

Consequences of Climate Change

“ Human influence on the climate system is clear. The more we disrupt our climate, the more we risk severe, pervasive and irreversible impacts. ”



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This key message was delivered by the Intergovernmental Panel on Climate Change (IPCC) after conducting the most recent comprehensive assessment on the state of climate in the world. Yet, there are those who question findings based on scientific evidence. They are probably misguided by non-peer reviewed articles with a political agenda designed to influence ongoing international negotiations on issues related to compensation, transfer of technology and resources.



The most recent assessment on global climate change is documented in reports of the IPCC Working Groups 1, 2 and 3 as well as the Synthesis Report, which was released in late 2013 and 2014. The entire reports are available at <http://www.ipcc.ch/>.

This article will provide some background on the IPCC and highlight key issues related to Malaysia. The information is derived from the most recent IPCC reports. We start with a brief description of the IPCC and the role of Malaysia. This is followed by a short discussion on key terms related to the climate change discourse, highlighting the need to clarify terminology for operational purposes. The final section focuses on the climate prognosis for tropical Asia. The implications for Malaysia can be inferred implicitly and some recommendations are made on the way forward.

IPCC, THE GLOBAL CLIMATE INSTITUTION

IPCC was jointly established by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO). It was endorsed by the UN General Assembly in 1988. Its 195 member states navigate the science-policy interface via the IPCC Plenary, with support from an elected IPCC Bureau and IPCC Executive Committee as well as three Working Groups and a Task Force, as well as assistance of the IPCC Secretariat and Technical Secretariat Units. The IPCC Working Group 1 covers The Physical Science Basis. Working Group II covers Climate Change Impacts, Adaptation and Vulnerabilities. Working Group III covers Mitigation of Climate Change. The Task Force focuses on National Greenhouse Gas Inventories. The IPCC Plenary comprises National Focal Points from member states which elect scientists and experts to its various bodies on a cyclic basis.

The role of IPCC is “to assess on a comprehensive, objective, open and transparent basis, the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.” Since 1990, IPCC has produced five Assessment Reports (1990, 1995, 2001, 2007, 2013/14) and other documents (Special Reports, Guidelines and Technical Papers) to support these assessments. The First Assessment Report (1990) led to the establishment of the United Nations Framework Convention on Climate Change (UNFCCC). Since then, four assessment reports have provided inputs for the UNFCCC and the latest Fifth Assessment Report (2013/2014) provide the scientific foundation for negotiating the Paris Agreement. The reports are neutral with respect to policy and deal objectively with scientific, technical and socio-economic factors relevant to the application of particular policies.



The new IPCC Bureau held its first session since the election in April 2016. Malaysia is represented for the first time in the Executive Committee (ExCOM) and Working Group 2 on Climate Change Impacts, Adaptation and Vulnerabilities.

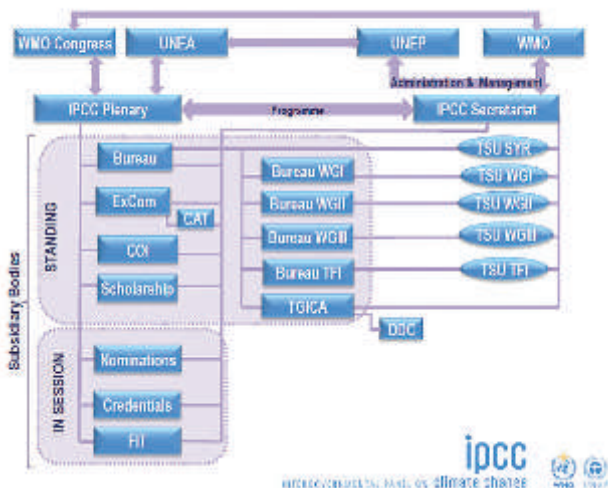
CLIMATE LINGO – AN EVOLVING DEBATE

An appreciation of the climate change discourse requires an understanding of the terms and definitions of some key concepts used by IPCC and its subtly different interpretation in other key platforms. IPCC issued the Special Report on Managing Risks of Extreme Events and Disasters to Advance Climate Change Adaptation in 2012.

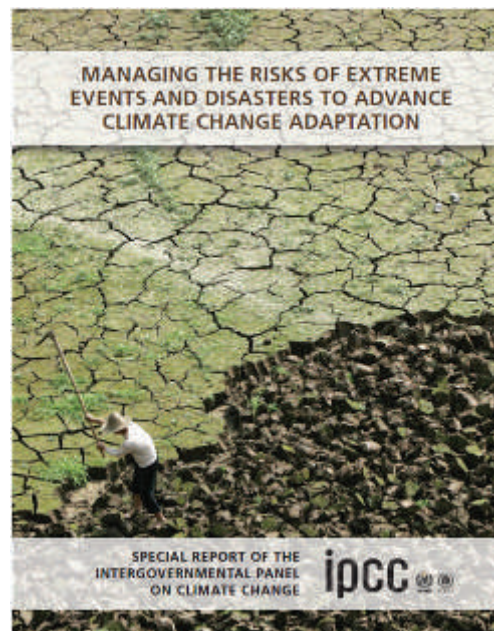
This report was momentous in that it integrated the perspective of three historically distinct groups of scientists: Specialists in disaster risk reduction, who are mostly new to IPCC, authorities in the areas of the physical science basis of climate change, who are generally associated with Working Group 1 of the IPCC, and experts in climate change impacts, adaptation, and vulnerability, who work under the auspices of Working Group 2.

Some key terms used that are of relevance to Malaysia are highlighted below, with differences in other platforms highlighted briefly.

IPCC Structure



Malaysia is represented in the IPCC Plenary by the Ministry of Natural Resources and Environment, which serves as the National Focal Point.



The SREX (2012) bridges gaps in terminology between specialists in disaster risk reduction, physical climate science and climate change adaptation. The entire report can be downloaded at <http://www.ipcc.ch/>

Climate Variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of climate at all spatial and temporal scales beyond that of individual weather events. This covers short-term changes. Climate Extremes refers to the occurrence of a value of weather/climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable.

Climate Change in IPCC refers to change that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of climate properties and which persist for an extended period, typically decades or longer, and may be due to natural variability or a result of human activity. This broad definition covers the long-term, including natural and human causes.

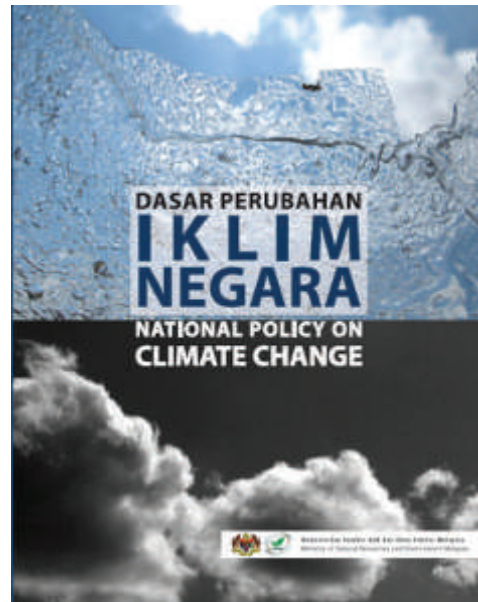
Climate Change in Article 1 of the UNFCCC refers to “a change in climate attributed directly or indirectly to human activity which alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”. This narrow definition leaves out natural causes and has implications on negotiations on compensation for loss and damage, from developed to developing countries.

Climate change mitigation is restricted to human intervention to reduce the sources or to enhance the sinks of greenhouse gases.

Disaster mitigation refers to the lessening of potential adverse impacts of physical hazards (including those that are human-induced) through actions that reduce hazard, exposure and vulnerability. Thus, climate change mitigation and disaster mitigation are two different concepts that occasionally cause confusion when disaster management specialists interact with climate change adaptation experts.

Climate Change Adaptation refers to both human and natural systems. In human systems, it is the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, it refers to the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate.

Climate Change in the National Policy on Climate Change (2008) refers to any change in climate over time that directly or indirectly affects humans and their activities as well as natural systems and its processes. This definition is silent on the causal element. The goal of the National Policy is climate resilient development. In Malaysia, this refers to development that takes into account measures to address climate change and extreme weather in line with national priorities. This broadened definition enables the National Policy to serve as an instrument to harmonise and integrate to the extent possible and corresponding to national priorities, measures on climate change adaptation, climate change mitigation and disaster risk reduction.



The National Policy on Climate Change contains 5 Principles, 10 Strategic Thrusts & 43 Key Actions to be undertaken by a variety of stakeholders.

In order to make this goal operational, there is a need to develop a lexicon of concepts that can accommodate the variety of disciplines and perspectives of practitioners working on these areas in Malaysia. Examples of such concepts include susceptibility, exposure, vulnerability and risk, among others.

CLIMATE PROGNOSIS FOR ASIA: A FUTURE INFERENCE FOR MALAYSIA

The Fifth Assessment Report of the IPCC Working Group II on Climate Change Impacts, Adaptation and Vulnerabilities for Asia (Chapter 24) reports with high confidence that warming trends and increasing temperature extremes have been observed across most of Asia in the past century. Increasing numbers of warm days and decreasing numbers of cold days have been observed, with the warming trend continuing into the new millennium. Precipitation trends including extremes are characterised by strong variability, with both increasing and decreasing trends observed in different parts and seasons of Asia. The report states that “there is evidence that climate has changed in Asia and future changes can be expected which will increasingly challenge the resilience and undermine the development that has been achieved in the region”.

The report identifies 10 Key Risks for Asia, based on available literature and expert judgment. They are in no particular order of importance and cannot be compared to other regions. Of these, 8 have a direct impact on society in terms of health, well-being and security while two are related to ecosystems and their services, which will indirectly affect the resilience and sustainable development in the region.

Climate Extremes: Five of the 10 Key Risks are related to extreme climate events linked to precipitation and

high temperatures. The report concludes that “extreme climate events will have an increasing impact on human health, security, livelihoods, and poverty, with the type and magnitude of impact varying across Asia. More frequent and intense heat-waves will increase mortality and morbidity in vulnerable groups. Increases in heavy rain and temperature will increase the risk of diarrhoeal diseases, dengue fever and malaria. Increases in floods and droughts will exacerbate rural poverty in parts of Asia due to negative impacts on the rice crop and resulting increases in food prices and the cost of living.”

Evidence from an earlier IPCC Report (2012) indicates that fatalities from climate-related hazards are higher in developing countries (In 1970-2008, over 95% are in developing world). However, economic losses are highest in middle income countries such as Malaysia, with losses amounting up to 1% of the GDP. In low income countries, losses amount to about 0.3% of the GDP and in high income countries they are 10-fold lower, at 0.1% of the GDP. The National Disaster Management Agency (NADMA) is taking serious consideration of climate-related hazards such as floods and flash-floods and its cascading effect such as landslides and environmental pollution. A National Disaster Risk Reduction Platform has been established, bringing together stakeholders, including government and non-government agencies, universities, research institutes and the private sector, to review the problem in a holistic manner and to implement coordinated actions, from national to local levels. In Malaysia, disaster risk reduction is viewed as the first step to climate change adaptation.

The 10 Key Risks For Asia

1. *Increased (coastal, riverine and urban) flooding leading to widespread damage to infrastructure and settlements (medium confidence)*
2. *Increased risk of heat-related mortality (high confidence)*
3. *Increased risk of drought-related water and food shortage causing malnutrition (high confidence)*
4. *Increased risk of flood-related deaths, injuries, infectious diseases and mental disorders (medium confidence)*
5. *Increased risk of water and vector-borne diseases (medium confidence)*
6. *Increased risk of crop failure and lower crop production could lead to food insecurity (medium confidence)*
7. *Water shortage in arid areas (medium confidence)*
8. *Exacerbated poverty, inequalities and new vulnerabilities (high confidence)*
9. *Coral reef decline (high confidence)*
10. *Mountain-top extinctions (high confidence)*

Source: Chapter 24 (Asia), Climate Change 2014, Impacts, Adaptation and Vulnerability (Volume II) available at <http://www.ipcc.ch/>

Food and Water Security: Water scarcity is expected to be a major challenge for most of the region. However, for tropical Asia (including Malaysia), this is not attributed to climate change but rather to increased demand and poor management. Current management practices cannot continue and must be improved to support sustainable development. Increase in population and demand arising from higher standards of living, may worsen water security in many parts in Asia. Integrated water management strategies can help adapt to climate change, including developing water saving technologies, increasing water productivity and water reuse.

The impact of climate change on food production and food security in Asia will vary from region to region, with many areas to experience a decline in productivity. This is evident in the case of rice production. Most models show that higher temperatures will lead to lower rice yields as a result of shorter growing periods. A number of regions are already near the heat stress limits for rice. However, CO₂ fertilisation may, in part, offset yield losses in rice and other crops. The rise in sea levels will inundate low lying areas and affect rice growing regions.

Poverty, Inequalities and New Vulnerabilities: There is a high level of confidence that key risks related to climate extremes, food and water security are expected to exacerbate poverty and inequalities as well as create new vulnerabilities. This will most certainly undermine all the achievements in Asia so far. Climate change will compound the various stresses caused by rapid urbanisation, industrialisation and economic development. It is expected to adversely affect the sustainable development capabilities of most Asian developing countries by aggravating pressures on natural resources and the environment. Development of sustainable cities with fewer fossil fuel driven vehicles and with more trees and greenery will have a number of co-benefits, including improved public health. The push for low carbon development is critical in this context. Malaysia has announced an ambitious reduction in carbon intensity but this is subject to availability of international resources particularly technology.

Biodiversity and Ecosystem Services: Rising sea-levels are expected to cause a decline in mangroves, salt marshes and seagrass beds unless these can move inland, while coastal fresh water swamps and marshes will be vulnerable to saltwater intrusion with rising sea-levels. Widespread damage to coral reefs, correlated with episodes of high sea-surface temperature, has been reported in recent decades and there is high confidence that damage to reefs will increase in the 21st century as a result of ocean warming and acidification. Marine biodiversity may decrease if thermal tolerance limits are exceeded. There are major research gaps in the tropics and these include the temperature dependence of carbon fixation by tropical trees and

the thermal tolerances and adjustment capacities of both plants and animals. Interactions between climate change and the direct impacts of carbon dioxide on crops and natural ecosystems are also currently poorly understood. In Malaysia, research has to be prioritised to assess the potential impacts on biodiversity in a warming world.

THE PATHWAY FORWARD

Given the scenario of a warming world and limits to adaptation, the international community, and in particular developed countries have to accelerate efforts under the Paris Agreement to achieve greater emission reduction. Malaysia has embarked on an economic transformation plan that emphasises green technology and low carbon development. It is critical to accelerate low carbon development to ensure inclusive and sustainable development while building resilience to climate change and disaster risk reduction, as we are exposed primarily to climate induced hazards.

The Ministry of Natural Resources and Environment (NRE), in its capacity as the National Focal Point for critical climate change platforms such as the UNFCCC and IPCC, has a critical role to play. There is ongoing collaboration with other Ministries to fulfill national commitments under the Paris Agreement. It also has to engage more with the National Disaster Management Agency and other agencies working on climate change adaptation on an operational level, to manage the risk of impacts due to climate extremes and climate change. One aspect that is critical for enhancement is coordination of multi-disciplinary research involving multi-sectoral research institutes, universities, professional bodies and knowledge societies. No one entity can work

alone to address the challenges of climate change. NRE should consider engagement with multi-sectoral and multi-disciplinary platforms such as the Academy of Sciences and the National Council of Professors to advance the research agenda on building climate and disaster resilience. ■

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