Physical Risks

Businesses are at risk from the physical impacts of climate change, such as increased intensity and frequency of weather events, droughts, floods, storms and sea level rise. Changes in consumer habits that accompany changing weather patterns will also affect profitability in a number of sectors.

Regulatory Risk

State, national and international regulations are putting increasing pressure on companies with emissions from operations or products to invest in emission controls, purchase carbon credits or face clean-up costs.

Competitive Risk

Tightly linked to regulatory risk in the global and domestic marketplaces, climate risk preparedness will be a key driver in a company's ability to compete.

Technological and Competitive Risks and Opportunities

Companies in many sectors can increase profitability by implementing energy efficiency strategies and developing emission-reducing technologies or new products that meet changing corporate and consumer demands. The report identified four key elements for companies to implement in order to successfully put in place comprehensive climate change strategies:

- 1. Assess the deepening financial connections between climate change and businesses. Companies with significant greenhouse gas (GHG) emissions or high-energy use need to assess their exposure from new regulations and develop strategies for mitigating those risks.
- Develop and implement action plans to manage climate risks and seize new market opportunities. Plans should include new corporate policies and procedures for reducing and mitigating risk, setting absolute greenhouse gas reduction targets and energy efficiency goals, and developing or purchasing new clean energy technologies.
- Share and discuss climate strategies with investors, analysts and stakeholders. Companies should disclose their assessments and implementation plans in annual financial reports and corporate responsibility reports.
- Corporate leaders must overcome a tendency toward short-term thinking and emphasise long-term thinking to implement these climate strategies successfully.

This growth of effective corporate response to climate change is built on well-functioning environmental management systems and properly focused governance practices.

In Malaysia, medium and small scale industrial plants are responsible for much of the country's industrial production. Energy consumption and energy intensity in the industrial sector are expected to increase commensurate with projected economic growth. Including both conventional and non-conventional sources of energy, the industrial sector represents the largest



This pictured published in the web is indeed an interesting one. It shows the globe, melting away, with the caption "**Don't talk about global warming... talk to me about change**"

consumer of energy in Malaysia. (Gurmit Singh KS, Malaysia's Communication to the UNFCCC, 2000). This is clear evidence that there are enormous opportunities for energy efficiency improvements to be put in place. These include using cleaner energy sources, optimising energy consumption, cutting back on emissions, optimising the process and cutting back on raw material consumption.

The existing regulations are moving towards making environmental protection a vital element in running businesses. The Prime Minister's Department and the Ministry of Domestic Trade and Consumer Affairs are presenting awards such as the Prime Minister's Hibiscus Award and Responsible Care awards to deserving companies, which have taken initiatives to implement good environmental practices. These awards serve as an incentive to companies which went the extra mile to do business in a 'clean way'.

Environmental consciousness in Malaysia is growing at a steady pace. Already we can see more and more articles on climate change in our local media. Something we never would have seen even five years ago. Awareness and realisation is a good first step towards mitigating climate change!

Are We Doing Enough for Climate Change?

To the ordinary citizens, climate change effects are not that clearly visible in the region although the frequency of weather extremes like typhoons and floods in most of the countries, including the Philippines, Indonesia and Malaysia, is increasing. Droughts are also becoming more severe in Northern Thailand. Water scarcity is also raising its head. Some countries have experienced temperature rises of about 1 degree celcius over the last 50 years.

The impacts on agriculture are not clear-cut. Rice yields have not changed very much nor have the areas of paddyland. Some highland areas are facing problems in cultivating certain types of vegetables due to local temperature increases, some of which could be attributed to massive deforestation in the vicinity.

Most of the governments in South-east Asia are signatories to the UNFCCC and most have also ratified the Kyoto Protocol. But as all are non-Annex 1 countries, they do not have legal obligations to cap their growing emissions. While the individual national emissions are not large on a global scale, the per capita emissions of the three largest ones (Singapore, Brunei and Malaysia, in that order) are way above 5 tonnes. Singapore, Indonesia, Thailand and Malaysia were among the 50 countries listed in the 2007 Climate Change Performance Index, with Malaysia only being rated slightly better than Saudi Arabia.

Given this scenario, most ordinary residents do not see a connection between their daily lives, energy use and global climate change. Even when informed of the links between transport and agriculture with increased global warming, the better informed ones tend to put the blame on the developed countries, especially the USA, with the excuse that even their national emissions are very small on the global scale. The wealthiest among them do not act to reduce their emissions even when confronted with the results of increased weather extremes like typhoons and floods!

Energy Mitigation Efforts in Malaysia

Most of the energy mitigation efforts in Malaysia have not been driven by climate change considerations but more by efficiency, new technology or environmental reasons. The Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP), about to be completed by PTM (National Energy Centre) was aimed more at identifying and removing barriers. In terms of reducing greenhouse gas emissions, there is uncertainty as to whether it will be able achieve its modest target of 10%.



The emerging Clean Development Mechanism (CDM) projects in the Malaysian energy sector, unfortunately, sell all the Carbon Emission Reductions (CERs) to Annex I countries and such sales do not count as mitigation efforts within the country. In fact, having already been "sold" to foreign countries, these CDM projects place Malaysia at a disadvantage when we will be required to cap and reduce our emissions – the latest by 2020 when we achieve developed country status.

The Small Renewable Energy Project (SREP) target of obtaining 5% of the electricity supply from renewable sources (under the 8th Malaysia Plan) has now been drastically scaled down to 350 megawatts under the 9th Malaysia Plan. Part of the problem is that the National Energy Company (TNB) and other electric utilities are under no legal obligation to ensure that a portion of their supply must be from renewable sources - and so make no effort to offer better buying prices to SREP suppliers. Unless the government places the obligation on the electric utilities and enforces a feed-in regulation like in Germany that offers premium prices to suppliers of renewable energy, we may still be struggling to get renewable energy to provide a significant mitigation effort. This also applies to the Malaysian Building Integrated Photo Voltaic (MBIPV) project being implemented by PTM.

Another major constraint to more widespread energy mitigation efforts in the country is the very low prevailing energy prices – much below world market ones. Thus there is very little financial incentive, especially in terms of lower utility bills, for most entities as well as individuals to save energy. Even our current petrol prices are still lower than that of our neighbours (and hence the unending smuggling)!

Although there seems to be some improvement in the ridership of the LRT (Light Rail Transit) and Rapid KL (bus company) in the Klang Valley, there is no data in the public domain to indicate whether total greenhouse gas emissions from the transport sector have actually declined. This is in view of the fact that private motor vehicle ownership (and usage) is still increasing and more aviation fuel is being used by the low-cost airlines. Hence it is difficult to prove that any significant energy mitigation is occurring in this sector.

While there is a Malaysian Standard to provide guidance on energy benchmarking in the design and operation of office and commercial buildings, its failure to be incorporated in the Building By-laws means that neither the builders nor users of such buildings are paying much attention to it. Hence energy mitigation efforts in this sector are isolated. Let us hope that the Prime Minister's directive of 2005 for government departments to reduce energy consumption by 10% is heeded.

Energy mitigation in the housing sector is not faring better either. Almost none of the new houses being built are energy savers except for some that have adopted the patented SMART & COOL HOMES technology. Very few existing houses have adopted the practices of the Centre for Environment, Technology and Development, Malaysia's (CETDEM) demonstration terrace house in Petaling Jaya, despite CETDEM's attempts to popularise it! The general excuse given by developers and house owners is that such actions increase costs and the economic returns take too long to be realised. But do they use the same return costs calculations when they lavish funds on aesthetic renovations or internal furnishings?

Malaysia Must Move Forward

It should be obvious that Malaysia cannot sit back on the issue of energy mitigation as well as climate change. External forces will definitely push us on through greenhouse gas emission targets especially in the post 2012 period, if not at least by 2020. We also have an obligation under the UNFCCC to do our share to limit climate change and the latest IPCC reports clearly indicate that the adverse impacts are becoming serious. Tropical countries, like Malaysia, will bear a sizeable part of the brunt.

While moving fast to develop immediate adaptation measures, we also have to curb energy consumption, especially the massive wastages that we are facing in all sectors, through more effective market mechanisms like realistic pricing. We need to redirect Energy Efficient (EE) and Resource Efficient (RE) projects from chasing the CDM 'peanuts' to reducing our own greenhouse gas emissions, especially from the transport sector. It is time for the country to establish its own greenhouse gas reduction fund through applying a cess on electric utilities and Independent Power Producers (IPPs), including palm oil mills. Coupled with this, there should be a legal requirement on all utilities to have an escalating percentage of their energy from 'green' sources as well as a feed-in law, similar to that in Germany.

In the meantime, work should start on *A Comprehensive Integrated Malaysian Energy Policy* that is adopted by the government, after full consultation with all stakeholders, especially final energy users. It should seek to ensure that all forms of energy are generated/ sourced and utilised in a sustainable manner so as to ensure an adequate quality of life for all Malaysians.

Such a policy should have at least the following objectives:

- 1. Provision of adequate and affordable end-use energy services that will ensure sustainable lifestyles for ALL Malaysians.
- 2. Adequacy and accessibility of all primary energy sources from within the nation.

 Optimisation of energy (system, conversion and usage) by all sectors with minimal adverse environmental disruptions.

The approach should be to adequately assess existing energy sources within Malaysia and optimise their use to match final end-use so that conversion efficiencies are maximised while adverse environmental impacts are minimised. They will also be cost-effective and socially just. Self-sufficiency will be the driving force and reliance on imports will be restricted.

Appropriate strategies will have to be adopted that favour energy conservation and renewable energy, and remove subsidies from fossil fuels. If necessary, a dedicated Ministry of Energy, Water and Communication (MEWC) should be established which can coordinate and drive all forms of energy supply and use in the country. The relevant and necessary infrastructure should also be in place so that delivery is efficient and reliable.

Efforts and Initiatives by NGOs in South-east Asia

A few of the NGOs from Indonesia, Malaysia and the Philippines banded together in 1992 to form the Climate Action Network South-east Asia (CANSEA). They were joined by two Thai NGOs in 2004. CANSEA members have been active, at most of the international forums but many of them have also tried to improve public awareness of the issue within their own countries as well as to get their governments to be proactive.

It is interesting perhaps to note that international environmental NGOs like WWF and Greenpeace have an uneven record of work in climate change in the region. While WWF has offices in most of the countries, not all of them have been involved in climate change work. For example, WWF Malaysia has still to join the Malaysian Climate Change Group. In the case of the Philippines, Thailand and Indonesia, the national WWF offices have been working on the issue for some years although at the moment only the Thai office has become a member of CANSEA.

In the case of Greenpeace, only their Thai and Filipino units are working on climate change at the national level. The rest of their work is regional and international.

Will the Region Move on Climate Change?

So far, ASEAN has still not taken a common position on Climate Change and has never articulated a shared position at any of the Conference of the Parties (COP) of the UNFCCC. There are now attempts to change this by the Bali COP in December 2007.

ASEAN governments and the people will have to move quickly on climate change issues. The world will not allow us to sit by idly. But we assume that the world as a whole (including the USA) will move decisively to curb further global warming and support immediate adaptive measures. Money and technology sharing will finally have to be made available (so long promised under the UNFCCC) so that non-Annex 1 nations have the resources to act.

But on the other hand, the world could continue to generate more hot air on climate change but take no action to reduce emissions or adapt to climate change. In that case, ASEAN will possibly continue to slumber on! Probably while the globe starts to steam up. Not a reassuring future?

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combined with efforts to optimise consumption as a sustainable solution.

Commercial buildings

Air-conditioning in commercial buildings has become a must, and it consumes huge amounts of electricity. Some buildings are using advanced technology to reduce the electricity needs. The best solution is remarkably simple – increase the temperature setting. Many buildings' thermostats are set too cold. Increasing the temperature to 24°C will save a lot of electricity and make the building more comfortable. Another very practical option is to replace high-energy light-bulbs for energy saving ones, especially in places that need constant illumination. The savings in electricity consumption will offset the initial expenditure of replacing the bulbs.

Transportation

Whenever energy efficiency is mentioned, the immediate thought is electricity. However, transportation uses a large chunk of energy. Lorries, cars, buses and airplanes use massive amounts of petroleum products daily to operate, releasing equally large amounts of carbon into the atmosphere. How can this be reduced? For the common man, opting for public transportation or car-pooling instead of driving a single-occupancy vehicle will be a good start. Reducing consumption of air-flown goods and air-travel is another action to reduce CO₂.

Conclusion

Being more energy efficient is not impossible and it does not have to cost massive amounts of money; but there must be a definite push in that direction. There must be incentives to encourage people to be more energy efficient; it could result in massive cost savings. People may not relate the effect of their actions on the Earth's temperature, but they usually will react to the pinch in their pockets. Hopefully, more Malaysians will soon realise the link between energy consumption and global warming and strive to be more energy efficient in their actions.

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Addressing Global Warming and Climate Change: What Has Malaysia Done?_____



In a recent public forum related to climate change, a foreign ambassador said Malaysia has not been taking global warming and climate change seriously till the occurrence of severe floods in Johor in last December. This statement seems to imply that Malaysia has not taken sufficient steps to address climate change seriously. Has Malaysia been ignoring global warming and climate change all this while? What has Malaysia done to address climate change?

Way back in 1990, Malaysia was one of the developing countries which actively negotiated for a convention on climate change. We insisted that developed countries must take the lead in reducing greenhouse gases. Malaysia was the only country that objected to the adoption of the text of the Framework Convention on Climate Change at the Intergovernmental Negotiating Committee in 1992 because it did not contain any meaningful commitment to reduction of greenhouse gases by developed countries.

On 11 October 1994, Malaysia became a Party to the Framework Convention on Climate Change, a clear reflection of our commitment to addressing climate change. Malaysia subsequently became a Party to the Kyoto Protocol on 16 February 2005.

In 1995, the Institute of Strategic and International Studies (ISIS) coordinated the preparation of the Initial National Communication of Malaysia which was submitted to the UNFCCC in year 2000. It contains a snapshot of the greenhouse gas inventory, possibly vulnerability and impact assessment of adverse climate change on the agricultural sector and the costal zones. A copy of the Communication is obtainable from http: //unfccc.int/resource/docs/natc/malnc1.pdf. In March 2007, the Ministry of Natural Resources and Environment launched the preparation of the second National Communication. The report, which is expected to be completed in three years, will update the inventory of greenhouse gases, vulnerability and adverse impact assessment as well as policies and measures taken by Malavsia.

Malaysia, like other developing countries, does not

have a single policy for climate change. However, several sectors have instituted their own policies and measures to address climate change. For example, for decades Malaysia has had clear policies, rules and regulations for the conservation of forests and reforestation for we are well aware that forests acts as carbon sinks.

Consumption of fossil fuels is a major source of greenhouse gas emissions in Malaysia. Chapter 19 of the Ninth Malaysian Plan indicates Malaysia's commitment to reducing her high dependence on petroleum products by increasing the use of alternate fuels and promotion of greater use of renewable energy for power generation by industries. Malaysia will also intensify energy efficiency initiatives in the industries, transport and commercial sectors as well as in government buildings.

In its move to promote renewable energy as an alternative fuel, Malaysia has several projects currently funded by Global Environment Facility (GEF). A major project is the Global Biomassbased Power Generation and Co-generation in the Malaysian palm oil industry. Here, palm oil refinery waste and empty fruit bunches are turned into biogas, while methane capture in the process also reduces emission of potent greenhouse gases into the atmosphere.

In the area of transport which is a major user of energy, the initiation of the Light Rail Transits (LRTs) and recently instituted Rapid KL aim to improve the public transport system in the Klang Valley in a move to reduce the use of private vehicles. Such integrated public transport systems will not only ease traffic congestion but also reduce emission of greenhouse gases. Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP) carries out capacity building and demonstration programmes to industries. It also examines incentive schemes to address inadequate information and perceived risks among the industrial players. At the moment, the project has successfully implemented more than seven energy efficiency technology demonstration projects.

While some big emitting developed countries are still reluctant to acknowledge the adverse impacts of climate change, the Malaysian Government has directed the Ministry of Science, Technology and Innovation to organise a National Seminar on Socio-economic Impacts of Extreme Weather and Climate Change in late June 2007 with a view to formulating a national strategy for future action.

Moves and efforts to address climate change are not restricted to government agencies only. Malaysian NGOs are also active in promoting public awareness. Mobilising Malaysians on Climate Change (MMCC) was a project funded by Danish International Development Agency (DANIDA) from 1 January, 2004 till 31 May, 2005. The project was initiated by CETDEM on behalf of the Malaysian Climate Change Group (MCCG). The project aimed at motivating Malaysians to act proactively on climate change issues through enhancement of their understanding and awareness of these issues. Four outputs emanated from this project: (a) advocacy and awareness campaigns, (b) expanding and sustaining MCCG, (c) establishing partnerships with important stakeholders and (d) capacity building among Malaysian NGOs.

While Malaysia does not have any limit to greenhouse gas emissions, the nation will continue to fulfill its commitments under the Convention. Towards this end, both the public and private sectors should work closely towards a low carbon society through enhancement of energy efficiency and consumption of renewable energy. In addition, Malaysia should enhance conservation of resources and develop adaptation strategies.

Global warming and climate change affect each and every individual irrespective of where he lives or how much of greenhouse gas he has emitted. Public participation is crucial in combating climate change. All of us could contribute positively before the reminder comes from the next severe flood. Addressing climate change is an imperative, which if ignored is at our own peril!

> Source Chow Kok Kee Email: kkchow111@gmail.com

Curbing the Impact of Global Warming

Global warming is our current perennial problem. It is complicated and involves the entire world, which is tangled up with difficult issues such as poverty, economic development and population growth. It will not be an easy task to deal with it. Nevertheless, not dealing with it or ignoring it will have dire consequences as already indicated by present scenarios and predicted impacts by studies that have been conducted. There will always be debates on the impacts of this issue. Still, the sooner we seek for solutions, the better it will be to ensure future sustainability.

In the mean time, human activities and modern lifestyles, particularly the burning of fossil fuels has and will continue to contribute to the increase in greenhouse gases around the Earth's atmosphere. This resulting increase in global temperatures is altering the complex web of systems that allows life to thrive on Earth. Thus, it is pertinent we understand and appreciate how we live our lives plays a part in the global picture.

Each individual can play their role to curb or reduce the emission of greenhouse gases. To help figure out what you can do in your own daily life, these are some of the most effective tips and things that can be done by all of us. Modifying these little things we do every day, like cooking or driving, can together add up substantially to a big impact on the globe's climate.

There are ways you can help to cut greenhouse gases and help stop global warming. The list below (though not exhaustive) consists of simple things that each of us can do, but which can make a big difference if everyone does them collectively:

- 1. Recycle as much recyclable items like glass bottles, jars, newspapers and magazines and tin cans. Save them and take them to local recycling centres.
- 2. Reuse plastic shopping bags and envelopes instead of getting new ones.
- **3.** Give unwanted gifts and clothes to charity and the needy.
- 4. Make a compost heap in your garden. It keeps the organic wastes like leftover food, vegetable peelings, tea bags, even animal hair from going to the landfill and producing methane. Start a composting campaign in your neighborhood.
- 5. You can place a brick in a plastic bag into your toilet cistern, so that the toilet will use

less water each time you flush.

- Only fill the kettle up with the amount of water you need to boil that time.
- 7. Only do your laundry when the washing machine is full.
- 8. Don't use your dryer; instead dry your clothes outside.
- 9. Car pool to office and when taking your children to school.



- **10**. Drive a car with good gas mileage and leave it in the garage as much as possible, i.e, use it only when necessary.
- 11. Attempt to take public transit to work instead of sitting in traffic; it helps to conserve energy and preserve the environment.
- **12.** Keep your engine tuned and your tires inflated.
- **13.** Take a train rather than a plane; it causes less than half the emissions.
- 14. Consider a diesel car. Emissions can be up to 10% lower.
- 15. Try to shop online to cut out the middleman and the extra burden of shipping and driving to the store.
- 16. Have showers instead of baths.
- 17. Insulate your water heater for better energy efficiency.
- Replace incandescent bulbs with compact fluorescents in your home and business. Fluorescent bulbs last 10 times as long and use considerably less energy.
- 19. Get rid of all your standby power-cell phone chargers, iPods, PDAs, even appliances and your TV and DVD player. Unplug them when they're not being used as they would

continue to consume energy (30 million tonnes of greenhouse gases a year).

- 20. When replacing kitchen appliances, go for Energy Star models, which save money as well as energy. If your appliances are less than five years old, it's a waste to replace them; just keep them in good working order.
- 21. Have proper ventilation and the right amount of insulation, so your home doesn't need air-conditioning or cooling
- 22. Switch air-conditioners, fans and lights off when you're leaving the room.
- 23. Have your heater and your air-conditioning system regularly serviced. These appliances won't keep as hot or as cool if they're not working properly, and they'll produce more emissions.
- 24. Clean your refrigerator coils. They will cool the fridge down more easily, reducing emissions. Keep door seals clean too, to retain the chill.
- 25. Use paper on both sides.
- 26. Try and buy products that don't use much packaging.
- Buy only post-consumer recycled paper products; the paper industry is the third greatest contributor to global warming emissions.
- 28. Eat less meat, dairy and rice; the production of these foods increases the amount of methane in the atmosphere.
- 29. Plant a tree. Deforestation is responsible for one-fourth of the carbon emissions in our environment.
- 30. Tell companies you invest in that you care about global warming and you will pull out your investment if they don't address the issue.
- 31. Get involved in community planning in your own town. Voice your concern about the need for sustainable city and living, e.g. building energy efficient buildings, adding bike lanes and bike racks into urban centres, and improving public transport.
- **32.** Use your voting power to appoint representatives and candidates with an environmental conservation record.
- **33.** Try to watch Al Gore's new movie, *An Inconvenient Truth*, to appreciate and understand more about global warming issues.

Cutting fossil fuel use while maintaining economic growth will be a major challenge to mankind.

Source Dr. Sumiani Yusoff Email: sumiani@um.edu.my

Activity Highlights Department of Environment, Malaysia

April 2007

The 6th Malaysia – Singapore Joint Committee on the Environment (MSJCE) Working Group Meeting

The Sixth Meeting of the Malaysia – Singapore Joint Committee on the Environment (MSJCE) Working Group was held on 16–17 April 2007. As the first recipient of the Sustainable City-Environment Award, Kuantan was chosen as the venue for this annual bilateral meeting.

The meeting was co-chaired by Dato' Hajah Rosnani Ibarahim, Director General of Environment, Malaysia and Mr. Lee Yuen Hee, Chief Executive Officer of the National Environment Agency (NEA), Singapore. The



May 2007

Task Force Meeting to Develop a Framework of Collaboration Between Malaysia and Indonesia in Dealing with Land and Forest Fires and Haze in Riau Province, Sumatra, Indonesia



A Task Force Meeting to develop a Framework of Collaboration between Malaysia and Indonesia in Dealing with Land and Forest Fires and Haze in Riau Province, Sumatra, Indonesia was held in Putrajaya on 30 – 31 May 2007. Co-chaired by Mrs. Masnellyarti Hilman, Deputy Minister for Conservation, Enhancement and Environmental Degradation Management, Ministry of Environment, Indonesia and Dato' Hajah Rosnani Ibarahim, Director General, Department of Environment,

Malaysia, the main objective of the meeting was to discuss activities with potential to prevent land and forest fires in accordance with Indonesia's Plan of Action (POA) in Dealing With Transboundary Haze Pollution.

June 2007 World Environment Day

On 5 June 2007, the Department of Environment (DOE) commemorated World Environment Day (WED) with the theme "Melting Ice – A Hot Topic?" at Dewan Baiduri, Putrajaya. The theme focused on the effects of climate change on the polar ecosystems and communities, and the ensuing consequences of climate change around the world. Several activities were implemented to mark WED:

- Car pooling
- Collection of used papers and old newspapers for recycling
- Energy conservation
- Screening of documentary, An Inconvenient Truth





Upcoming Event

Sustainable School Workshop 2006/2007

The above workshop will be held on 14 to 16 August 2007 at Guoman Hotels in Port Dickson, Negeri Sembilan. For further enquiries, please contact azlinaomar@doe.gov.my.

Forthcoming Issue

To commemorate the nation's 50th Anniversary celebrations, the third issue of IMPAK will focus on the nation's efforts to sensitize its citizens, both individuals and corporations, towards responsible environmental citizenship.



Article contributions and comments are welcomed. They are to be directed to : lingchui@doe.gov.my Tel: 603 8871 2083 Fax: 603 8889 1042

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Views and opinions expressed by the contributors do not necessarily reflect the official stand of DOE.

