Ministry of Science, Technology and Innovation

Rapporteurs Report
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EXECUTIVE SUMMARY

The National Seminar on Socio-Economic Impact of Extreme Weather and Climate Change was organised by the Ministry of Science, Technology and Innovation on 21-22 June 2007 at Putrajaya, Malaysia. The Seminar aimed to improve understanding of the predictability of the changing climate and extreme weather phenomena and assess its socio-economic impact to create awareness as well as identify appropriate research, policy responses and institutional arrangements. The knowledge gaps and issues discussed during the National Seminar are highlighted below.

Future Climate Scenario

The trends observed globally in some climatic variables were highlighted, notably temperature and rainfall indices and also the trends in sea-level rise and extreme weather events including droughts, heat waves, intensity of tropical cyclones and severe floods that have assumed significant changes in intensity and frequency in the context of global warming. Based on the projections of the Intergovernmental Panel on Climate Change (IPCC), it has been concluded that the climate will be warmer in the future independent of the scenario assumed. However, the degree of the warming, particularly during the latter half of the century, is determined by the strength of the scenario pathway followed. It was noted that the 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 is not very certain.

However it is imperative that all necessary steps be taken to better prepare ourselves against the impacts of such changes.

There is no doubt that global warming is real and happening. Modelled results have also forecasted the occurrences of extreme events, thus actions by all stakeholders are needed to address the problem. Developing countries such as Malaysia will be harder hit and there is urgent need to understand our vulnerability and risks to formulate the needed adaptation measures. In this respect, there is need to understand the scientific aspects of climate variability and climate change, in particular, the climate variability at local levels. Funds are needed for this purpose to ensure good planning for the future.

The meeting suggested that local research should be built on international work and should engage all stakeholder groups, especially the business sector, so that the research is relevant. Among the topics highlighted for research activities include the following:-

- Projection of climate change and climate variability at local levels and its impact on social and economic sectors (agriculture, forestry, biodiversity, coastal resources, water resources, public health and energy) of Malaysia.
- Expected changes in water availability by year 2050 require a review of current water resources plans in the various sub-sectors and states of Peninsular Malaysia.
- Performance of water supply systems and irrigation systems under future water demands and hydrologic regime.
- Impact of rapid polar warming on Malaysia, in terms of new navigation routes for resource exploitation and ecosystem changes; nutrient transport and fisheries; impact on coastal resources including the coral and marine ecosystems.

Early Warning Systems

The government has done much to strengthen disaster prevention and preparedness in Malaysia. Actions taken include amendments to existing laws and acts, public awareness and education, establishment of forecasting and early warning systems, construction of mitigation structures, establishment of a national disaster relief fund and development of standard operating procedures. These actions involve several agencies including the Prime Minister Department, Public Works Department and Drainage and Irrigation Department, among others. Notwithstanding this, several issues were highlighted that requires further action. These include the following:-

- Strong legislation and enforcement of laws is needed to minimise the impact of disasters and institute preventive measures.
- The operational approach with standard operating procedures must be well instituted at the ground level so that during disasters relief activities are coordinated smoothly and effectively.
- There is need to bridge the community interface, which is grossly lacking in the monsoon flood monitoring system, and enhance understanding of the linkages between the environment and disaster.
- Early warnings systems must be “People-Centred Warning Systems” and should include the elements of Risk Knowledge; Monitoring and Warning Service; Dissemination and Communication; and Response Capabilities.
- Since not all hazards are the same, the need for a multi-hazard warning system was emphasized, which takes into account basic characteristics such as predictability, detectability, certainty, lead time, duration of time and visibility.

- A long term integrated program for community based climate change adaptation and implication to disaster risk reduction is required, taking into account assessment, planning, implementation and dissemination; training and capacity building; and participatory action research.

Flood and drought are significant natural disasters in Malaysia due to its topography and uneven rainfall characteristics. Preventive approaches and structural measures have helped tremendously in reducing loss of lives, trauma, crop and property damage due to floods and droughts. The fact that the death toll due to floods is much lower compared to the death toll due to geological disasters, testifies to the effectiveness of the measures that are already in place. A similar scenario is observed in Asia where geological disasters are far more common compared meteorological disasters, unlike in America and Europe. There is an urgent need to strengthen the management and prevention of geological disasters such as landslides and mudflows, which are expected to increase in intensity with increasing precipitation, particularly in tropical areas such as Malaysia.

Socio-economic Impacts

In the discussion on socio-economic impacts, the presentations focused on the many initiatives that were ongoing as part of the preparation for the anticipated change in the climate regime. Several issues pertaining to knowledge gaps with respect to socio-economic impacts were highlighted and these are summarised below.

The quantification of socio-economic impacts requires a paradigm shift where costing is involved, as aspects such as direct tangible costs,

indirect tangible costs and intangible costs are not easy to evaluate. There is a need to refine the methodology of costing socio-economic impacts through more research. Cost-benefit analysis for taking preventive measures in a hazard-prone area indicates that the benefit would be the avoided cost in the event of a disaster. The time has come to establish a disaster impact inventory. This can be done through collection of data on the direct and indirect, tangible and intangible losses. Contingent valuation, which employs methods such as “willingness to pay” and “willingness to accept” can be employed for this purpose. In addition, it is necessary to develop and incorporate economic recovery plans in dealing with disasters.

In addition to weather, abiotic factors such as pollution and high ozone levels have an impact on crop production variability. However this is rarely considered or studied. There is a need to study abiotic factors in the agriculture sector, which are important to achieve optimal crop production. Malaysia should look into the ozone impact on grain production more seriously.

With current global warming trends, a wide range of negative health impact is expected due to potential depletion of resources, loss of territories following sea-level rise, changes in sanitary and hygiene situations, rise in vector and pest breeding areas, deterioration of ambient air quality and increasing frequencies and intensities of extreme weather events. Appropriate mitigation measures and adaptation programmes should be planned and implemented over the next fifty years to lower the rates of mortality and morbidity. There is also a need to study non-communicable diseases that may result from changes in the

climate scenario such as increased stress within residents of small houses or flats as a result of rising temperatures.

Generally, there is massive wastage in many resource sectors of the country. The management of energy, water and land resources need to be planned to balance demand and supply with adequate emphasis on the management of consumption. Traffic is the biggest contributor to emission in Kuala Lumpur and the cause of time wastage as well. Unfortunately, there are no statistics on time and effort wasted in traffic jams and these aspects are not factored in when decisions are taken to build roads. More action should be taken towards providing more information to policy makers to promote information based decision-making.

Information Access and Technology Transfer

There was an opinion that relevant research and policies are already available and sufficient but the issue is to use them to the benefit of the current situation. Equally important, is to ensure that policy makers are aware of and have a grasp of the research findings, which in many cases are not well disseminated, particularly to the policy makers.

With respect to risk prediction and early warning, it was noted that many databases exist for local studies. However, the databases, which are critical for risk modelling, are held by sectoral agencies. Hence, there is a need to compile and integrate them, probably under the custodian of a lead agency. The importance of data sharing and easy exchange of information on climate change in Malaysia cannot be over emphasised, as the impacts also affect neighbouring countries.

The issue of difficulty in obtaining data and information that does not reach the public on time was also discussed. The importance of the availability, accessibility and transparency of information and their sources is critical in order to mobilise the public to take appropriate actions with respect to climate change.

There was an opinion that certain parties profit from selling western technology at exorbitant prices. However, as the standard of living here is much lower, the price may not be affordable. A similar concern was expressed over the renewable energy technology, i.e. how to increase its affordability. It was noted that technology transfer from developed countries to developing countries has not been effective. It appears that more energy-intensive industries are being transferred to developing countries.

Policy Responses and Institutional Arrangements

There are many climate related policies in Malaysia including the National Policy on the Environment, National Forest Policy, Biodiversity Policy, National Energy Policy, National Transport Policy (Land) and Third National Agricultural Policy, among others. Notwithstanding this, there is no clear indication of climate change in these policies, although there are indirect references to climate change initiatives in the transportation, energy and industry sectors. Furthermore, there is need for the various policies to be harmonised with each other so that win-win options could be formulated through inter-agency collaboration and coordination for climate change mitigation and adaptation measures. In view of this, the Ministry of Natural Resources and Environment has embarked on an initiative to develop a National Climate Policy and Strategy to guide national activities and strengthen inter-agency

collaboration to address climate change. This effort could be further consolidated under the framework of Sustainable Development, which is spearheaded by the Economic Planning Unit.

In order to be effective, national policies must be adopted and implemented by the state authorities without amendments. It was highlighted that sound planning can still fail in the absence of enforcement at the operational level. Thus, plans made at the national level need to be implemented effectively at the local level without any political interference. Furthermore, the roles and responsibilities of all stakeholders should be clarified and participation of industry players in addressing climate change should be enhanced.

The convergence of disaster and climate change was noted and it is very clear that their management should be mainstreamed into national policies, programmes and plans as both are cross-sectoral issues. Although the institutional capacity in the country is capable of managing disasters, there is still much room for improvement. The existing mechanism for stakeholder consultation is insufficient and requires enhancement as it is both the responsibility of government and the community in dealing with issues pertaining to disasters. In addition, current sectoral approaches need to be changed, with reference to the Hyogo Framework Action, which emphasises mainstreaming disaster management into planning.

Climate change is expected to cause sea level rise and impact various sectors such as agriculture production, water resources and public health, among others. Adaptation strategies are required to prepare the nation for this phenomenon and to a large extent these will have to be implemented on a sectoral basis. However, a more integrated approach should be taken in planning and development programmes to reduce the

impact of disasters and strengthen coordination between ministries, technical agencies, non-government organisations and other stakeholders including the community, Thus, it is imperative that the existing land use system and its mechanism be understood by the relevant agencies and the public to ensure its effectiveness, especially in producing risk maps for vulnerable settlements.

There are no doubts that the political commitment to manage hazards exist as demonstrated by the construction of the SMART Tunnel, the tsunami recovery plan and the December 2006 flood recovery plan, among others. Notwithstanding this, the meeting noted that adaptation measures are necessary and should be given more priority, especially in the next 20-30 years. In addition, mitigation measures should also be taken into account and the policy options that could be explored may be either regulatory or economic in nature with instruments such as trading permits, carbon tax and tax rebates. Thus, the challenge lies in balancing adaptation and mitigation measures.

As a policy response to climate change, the insurance industry is now preparing for an increase in catastrophic risk through several measures. These include development of new risk models that take into account climate change, adequate pricing, substantial deductibles based on the respective exposure, accumulation control, loss prevention, improved claims settlement, liability limits, exclusion of certain hazards, exclusion of particularly exposed areas, reinsurance and retrocession as well as private-public partnership. This aspect and the role of the insurance industry should also be taken into account when planning adaptation measures.

Political Awareness and Public Participation

The level of awareness among politicians and government officials regarding climate change as well as the priority accorded to the issue was also discussed. It was generally agreed that politicians and government officials are aware of the issues involved. This is reflected by organisation of the National Seminar at the behest of the Cabinet of Malaysia, to understand the socio-economic impacts of climate change. However, as climate change is a slow and gradual process, politicians tend to be more concerned with immediate short-term but equally important issues.

The meeting generally agreed that the public can play a very important role in bringing about change. However, the public attitude leaves much to be desired. Even if they are aware, they refuse to react or respond. There is a need to change public attitude and some quarters were of the opinion that the government should lead by example in addition to reassessing the effectiveness of enforcement versus incentives such as tax rebates, to foster a change in public attitudes.

As public participation is important, it was suggested that information on climate change be disseminated in a user-friendly to be effective. Proper consultation methods also need to be utilised. This is particularly true for community participation in disaster risk reduction or promotion of mitigation using the community. The importance of reaching the targeted audience effectively with the information to be disseminated was also highlighted. Notwithstanding this, the audience was reminded that the provision of government incentives or rebates may not be sustainable in the long term and that the public should do something because they believe in it.

Post 2012 Viewpoints

There was an opinion that the focus of developing countries should be on adaptation to climate change rather than mitigation. Developing countries should therefore strive towards accelerated development to build up their adaptive capacities quickly. It was further advocated that climate change be taken into account in infrastructure planning for the short term adaptation.

The role of developed countries should reflect their responsibility for contribution to climate change as well as their greater capacity for addressing it. In addition to reducing emissions, developed countries should also share financial and technical resources as well as build the human resource capacity of developing nations. It was noted that while the international climate agreements require all countries to formulate and implement programmes containing measures to mitigate climate change, scarce financial resources should not be diverted from development priorities, as this would cripple the adaptive capacity of developing countries.

There was also a call for a firm stand against differential entitlement to energy use. Propositions that all countries reduce emissions by 2030 translate to developing countries signing an international agreement binding them in perpetuity to using a smaller proportion of their rights to energy.

Another viewpoint saw climate change as an integrated framework where all actions are inter-related, be it adaptation or mitigation measures. Although developing countries have no commitment to reduce emission, it cannot be denied that carbon emissions therein grow at a much faster rate. Thus, Malaysia and other developing countries should consider the possibility of accepting emission reductions or else the

future of the convention itself would be at stake. In such a scenario, the baseline that Malaysia should adopt if the country were to reduce emissions becomes critical. In this regard, the institutional memory and capacity within government agencies should be enhanced by drawing on the experience of those who have experience in international negotiations. Mechanisms should be developed to tap the institutional memory of such experienced officers.

Both developed and developing countries have a role to play in the post-2012 regime. Developed countries should accelerate their reductions, increase provision of sufficient financial resources and transfer of technology to assist developing countries in adapting to climate change. They should promote joint research and development for this purpose and stop using economic competitiveness as an excuse not to take action. Developing countries should take climate change into consideration at all levels of planning. Adaptation programmes should be initiated to ensure food security, water security, resource security and sustainable socio-economic development. Developing countries should also formulate policies and measures that lower greenhouse gas emissions and make preparation for inter-provincial migration as a result of climate change.

Climate change will impact humanity on the whole and countries will have to draw on each other for sustenance. In this respect, all countries have an obligation to undertake systematic observation and research as well as promote integrated global cooperation that is complementary. Regional consultations on sharing of water, food and shelter should also be undertaken, to ensure the sustainability of humanity.

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INTRODUCTION

The National Seminar on Socio-Economic Impact of Extreme Weather and Climate Change was organised by the Ministry of Science, Technology and Innovation on 21-22 June 2007, at Putrajaya, Malaysia. The Seminar aimed to improve understanding of the predictability of the changing climate and extreme weather phenomena and assess its socio-economic impact to create awareness as well as identify appropriate research, policy responses and institutional arrangements to address this issue. About 120 participants attended the meeting comprising academics, researchers and practitioners from government, non-government organisations as well as the private sector.

The Seminar commenced with an official opening by the Honourable Dato' Kong Cho Ha, Deputy Minister of Science, Technology and Innovation (MOSTI), Malaysia. The programme comprised of six technical sessions arranged around two principle themes, followed by a Panel Discussion on the final day. The themes were on "Scientific, Technical and Disaster Preparedness and Prevention" and "Socio-economic Aspects". The Panel Discussion saw the perspectives of six panellists on research, policy and institutional arrangements to face climate change and increasing extreme weather events as well as address adaptation and mitigation needs.

THEME 1 – SCIENTIFIC, TECHNICAL & DISASTER PREPAREDNESS & PREVENTION

Day 1 of the seminar was devoted to the scientific, technical and disaster preparedness and prevention aspects of extreme weather and climate

change. It was divided into 3 sessions, with each session lead by a keynote lecture and followed by short presentations. A total of 3 keynote lectures and 11 scientific presentations were presented during these sessions.

Keynote Lecture 1: Local to Global Scale Atmospheric Circulation Features Associated with the Floods in Malaysia in December 2006 and January 2007, by Prof. Tetsuzo Yasunari, Nagoya University

Professor Yasunari addressed several questions in his lecture: Why rainfall episodes that caused the floods were abnormally severe even though several cold surge events appeared during the season; Were there other anomalous climatic conditions regionally or globally that might be connected to these extreme events; and if the higher frequency of these extreme events occurrence was due to global warming. Professor Yasunari presented some diagnostic analyses of the regional monsoon circulation, tropical circulation and convective systems associated with the events, mid to high latitude circulations in the northern hemisphere, the long-term changes of the extreme rainfall events in Malaysia in the past decades, and some implications under the global warming climate. Despite the number of factors that could have caused the observed severe weather; Professor Yasunari concluded that some of the more significant causes were as listed below:

- Abnormally heavy rainfall in mid-December 2006 and mid-January 2007 were due to strong northeasterly surge that hit southern Peninsular Malaysia with strong cyclonic shear and associated meso-scale cloud systems. These heavy rainfall episodes were not directly related to the Madden-Julian Oscillation (MJO) disturbance.

- These strong northeasterlies were not necessarily connected with strong cold surges in East Asia (as is common in north east monsoon surge).
- Eastward-propagating MJO disturbance caused heavy rainfall in Indonesia and Sarawak between end of December 2006 and early January 2007.
- Localised subtropical high over south China likely induced strong surges to southern Peninsular Malaysia.
- This localised Siberian-high seemed to be induced by wave-train activity along the subtropical jetstream (~30N) forced presumably by blocking situation over the North Atlantic.
- Heavy rainfall & floods in Johor was found to be part of anomalous global circulation including the stratosphere.
- Rainfall amount and/or frequency of heavy rainfall events in Malaysia in winter in the past few decades have not shown any increasing (or decreasing) trends, but local pattern of Malaysian rainfall variability and trends are likely to be very sensitive to patterns of large-scale circulation over east and southeast Asia.
- The IPCC projection of the winter monsoon for the much longer term sees the weakening of East Asian winter monsoon, which suggests possible increase of similar heavy rainfall events.

Climate Change and Extreme Weather: IPCC Findings, by Dr Yap Kok Seng, Director-General of Malaysia Meteorological Department (MMD)

Dr. Yap highlighted the trends observed globally in some climatic variables, notably temperature and rainfall indices and also the trends in sea-level rise and extreme weather events including droughts, heat

waves, intensity of tropical cyclones and severe floods that have assumed significant changes in intensity and frequency in the context of global warming. Based on IPCC's projections of future climate scenarios and projections of extreme events, Dr. Yap concluded that the climate will be warmer in the 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. He further noted that 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 man's anthropogenic activities, or to long term natural variability of the climate, it is imperative that all necessary steps need to be taken to better prepare ourselves against the impacts of such changes.

Climate Variability, Climate Change and Extreme Weather Events in Malaysia, by Assoc. Prof. Dr. Fredolin Tanggang, Universiti Kebangsaan Malaysia

In his presentation Dr. Fredolin gave a detailed description of the variability of the monsoon with regards to its onset, intensity and duration in association to large scale ocean-atmospheric interactions. In particular he stressed on the intra-seasonal oscillation associated with the MJO mode and the inter-annual variations associated the ENSO and IOD modes. Some of his findings are summarised as follows:

- Climate variability in Malaysia is very much influenced by MJO (intra-seasonal) and ENSO, IOD (inter-annual) modes.
- MJO, ENSO, IOD must be monitored closely and should be used for short-lead and long-lead for local climate outlooks.

- Consistent with other places, generally temperature in Malaysia is rising.
- Long-term trends of precipitation appears to be more varying, with some stations showing positive trends and others showing negative trends.
- It is not certain precisely how global warming alters local rainfall distribution or extreme events, thus this relationship needs further investigation.
- If ocean warming affects MJO, ENSO and IOD, characteristics of climate variability in Malaysia will be affected.

The Implications of Rapid Polar Warming to the Tropics, by Prof. Azizan Abu Samah, Universiti Malaya

Professor Azizan showed observed hotspots, 2 in the Artic and 1 in the Antarctic where temperatures have risen rapidly since the 1950s. This caused a decrease in the sea ice extent and widespread loss of permafrost, and Global Climate Models are predicting that this trend will continue if the warming is not stopped. The consequence of sea ice loss and shrinking of ice shelves may result in less production of Antarctic Bottom Water (ABW) with consequent global impacts since the ABW is the densest water mass in the world's ocean and plays a major role in the global ocean circulation. It was demonstrated that the observed hotspots were linked to Artic Oscillation (AO), North Atlantic Oscillation (NAO) and the Pacific Decadal Oscillation (PAD). Professor Azizan also pointed out the complicated nature of the processes of change that can occur from global warming due to changes in these natural modes of oscillation. The impacts of rapid polar warming on the tropics, including Malaysia, were concluded as follows:

- The decrease in sea ice will open the Arctic to new navigation routes, resource exploitation and ecosystem changes.
- The thermohaline oceanic may change and may impact nutrient transport and fisheries in our region.
- Predicted moderate sea level rise may impact our coastal resources.
- Increased acidification of the ocean may impact corals and marine ecosystem.

Disaster Mitigation Support and Management in Malaysia, by En. Che Moin Umar, National Security Division, Prime Minister's Department

En. Umar gave various definitions of disaster with the adage, "*Natural Disaster is hard to prevent, but mitigation measures can be done to reduce the impact of disaster*", and emphasized how disaster management is an end-to-end system. He went on to define the responsibilities of various designated lead agencies in the country for the handling of specific disaster events. The various phases of disaster management was elaborated upon, and in the case of prevention and mitigation, two modes of implementation were highlighted – the structural and the non-structural modes. The physical setup of the Malaysian Tsunami Early Warning System was cited as an example of the structural component. Other examples included the national Disaster Data and Information Management System (NADDI) operated by MACRES and the Flood Forecasting and Warning System operated by DID. The most prominent example was the SMART tunnel designed to alleviate flash flood problems in Kuala Lumpur City. En. Umar also emphasized that the physical infrastructure for information dissemination,

technology revision for search and rescue, emergency medical response, and prevention technology were important structural requirements. Referring to the non-structural components, En. Umar mentioned the organisational structure and their sub-systems/levels of disaster management and relief committees. In addition, he spoke of the need for strong legislation and law enforcement to minimise disaster impacts and encourage preventive measures. At ground level the operational approach should have standard operating procedures to assure relief activities will be smoothly and effectively coordinated in times of a disaster. He discussed the various programs and activities implemented to raise awareness, the roles of NGOs, and bilateral, regional and international cooperation on disaster mitigation and support. Finally he concluded by informing the audience on the implementation of Hyogo Framework for Action (HFA) by Malaysia. The HFA was adopted by Malaysia in November 2005.

Keynote Lecture 2: Flood and Drought Management in Malaysia, by Ir. Hj. Ahmad Husaini bin Sulaiman, Department of Irrigation and Drainage

The speaker gave an overview of flooding in Malaysia including statistical data for the past century, spatial distribution, economic impact and the most significant activities implemented by DID to mitigate floods and preventive measures to reduce flooding. The key points of his lecture are summarised below:

- Floods and droughts are significant natural disasters in Malaysia due to its topography and uneven rainfall characteristics.
- Despite implementing structural flood and drought control measures, population increase and land development activities

have aggravated the incidence of floods and droughts, particularly in the urban centres.

- Preventive approaches taken by DID (i.e. Urban Stormwater Management Manual and Integrated Water Resources Management) constitute an effective means to supplement structural measures in reducing loss of lives, trauma, crop and property damage due to floods and droughts.
- A forecast, warning and response system is very important for reducing the risk of life and economic losses. However providing an acceptably accurate forecast is a great challenge.
- DID has established 208 telemetric river level stations and 335 telemetric rainfall stations in 40 river basins in Malaysia to provide real-time flood warnings.
- An additional 100 hydrometric stations will be established over the next two years to improve flood forecasting and drought monitoring.
- The potential climate change impacts on the occurrence of floods and droughts are still uncertain, and thus no prediction on the potential increase in flood peaks or drought rainfall deficits for specific river basins in Malaysia has been provided.
- The freeboard of flood mitigation works may accommodate the potential impact of climate change on flood.

In conclusion, Ir. Hj Ahmad Husaini reiterated that water is a national heritage, which needs to be preserved and well managed, and that without proper flood and drought management, water related problems would recur.

Remote Sensing and GIS for Extreme Weather related Disaster Management, by Tuan Haji Darus Ahmad, MACRES

In this presentation the role of MACRES in support of national disaster management was elaborated, in particular the structure and organization framework of the National Disaster Data and Information Management System (NADDI) hosted by MACRES. It noted that remote sensing and related technologies were useful tools for Disaster Management, Natural Resources, Environmental Management, and National Security. These technologies have proven to be useful for mapping and monitoring relatively extreme weather phenomena. Repetitive coverage of earth surface areas by satellite imagery provides a means of monitoring processes on a regular basis. MACRES being a national centre entrusted for the development and application of remote sensing has offered to provide the necessary support to set the technology in operation, in support of the nation's effort to prevent and mitigate natural disasters.

Impact of Climate Change on Malaysia Water Resources, by Ir. Haji Ahmad J. Shaaban, National Hydraulic Research Institute Malaysia (NAHRIM)

One of the tasks under the NC2 is to assess potential impacts of climate change on seven vulnerable sectors and to formulate corresponding adaptation measures. Water resources are one of the seven sectors identified, and the sixth speaker for the session Ir. Hj Ahmad J. Shaaban presented the work done by NAHRIM on the "Impact of Climate Change on Malaysia Water Resources". The study is based on a fine resolution Regional Hydro-climate Model of Peninsular Malaysia that was

downscaled from a coarse grid GCM. Ir. Ahmad presented the simulations to assess the impact of climate change over Peninsular Malaysia with respect to rainfall and river flow by way of comparison of historical simulations during the 1989-1993 periods against their future counterparts 2025-2034 periods and 2041-2050 period. This study revealed a substantial increase in mean monthly rainfall over the North East Coastal region and over Kelantan; and a decrease in mean monthly rainfall over Selangor and Johor. In the future, a higher maximum and lower minimum rainfall were also anticipated in many sub regions, which may lead to more extreme hydrological conditions. The hydrological component indicated mean monthly flows should stay about the same in most watersheds except in Kelantan and Pahang where it is expected to increase, and in Selangor and Johor where it is expected to decrease. Hydrological extremes will be magnified significantly in Kelantan, Terengganu and Pahang watersheds. Simulations of future monthly flows indicated the lower and the maximum monthly flows would be significantly higher than their historical counterparts in these watersheds, and an increase in inter-annual and intra-seasonal variability with increased hydrologic extremes (higher high flows, and lower low flows) in Kelantan, Pahang, Terengganu and Kedah watersheds is to be expected. Ir. Hj Ahmad in conclusion stressed the following points:

- Climate Change projections have to be studied further and translated into how it would impact Malaysia's social and economic sectors (agriculture, forestry, bio-diversity, coastal resources, water resources, public health & energy).
- Expected changes in water availability by year 2050 require a review of current water resources plans in the various sub-sectors and states of Peninsular Malaysia

- Studies need to be carried out at selected river basins on performance of water supply systems and irrigation systems based on future water demands and hydrologic regime.
- Further research on the future hydrologic regime (rainfall/streamflow characteristics at finer temporal and spatial timescales) is required.

Capacity Building and Research Requirements for Disaster Management and Prevention, by Assoc. Prof. Dr. Joy Jacqueline Pereira, Institute for Environment and Development (LESTARI), UKM

Dr. Joy explained that although earth-related processes serve to provide resources such as water, minerals and fossil fuel, they also pose a threat to the well-being of society through events such as earthquakes, tsunamis, landslides, typhoons and floods among others. Technological advancement has brought untold benefits to humanity, but at the same time these have been accompanied by challenges such as pollution, industrial disasters and other catastrophic disasters. Over the years, the number victims affected by disasters have increased, from around 70 million per year in the 1970s to 213 million per year in the 1990s. It is anticipated that disaster events will intensify with the growing impact of climate change and an increased frequency of weather related disasters is to be expected. She indicated that the costs of disasters are tremendous – with half of the USD 664 billion damage caused by disasters in the past decade occurring in Asia alone. With the growth of population and urbanisation, Dr. Joy pointed out that the cost is expected to increase significantly in the future. Currently, 3% of the land surface is occupied by cities and 50% of the world population live in cities. Thus,

cities are extremely vulnerable to disasters as the risk of life and capital losses are relatively higher. Given this scenario, it is increasingly critical that any initiative on disaster management and prevention should provide special emphasis on cities, including aspects of demographic distribution, technological and social conditions and planning systems.

Dr. Joy elaborated that disasters are caused by hazards of natural origin or human activity or a combination of both natural and anthropogenic activities. Disasters include the loss of life or injury, property damage, social or economic disruption or environmental degradation. Hazards are defined as a potentially damaging physical event, phenomenon or human activity that may cause a disaster. She noted that the vulnerability of a community to hazards depends on physical, social, economic and environmental conditions as well as the factors and processes that prevail in their location. In America and Europe, the main cause of disaster related deaths is hazards of meteorological origin. However, statistics indicate that in Asia, geological disasters are far more common compared to meteorological disasters. A similar scenario is observed in Malaysia. There is now international recognition that in order to reduce the risk of disasters, efforts should focus on ensuring that this issue is systematically integrated into policies, plans and programmes for sustainable development and supported by good governance. Notwithstanding this, the management and reduction of risk of disasters continue to pose a challenge. Finally she drew the participants' attention to the Hyogo Framework Action (2005-20015), which has identified five key areas to be addressed in an effort to strengthen management and prevention of disasters. These include governance, risk management and early warning systems, information management and education,

reduction of underlying factors and preparedness for response and recovery.

Climate Change – its Effects on the Agricultural Sector in Malaysia, by En. Mustafa Kamal, Ministry of Agriculture

Food security is of major concern to everyone, and agriculture is a sector highly vulnerable to global warming and climate change. En. Mustafa gave an overview on the economic importance of agriculture, including the food production growth, and some of the major concerns of the agricultural sector. With regards to the impacts of climate change on agriculture, the main concerns highlighted were droughts related to El Nino events (which are a naturally occurring inter-annual climatic phenomena), and excessive rainfall due to extreme weather events. En Mustafa pointed out climate change management in Malaysia has implemented policies and strategies to minimise impacts on our economy. To accommodate possible climate change scenarios as predicted by Global Climate Models, En. Mustafa mentioned that the following adaptation measures were being undertaken to ensure sustainability of the agricultural sector:

- Use of agro-climatic classification in agricultural planning and use of soil suitability criteria for crop production.
- Development of crop varieties that are tolerant to high temperatures with high water-use efficiency, pest and disease resistance.
- Development of precision technology for maximum efficiency in water and nutrient inputs.
- Strengthening of agricultural extension services (soil conservation measure and production efficiency).

- Strengthening the Integrated Pest Management (IPM) and Bio-control procedures to deal with increased incidences of pest and diseases.
- Introduction of agriculture insurance to minimise risks related to climate change.

Keynote Lecture 3: Disaster Risk Reduction Under Changing Climate Conditions: Roles for the National Meteorological and Hydrological Services (NHMs), by Dr. Heather Auld, Environment Canada

Dr. Auld provided a comprehensive overview and assessment of disasters and its impacts, along with various management strategies to minimise and reduce the risk of damage from disasters. She outlined the strategies for disaster risk management and crises management and how these are being implemented in her home country by their NHMs. In particular she emphasized the importance of risk management before a disaster occurs through proactive means to reduce vulnerabilities, such as improving warning and emergency response systems, incorporating climatic and hydrological design values for codes and standards, improving atmospheric and hydrological hazards information, and learning from past failures and disasters. Dr. Auld also elaborated on the reactive measures or crisis management to be carried during and after a disaster. In the case of extreme weather events it is important to move from weather prediction to risk prediction, as this would entail timely and accurate weather warnings leading to action. In this context, it is important to monitor and detect impending hazards and hazards risk guidance for quick recovery of a disaster-hit community. Although natural disasters are not always predictable, they are most often foreseeable

and thus risk planning requires understanding of frequencies, trends and changes of hydrometeorological events. The role of the NMHs community in this aspect is very important in providing weather hazard risk assessment. Dr Auld stressed the importance of understanding why some early warning programs fail, and how one would plan an effective early warning system. The success of a warning system is measured by the actions people take. In other words, warnings must use terminologies relevant to the decision-maker and messages that suggest appropriate action. Often this would require an appreciation of local and indigenous knowledge.

Early Warning Systems Do's and Don'ts in Environmental Hazard Management, by Prof. Dr. Khairulmaini Osman Salleh, Universiti Malaya

Professor Khairulmaini gave an overview of what constitutes an early warning system, building upon the UN definition which states, "the provision of timely and effective information, through identifying institutions, that allow those exposed to the hazard threat to take action to avoid or reduce their risk and prepare of effective response". Early warnings systems (EWS) must be "People-Centered Warning Systems" and should include the following four main elements:

- Risk Knowledge – Systematic Collection Data and Undertaking of Risk Assessments.
- Monitoring and Warning Service – Development of Hazard Monitoring and Early Warning Services.
- Dissemination and Communication – Communication of Risk Information and Early Warnings.

- Response Capabilities – Building National and Community Response Capabilities.

A weakness or failure in any one of these elements could result in the failure of the whole system. There would exist differences in practice, capacities, and gaps.

Acknowledging not all hazards are the same, Professor Khairulmaini emphasized the need for a multi-hazard warning system with six basic characteristics affecting one or more of the above-mentioned EWS components. These characteristics are listed as below:

- Predictability – Ability to predict or forecast the impact of a hazard with respect to magnitude, location and timing.
- Detectability – Ability to confirm predictions of impending impacts.
- Certainty – Level of confidence that predictions and detections will be accurate and not result in false alarms.
- Lead Time – Amount of time between prediction / detection and the actual impact of the hazard.
- Duration of Time – The time between the beginning and ending of impacts in dissemination of warning information.
- Visibility – The degree to which the hazard physically manifests itself so that it can be seen.

EWS can be made effective through the involvement, contribution and coordination of diverse components of society.

Climate Change & Communities – The Role of NGOs in the Last Mile, by Datuk Dr. Jemilah Mahmood, MERCY Malaysia

Speaking from her vast experience in disaster relief operations and with particular reference to the Johor floods, Dr. Jemiliah raised 3 key issues; firstly the changing rainfall pattern due to changing climate, with respect to its scale and time, recognizing the need to focus on climate change adaptation. Second, community interface is grossly lacking in the monsoon flood monitoring system. Lastly, an understanding of the linkages between the environment and disaster is important because each is a cause onto the other. Dr. Jemilah emphasized that recovery-related investigations must include at least these four issues:

a) The extent of disruption of the livelihood of the community.
b) The extent of local infrastructure damage.
c) The extent to which the local organizational structure is in place and functioning.
d) The psychological and social issues of the society traumatised by the disaster.

The speaker also spoke of the need for long-term risk reduction investigation, which takes into account the indicative local needs. In conclusion, Dr Jemilah proposed a Framework of Action Program, a 3-year integrated program for community-based climate change adaptation, as well as an assessment of its implication on disaster risk reduction. This program shall have 3 main components; first of which will include assessment, planning, implementation and dissemination; a second component encompassing training and capacity building; and a final component aimed at action research and implication to policy and field implementation.

Integrated Community Based Risk Reduction in Climate Change (ICBRR), by Dr. Selva Jothi Crescent Malaysia (MRC)

Dr. Jothi explained that the MRC is concerned about climate change because of the unpredictability of wet and dry seasons, as well as the rise of the frequency and impact of natural disasters. This will increase communities' vulnerabilities, in particular the poorer segments of the society. The general objective of an ICBRR is to develop and strengthen the capacities of vulnerable communities to undertake the integrated community based risk reduction activities in climate change. To implement this, MRC is integrating climate change adaptation into the MRC Disaster Management (DM) Strategic plan, incorporating the Vulnerable Capacity Assessment (VCA) module into the DM Training Curriculum, integrating risk reduction adaptation into existing community based disaster risk management programs, and ensuring that climate change risk awareness are being promoted through education programs for the general community, staff, volunteers, the government and other stakeholders.

THEME 2 – SOCIO-ECONOMIC ASPECTS

Day 2 of the seminar was devoted to the socio-economic aspects of extreme weather and climate change. It was divided into 3 sessions, with a total of 2 keynote lectures and 10 scientific presentations presented during these sessions. A panel discussion was held before the seminar closed.

Keynote Lecture 4: Climate Change and Sustainable Development, by Ambassador Chandrasekhar Dasgupta, India

The thrust of the speaker's message was that developing countries should focus on adaptation measures to climate change rather than mitigation measures, and should therefore strive towards accelerated development to better enable them in dealing with climate change by building up their adaptive capacities quickly. He pointed out that developing countries were lacking in financial, technical and human resources capacities. He advocated for climate change to be taken into account in infrastructure planning for short-term adaptation, and for sustained targets and accelerated growth for long-term to adaptation.

With regards to mitigation actions, he stressed that the developed countries' role should reflect their responsibility for contribution to climate change as well as their greater capacity for addressing it. They should not only reduce emissions, but also share financial and technical resources with developing nations. He pointed out that, if on a per capita basis, global emissions were that of India's population, climate change would not be occurring. He noted that while the international climate agreements require all countries to formulate and implement programmes containing measures to mitigate climate change, scarce financial resources should not be diverted from development priorities, as this would cripple the adaptive capacity of developing countries.

Questions:

1) Dr. Sivananthan Elagupillay (Department of Wildlife and National Parks) – In prioritising adaptation as opposed to mitigation, are we not

committing the same sins as that committed by the developed nations?

A: We would be committing a sin if we exceeded our fair share of atmospheric resources. After all, it cannot be the case that one side is developed by utilising atmospheric resources while others cannot do the same. If industrialised countries have an implicit right to exceed their fair share of atmospheric rights, then this will entrench the rights of one set of countries to develop faster. This is not only an environmental issue, but also an economic one. On the 'per capita' principle, we are actually referring to per capita of fuel. A per capita emission right would provide an equal right to development for all. Hence, as long as developing countries remain within their fair share of emissions to develop, then it is not only their right but also an obligation to future generations to do so.

2) Dr. Yap Kok Seng (MMD) – Rapid development in developing countries has resulted in higher energy needs and this has resulted in insecurities with the energy issue. What can be done?

A: In climate change negotiations, we must remain firm there can be no differential entitlement to energy use. Propositions that all countries should reduce emissions by 2030 translates to developing countries signing an international agreement binding them in perpetuity to using a small proportion of energy that industrial countries can use. Propositions in the Stern Review effectively ask developing countries to accept an energy regime that will force them to accept a smaller proportion of rights to energy.

Incorporating Climate Change into the National Economic Development, by Mr. Muthusamy Suppiah, Economic Planning Unit

Mr. Muthusamy remarked that climate change has to be viewed from an integrated framework perspective, as all actions are inter-related, be it adaptation or mitigation measures. Although we have no commitments toward emission reductions, carbon emissions in developing countries do grow at a much faster rate. Malaysia and other developing countries should consider the possibility of accepting emission reductions or else the future of the convention itself would be at stake.

He then went on to explore available policy options – either regulatory, or via economic instruments such as trading permits, carbon tax and tax rebates. Several barriers/constraints faced by developing countries were later discussed. There was no clear indication of climate change in national policies, although there were many climate change initiatives/measures implicitly/indirectly referred to. He observed that this was probably due to insufficient evidence of the effects of climate change on the Malaysian environment. Some examples of climate change related initiatives on transportation, energy and industry were cited. He ended by suggesting that the way forward would be to consolidate all these efforts under the framework of Sustainable Development and added that EPU already has plans of doing so.

Comment/Questions

1) Dr. Yap Kok Seng (MMD) – Traffic is the biggest emission contributor in KL and the cause of time wastage as well. There are GEF funds to address this issue and EPU is the most likely agency to tackle it.

A: Statistics on time and effort wasted in traffic jams are not taken into account when decisions are taken to build roads, however we are moving towards providing more information to policy makers. Some decisions of course are made based on political considerations.

2) Faisal Parish (Global Environment Centre) – What are the planned adaptation strategies and will EPU/other agencies help finance them?

A: Dr. Lian will be providing examples of national adaptation initiatives later.

3) Dr. Mazlan Othman (Academy of Sciences Malaysia) – In Europe, measures are taken at individual levels. Malaysians should also achieve this level of involvement. How can EPU facilitate this?

A: The public can play a very important role, however public attitude leave much to be desired. Even if they are aware, they refuse to react or respond. Perhaps if the government were to try and change public attitude, they should consider changing from within (lead by example). We cannot yet compare ourselves to developed nations. Here we should consider effectiveness of enforcement versus incentives to foster a change in public attitudes.

Social Economic Costs of Floods: A case of the Johore Floods During Northeast Monsoon 2006/2007, by Dr. Yee Lai Wan, Socio-Economic and Environment Research Institute (SERI)

Dr. Yee listed the costs of floods; including direct tangible costs, indirect tangible costs and intangible costs. The socio-economic impacts are divided into physical, social and environmental impacts. In the recent Johore floods, several indirect tangible losses affected the public sector, the community and the private sector. These losses are difficult to evaluate.

She noted that socio-economic costing required a paradigm shift in thinking about costing, and was previously limited to technical discussions.

Refinement of the methodology would occur with collaboration and more research. She highlighted that a cost-benefit analysis for taking measures in a flood-prone area indicates the benefit would be the avoided cost in the event of a flood. She concluded by stating that interim measures for flood management such as community awareness programmes, drills on flood preparedness, flood warnings should be undertaken, and reiterated the need to establish a flood impact inventory.

Questions/Comments:

1) Dr. Yap Kok Seng (MMD) – How can the government create this inventory?

A: Collect data on the direct and indirect, tangible and intangible losses. Contingent valuation, which employs a willingness to pay and

willingness to accept method, can be employed in estimating the latter. As for estimating value of life, it is suggested to apply the value of statistical life that insurers use.

Economic Aspects of Climate Change: Effect of Ambient Tropospheric Ozone on Rice Yield in MADA, by Dr. Marzuki Ismail, Universiti Malaysia Terengganu

This paper highlights a study by the speaker on the effect of pollution on rice cultivation. He pointed out that the domestic consumption of rice is expected to increase to 2.3MT in 2010 from 1.8MT in 1995.

The study concluded that apart from weather, which has a strong impact on crop production variability, abiotic factors such as pollution also have an impact. However this is rarely considered or studied. He stated that if abiotic factors are ignored, optimal production could never be achieved regardless of everything else.

He summarised that if ozone levels were high, yields would be low, resulting in economic loss. Understanding the impact of abiotic factors will enable us to take action. He cited the Californian example of wine growers who faced a similar problem. The solution was to plant a variety of grapes resistant to increased ozone levels. He noted that similarly, Malaysia should look into the ozone impact on grain production more seriously.

Sustainable Peatland Management for Fire Prevention, Climate Change Mitigation and Adaptation, by Mr. Faizal Parish, Global Environment Centre

Mr. Faizal summarized the key roles of peatlands, i.e. for carbon storage and sequestration, biological diversity, sustainable forestry, non-timber forest products, flood control and water supply, tourism and recreation, and livelihood support for local communities. Several statistics on the CO2 emissions from peat fires and peatland drainage were given.

On regional actions, Mr. Faizal informed that 10 ASEAN countries had established Peatland Management Initiative and Strategy in 2003 and 2006, respectively. The key strategies included fire prevention, control and monitoring, integrated management of peatlands, peatland restoration, and peatlands and climate change.

Health Effect from Climatic Change: Malaysia's Scenarios, by Dr. Rozlan Ishak, Ministry of Health Malaysia

Dr. Rozlan informed that the incidence of malaria was gradually reduced in the last 50 years through proper planning, appropriate strategies and preventive work, and medical treatment. On the other hand, the improvement in quality of potable water supply has greatly reduced diarrhoea, typhoid, cholera, dysentery, worm infestation and other food and water borne diseases.

With current global warming trends, a wide range of negative health impact is expected to affect the health of many due to the potential depletion of resources, loss of territories following sea-level rise,

changes in the sanitary and hygiene situations, rise in vector and pest breeding areas, deterioration of ambient air quality and increasing frequencies and intensities of extreme weather events. Without the appropriate mitigation measures and adaptability programs planned and implemented, over the next fifty years we would expect higher incidences of mortality and morbidity from vector borne diseases such as malaria and dengue; food and water borne diseases such as cholera, typhoid, dysentery and etc; infant and maternal mortality; morbidity and mortality from cardio-respiratory related diseases; and more suffering from natural disasters especially among infants, pregnant women, the elderly and the sick.

Questions:

1) Dr. Fredolin (UKM) – What model did you use for the predictions?

A: We need statisticians to help with the modelling. The predictions were based on 50 years' population growth of a triple increase. Therefore using the same calculation, the risks can increase 3 times.

2) Dr. Yee (SERI) – We don't look at non-communicable diseases. For example, rising temperatures can cause more stress because of small houses/flats.

A: This issue was not addressed due to time constraints. The Ministry of Health, however, has a Committee studying this issue.

Effects of Extreme Climatic Change on Infrastructures Utilities, by Ir. Dr. Safry Kamal Hj. Ahmad, Public Works Department Malaysia

Dr. Safry informed that several recent extreme weather events had called for the government to identify mechanisms and procedures for rapid response. He described examples of road damages caused by natural disasters. He also described the recent floods in Southern Malaysia in which overall damage costs exceeded RM 317 million.

He summarised several actions undertaken by the government, including amendments to existing laws and acts, public awareness and education, establishment of forecasting and early warning system, construct mitigation structures, national disaster relief fund, and develop standard operating procedures. He later elaborated on several strategies implemented by the government in managing the disaster, which consists of flood operation manuals, immediate actions, medium term actions, and long-term plans. These governmental levels of intervention involve several agencies including Prime Minister Department, Public Works Department and Drainage and Irrigation Department.

Climate Change, Energy and Transport, by Mr. Azman Zainal Abidin, Pusat Tenaga Malaysia

Mr. Azman described Malaysia's energy supply and demand in 1994 and 2000, which both showed significant increments. Some initial results of the greenhouse gas (GHG) inventory for the energy sector were shown. The estimations using both the Reference Approach and Sectoral Approach indicated that the GHG emissions had escalated from 1994 to 2000.

He explained the Clean Development Mechanism (CDM) as an effort to reduce GHG emissions. As of April 2007, there were 42 PIN and 30 PDD submitted to the Designated National Authority. Of these, 24 projects were given host country approval and 14 projects were registered with the CDM EB. The types of project were summarised and total estimated emission reduction approximated 7.9 million tonnes per year. He further noted on other direct benefits from reducing GHG emissions, i.e. energy conservation and improved air quality.

Questions:

1) Mr. Faizal Parish (GEC) – You mentioned earlier about the projects' failure to improve energy efficiency. Does this mean that financial incentives are needed?

A: I did not say that the projects were a failure but that the results were not encouraging. This was due to certain barriers; e.g. SREP's stumbling block was the tariff between buyers (wanting a lower price) and sellers (wanting a higher price); and the sustainability of supply – whether the supply of empty fruit bunches (the energy feed stock) can be sustained indefinitely. Also, our energy price is cheap due to heavy subsidies and therefore the question is, "Why care about energy efficiency?" Our mindset has not changed. Our study shows that these subsidies must be removed.

2) Dr. Rawshan Ara Begum (LESTARI, UKM) – Ecological footprint concept is an indicator of sustainable development. Malaysia must

reduce the ecological footprint by reducing subsidies. What are your views on ecological footprint and subsidies?

A: We are all for it but subsidies will be reduced over time.

Keynote Lecture 5: National policy responses to climate change: The Malaysian Experience, by Dr. Lian Kok Fei, Ministry of Natural Resources and Environment

Dr. Lian informed of Malaysia's climate related policies, including the National Policy on the Environment, National Forest Policy 1978, Biodiversity Policy, National Energy Policy; National Transport Policy (Land) and Third National Agricultural Policy (1998-2010).

Climate change is expected to cause impacts on the agriculture sector, water resources, sea level rise, and public health. Adaptation strategies for these impacts include maximizing water efficiency, and integrated coastal zone management to reduce flood intensities. On the other hand, the government has taken several actions to reduce anthropogenic GHG emissions and raise awareness. Other ongoing projects under the Ministry's custodian include Development of National Climate Policy and Strategy, Second National Communication and National Capacity Self Assessment.

Global Warming a Risk of Change – New Challenges for the Insurance Industry, by Mr. Alexander Milberg, Munich Re Malaysia

Mr. Milberg remarked on the trends of natural disasters in the last few years which have increased in intensities, frequencies, resulting in increased damages and losses. Several natural disasters and estimated losses were given. With more scientific evidence, he pointed out the link between extreme events and global warming.

The insurance industry is affected by the increase in weather variability, new levels of weather extremes, new kinds of weather risks, higher loss potentials, lacking experience in new kinds of damages, increased capacity demand due to larger accumulation risks, prospective premium calculation becomes necessary, increased coverage of climate change by the media and own perception of changes in weather patterns. The insurance industry can prepare for the increasing catastrophe risk through several measures, including development of new risk models considering climate change, adequate pricing, substantial deductibles, based on the respective exposure, accumulation control, loss prevention, improved claims settlement, liability limits, exclusion of certain hazards, exclusion of particularly exposed areas, reinsurance and retrocession, and private-public partnership.

Climate Change: The Security Impacts and Responses in the Short, Medium and Long Terms, by Mr. Chow Kok Kee

Mr. Chow firstly discussed on the impacts of global warming and climate change on several aspects, including water resources, ecosystem, food production and health. He further noted the aggregate impacts of climate

change alone or when interacting with other non-climate stresses cause a higher vulnerability. He later summarised his findings and recommendations in a study on National Security and the Threat of Climate Change undertaken by the USA Military Advisory Board.

A review of the impacts on security for short term (up to 2020), medium term (up to 2040) and long term (beyond 2060) were given. For each duration, Mr. Chow then provided the potential response strategies that can be considered and implemented by the developed countries, developing countries as well as for all countries.

Climate Change or Extreme Weather Impact on Human Settlement and Land Use, by Mr. Mohd. Jamil bin Ahmad, Federal Department of Town and Country Planning

Mr. Mohd. Jamil firstly gave an overview on climate change impacts on human settlement and land use in Malaysia and analyzed the current mechanism which can be used to reduce these impacts. Evaluation of land use system and its implementation in Malaysia provided some perspective on how the existing mechanism could reduce impacts from climate change through development strategies and development control. He remarked that it is imperative that the existing land use system and its mechanism must be understood by the relevant agencies and the public to ensure its effectiveness. Better understanding on existing development policies and improvement of existing documents therefore are important.

He noted that climate change is a global phenomenon and will have impacts on Malaysia. Principles of the Hyogo Framework of Action

should be disseminated to other technical agencies in their planning and development programme to reduce impacts of disasters. A more integrated approach between ministries, technical agencies and NGOs in mitigation measures especially in producing risk mapping for vulnerable settlements should be expedited. Community participation in disaster risk reduction is necessary.

PANEL DISCUSSION

Chair: Mr. Chow Kok Kee (former Director General of Malaysian Meteorological Department)

Panel Members: Dr. Yap Kok Seng (Malaysian Meteorological Department)
Dr. Lian Kok Fei (Ministry of Natural Resources and Environment)
Mr. Che Moin bin Umar (National Security Council)
Assoc. Prof. Dr. Fredolin Tangang (Universiti Kebangsaan Malaysia)
Mr. Gurmit Singh (CETDEM)

This discussion began with the panel expressing their views against a question posed by the Chair. An open forum followed with comments and questions from the participants. The panel members were later invited to address the comments and questions.

The Chair informed the panel that the discussion topic was: “What are the research, policy and institutional plans on climate change and

increasing extreme weather events, and how do these address adaptation and mitigation needs?”

Dr. Yap firstly noted the convergence of disaster and climate change – their management should be mainstreamed into national policies, programmes and plans. As both are cross-sectoral issues, he suggested that the Economic Planning Unit (EPU) should lead the way in tackling these issues. With regards to risk prediction and early warning, Dr. Yap remarked that many databases exist for local studies. However, the databases, which are critical for risk modelling are held by sectoral agencies, hence there is a need to compile and integrate them, probably under the custodian of a lead agency.

From the presentations delivered during the seminar, Dr. Yap noted that several relevant studies/policies, that are in the stage of preparation or have already been adopted, e.g., National Climate Policy Study, National Urbanisation Policy and National Sustainable Development Policy need to be coordinated and interacted with each other. He indicated that win-win options should be formulated for climate change mitigation measures. He further highlighted energy security and usage, which need inter-agency collaboration and coordination, particularly the Ministry of Energy, Water and Communication and Ministry of Transport.

Dr. Fredolin remarked that universities have a role to play in all aspects from policy to science and governance. He further stressed the need to understand the scientific aspects of climate variability and climate change at broad and local scales. In particular, the climate variability at local level is temporally and spatially complex, but is critical for good planning for the future. Dr. Fredolin later expressed the need to increase

R&D in climate studies. As there are only 2 groups working on these aspects presently, he suggested increasing research activities and academic programmes in universities with support from the government.

Dr. Lian suggested building on the findings of existing activities such as Second National Communication, which examined the impact of energy savings on climate change or the impacts of biodiversity by climate change. Because global climate models are generic, he highlighted that research is needed to generate regional climate models. Nevertheless, he informed that local research should be built on international works, and should engage the business sector so that research is not for the sake of researching only. Furthermore, the research should garner support from all stakeholder groups.

Mr. Gurmit explained that climate change is a broad issue that necessitates an action plan to guide the national activities. He also noted that there is still a lack of inter-agency collaboration. In addition, more political support is required for handling climate change, describing a previous experience where he briefed the Members of Parliament on climate change. As public participation is important, he suggested that information on climate change should be provided to the public in a user-friendly way so that dissemination is effective. On the other hand, he stressed the need to develop proper consultation methods. Mr. Gurmit pointed out that no enforcement was undertaken at operational level, i.e. plans at national level need to be implemented at local levels. During implementation, he emphasised that political interference should be prevented. He later underscored the weaknesses of institutional memory and capacity within the government agencies, which could be observed

particularly during international negotiations. He suggested finding ways to tap the institutional memory of those experienced officers.

Mr. Gurmit remarked that the management of energy, water and land resources need to be planned on a demand basis. Besides the supply side, consumption should also be managed. He gave an example whereby in Selangor, the water usage is double that of Singapore. He further noted that there are massive wastages in all resource sectors. Mr. Gurmit underlined the importance of the availability, accessibility and transparency of data and their sources. He pointed out that currently there are too many restrictions by the OSA.

Mr. Che Moin indicated that relevant research and policies are already available and sufficient. The key is to use them to the benefit of the current situation. Equally important, he noted, is to ensure the policy makers are aware of and have a grasp on the research findings, which are, however, not well disseminated particularly to the policy makers.

According to Mr. Che Moin, management of natural disaster has been a normal routine activity implemented by the government agencies. He further stressed several key questions that require attention, i.e. the potential risks due to the climate change; how this has been studied and understood at the local level; and how it will affect the existing actions.

Mr. Che Moin believed that Malaysia's institutional capacity is capable of managing the disaster hazards. Nevertheless, the institutional arrangement and management still needs improvement. He cited the example of actions taken in dealing with the recent flooding. Although he acknowledged that such actions might not be perfect, there were other

factors affecting the effectiveness of the actions, particularly the negligence of humans or the victims.

He later provided his views on the strategy and institutional arrangement as follows:

- The existing consultation is insufficient and requires improvement as it is both the responsibility of government and the community in dealing with the issues;
- Current sectoral approach needs to be changed, with reference to the Hyogo Framework Action, which emphasises mainstreaming of disaster management into planning;
- National policies must be adopted and implemented by the state authorities without amendments;
- Political commitments in managing the hazards exist, such as the construction of the SMART Tunnel, the tsunami recovery, the December 2006 flood recovery, etc;
- Economic recovery plan is required, along with public awareness and warning activities.

During the open forum session, several questions and comments were raised by the participants. Dr. Yee Lai Wan, Social Economic and Environment Research Institute (SERI) suggested the adaptation by community approach. For example, a market for technologies such as domestic solar water heaters can be viable if the government provides tax rebates or subsidies,

Ms. Khairiah Tauha from the Eastern Regional Organisation for Planning and Housing (EAROPH) agreed with Mr. Gurmit that an action plan is needed. She also noted that it is always the same faces attending these

events. Participation of industrial players are lacking in these seminars. The roles and responsibilities of all stakeholders should be clarified.

Ms. Elizabeth Lisa John, NST Press raised several questions as follows:

- Do the high level government officials realise the issues on climate change?
- Are we moving too slowly on adaptation to climate change?
- Information does not reach the public on time. Why is it difficult to obtain information?
- How much of a priority is climate change to the government?

Mr. Chow shared his recent experience in delivering a presentation on the impacts of climate change to business community. The business community were only interested he was able to link profit and competitiveness to low carbon economy and energy efficiency. Therefore, he reiterated the importance of reaching the targeted audience effectively with the information to be disseminated.

Mr. Gurmit indicated that solar panels have been quite well promoted but efforts need to be intensified to attract the public. He remarked that government's incentives or rebates are useful, but may not always work nor are sustainable. The public should do something because they believe in it.

Disagreeing with some perceptions, Dr. Lian informed that many politicians are aware about climate change. However, as climate change is a slow and gradual process, the reactions from the politicians are not urgent. More importantly, as politicians are short-term profession, they are concerned mainly with issues like employment.

Mr. Che Moin remarked that many technology producers profit from selling western technology at exorbitant prices. However, as the standard of living here is much lower, he felt that the prices were not comparable with what we can afford. He added that the Emergency Response Plan in chemical industries is mandatory under NIOSH and DOSH.

Dr. Fredolin highlighted that global warming is real and happening. Modelled results have also forecasted the occurrences of extreme events, thus actions by all stakeholders are needed to tackle the problems. Developing countries like Malaysia will be harder hit. He indicated that our vulnerability and risks should be understood in order to formulate the needed adaptation measures.

Dr. Yap shared a similar concern over the renewable energy technology, i.e. how to increase its affordability. He also noted that technology transfer from the developed countries to the developing countries has not been taking place. Dr. Yap further remarked that climate change issues are broader than just environmental issues, and covers development and energy security. He also concurred that the politicians are aware of these issues, and in fact the seminar was held in parallel with the Cabinet's decision to understand the socio-economic impacts of climate change. He cited another experience in Penang where the Chief Minister and state executive councillors of the state had participated in the whole session of their activity.

While the adaptation measures are necessary over the next 20-30 years, he informed that the government has already been tackling disaster risk

reduction. He further highlighted the importance of data sharing and informed that MMD has been collecting relevant data. When deliberating on the impacts of climate change on Malaysia, he stated that it would be more apparent in 10-20 years. Besides Malaysia, Dr. Yap also noted that the impacts would also be apparent in the neighbouring countries.

Mr. Chow suggested creating a think tank to the government for long-term policies, as the climate change issues refer to more than just mitigation and adaptation efforts. When referring to post-2012 scenario, he raised a question on the baseline that Malaysia should adopt if we were to reduce the emissions.

Mr. Che Moin indicated that the issues should be addressed on a sectoral basis. For example, for tackling droughts, he informed the panel of the Cabinet's directive to the Mineral and Geoscience Department to determine groundwater resources.

Lastly, Dr. Yap confirmed that more energy-intensive industries have shifted to developing countries.

LIST OF RAPPORTEURS

Lead Rapporteurs:

Assoc. Prof. Dr. Joy Jacqueline Pereira
Institute for Environment and Development (LESTARI), UKM

Mr. Subramaniam Moten
Malaysian Meteorological Department

Rapporteurs:

Mr. Ling Leong Kwok, *Malaysian Meteorological Department*
Mr. Kwan Kok Foo, *Malaysian Meteorological Department*
Mr. Kumarenthiran, *Malaysian Meteorological Department*
Mr. R. Loganathan, *Academy of Science Malaysia*
Ms. Lavanya Rama Iyer, *Second National Communication (NC2) Project*
Dr. Rawshan Ara Begum, *LESTARI, UKM*
Mr. Tan Ching Tiong, *LESTARI, UKM*
Ms. Nur Azrina Azhar, *LESTARI, UKM*

LIST OF SPEAKERS

Bil	NAMA PEMBENTANG	AGENSI/JABATAN/KEMENTERIAN
1.	PROF. T. YASUNARI	Nagoya University, Japan
2.	DR. YAP KOK SENG	JMM
3.	PROF. MADYA DR. FREDOLIN TANGANG	UKM
4.	PROF. DATO' DR. AZIZAN BIN ABU SAMAH	UM
5.	EN. CHE MOIN BIN UMAR	MKN
6.	IR. HJ. AHMAD HUSAINI BIN SULAIMAN	DID
7.	TUAN HAJI DARUS BIN AHMAD	MACRES
8.	IR. HJ. AHMAD J. SHAABAN	NAHRIM
9.	PROF. MADYA DR. JOY JACQUELINE PEREIRA	UKM
10.	EN. MUSTAFA KAMAL BIN BAHARUDDIN	Ministry Of Agriculture And Agro-Based Industry
11.	DR. HEATHER AULD	Environment Canada
12.	PROF. DR. KHAIRULMAINI OSMAN SALLEH	UM
13.	DATUK DR. JEMILAH MAHMOOD	MERCY
14.	DR. S. SELVA JOTHI	Red Crescent Malaysia
15.	AMBASSADOR CHANDRASHEKHAR DASGUPTA	TERI, India
16.	EN. MUTHUSAMY SUPPIAH	EPU
17.	DR. YEE LAI WAN	SERI
18.	DR. MARZUKI BIN ISMAIL	Universiti Malaysia Terengganu
19.	DR. LIAN KOK FEI	MNRE
20.	EN. FAIZAL PARISH	Glabal Environmenta Centre
21.	DR. ROZLAN BIN ISHAK	Ministry of Health
22.	IR. DR. SAFRY KAMAL B. HJ. AHMAD	Public Works Department
23.	ENCIK AZMAN ZAINAL ABIDIN	Pusat Tenaga Malaysia
24.	DR. LIAN KOK FEI	MNRE
25.	EN. ALEXANDER MILBERG	Munich Re Malaysia
26.	EN. CHOW KOK KEE	BEKAS KP JMM
27.	EN. MOHAMED JAMIL BIN AHMAD	Ministry of Housing and Local Government

LIST OF PANEL MEMBERS

Bil	NAMA AHLI PANEL	AGENSI/JABATAN/KEMENTERIAN
1.	EN. CHOW KOK KEE	BEKAS KP JMM
2.	DR. YAP KOK SENG	JMM
3.	IR. HJ. AHMAD HUSAINI BIN SULAIMAN	DID
4.	DR. LIAN KOK FEI	MNRE
5.	EN. CHE MOIN BIN UMAR	MKN
6.	PROF. MADYA DR. FREDOLIN TANGANG	UKM
7.	EN. GURMIT SINGH	CETDEM

LIST OF PARTICIPANTS

Bil	NAMA PESERTA	AGENSI/JABATAN/KEMENTERIAN
1.	SIOW SUAN NEO	Jabatan Perancangan Bandar & Desa Semenanjung Malaysia
2.	MHD. FAIROS ASILLAM	Agensi Angkasa Negara, MOSTI
3.	HARIS ABU KASSIM	Kumpulan Perbadanan Pembangunan Pertanian Negeri Perak
4.	PROF. DATIN ZAHARAH HAJI MAHMUD	Jabatan Geografi, Universiti Malaya
5.	PROF. DR. HAMIRDIN ITHNIN	Jabatan Geografi, Universiti Malaya
6.	TEO BOON KHEE	Technology Park Malaysia Corporation Sdn. Bhd.
7.	PROF.MADYA DR.NORHASLINA HASSAN	Urban Studies & Planning Program, Universiti Malaya
8.	BENJAMIN LOH	Malaysian Environmental NGOs MENGO Support Unit
9.	DR. SIVANANTHAN ELAGUPILLAY	Jabatan Perlindungan Hidupan Liar Dan Taman Negara, (PERHILITAN) NRE.
10.	KDR MARITIM YUSOF ALI	Agensi Penguatkuasaan Maritim Malaysia, Jabatan Perdana Menteri
11.	SONNY WONG	Malaysian Nature Society
12.	PROF. DR. MAD NASIR SHAMSUDDIN	Universiti Putra Malaysia
13.	HASLINA ZAINOL	Lembaga Perlesenan Tenaga Atom, MOSTI.
14.	JUSOH LATIF	MPOB, Kem. Perusahaan Perladangan & Komoiti.
15.	KHAIRIAH MOHD TALHA	Eastern Regional Organisation for Planning & Human Settlements (EAROPH)
16.	PKPjB MOHAMAD RODZI SULAIMAN	Jab. Bomba & Penyelamat Negeri Johor
17.	PIARAPAKARAN SUBRAMANIAM	FOMCA
18.	VOL.CORP. R. RAMAKRISHNAN	Malaysian Volunteer Fire And Rescue Associate
19.	SITI ZUHAINI ABD. SAMAH	Pusat Sains Negara, MOSTI
20.	CHANG LENG HUA	Jabatan Ukur dan Pemetaan Malaysia.
21.	LOW XUN YUN	Astronautic Technology (M) Sdn. Bhd.
22.	MOHD ZAMRUNI KHALID	Bahagian Ekonomi Pelbagaihala dan Alam Sekitar, Kementerian Luar Negeri
23.	DR. NG INN KHUAN	Agensi Nuklear Malaysia, MOSTI
24.	CHAN KENG SAM	Institut Penyelidikan Sains & Teknologi Pertahanan (STRIDE), Kementerian Pertahanan
25.	MOHD ZULKEPHLI MOHD NOOR	Bahagian Ekonomi Pelbagaihala dan Alam Sekitar, Kementerian Luar Negeri

Bil	NAMA PESERTA	AGENSI/JABATAN/KEMENTERIAN
26.	RUSTAM KHAIRI ZAHARI	Universiti Islam Antarabangsa Malaysia
27.	ROHANI MOHAMED	Persatuan Sejahtera Kuantan (PSK) & Sustainable Development Network Malaysia
28.	TAN ENG LEONG	Persatuan Insurans Am Malaysia
29.	FAIZAL AZRIN ABD. RAZALIM	Agensi Nuklear Malaysia, MOSTI
30.	PROF. MADYA DATO' IR. DR. NORDIN YUNUS	Pusat Pengajian Kejuruteraan Alam Sekitar, Universiti Malaysia Perlis (UniMAP)
31.	MOHAMMAD HAMDAN WAHID	Jabatan Bomba dan Penyelamat Malaysia
32.	MOHD FADHIL KAMARUDDIN	Bulan Sabit Merah Malaysia
33.	KULWANT SINGH	Bulan Sabit Merah Malaysia
34.	RAMAKRISHNAN RAMASAMY	REACH
35.	AZMI HASSAN	Agensi Nuklear Malaysia, MOSTI
36.	PROF. MADYA DR. JOY JACQUELINE PEREIRA	Institut Alam Sekitar dan Pembangunan (LESTARI)
37.	PROF. MADYA DR. LEE YOOK HENG	Universiti Kebangsaan Malaysia
38.	CHIN SOONG KEAD	Sin Chew Media Corp.
39.	MAISARAH IBRAHIM	Perbadanan Putrajaya
40.	DR. MUHAMMAD BORZANI GAZIM	Universiti Kebangsaan Malaysia
41.	HJ. MOHD. SHAFIE ARIFIN	Majlis Perbandaran Kuala Kangsar
42.	NOORHASNITA ABD. SAMAD	Kementerian Perumahan Kerajaan Tempatan
43.	DATIN NOR ASHIKIN KARMAN	Kementerian Perumahan Kerajaan Tempatan
44.	ROZI EFFENDI ABD. RAHMAN	Kementerian Perumahan Kerajaan Tempatan
45.	ZULKIFLI HJ. ZAHARI	CETDEM
46.	WAN PORTIAH WAN HAMZAH	ISIS MALAYSIA
47.	PHILIP MATHEWS	ISIS MALAYSIA
48.	WAN MOHD RAZI IDRIS	Universiti Kebangsaan Malaysia
49.	ROZITA OSMAN	Lembaga Koko Malaysia
50.	MAGESWARI SANGRALINGAM	Sahabat Alam Malaysia
51.	IR. MOHD ZAKI MAT AMIN	Jabatan Pengairan dan Saliran Malaysia
52.	DR. LIEW JU NENG	Universiti Kebangsaan Malaysia
53.	HALIMATUN MUHAMAD	Universiti Kebangsaan Malaysia
54.	ESTER SALIMUN	Universiti Kebangsaan Malaysia
55.	ZULKAFLI ABD RASHID	Jabatan Perikanan Malaysia
56.	MOHD RAFI JASMAN	Majlis Bandaraya Johor Bahru
57.	AR. ASSOC. PROF. DR. ASIAH ABDUL RAHIM	Lembaga Arkitek Malaysia

Bil	NAMA PESERTA	AGENSI/JABATAN/KEMENTERIAN
58.	PROF. MADYA DR. MASTURA MAHMUD	Universiti Kebangsaan Malaysia
59.	HJH. HASSENAH MOHD	Lembaga Kemajuan Terengganu Tengah (KETENGAH)
60.	ZAMERI MUHAMED	Lembaga Getah Malaysia
61.	RAMLI OSMAN	Lembaga Getah Malaysia
62.	MOHD EKHWAN TORIMAN	Universiti Kebangsaan Malaysia
63.	MOHD KAMIL MOHD NOOR	Majlis Keselamatan Negara (MKN) Negeri Kelantan
64.	DR. SARASWATHY SINNAKKANNU	Universiti Teknologi Mara (UiTM)
65.	ISMANIZA ISMAIL	Universiti Teknologi Mara (UiTM)
66.	ASMA AINI MOHD NADZRI	Suruhanjaya Tenaga
67.	R. RAJAKUMAR	Dewan Bandaraya Kuala Lumpur (DBKL)
68.	PUTRI RAZREENA ABD. RAZAK	SIRIM BERHAD
69.	ZULFAHMI ALI RAHMAN	Universiti Kebangsaan Malaysia (UKM)
70.	FARAH ABU BAKAR	Malaysian Industry Government Group For High Technology (MiGHT)
71.	MOHD AFZANIZAM MOHD BADRIN	MiGHT
72.	NOR AZLIZA ARIS	MiGHT
73.	SYED MOHD HASNIE SAYED MOHD KHAN	MiGHT
74.	MOHAMED NORAZMAN MOHAMED ARIFFIN	Majlis Keselamatan Negara Negeri Melaka
75.	NORHISHAM KAMARUDIN	Majlis Keselamatan Negara, Jabatan Perdana Menteri
76.	NIK MUNIRAH MUHD NUR	Majlis Keselamatan Negara, Jabatan Perdana Menteri
77.	ALMIZI BIN IBRAHIM	Kementerian Perindustrian Kayu Malaysia
78.	NORIZAN ABDUL PATAH	MACRES
79.	SAYANG MOHD DENI	UiTM
80.	BAHTIAR B. PADLI	LKIM
81.	THIAGARAJAN NADESON	Worl Wide Fund for Nature (WWF Malaysia)
82.	CHIANG THIN THIN	MADA
83.	RAMLI ABDULLAH	MPOB
84.	ACP MOHD SHAHRIZAN CHE MAT DIN	Pusat Pengajian Pengurusan Krisis dan Bencana
85.	SURAYA BADARUDDIN	Kementerian Perumahan dan Kerajaan Tempatan
86.	NORZILLA MOHAMED	UNDP
87.	TAN CHING TIONG	LESTARI, UKM
88.	MOHIDEEN ABDUL KADER	Consumer Association of Penang (CAP)
89.	NURUL SULIANA AHMAD HAZMI	UPM
90.	HANI ADZLIN AD'NAN	UPM

Bil	NAMA PESERTA	AGENSI/JABATAN/KEMENTERIAN
91.	LAVANYA RAMA IYER	NRE
92.	ASFAAZAM B. KASBANI	UNDP
93.	ZAMARA MUSTAPHA	ATSB
94.	SUZANA MOHKERI	Global Environment Centre
95.	TENGKU HANIDZA TG. ISMAIL	UPM
96.	KAMARUZZAMAN ISMAIL	TNB
97.	ROZNITA BT OTHMAN	Lembaga Jurukur Bahan Malaysia
98.	DR. RAMLAN OMAR	UKM
99.	DR. SHAHARUDDIN AHMAD	UKM
100.	OOI SEE HAI	Universiti Malaya
101.	GAN PEK CHUAN	UNDP-GEF/NRE
102.	NUR WAHIDAH WONG ABDULLAH	MOSTI
103.	MOHAMAD HAMDANI B. HJ MADORI	BOMBA DAN PENYELAMAT
104.	HJ. SHAHRUDDIN HJ YUSOF	NOD MOSTI
105.	RUDY BIN FREDZEX@PARIOIK	JAB. BOMBA DAN PENYELAMAT
106.	ZAIDI BIN ZAINAL ABIDIN	Jabatan Meteorologi Malaysia (JMM)
107.	PROF. DR. MUHAMAD AWANG	UPM/ACADEMY OF SCIENCES MALAYSIA
108.	RAJA MUHAMAD HILMI B. RAJA KAMARUL BAHRIN	UPM
109.	SITI EMI AMINAH IBRAHIM	Sustainable Development Network Malaysia
110.	ZAIPUDIN MOHAMAD	Lembaga Pertubuhan Peladang
111.	SANTHIRA SEGARAN	JMM
112.	MOHD SANI BIN SA'AYON	JMM
113.	WAN MOHD NAZRI WAN DAUD	JMM
114.	NOR ZUHAILI ZAIDAN	JMM
115.	ATIFAH BINTI MOHD ALWI	JMM
116.	ZUREEN NORHAIZATUL BT CHE HASSAN	JMM
117.	SHARIFAH FARIDAH SYED MAHBAR	JMM
118.	DR. RAWSHAN ARA BEGUM	Institut Alam Sekitar dan Pembangunan (LESTARI), UKM
119.	NORMADIAH HAJI HUSIEN	Jabatan Alam Sekitar