





Quarterly DOE Update on Environment, Development & Sustainability

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Your Planet Needs You! UNite to Combat Climate Change



World Environment Day

Every year, 5th of June is commemorated as World Environment Day - each time in a different city of the world. It is one of the ways in which the United Nations works to make the world's population aware of the environment and to encourage people and governments around the world to take action that promotes the common good by promoting a healthy environment.

The day's agenda is to give a human face to environmental issues; empower people to become active agents of sustainable and equitable development; promote an understanding that communities are important to changing attitudes towards environmental issues; and advocate partnership which will ensure all nations and people enjoy a safer and more prosperous future.

This year's theme – “Your Planet Needs You! UNite to Combat Climate Change” invites governments, industries, communities and individuals to focus on lessening the impact of human activities on the global climate. Aimed at promoting low carbon economies and lifestyles, such as improved energy efficiency, alternative energy sources, improved management of forests and eco-friendly consumption, it also reflects the urgency for nations to concur on a new agreement at the crucial climate convention meeting in Copenhagen later this year.

The host this year is Mexico – a country that accounts for about 1.5% of global greenhouse gas emissions, but determined to demonstrate its commitment against climate change by being a leading partner in UNEP's Billion Tree Campaign and through better management of its natural resources.



Mexico's President, Felipe Calderon, declared that his country would plant 250 million trees in 2007. With this commitment, the Government of Mexico launched the *Pro Árbol (Pro tree) Campaign*. It aims to reach one-fourth of the goal set by the United Nations Environment Program (UNEP) Global Campaign.



your planet needs YOU!

UNite to combat climate change

WORLD ENVIRONMENT DAY, 5 JUNE 2009



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From the desk of the Director General

Your Planet Needs You! UNite to Combat Climate Change



Every year on 5 June, the World commemorates Environment Day. The city chosen to mark the occasion this year is Mexico City. The host country, Mexico is a leading partner in the United Nations Environment Program (UNEP) "Billion Trees Campaign". The theme of the commemoration this year is "Your Planet Needs You! UNite to Combat Climate Change". And the response from all of us must be a resounding "Yes, we will Unite, for a Safer and a More Prosperous Future!"

We must make a very serious commitment to combat climate change because we cannot just wait and watch and despair. It will take years before scientists can confirm climate change assertions with certainty. Meanwhile communities and individuals are bearing the brunt of changes they cannot fully understand. Take for example, small islands which depend almost entirely on tourism. The island country of Tuvalu is literally sinking! The island's marine ecosystem is severely endangered affecting fisheries and coral reefs. Sedimentation, erosion and coastal land loss are restricting human habitation. Coastal aquifers and soils are experiencing greater salination. The IPCC reported (in 2007) that by 2080, rising sea levels could convert as much as 33% of the world's coastal wetlands to open water.

Clearly, climate change will be one of the scourges of the twenty-first century. To deal with this unprecedented threat, we must UNite and educate our people on how climate change can affect our lives in the near future. Environmental consciousness is said to be a hallmark of a prosperous society. And we in Malaysia must go all out to step up the pace of combating climate change. We must get our people to make a commitment to be 'kind' to Planet Earth. We must make an effort to de-carbon our life. We must become more energy efficient. We must become more materials efficient. We must seek cleaner alternatives. We must buy low carbon products on offer. We must 'buy and sell green'. Together, all of us must work towards eco-friendly solutions that reduce our carbon footprint.

Today's youth will experience the effects of climate change tomorrow. Of course, the thermal expansion of sea water and the rapid melting of land ice are not of their doing. And it is precisely because they are not involved in bringing about this that they have become our best hope of getting us out of this vicious

cycle. Youth, more than ever, are beginning to believe that their personal choices will make an environmental difference. It is indeed a heartening development!

We must emulate the European Union (EU). The EU has been at the forefront of efforts to disseminate communication initiatives on climate change in schools. These include video clips, publications and diaries. Youths are exposed to the concept of carbon footprint thus encouraging carbon neutral practices from an early age. Educators are also promoting various activities to create awareness. Poster campaigns, fund raising activities, incorporating eco-friendly solutions in schools/colleges, encouraging bicycle rides and walking expeditions are all part of the "It's Happening, Man" thing!

In this issue, we are also highlighting the tax incentives provided in Malaysia, for going green. In this article, these relate to use of biomass as a renewable energy resource. Hydropower and solar power generation also enjoy tax incentives. There are also incentives for energy conservation, waste recycling and reduction of greenhouse gas emissions. But the onus remains on polluters being made accountable for their actions and practices. They must be brought to book. This issue also looks at the exciting and hopeful practice of carbon capture and storage to mitigate global warming, a technology which Malaysia is rather inexperienced in relation to technical know-how. As ever, the boundaries of developing strategies to cope with climate change are being pushed back and we as a country must keep pace with such innovations.

In essence, the World Environment Day is a stark reminder of the hard work ahead and of the unity of purpose required of the world's inhabitants to combat climate change.

Yes we will UNite!

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

UNite to Combat Climate Change



Parties agree in Poznan, Poland that the first draft of a concrete negotiating text would be available at a UNFCCC gathering in Bonn in June of 2009.

The facts are clear. Global climate change is happening and is threatening the lives and livelihoods of billions of people and the existence of millions of species.

In 2007, the Climate Conference in Bali culminated in the adoption of the Bali Road Map, which consisted of a number of forward-looking decisions that represented the various tracks essential to reaching a secure climate future. The Bali Road Map included the Bali Action Plan that charted the course for a new negotiating process designed to tackle climate change, with the aim of completing this by 2009.

In December 2008, the United Nations Climate Change Conference was held in Pozna, Poland, with a clear commitment from governments to shift into full negotiating mode in 2009 in order to shape an ambitious and effective international response to climate change.

In December 2009, some 189 governments are expected to meet in Copenhagen, Denmark, for the fifteenth UN Climate Conference, to agree on a comprehensive global climate regime for the period after 2012, when the first commitment period of the Kyoto Protocol expires. This will be the biggest summit on climate change ever to take place. "UNite to Combat Climate Change" will be the United Nations' campaign to support the call for a definitive agreement at the Copenhagen meeting.

Your Contribution to Planet Earth

Climate change may seem like a problem that is too big for individuals to address. But we can, because

Small Actions x Lots of People = Big Change!

There are a number of steps that you can take to reduce your carbon emissions, the total of which is described as your 'Carbon Footprint'. The UNEP outlines the following 12 pointers^[1] to individuals, organisations, businesses and governments, to kick-start their effort to combat climate change.

1 Make a commitment

Just as it is for most tasks that you yearn to accomplish, it needs to start with a firm commitment. Announce your commitment to reduce your carbon footprint (or even go 'Carbon Neutral' by achieving net zero carbon emissions) within a time-frame you think is realistic. Discuss and ask for ideas so as to develop creative and innovative solutions for your venture.

Several countries in recent months have declared their intention to go carbon neutral, essentially through carbon offsetting. And the UNEP, through its climate neutral network, facilitates carbon neutrality in all sectors and all regions.

2 Assess where you stand

Identifying your baseline to know where and how you generate greenhouse gases is the first step to reducing them. For individuals and small businesses, there are several online calculators^[2-4] and internal assessments to help start the process.

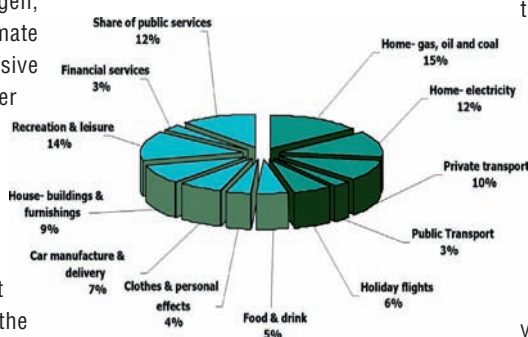


Figure 1: A typical person's carbon footprint.

As an example, the pie-chart above indicates the main elements which make up the total of a typical person's carbon footprint in the developed world.^[5] Larger organisations may need specialised advice and tools to quantify, manage and report their greenhouse gas emissions.

3 Decide and plan where you want to go

Build a strategy and action plan to reduce your carbon emissions, based on an assessment of your carbon footprint. Develop targets to help focus your efforts and to provide a benchmark for measuring your achievements. An easily achievable target for most homes or businesses is a 10% reduction in energy use. This usually translates to a

10% reduction in greenhouse gas emissions with a payback period of a year or less.

Plans to reduce carbon emissions commonly focus on the type of energy and the way it is used; for example, electricity for buildings and fuel for transport. Reducing this energy use can create instant savings. An effective tool for this purpose is an energy audit. Many electric utilities and government energy offices now offer an audit as part of their efforts to reduce carbon emissions.

4 De-carbon your life

Everything, an individual, organisation, business or government does or uses, represents some form of carbon, either in the products themselves or in the energy and materials that are used to make them. Therefore, if consumers, manufacturers and lawmakers all think 'low carbon' and 'climate friendly', savings in carbon emissions will multiply.

Using recycled or sustainably sourced paper can also lead to considerable savings, reducing both landfill use and carbon emissions. It is claimed that recycled paper can save 1.4 tonnes of CO₂ for every tonne of paper and cardboard used.

Wasting less time and energy on travel can reduce your carbon footprint significantly. Public transport options can be improved in cities and individuals can car pool or use public transport or even commute by bicycle.

Other ways you can reduce your carbon footprint include buying only things that you really need or want, because every time you buy a product you are responsible for the emissions due to its manufacturing, packaging and transportation. Buying local products avoids unnecessary 'transportation miles' while buying organic produce or growing your own helps to cut carbon emissions because conventional intensive farming methods use 25-50% more energy than organic farming per unit of product. Do not waste food because there is a lot of CO₂ emissions associated in preparing, packaging, transporting and heating food.

ACTUAL SAVINGS

By reducing packaging on 16 items: Walmart, the US retail giant, **SAVED**

- 41,000 litres of oil!
- 1,300 trees!

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5 Get energy-efficient

Improving the efficiency of your buildings, cars and electrical appliances is the direct, fastest and most attractive way to save money, energy and to limit carbon emissions. Turning off unused lights, motors, computers, fans and air-conditioners (for cooling or heating) can substantially reduce wasted energy and money. Where possible, go for appliances that use the US Environmental Protection Agency (EPA) - established Energy Star rating.

Telecommuting (using telecommunications to avoid the use of transportation to travel to and from the traditional workplace) is increasingly becoming an option for many. A study by the Telework Coalition found that if 32 million Americans who could telecommute did so one day a week, they would drive 2 billion kilometres less, save 300 million litres of fuel and gain the equivalent of 32 million extra hours every week for leisure, family or work.

About 15-20% of total electricity generated goes for lighting. Compact Fluorescent Lights (CFLs) are not only long-lasting, but also reduce electricity use by at least 75% compared to a standard incandescent bulb. In 2007, Australia was the first country to mandate that no incandescent bulbs will be sold by 2012, a move that will reduce carbon emissions by 4 million tonnes and cut power bills for lighting by up to 66%.

According to the International Energy Agency's World Energy Outlook 2008, almost half or 48% of energy consumed in the home is wasted through inefficiency. [6] To reduce such wastage, drawing open curtains in the morning for natural lighting and painting offices and households in light colours help reflect available light. Waste less water because the biggest use of electricity in most cities is in supplying water and cleaning it up after it has been used. Upping the temperature of the air-conditioner from, say, 20° to 24°C, can save up to 33% of energy.

6 Switch to low carbon energy

If the option is available, switch to energy sources that emit less carbon. In general, coal produces twice the emissions of natural gas, 6 times the amount of solar, 40 times the amount

of wind and 200 times the amount from hydro. Customers in many parts of the world have the option to choose a percentage of their electricity to be supplied from a renewable energy source such as a wind farm or a landfill gas project. These 'Green Choice' programmes are maturing and proving to be a powerful stimulus for growth in renewable energy supply.

7 Invest in offsets and cleaner alternatives

When there is only that much of carbon that you can squeeze from your lifestyle or your organisation's operations, there is a choice for those who wish to compensate for their remaining carbon emissions. This is by funding an activity by another party that reduces emissions. This is commonly called a 'Carbon Offset' or 'Carbon Credit'. The term carbon neutral includes the idea of neutralising emissions through supporting carbon savings elsewhere. The average price for carbon offsets is USD15 per tonne, but costs range from USD5-50 per tonne. To purchase offsets, individuals or businesses pay an offset company to implement and manage projects that avoid, reduce or absorb greenhouse gases.



8 Get materials-efficient

Reducing waste and becoming more efficient is always a good idea. So integrate the 3R approach – reduce, reuse and recycle – into your thinking.

9 Offer – or buy – low carbon products and services

Climate friendly products and services represent a growing market. 'Ecodesign' is an approach to designing a product with special consideration for the environmental impacts of the product during its whole lifecycle. The design process for such items also considers 'energy-efficient specifications' to make products that minimise energy consumption during its use.

10 Buy green, sell green

There is a huge potential for green products and services because growing numbers of consumers are willing to buy green products, if given the choice. However, the market for green

products remains underdeveloped because people still find it difficult to locate such products or trust their environmental claims. Businesses should arise to this opportunity to be innovative in product design and presentation, and with responsible marketing and communications, help ensure that such consumer interest translates into purchasing.



11 Team up

Many private sector companies are increasingly working with non governmental organisations, cities or governments to identify and implement best practice solutions to reduce carbon emissions. Similarly, local and national governments are seeking opportunities to partner with business on delivering low carbon solutions. In 2006, American businesses and consumers saved USD14 billion on energy bills with the help of the US EPA Energy Star and reduced greenhouse gas emissions equal to 25 million vehicles annually.

12 Communicate and report results

Finally, it is important to talk about performance. For businesses and organisations, communication and transparency are vital against a setting where their operations can influence global climate change.

Global Challenge that Requires Global Action

People around the planet must mobilise and unite to take action against the root causes of climate change and the key agents responsible. We have to collectively decide what our future can be. And more important than ever, this has to start right now ... Yes, Your Planet Needs You NOW. So get involved to combat climate change!

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Source
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Climate Change: International Responses and Malaysia

Climate change and variability has been the topic of discussion among students of Meteorology and Climatology for many years well before the 1970s. But serious public attention regarding the issue came about only after 1979 when climate change and variability became an important discussion topic in the First World Climate Conference (WMO 1979). Finally in 1988, through the United Nations General Assembly (UNGA) 43/53, a resolution declaring climate change to be “a common concern of mankind” was adopted. In the same year, WHO and UNEP created the Intergovernmental Panel on Climate Change (IPCC) – a special panel to oversee and assess scientific information on the subject of climate change.

The IPCC

Two years after its creation, the IPCC issued its First Assessment Report in 1990 which confirmed that the threat of climate change was real with far-reaching consequences. This Report formed the background to the November 1990 Ministerial Declaration of the Second World Climate Conference, which recommended that negotiations on a ‘Framework Climate Convention’ begin without delay. The UNFCCC was finalised and adopted in 1992 and came into force in March 1994. The UNFCCC (1992) divides Parties into three major categories as follows:

Annex I

OECD* countries and ‘economies in transition’ (EITs) totaling 41 altogether including 16 EITs

Annex II

OECD countries only – totaling 24 altogether

Non-Annex

Most developing countries

* Organisation for Economic Cooperation & Development

The Kyoto Protocol

The Kyoto Protocol which is integral to the UNFCCC was adopted three years later in December 1997 in Japan and came into force eight years later in February 2005. The United States, the largest producer of greenhouse gas emissions, has not ratified the Protocol.

For purposes of meeting the commitments under Article 3, the Kyoto Protocol introduced ‘flexible mechanisms’ which

allow Annex I economies to meet their greenhouse gas emission limitations by purchasing greenhouse gas emission reductions from elsewhere. These can be bought either from financial exchanges, from projects which reduce emissions in Non-Annex 1 economies under the Clean Development Mechanism (CDM), from other Annex I countries under the Joint Implementation (JI), or from Annex I countries with excess allowances. Only CDM Executive Board – accredited Certified Emission Reductions (CERs) can be bought and sold in this manner. Under the aegis of the UN, Kyoto established this Bonn-based CDM Projects in Non-Annex I economies prior to awarding CERs. A similar scheme called ‘Joint Implementation’ or JI applies in transitional economies mainly covering the former Soviet Union and Eastern Europe.

Malaysia’s Response

Malaysia signed the UNFCCC on 9 June 1993 and ratified it about one year later on 17 July 1994. Malaysia also signed the Kyoto Protocol on 12 March 1999 and ratified it on 4 September 2002. Malaysia was included under non-Annex Parties who generally argued that the per capita emission rates of the developing countries are only “a tiny fraction of those in the developed world.” Following the principle of “common but differentiated” responsibility,

the developing countries maintain that the major responsibility of curbing emission rests with the developed countries which have accumulated emissions over a long period of time.

The most often asked questions about Malaysia’s response to climate change remain the following:

1. What has Malaysia done to address global warming and climate change?

2. Has Malaysia done enough for climate change?

Table 1 has been compiled to answer question (1). It highlights some selected initiatives which are already in place in an attempt to address the climate change issues both internationally and at home. It can be observed that the initiatives shown in Table 1 involve not only the government but also the industries and NGOs.

As a signatory to both the Convention and the Protocol, Malaysia has no greenhouse gas emission restrictions as those classified under Annex I. However, Malaysia (along with the rest of the developing countries) is subject to the obligations as articulated in Article 4 of the UNFCCC.

Table 1: Climate change: some major initiatives by Malaysia

1. In 1990, Malaysia was one of the developing countries which actively negotiated for a convention on climate change. It insisted that developed countries must take the lead in reducing greenhouse gases.
2. In 1992, Malaysia objected to the draft text of the UNFCCC at the Intergovernmental Negotiating Committee because it did not contain any meaningful commitments to a reduction in greenhouse gases by developed countries.
3. Malaysia signed the UNFCCC on 9 June 1993 and ratified it on 17 July 1994. She also signed the Kyoto Protocol on 12 March 1999 and ratified it on 4 September 2002 – a commitment by Malaysia to address global warming and climate change.
4. In 1995, Institute of Strategic and International Studies (ISIS), Malaysia coordinated the preparation of the Initial National Communication of Malaysia (NC1) which was submitted to UNFCCC in 2000. The Report provides information on the greenhouse gas inventory, possible impacts and vulnerable economic sectors due to climate change, and public awareness and education programmes. The NC2 is now due to be completed in 2009.
5. Although Malaysia does not have a dedicated policy on climate change, several sectors have instituted their own policies and measures to address the impacts of climate change. For example, Malaysia has had clear policies, rules and regulations for the conservation of forests – the latter being an efficient carbon sink.
6. Chapter 19 of the Ninth Malaysia Plan indicates Malaysia’s commitment to reducing her high dependence on petroleum products by promoting the use of alternative fuels and renewable energy for power generation. Malaysia shall continue to promote energy efficiency initiatives not only in industries, transport and commercial sectors but also in government buildings.
7. Several projects on renewable energy funded by the Global Environment Facility (GEF) are currently underway. The Global Biomass-based Power Conservation and Co-generation project using palm oil refinery waste and empty fruit bunches is a good example. It produces biogas, while methane capture in the process also reduces emission of greenhouse gases into the atmosphere.
8. Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP) undertakes capacity building and demonstration programmes to industries.
9. Malaysian NGOs are also active in promoting public awareness. A project to mobilise the level of awareness amongst Malaysians regarding climate change was initiated by CETDEM to act proactively on climate change issues through enhancement of their understanding and awareness of these issues.

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3. Ninth Malaysia Plan (2006 – 2010). Government Printers: Kuala Lumpur

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Article 4 Obligations

1. To develop, periodically update, publish and make available to the Conference of Parties national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties.
2. To formulate, implement, publish and regularly update national and where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change.
3. To promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems.
4. To promote and cooperate in education, training and public awareness related to climate change and encourage the widest participation in this process, including that of non-governmental organisations.
5. To communicate to the Conference of the Parties, information related to implementation, in accordance with Article 12.

With regard to obligations (1) and (5), Malaysia submitted an Initial National Communication to the UNFCCC in July 2000 (Ministry of Science, Technology and Environment Malaysia, 2002).

To be realistic obligations (2), (3) and (4) need to be discussed appropriately in the context of environmental conservation, protection and management programmes already in place in Malaysia. While it might be true to a certain extent, that climate change is not a major area of concern among Malaysian society as yet, the concerns and efforts to mitigate and manage climate change date back to as early as the 1920s if not earlier (Sham and Arif 2007). The Waters Enactment and the Forest Enactment, for example, were introduced in 1920 and 1934 respectively.

We already have some key regulations (as of October 2007) under Environment Quality Act (EQA) 1974 which are relevant to climate change and a reduction in greenhouse gas emissions (Obligation 2). In addition, the Ninth Malaysia Plan (2006-2010) also outlines several measures to reduce emissions from both stationary and mobile sources including a comprehensive Clean Air Action Plan, the promotion on cleaner

technologies and the use of renewable energy as alternative fuels apart from several energy efficiency improvement projects in industries (Sham, 2009).

Efforts to address climate change also involve NGOs in promoting public awareness. Mobilising Malaysians on Climate Change (MMCC) was a project funded by Danish International Development Agency (DANIDA) between 2004 - 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. Four outputs are expected from the project: (a) advocacy and awareness campaigns; (b) expanding and sustaining MCCG; (c) establishing partnerships with important stakeholders; and (d) capacity building among Malaysians NGOs.

The promotion of sustainable management in the conservation and enhancement of "sinks and reservoirs of all greenhouse gases including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems" is another obligation for Malaysia under the UNFCCC and the Kyoto Protocol (Obligation 3). In principle, Malaysia is already committed to the concept of sustainable development. The spirit embodied in this concept was officially endorsed in the Third Malaysia Plan (1976 - 80) and continued to be the thrust in the subsequent Malaysia Plans. The Langkawi Declaration on Environment and Development, mooted by Malaysia and issued by the Commonwealth Heads of Governments on 21 October, 1989 provides an affirmative programme of action to help protect and conserve planet Earth. The Ninth Malaysia Plan (2006 - 2010) reiterated that "environmental stewardship will continue to be promoted to ensure that the balance between

development needs and the environment is maintained. Greater focus will be placed on preventive measures to mitigate negative environmental effects at source, intensifying conservation efforts and sustainably managing natural resources." Table 2 summarises some of the climate-related policies that are already in place in the process of achieving sustainable development. It is interesting to note that many of these policies are crucial in the "conservation and enhancement of sinks and reservoirs of all greenhouse gases." Indeed, the National Transport Policy (Land) and the National Energy Policy, for example, are direct efforts to reduce greenhouse gas emissions from motor vehicles and industries.

Another of Malaysia's obligations under the UNFCCC and the Kyoto Protocol is the commitment to "promote and cooperate in education, training and public awareness related to climate change and encourage the widest participation in this process, including that of NGOs" (Obligation 4). For many years, the Department of Environment (DOE) together with NGOs, the corporate sector and other government agencies have been implementing various environmental education and awareness programmes, targeted at various groups. Some of the major programmes are shown in Table 3. In 2002, the Malaysian Environmental NGOs (MENGOs) was established to bring together 18 environmental-related organisations to improve cooperation and integration of their efforts in raising awareness on environmental and natural resource issues and in providing inputs, comments and feedback to the Government. In addition, the *Bandar Lestari - Anugerah Alam Sekitar* programme was launched in 2005 to recognise Local Authorities that keep abreast of innovations and practices

Table 2: Selected national climate-related policies already in place towards achieving sustainable development

National Policies	Objectives
1. National Environmental Policy	To promote continuous, social and cultural progress and enhancement of the quality of life of Malaysians through environmentally sound and sustainable development.
2. The National Forest Policy 1978	To ensure the sound climatic and physical condition of the country; the safe guarding of water supplies and soil fertility; and minimisation of damage by agricultural land.
3. The Biodiversity Policy	To conserve Malaysia's biological diversity and to ensure that its components are utilised in a sustainable manner for the continued progress and socio-economic development of the nation.
4. The National Energy Policy	A major objective of this Policy is to minimise the negative impacts of energy production, transportation, conservation, utilisation and consumption on the environment.
5. The National Transport Policy (Land)	Three major objectives: (1) To enhance public transportation infrastructure and to encourage use of public transport; (2) To encourage development and construction of public transportation facilities; (3) To encourage the use of natural gas in the motor vehicles.
6. Third National Agricultural Policy (1998 - 2010)	Sustainable management and utilisation of resources will be the guiding principle in pursuing agricultural and forestry development. Rules, regulations and incentives will be strengthened to encourage 'environment-friendly' agricultural and forestry practices and to minimise the negative impacts of these activities on the environment.

in creating and maintaining a healthy environment for human habitation. During the Ninth Malaysia Plan (2006 - 2010), efforts to promote and inculcate an environment-friendly culture and practice among Malaysians are being intensified and will involve the active participation of the private sector and NGOs. Appropriate interventions and changes will be made through the school curriculum to create a deeper and longer lasting awareness of the need to care for the environment. The private sector will be encouraged to institute responsible care programmes within industries and companies to develop a higher degree of care towards public safety, security and the environment.

Table 3: Some of the major programmes promoted by the DOE

• Enviro-Camps
• Environmental Debates
• Sustainable School - Environmental Award
• Clean-up Projects (<i>Gotong Royong</i>)
• Tree Planting and Landscaping
• Radio Environmental Quizzes
• Environmental Essay Writing Competition
• Drawing/Colouring Competition
• Langkawi Award
• Enviro-camp Facilitators' Training Programmes (for environmental educators/ teachers)
• Sustainable City Programme (for the local authorities)
• "Enviro-Walk" (for senior management of companies/ industries)

Is Malaysia Doing Enough for Climate Change?

Obviously Malaysia has a long way to go in its efforts to cut down greenhouse gas emissions due to motor vehicles and industrial activities. Nevertheless efforts are being made. And although under the UNFCCC and the Kyoto Protocol, Malaysia is not subject to emission reduction limits, it is nevertheless, required, among other things, to formulate, and implement national programmes "containing measures to mitigate climate change by addressing anthropogenic emissions..." (Obligation 2). Malaysia should also be prepared for a stiffer obligation and commitment in the post-Kyoto period. Pressures for developing countries to make a more meaningful contribution to reduce effects of climate change in the post-Kyoto period are already mounting. Serious efforts are needed by Malaysia to reduce greenhouse gas emissions through the clean technologies mechanism, legislation, stricter standards, enforcement of regulations, and the implementation of the newly formulated Clean Air Action Plan. The participation of the corporate sector and the public is critical in order to ensure the success of this effort.

Equally important is the concern about the gap between policies and their implementation. While efforts in the forms of policies, plans and intentions are useful, such efforts will need to be translated into real actions and implemented effectively. The effectiveness of such actions should be reported "in a transparent and verifiable manner." In this respect, a Climate Change Performance Index (CCPI) could be a useful tool to assess and monitor progress and performance of an individual nation in its efforts to reduce greenhouse gases in the climate change regime. The Climate Change Performance Index developed by Germanwatch is one such tool (Germanwatch 2007). It enhances transparency in international climate change politics provided the CCPI is developed fairly and administered judiciously. The Germanwatch (2007) noted that in terms of climate change performance index, Malaysia was among the 10 lowest in comparison with a total of 56 countries analysed. Although the basis of the climate change performance index by Germanwatch could still be argued, the fact remains that Malaysia is not ranked favourably among nations.



Malaysia can no longer ignore public opinion regarding its performance in mitigating climate change. There is indeed a need for Malaysia to quickly consolidate all the existing sectoral policies related to climate issues into a National Climate Policy and Strategy (followed by an action plan) with the hope that Malaysia can be more focused in its efforts to reduce effects of climate change. The National Climate Policy should have the following as its objectives:

1. To propose implementation strategies of the UNFCCC and Kyoto Protocol up until 2012;
2. To provide guidance in preparation for the post-Kyoto era;

3. To facilitate incorporation of future climate risks and adaptation to climate change; and
4. To strengthen the institutional framework for inter-agency collaboration and to streamline state and local level participation in national climate change initiatives.

Concluding Remarks

A number of climate-related policies and programme activities are already in place. Policies on forestry, biodiversity and the environment, for example, have been instituted and implemented for many years. That notwithstanding, and in order to be more focused, concerted efforts need to be made to consolidate what Malaysia already has into a National Climate Policy, professionally instituted and implemented. Such a National Climate Policy should address not only Malaysia's obligations as articulated in the UNFCCC and the Kyoto Protocol but move beyond to cover sustainable development at the same time. This is because the challenge of climate change is really the challenge of sustainable development. The way we produce and consume energy is by far the single biggest contributor to global warming. Ideally, what is needed is a new political dynamic that is not so intent on "burden-sharing" but more on the opportunity to move toward more sustainable policies and practices.

In the meantime, Malaysia should be aware and sensitive about the prevailing international politics of climate change. We should be able to distinguish between our domestic policies and commitments, and those that are expected of us at the international level through multi-lateral agreements. Malaysia must respond accordingly.

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Source

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Climate Change: Educating the Youth of the World

Temperature is rising. Large parts of the planet are becoming drier and deserts spreading. Other parts of the world are receiving more rain and floods are becoming a norm. The oceans are warming up and expanding, washing over islands and coastlines. Fierce storms are occurring at a frequency never seen before. Crops are failing and vulnerable communities are abandoning their homes to migrate elsewhere. As the climate is changing faster than ever before in human history, a crowded and troubled world is struggling to cope. Call it *El-Nino* or *La-Nina*. They are 'Nature's Vicious Cycle' resulting from climate change.

Many questions remain, and researchers are working hard to answer them. But while scientific certainty is still some years away, the world's Governments have decided that the risks are simply too big to ignore. As an educator, what can I do to help? What can schools and universities do to fill the information gaps on climate change in terms of awareness?

Today's teenagers are likely to experience the effects of climate change tomorrow, perhaps much more than what we are facing today and they will be forced to address the issue. It is thus important that we familiarise them with what we know today so they become aware of the causes of climate change and understand what actions they can take. They must understand that the full brunt of climate change will be significant in their generation.

Promoting more research into climate change and featuring the issues in the curriculum for both children and youth certainly represent the way forward in making the future generations understand the seriousness of the catastrophe. The unique challenges faced by every country and the response towards their business in reducing the impact on the environment can be made into case studies in university curriculum. India's wind power project, Europe's carbon trading scheme, Brazil's forest conservation legislation and China's air pollution control are some of the good examples that should be well documented (Table 1).

The Green Audit

The preliminary step in scrutinising any business and the way in which it uses resources to reduce impact on the climate is to undergo a green audit. Getting students to carry out thorough assessments will help them define meaningful goals for a green strategy that can serve as a useful learning experience.

The types of audit will vary depending on the type of business that these students are intending to assess. For heavy industries, for example, students can be employed to investigate energy use in their plants and by their machinery, as well as the impacts of their transport systems, use of water, and systems for waste disposal. For service providing businesses such as insurance, tourism and banking, the focus of the audit is more likely to be on office-based energy use and waste, the working environment, and the impact of an organisation's business activities on the environment. The tourism industry is one example of an industry that has responded well in incorporating the responsible tourism concept that ensures all stakeholders are conscious of the impact of their operations on the environment (Nair & Azmi, 2008).

Once the students have identified areas to focus on, there are various types of audit that can be done including:

- **Energy audits:** Understanding how to reduce CO₂ emissions by identifying the points at which the organisation uses the most energy.
- **Waste audits:** Pinpointing the sources of waste in organisations and enabling waste reduction strategy.
- **Water audits:** Identifying areas in which water use can be monitored and reduced.
- **Environmental systems audits:** Constructing an environmental management strategy by looking at the staff and management structures that are in place.
- **Compliance audits:** Establishing whether all aspects of the business are fully compliant with regulatory requirements.

Activities Directed at Youth

The European Union (EU) has been at the forefront of international efforts to combat

Table 1: Global measures responding to climate change (Der Zee 2008)

	Rapid population growth is leading to increasing environmental problems. In response, India is now the world's fourth largest producer of wind power and is encouraging the development of other renewable energy sources.
	The European Trading Scheme (ETS), the world's largest carbon trading scheme – has been set up in Europe. The Common Agricultural Policy that subsidises farming has been amended to encourage more sustainable farming practices.
	The greatest challenge being faced in Brazil is preventing massive deforestation that is presenting a serious threat to the climate. International negotiators are working hard to find a way to include forest conservation in the legislation that will become the successor to the Kyoto agreement.
	Tackling the congestion and air pollution problem that plagues the populous cities in China is an urgent priority. The government has set itself the task of improving industrial recycling, water use, and energy efficiency, and is building eco cities that will ban cars from their centres and have the latest waste and energy technologies in place.

climate change (European Community 2007). According to the European Commissioner for the Environment, Stavros Dimas:

"People tend to believe that their personal choices do not make a difference for the greater good. In fact, they do. As much as we have been the source of climate change, we can help combat it. Each and every one (of us) can contribute by making those choices that express respect for the environment."

The reports from the European Community (2006) showed the various activities done in schools to disseminate communication initiatives on climate change, which include producing and disseminating video clips, publications and a diary for schools, hosting conferences and organising exhibitions. Coordinating a network of climate ambassadors in schools, can make a difference. Students are made to understand that each EU citizen is responsible for 11 tonnes of greenhouse gas emissions per year, out of which close to 9 tonnes are emissions of CO₂. They are also exposed to technologies that could reduce global CO₂ emissions from energy combustion (European Community, 2008).

Youths are exposed to the concept of carbon footprint and carbon neutral practice at an early age. Calculating the carbon footprint (calculating the CO₂ emissions produced annually by an individual or a company – their 'footprint' on the atmosphere) and practising carbon neutral (reducing the net amount of CO₂ emissions for which a company is

responsible to zero) is an important aspect that can be addressed in the curriculum. They should also be made aware of the various technologies that could reduce global CO₂ emissions from energy combustion (see Figure 1).

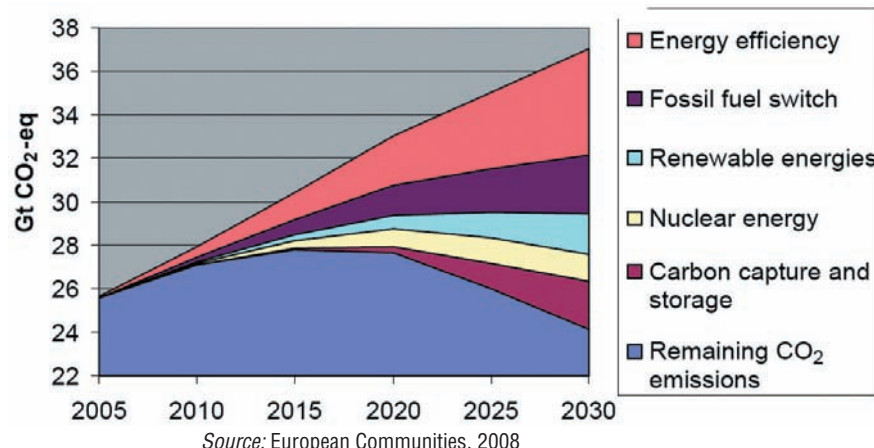


Figure 1: Technologies that could reduce global CO₂ emissions from energy combustion

Educators can organise various activities to create awareness, namely developing poster campaigns, organising fund raising activities to finance climate change activities, incorporating eco-friendly solutions in schools and universities, and carrying out sponsored bicycle rides and walking expeditions. Every student must be educated to control climate change and pledge to become responsible citizens by reducing CO₂ emissions through making small changes to their daily behaviour.

Students can keep track of their actions to reduce climate change. For a period of six weeks, they should award points to themselves for every simple action they have taken during that week and, at the end of the period, add all the totals and see how they score (see Table 2).

Developed countries are responsible for 75% of the greenhouse gases in the atmosphere today, excluding those from tropical deforestation. These nations have the most financial resources and the greatest technological capacity to cut their emissions.

They should therefore be the ones to make the greatest effort to tackle climate change and to educate the youths of the world to make a difference over the next decade.

As asserted by Curtin and Jones (2000), environmental consciousness is the hallmark of a prosperous society. Every country including Malaysia must be clear on who leads the green agenda in the global fight towards climate change. Every citizen of this world can play a small part in the global sense, but that does

not make them any less real or important. As human beings, we only have written and verbal communications at our disposal. It is the latter that brings true results. So go on, communicate and help combat climate change. To maintain progress so that our grandchildren can continue

to enjoy what our grandparents have left us, the youth of today must be imbued with the knowledge to make the change.

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Table 2: Action checklist to reduce climate change

	Week 1:	Week 2:	Week 3:	Week 4:	Week 5:	Week 6:
Turn down						
Turn down the heating of your home by 1°C for one week. <i>You get 10 points.</i>						
Close doors and windows of heated rooms for one week. <i>You get 5 points.</i>						
Take a quick shower instead of a bath for one week. <i>You get 5 points.</i>						
Make up your mind before opening the fridge – don't leave the fridge door open. Do this for one week. <i>You get 1 point.</i>						
Switch off						
Switch off the lights whenever you can for one week. <i>You get 5 points.</i>						
Unplug your mobile charger when your phone is charged. Do this for one week. <i>You get 1 point.</i>						
Switch off your TV, stereo or computer for one week. Don't leave them on stand-by. <i>You get 5 points.</i>						
Recycle						
Bring used glass to the bottle bank for one week. <i>You get 1 point.</i>						
For one week, bring a refillable bottle to school instead of a can or a disposable plastic. <i>You get 5 points.</i>						
Take a shopping bag to the supermarket or reuse old disposable plastic bags for one week. <i>You get 5 points.</i>						
Walk						
Walk, cycle or take public transport to get to school, to your after-schools activities, and back home. <i>For each km, you get 1 point.</i>						
Others *						

Source: European Community, 2007

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Tax Incentives for Going Green

In 1992, the United Nations Framework Convention on Climate Change (UNFCCC) called for the stabilisation of greenhouse gas (GHG) concentrations at a level that would deter dangerous 'anthropogenic' interference with the climate system. 'Anthropogenic' interference relates to the influence that humans have on the natural world. The Intergovernmental Panel on Climate Change (IPCC) projected that the world will experience a rise of one to six degrees Celsius in global average temperatures by the end of this century. A rise in the average temperature of this magnitude will result in severe deterioration of eco-systems, an unprecedented rise in sea levels, negatively impact food and health infrastructure and deplete water resources.

Industrial sources account for nearly 80% of GHG emissions. The remaining GHG emissions can be traced to those resulting from deforestation and land use which mainly occur in developing countries located in tropical zones (McLennan, 2008).

Generally, carbon emissions contribute to other pollution-related problems and they include prevalence of haze, respiratory illness and low quality air. This phenomenon is particularly true in the case of Malaysia. In 2005, a choking smog-like haze covering vast areas brought the central part of Peninsular Malaysia to a standstill. On 11 August 2005, a state of emergency was announced for the world's twelfth largest port, Port Klang and the district of Kuala Selangor after air pollution in these areas reached dangerous levels (www.theage.com.au).

The Kyoto Protocol committed industrialised economies to reduce their combined greenhouse gas by at least 5% below their 1990 levels between 2008 and 2012 (Scheelhaase & Grimme, 2007). In 1999, Malaysia became a signatory to the Kyoto Protocol and in 2002 announced ratification of the Protocol. This is a considerable development as there are no emission reduction commitments for developing countries such as Malaysia. The Kyoto Protocol covers the period 1 January 2008 to 31 December 2012 and was signed by 39 industrial countries. All signatories are bound by greenhouse gas emission targets, averaging 95% of 1990 emissions.

EARLIER TAX INCENTIVES

Several tax incentives have been introduced by the Malaysian Government since 2003 for industries to adopt green technology and help the

nation reduce GHG emissions. Over the years, tax incentives have been offered to corporations to protect the environment. This paper outlines some of these tax measures to "go green" and makes further proposals for due consideration.

Incentive 1: Energy Conservation

Companies providing energy conservation services have been given the following incentives from October 2000:

- 1 Pioneer status with tax exemption of 70% of statutory income or investment tax allowance of 60% on the qualifying capital expenditure for each year of assessment; and
- 2 Exemption of import duty and sales tax on foreign manufactured equipment used in the related project. Equipment purchased from local manufacturers is exempted from sales tax (Kasipillai, 2009).



Incentive 2: Energy Conservation for Own Consumption

Meanwhile those companies which incur qualifying plant expenditure for energy conservation for own consumption are eligible to claim accelerated capital allowance of 100% of the capital expenditure incurred on the energy conserving equipment in the year of purchase effective from 2002.

Use of Biomass as Renewable Energy. Companies using biomass as a renewable source of energy are given:

- 1 Tax exemption of 70% of statutory income for a period of five years or investment tax allowance of 60% on the qualifying capital expenditure.
- 2 Exemption of import duty and sales tax on foreign manufactured equipment used in the related project.

Utilisation of oil palm biomass. Since 13 September 2003, tax incentives are also given

for oil palm biomass. In encouraging the utilisation of oil palm biomass to produce value added products such as particleboard, medium density fibreboard, plywood, pulp and paper, new companies are given:

- 1 100% tax exemption under the pioneer status for a period of 5 years, or
- 2 100% investment tax allowances on the statutory income in each year.

Waste recycling. For companies undertaking waste recycling activities which are high value added using high technology in the areas of recycling of agricultural waste of agricultural by-products and located in promoted areas, the incentives given are:

- 1 100% income tax exemption under pioneer status for a period of five years, or
- 2 100% investment tax allowances on the statutory income in each year.

Incentive 3: Renewable Resources

Several tax incentives are targeted at energy generated from renewable resources. For instance, equipment used by companies to generate energy from renewable resources for their own consumption such as biomass, hydropower and solar energy are granted Accelerated Capital Allowance which allows a full claim in one year instead of over four to eight years.

ENHANCED INCENTIVES

Renewable Energy, Energy Conservation and Waste Recycling Activity.

In recent years, particularly from 2007, tax incentives were further targeted towards renewable energy, conservation of energy and waste recycling activity and they are given up to 31 December 2010.

Renewable energy. The Government enhanced the several incentives to encourage the generation of renewable energy sources that are environmental friendly. For companies generating energy from renewable sources such as biomass, hydropower (not exceeding 10 megawatts) and solar power, incentives given are enhanced as follows:

- 1 Pioneer status with tax exemption of 100% of statutory income and the incentive period is for 10 years or investment tax allowance of 100% on the qualifying capital expenditure incurred with the allowance to be set-off against 100% of statutory income for each year of assessment.

- 2 Exemption of import duty and sales tax on foreign manufactured equipment used in the related project.

Energy Conservation. To further encourage the conservation of energy, the following incentives are given for companies.

1. Energy Conservation Services:
 - Pioneer status with tax exemption of 70% of statutory income for a period of five years or investment tax allowance of 60% on the qualifying capital expenditure incurred within a period of 5 years with the allowance being restricted to a maximum of 70% of statutory income for each year of assessment.
 - Exemption of import duty and sales tax on foreign manufactured equipment used in the related project.
2. Energy Conservation for Own Consumption :
 - Investment tax allowance of 60% of the qualifying capital expenditure incurred within a period of five years to be set-off against 70% of statutory income for each year of assessment.

Waste recycling. For companies undertaking waste recycling activities which are of high value added using high technology in the areas of recycling of agricultural waste and recycling of chemicals in promoted areas, the following incentives are given:

- 1 Pioneer status with tax exemptions of 100% of statutory income for a period of five years, or
- 2 100% investment tax allowances on the statutory income in each year.

Reducing GHG Emissions, Energy Conservation and Energy Efficiency

From 8 September 2007, tax incentives are provided for three specific sectors which reduce greenhouse gas emissions, enhance energy conservation services and promote energy efficiency.

Reduce Greenhouse Gas Emissions. All gross income from the sale of certified emission reduction (CERs) units less an amount equal to the expenditure, not being capital expenditure, incurred by the company for the purposes of obtaining CERs, are exempted from the payment of income tax from year of assessment 2008 to 2010. Certified emission reduction means a Kyoto Protocol unit equal to one metric tonne of carbon dioxide equivalent,

calculated in accordance with Kyoto rules and is issued for gas emission reductions from an activity of Clean Development Mechanism(CDM) project.

Enhance Energy Conservation Services. The incentives listed under *Energy Conservation* in pg.10 col.2 are given to promote energy conservation and at the same time discourage wastefulness and excessive energy consumption.

Promote Energy Efficiency. The Government has enhanced the pioneer status or investment tax allowance incentives listed under *Energy Conservation* in pg.10 col.2 to reinforce its efforts to promote energy efficiency and the use of renewable energy sources that are environmental friendly.

Incentives for Hybrid Cars

From 30 August 2008, tax incentives were introduced to develop hybrid cars which are environmentally friendly. Local car manufacturers are given 100% exemption of import duty and 50% exemption of excise duty on new completely built-up (CBU) hybrid cars for a period of two years but they are subject to several conditions. For example, a new CBU hybrid passenger car should have less than 2000cc engine capacity and the emission of carbon monoxide has to be less than 2.3 gram per kilometre. The incentive is effective for applications received from 30 August 2008 to 31 December 2010.

GREEN RECOMMENDATIONS

Malaysia can endeavour to do more for climate change. Restructuring our economy along low carbon lines will require concerted policy action and leadership. It is suggested that policymakers focus on a policy mix that responds to new situations. Market-based instruments must be given a bigger role because they can lower the cost of action. In the forthcoming 2010 Budget, the Government should seriously consider introducing the following:

Tax incentives for Green Housing

Property developers have a role in contributing towards enhancing the country's residential landscape and living environment. On 21 May 2009, the government launched the Green Building Index which is Malaysia's very own certification scheme for sustainable buildings. Such an effort is part of the Government's strategy to green the property industry. For further effect, the Government should provide tax incentives to promote the growth of Green Housing Projects. For

example, double deductions should be given for expenses incurred by developers who use 'green materials' for property development. A list of items that fulfill the green criteria should be formulated by the Ministry of Science, Technology and Innovation.

Housing projects that fulfill the criteria of building Green Homes should be eligible for incentives under the Promotions of Incentives Act 1986. Income from these companies should be wholly exempted for five years with room for further extension after the expiry period.

Imposition of Fuel Levies

Fuel levies encourage a conservation ethic that leads to prudent energy management resulting in lower pollution emissions (Litman, 2007). The fuel levy should be imposed at source on the fossil fuels produced in or imported into Malaysia. Ideally, there should be varying rates for different types of fossil fuels, environmentally cleaner ones attracting lower fuel levies. To make fuel taxes more acceptable to the public, they must be hypothecated, that is, the revenue derived must be spent on improved public transportation.

CONCLUSION

Malaysia can do more to lower GHG emissions. More efforts should be made to minimise deforestation, reduce air pollution by promoting the use of hybrid cars and providing generous tax incentives for our industries to take care of our environment. In the final analysis, polluters must be made accountable, hence the need to enforce existing environmental laws in an effective and judicious manner.

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Source

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Carbon Capture and Storage to Mitigate Global Warming

Global warming is the increase in average temperature of the Earth's near surface air and oceans. [1] The increase in temperature is most likely caused by greenhouse gases (e.g. CO₂, CH₄, NO₂) that travel up into the upper atmosphere (the troposphere) where they act as a screen to sunlight but stop the heat radiation from leaving the Earth. Figure 1 shows the various sources of greenhouse gases (GHGs) that are now recognised as being responsible for climate change.

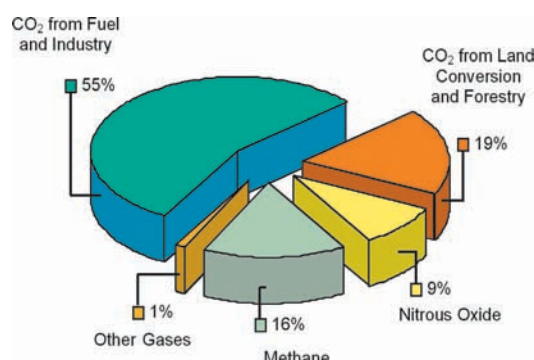


Figure 1 : Sources of greenhouse gases (adapted from [4])

Carbon dioxide (CO₂) emitted through fuel combustion and industrial activity contribute to more than 50% of GHGs. Fossil energy has fuelled industrial development, and will continue to fuel the global economy. Therefore, the emission of CO₂ is unlikely to reduce significantly. Table 1 shows world CO₂ emissions by region. [3] Note that the total CO₂ emissions are projected to continue increasing for the next 20 years.

Table 1 : World CO₂ emissions by region from year 1990–2025. [3]

Region	1990	2002	2010	2015	2020	2025
Mature market economies	10,465	11,877	13,080	13,745	14,392	15,183
North America	5769	6701	7674	8204	8759	9379
Western Europe	3413	3549	3674	3761	3812	3952
Mature Market Asia	1284	1627	1731	1780	1822	1852
Transitional economies	4894	3124	3643	3937	4151	4386
Emerging economies	6101	9408	13,478	15,602	17,480	19,222
Asia	3890	6205	9306	10,863	12,263	13,540
Middle East	845	1361	1761	1975	2163	2352
Africa	655	854	1122	1283	1415	1524
Central and South America	711	988	1289	1480	1639	1806
Total world	21,460	24,409	30,201	33,284	36,023	38,790

The United Nations Framework Convention on Climate Change (UNFCCC) has a mission to stabilise the greenhouse gas concentrations (between 450 and 750 ppmv CO₂) in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system. [2] The objective of this paper is to discuss the role of carbon capture and storage (CCS) in the reduction of CO₂ emissions so as to mitigate the effect of global warming on climate change.

Carbon Capture and Storage

There are three major approaches to reduce GHG emissions, namely (a) improving energy efficiency, (b) increasing use of non-carbon energy sources, and (c) carbon sequestration. There are two types of carbon sequestration, that is, natural sequestration and artificial sequestration. Natural sequestration removes carbon from the atmosphere via forests, oceans and soils. Artificial sequestration meanwhile captures carbon dioxide at its source and prevents it from being re-released into the atmosphere, either by passive storage or being utilised. No single technology can provide all of the emission reductions needed to achieve the mission of UNFCCC. A portfolio of measures will be needed. Interest has been increasing in CCS because it is very compatible with the infrastructure now in place. CCS consists of three steps: (a) separation of CO₂ from large point sources; (b) transport of CO₂ to a storage location; and (c) deposit of CO₂ in the storage location, where it is isolated from the atmosphere. A schematic diagram of CCS is shown in Figure 2. [5]

The CCS system targets large point sources of CO₂ emissions. CO₂ is emitted principally from the burning of fossil fuels in power generation. Other major CO₂ emitting sources are natural gas production, refineries, petrochemical plants and the cement, and pulp and paper industries.

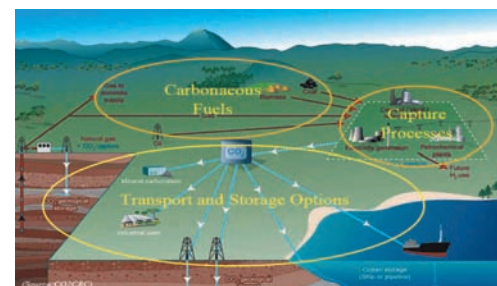


Figure 2 : A schematic diagram of carbon capture and storage system. [5]

second reactor where CO₂ is removed. The oxyfuel combustion system uses oxygen instead of air for combustion of the primary fuel. Pre-combustion and oxyfuel combustion are more elaborate and costly, but result in higher CO₂ concentrations in the gas stream and hence result in easier separation of CO₂. The oxyfuel combustion system is still in the demonstration phase. [5]

Post-combustion is the most common capture system. The flue gas from the combustion contains approximately 10% CO₂, 10% water with the remaining being N₂. The capture technologies available are amine absorption, membrane and vacuum pressure swing adsorption. The available technology captures about 85–95% of the CO₂ processed in a capture plant. A power plant equipped with a CCS system would need roughly 10–40% more energy than a plant of equivalent output without CCS, of which most is for capture and compression. In order to be cost effective, the capture cost needs to be reduced by 30%. Research needs to be carried out to develop more efficient solvents for the absorption process, and to develop new adsorbents that can remove CO₂ and water simultaneously using vacuum pressure swing adsorption. [4]

CO₂ transport

For small scale operations, CO₂ can be carried by rail and road tankers. For large scale transportation, pipelines are preferred for distances up to around 1,000 km. CO₂ can also be liquified and carried by ships. Research needs to be carried out to study the feasibility of using existing natural gas pipelines for CO₂ transport. If this is feasible, the cost of infrastructure will be reduced significantly. Another factor that needs to be carefully assessed is the potential of leakage during transport of CO₂. [7]

CO₂ storage

Carbon can be stored in three ways: (a) geological storage, (b) ocean storage, and (c) mineral carbonation. For geological storage, the CO₂ is injected into (i) depleted or nearly depleted oil and gas fields, (ii) unminable coal beds, and (iii) deep saline formations (see Figure 3).

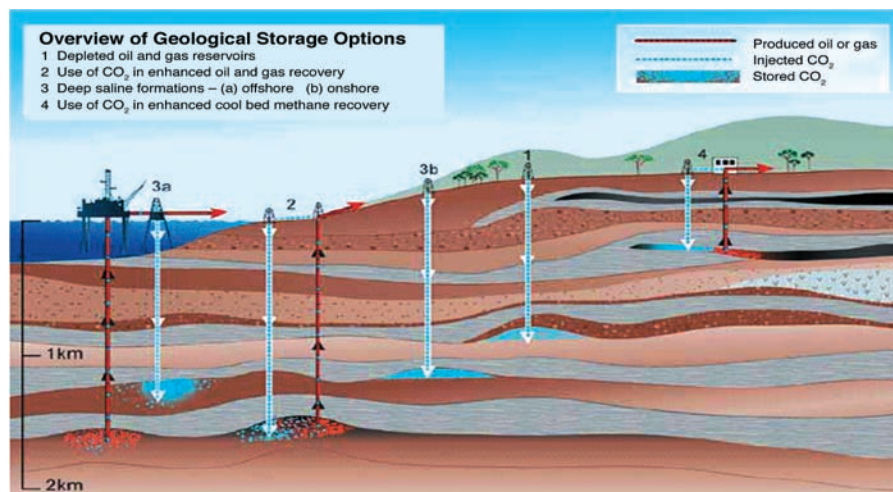


Figure 3 : An overview of geological storage options.^[5]

Geological Storage

This method uses similar technologies that have been developed by the oil and gas industry. At depths below 800 metres, the CO₂ is trapped by the presence of caprocks, which prevents it from migrating to the surface. Coal bed storage takes place at shallower depths. The CO₂ storage on coal beds depends strongly on the adsorption of CO₂ on the coal, and on the permeability of the coal bed. Well-drilling technology, injection technology, computer simulation of storage reservoir performance and monitoring methods need to be developed further for the optimal design and operation of geological storage projects.^[7]

Ocean storage

Ocean storage could be implemented in two ways (see Figure 4), namely (i) by injecting the CO₂ into the water column (below 1,000 metres) via a fixed pipeline or ship. The CO₂ would rapidly dissolve into the ocean water, or (ii) by depositing the CO₂ via a fixed pipeline or offshore platform onto the sea floor at depths below 3,000 metres. The CO₂, being denser than water, would initially stay on the sea floor. It would subsequently dissolve and disperse into the ocean and become part of the global carbon cycle and eventually equilibrate with the CO₂ in the atmosphere. Norway is by far the most advanced country in ocean storage technology.^[8] However, ocean storage is still in the research phase. Its impacts on ocean ecology need to be carefully assessed before large scale implementation.

Mineral Carbonation

This technology is currently in the research stage. The CO₂ can be fixed by reacting it with naturally occurring Magnesium (Mg) and Calcium (Ca) containing minerals with CO₂ to form carbonates. These minerals are abundant. The natural reaction is very slow and has to be enhanced by pre-treatment of the minerals, which at present is very energy intensive.

Economy

It is estimated that the implementation of CCS will increase the cost of electricity generation by about RM 0.04 - 0.20/kWh, depending on the fuel, technology, location and the specific circumstances. In the future, the costs of CCS could be reduced

by research and technological development and economies of scale. Carbon trading through the Clean Development Mechanisms may also make CCS more attractive.

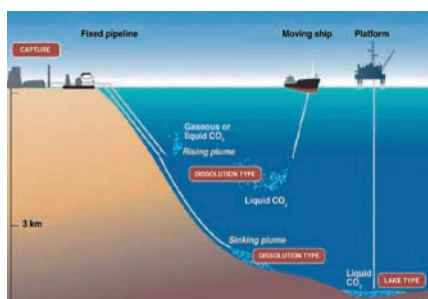


Figure 4 : An overview of ocean storage.^[5]

Potential and Stability of Storage

It is estimated that the worldwide potential for CO₂ storage is of thousands of gigatonnes (Gt). For storage in geological formations, the potential is estimated to be at least 2,000 GtCO₂. The capacity of oil and gas reservoirs is rather certain, ranging from 675-900 GtCO₂, while the storage capacity in coal beds is much smaller, probably not more than 200 GtCO₂. The storage capacity of the oceans is estimated to be larger than the capacity of geological formations. The accuracy of ocean capacity estimation depends strongly on the assumed stabilisation level in the atmosphere and on environmental constraints such as ocean pH change. The extent to which mineral carbonation may be used cannot be determined now as this technology is still at the very early stage of research.

For well selected and managed geological reservoirs, predictions from reliable engineering models suggest that the vast majority of the CO₂ stored will gradually be immobilised by various trapping mechanisms and could therefore be retained in the geological formation for up to millions of years! The release of CO₂ from ocean storage would be gradual, over hundreds of years. Model calculations predict that the CO₂ fraction retained is 65-100% after 100 years and 30-85% after 500 years (the lower percentage is for injection at a depth of 1,000 m, the higher percentage is at 3,000 m). The CO₂ stored in mineral carbonation is very stable and will not be released to the atmosphere.

Research Consortium

As Malaysia has very little experience in the design and monitoring of a CCS system, it is proposed that a research consortium be set up to develop technologies and to train skilled workers for CCS in the local context.

Conclusion

Given the significant economic growth of emerging economies in coming decades, global greenhouse gas emissions will continue to increase. CO₂ capture and storage technology is one viable option within a portfolio of mitigation activities to help stabilise atmospheric greenhouse gas concentrations. To make CCS more attractive, the implementation of carbon trading through the CDM is crucial to the global mitigation effort. The lack of a clear legal framework for international laws relating to ocean storage should be addressed. As the potential for industrial uses of CO₂ is now small, a breakthrough in research is required to produce valuable carbon-containing products. In the Malaysian scenario, a research consortium comprising of industry, government agencies and universities should be established to harness and to develop more economical and viable CCS technology.

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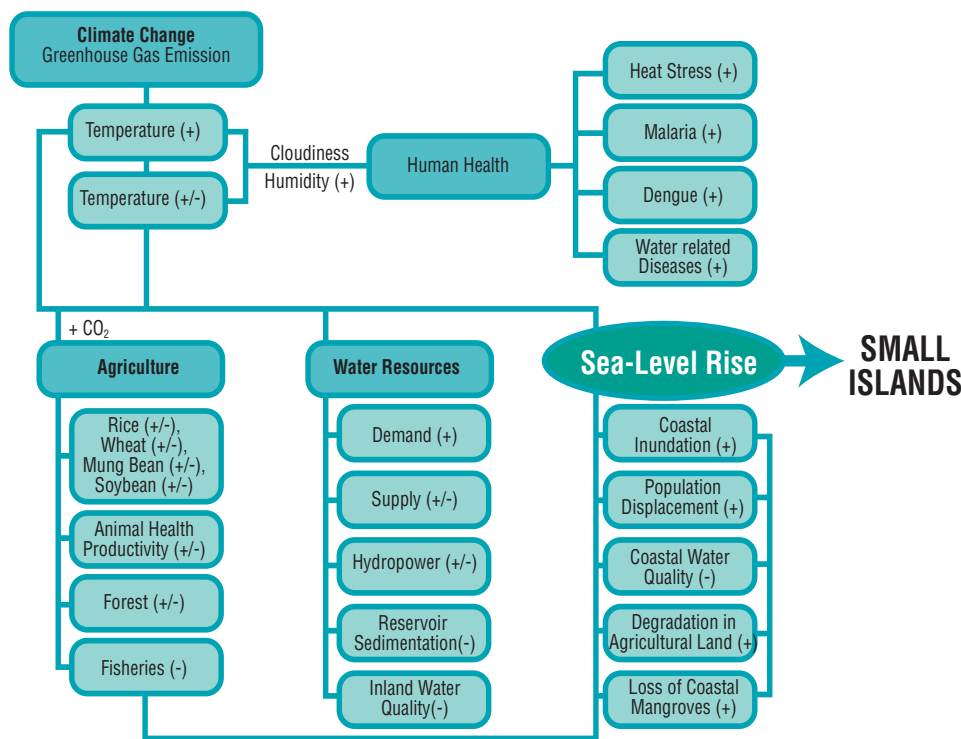
Are Small Islands 'Drowning'?

Climate change will be one of the scourges of the twenty first century. Almost without exception, small islands have been shown to be at great risk from climate change impacts. Small islands are considered to be climate change 'hot spots'. According to studies done elsewhere, small islands are highly susceptible to climate change effects such as sea level and temperature rises, rainfall changes and storm frequency.

Sea level rise can be defined as an increase in sea level caused by global warming. Two main processes involved are the thermal expansion of sea water and the rapid melting of land ice. Figure 1 summarises the potential impacts of some of the components of climate change in Tropical Asia. According to the Intergovernmental Panel on Climate Change (IPCC) (2000), tropical Asia's physical environment is extremely diverse and such diversity has important implications for assessing the impacts of future climate change, which would vary greatly from area to area, depending not only on the climate change scenario.

Studies on sea level rise in the South Asia seas indicate an average annual relative sea-level rise of 0.67 mm/yr. In addition, during the past half-century, relative sea-level changes in the region have ranged from a fall (i.e. land emergence) of 1.33 mm/yr to a rise (i.e. land submergence) of 2.27 mm/yr. In many parts of Tropical Asia, historical sea-level records appear to show significant effect of climate change. In Bangkok, for example, extraction of water from groundwater aquifers indicate accelerated land subsidence (i.e. a relative rise in sea level) of around 20 mm/yr since 1960, compared with an earlier trend of about 3 mm/yr. In contrast, high recent rates of sea-level rise in Manila have been blamed on coastal reclamation. Analysis of time-series data for 1955-1990 indicates an average sea-level rise of 1.9 mm/yr at Hondau in North Vietnam. This finding is in agreement with the observed rise in global mean sea level.

The predicted climate change is likely to cause a global rate of sea level rise of 5 mm/yr by the year 2100, which may increase the extent of seawater intrusion into aquifers (Figure 2). Small islands are particularly exposed as many are gradually facing the loss of their fresh water supply due to seawater intrusion. Low-lying coastal areas and small islands are particularly threatened by the sea level rise. Moreover, some of the



(+ = projected increase, - = projected decrease) (Source: IPCC, 2000)
Figure 1: Possible climate change-related impacts in Tropical Asia

developing countries are especially exposed to sea level rise due to their low lying nature and limited financial resources to respond. Among the most vulnerable countries are Bangladesh, Vietnam, China and Egypt. Sea level rise would generally enable saltwater to advance inland into aquifers, contributing to the rise in groundwater salinity in unconfined aquifers, just above the sea level (Figure 3). According to the Ghyben-Herzberg principle, if the top of the aquifer is one metre above sea level, the interface between fresh and saltwater is forty metres below sea level. If sea level rises one metre, the aquifers would usually raise one metre as well, causing seawater intrusion into the freshwater.

Most tropical small islands have limited sources of freshwater, no surface water or streams in exploitable form. Thus, fresh groundwater is the sole option to meet the water demand in the small islands. The inhabitants of these islands mostly depend on groundwater to meet their needs, particularly for drinking and tourism purposes. Freshwater sources in tropical small islands may easily be over-exploited or polluted due to dense development impacted by tourism expansion combined with improper management and vulnerability to global climate change (Rejani *et al.* 2008; Singh and Gupta, 1999; Griggs and Peterson, 1993; Beller *et al.* 1990).

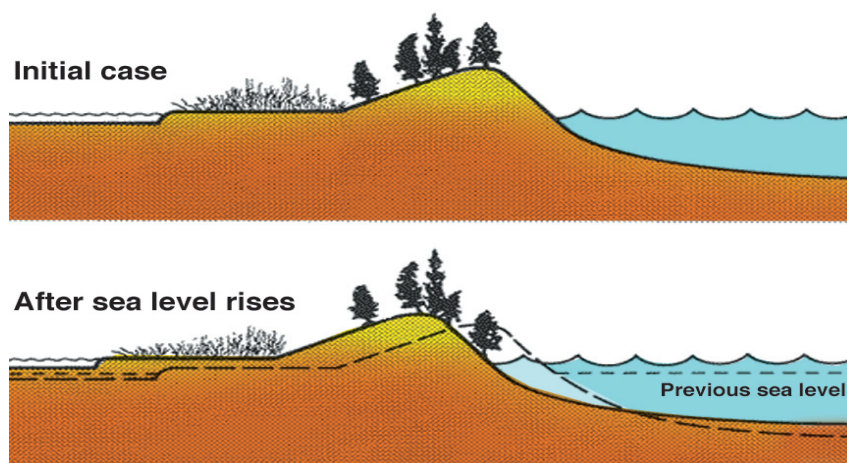


Figure 2: Responses to sea level rise in small islands

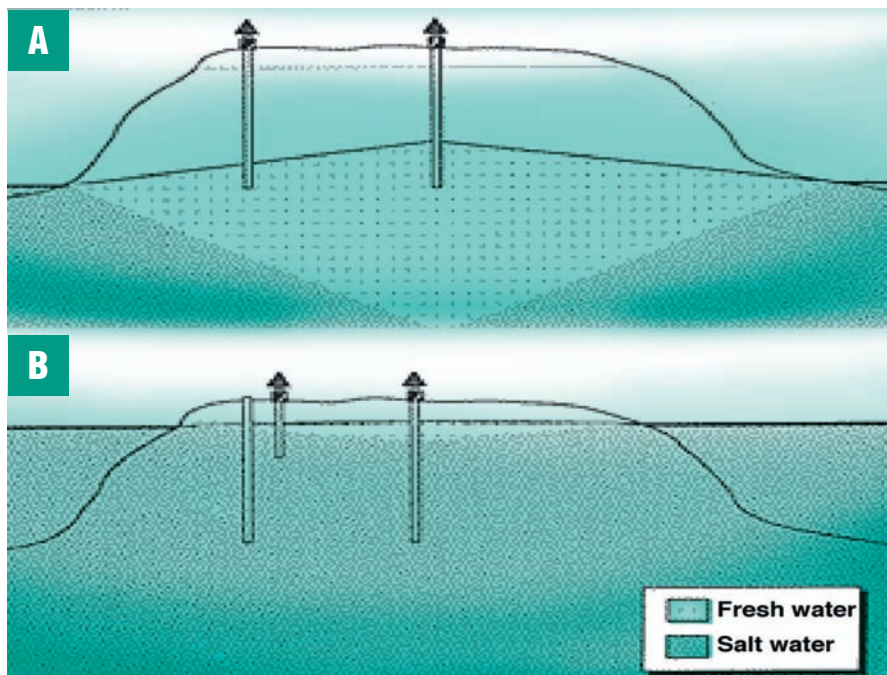


Figure 3: Sea level rise increases freshwater salinity
 (A) Freshwater table extends below sea level 40 cm for every 1 cm by which it extends above sea level.
 (B) If sea level rises one metre, aquifers would usually rise one metre as well, causing seawater intrusion into the freshwater.
 Source: Environmental Protection Agency (US) 1989.

Figure 4 summarises the effects of sea-level rise on the water resources of small islands. As many of these islands rarely exceed 3-4 metres above the present mean sea level, rising sea levels pose a big danger to the environment including the health of the inhabitants.

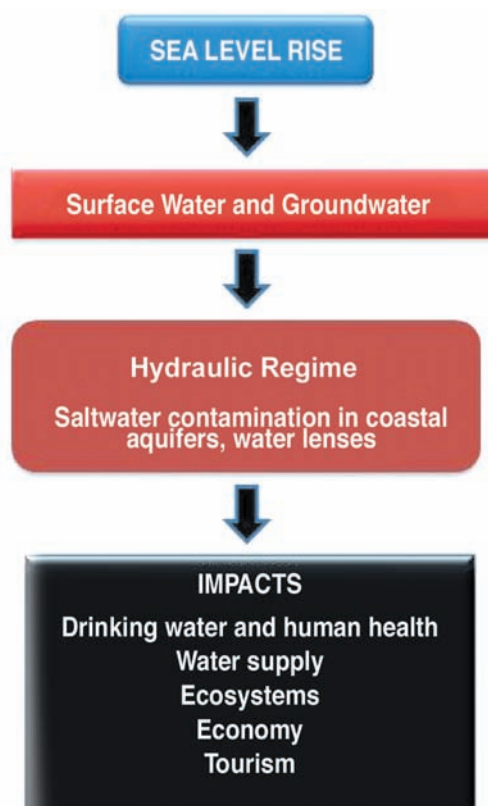


Figure 4: Effects of sea-level rise on water resources of small islands

The tourism industry of small islands is one of the first industries to be affected by a rise in sea level. Tourism in small islands plays a vital role, serving as the leading revenue earner of the country. This sector is expected to suffer severe disruption as a consequence of adverse impacts that accompany sea-level rise. For example, Tuvalu formerly known as the Ellice Islands, the fourth smallest country in the world is sinking due to a sea level rise of 0.07mm a year over the past two decades. El Niño-Southern Oscillation (ENSO) and cyclones Gavin, Hina and Keli too played a major role in Tuvalu's higher tides in recent years. In addition, there are reports of Pacific islands facing severe risks, for example, Tegua island in Vanuatu. The IPCC (2007) reports that by 2080, sea level rise could convert as much as 33% of the world's coastal wetlands to open water.

Sea level rise will also affect other aspects of coastal systems of small islands. It will worsen the marine ecosystem in small islands, eventually affecting the fisheries and coral reefs. Besides, it also may lead to sedimentation and erosion, beach erosion as well as coastal land loss, inundation, flooding and salinisation of coastal aquifers and soils. The mangrove ecosystem surrounding small islands is also expected to be threatened by the sea level rise. These vulnerable ecosystems cannot adapt to beach erosion and sedimentation causing the mangrove to migrate landward.

Studies on vulnerability provide a basis for understanding the potential impacts of climate change and sea level rise. These studies provide information on the vulnerability characteristics of the small islands. Various methods have been developed in recent studies to obtain a comprehensive and quantitative assessment. However, lack of monitoring data is still one of the major impediments for a complete assessment of vulnerability. In spite of the limitations, ongoing studies reveal conclusively that the small islands are very vulnerable to future sea level rise and climate change. The next step that needs to be addressed is to formulate adaptation strategies in a more specific form to fit a particular small island situation.



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Event Highlights

Department of Environment, Malaysia

April 2009

23rd Meeting of the Malaysia-Singapore Joint Committee on the Environment (MSJCE) and 22nd Annual Exchange Visits (AEV)



The 23rd Meeting of the Malaysia-Singapore Joint Committee on the Environment (MSJCE) and the 22nd Annual Exchange Visit (AEV) took place in Singapore from 17-18 April 2009. The MSJCE was co-chaired by Dato' Zol Azha bin Yusof, Secretary General of the Ministry of Natural Resources and Environment, Malaysia and Mr. Tan Yong Soon, Permanent Secretary of the Ministry of the Environment and Water Resources, Singapore.

Malaysia, the Attorney General's Chamber, Marine Department, Universiti Kebangsaan Malaysia, the National Hydrography Centre and the Johor Port Authority.

The aim of this meeting was to exchange views and experiences on tackling environmental issues of mutual interest, such as the control of vehicular emissions, water quality in the Straits of Johor, pollution in the Skudai Water Catchment Area, Emergency Response Plan for Chemical Spills at the Malaysia-Singapore Second Crossing, training programmes and transboundary haze pollution.

Meanwhile the 22nd AEV between YB Datuk Douglas Uggah Embas, Minister of Natural Resources and Environment, Malaysia and Dr. Yaacob Ibrahim, Minister of the Environment and Water Resources, Singapore was held to review the work progress carried out by the MSJCE.

The Malaysian delegates to this meeting were senior officers from the Department of Environment and representatives from the Ministry of Natural Resources and Environment, the High Commission of

May 2009

Site Visit to Rokan Hilir, Riau Province, Sumatra

On 28 May 2009, the Air Division from the Department of Environment made a site visit to Rokan Hilir to evaluate the pilot activities under the MoU on Fire and Haze Prevention Through Rehabilitation and Improved Management of Peatland in Riau Province, Sumatra, Indonesia. To reduce the risk of deep peat fires under the enhanced peatland management programme, four canal blocks had been built in Desa Bantaian and Desa Rantau Bais aimed at raising water levels and preventing water deprivation in peatland areas. Meanwhile the 11 storage wells that had been dug in Desa Mumugo serve as water sources to put out fires, should they occur.



Canal Block in Desa Bantaian

Storage well in Desa Mumugo



Air Quality Monitoring Station in Bagan Siapi-api, Rokan Hilir



Hands-on training for local staff

May 2009

Installation of Air Quality Monitoring Station in Rokan Hilir, Riau Province, Sumatra

Towards the end of May, an air quality monitoring station, PM10, was installed in Bagan Siapi-api, Rokan Hilir under a collaboration project between the Government of Malaysia and the Government of the Republic of Indonesia as part of the preventive measures against land and forest fires and haze in Riau Province. The equipment is envisaged to serve as an early warning system for haze. For a better understanding of the equipment operation and downloading of data, a hands-on training session for the local technical staff was held on 29 May 2009.

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