An overview of prospects and challenges in the field of climate change in Malaysia

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Abstract: Malaysia is realising the consequence of climate change impacts and efforts are harmonising with those of national interests. Here, we explain recent climate change experiences, several framework structures for policies and national agendas on climate change concerns undertaken in Malaysia. We attempt to identify three areas of policy concerns (a) issues (b) impacts and (c) strategies and figure out the national challenge:

i incorporating development concerns into climate policy

ii incorporating climate concerns into development policy.

We also evaluate ongoing policy preparations and strategies on climate change issues, and provide a critical review to improve Malaysian climate change related initiatives.

Keywords: climate change; impacts; national initiatives; policies; challenges.

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1 Introduction

Malaysia is a south-eastern tropical country [2 30 N, 112 30 (UTexas, 2010)] which borders with Singapore, Brunei, Indonesia and Thailand. It is divided into three regions, Peninsular Malaysia, Sabah and Sarawak (Figure 1). Malaysia has experienced substantial economic growth in the 1960s and 1970s. Throughout these decades, the main catalyst for growth was agriculture based, which was driven by farming sub-sectors, specifically rubber, cocoa beans, palm oil and tin-ore mining. However, the illiteracy rate hindered continual economic growth and modernisation of the nation. The nation's challenge was how to achieve a high growth rate and overcome the problem posed by the population increase which was between 2.7% and 3.0% (MDP, 2006). During that time, the proper strategy to solve a threatening environmental crisis was not the part of the national guiding principle (NRS, 2001). Taking a glance of reality, rules and regulations for the purpose of managing the environment had been existed during the period of the British colonisation. Nevertheless, the imposition of these regulations was limited at that time and existed only to serve the colonist's interests.[1] No environmental effort was undertaken to make the general public of Malaya aware of the effects of economic growth on the environment. Similarly, no importance was placed towards the conservation of the environment. This is clearly shown by the absence of any new environmental management by the colonial periods. At that time, Malaysia was covered by 70% forest land and still had the capability to absorb impacts posed by development activities (Fatimah, 2007).

Starting with the National Investment Stimulus Act (1968) and other incentives undertaken during the 1970s, Malaysia entered the industrial era (Hezri and Hasan, 2006). During the late 1970s the effects of development on the environment were starting to show through the increasing number of flash floods and rivers polluted, not only by industrial waste but also domestic wastes (Ngai, 1995). Negative effects of development, a big part of which was caused by basic agricultural industry (the processing of palm oil and rubber), was being felt increasingly by the general public, and awareness arose among the leaders of the nation to avert further disaster. Consequently, the Environmental Protection Act (1974) came into effect. Although the Environmental Protection Act (1974) has since been revised, environmental degradation continues to occur in proportion with development (Hezri and Hasan, 2006). Recently, environmental problems faced by Malaysia have become increasingly extensive and has been starting to include the degradation of urban air, marine and river water quality. The dreadful conditions are also starting to show on terrestrial land due to the burning of peat land, deforestation, agriculture, mining activities and the disposal of industrial waste. Since the introduction of the Environmental Protection Act (1974), Malaysia has been environmentally conscious and environmental concerns have been high on its development agenda onwards (Pereira, 2008).

Figure 1 Malaysian political map (see online version for colours)

Source: UTexas (2010)

Since the Third Malaysia Plan (1976–1980), environmental concerns are progressively being emphasised in development plans, although during the 1970s the significance of climate concern was not placed globally (Hezri and Hasan, 2006). A number of policy plans included and addressed the sustainable management of natural resources and energy resource management in the 1980s, which were related indirectly to climate change issues. However, Malaysia did not formulate any specific climate change strategy until 2009, and the national policy did not specifically address climate change issues, mitigation or adaptation policies (Al-Amin et al., 2011). Following cumulative scientific evidence compiled by the IPCC in its series of assessment reports since 1990, together with the Stern Review (Stern, 2007) study, the economic impact of climate change brought Malaysia to rethink the stark reality that climate change – if left unchecked – will pose a danger in the future. Since then Malaysia realises the consequence of climate change efforts at a national and international level, and efforts are harmonised with those of national interests. Country-wide feasible solutions to support the ministry's many proactive steps to manage the consequences of climate change were recently highly acknowledged (Pereira and Tan, 2008). Malaysia recognises that some level of climate change is inevitable irrespective of CO_2 emission-reduction strategies, and this is reflected in the conclusion of the IPCC in their 2001 Assessment Report (IPCC, 2001).

A good number of references can be found from current literature on climate change for the case of Malaysia and all over the world, including publications by Lobell et al. (2011), Rowhani et al. (2011), Georgescu et al. (2011), Ahmed et al. (2011), Burke et al. (2010), Hertel et al. (2010), Bonfils et al. (2008), Cahill et al. (2007) and IPCC (2007). Malaysia believes the fundamental concept of the Stern Review (Stern, 2007).[2] As we know, most of the climate change models and their outcomes are not controversial free, but current evidence is real and justified by the current climatic trends on climate change issues (MMD, 2009). In accordance with national interests, this study explains recent climate change experiences, several policies and framework structures, activities and national agenda on climate change issues in Malaysia. We first considered possible mainstreaming issues and institutional frameworks to assess how Malaysia could support the climate change concerns. Then we visualised virtual

strategies in order to minimise uncertainty in pursuing sustainable objectives and finally, we identified policy challenges towards potential climate change impacts. Specifically, this study tries to identify three areas on policy concerns

- issues
- impacts
- strategies and attempts to figure out the national challenge:
  - incorporating development concerns into climate policy
  - incorporating climate concerns into development policy, in details by providing critical reviews.

2 Climate change issues and Malaysian initiatives

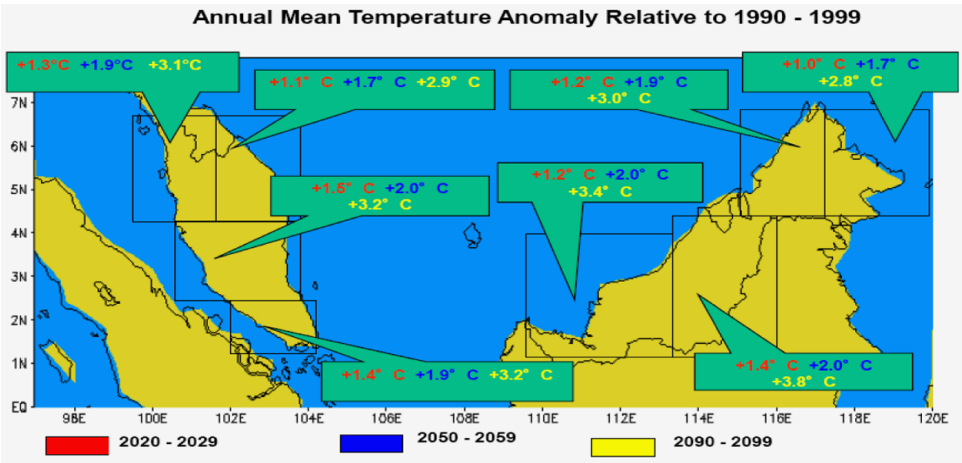
Considerable studies have been undertaken recently to simulate climate change issues and vulnerabilities. The pioneer studies are prepared by the Malaysian Metrological Department (MMD), National Hydraulic Research Institute of Malaysia (NAHRIM) and Institute for Environment and Development (LESTARI) in Malaysia (Figure 2). Based on three emission scenarios using GCM[3] modelling, designated by MMD as A2, A1B and B2, the range of highest temperature increase was projected between 2.3°C and 3.6°C for Peninsular Malaysia and 2.4°C to 3.7°C for East Malaysia (MMD, 2009). Similar scenarios were revealed earlier by NAHRIM (2006) and projected the possible vulnerable regions up to 2050. Their initial simulated outcomes also indicate uncertainty in rainfall by ±30%, and average temperature in the country would be up by as much as 4.5°C. The uncertainty of rainfall (±30%) is quite large, and some other research group even indicates that if the current scenario projections continue only within ±5% rainfall fluctuations (Figure 3), then this economy would be more vulnerable because of its lack of adaptive capacity and proper policy-relevant appropriate technical foundations (Siwar et al., 2009). The possible impact and uncertainty of rainfall is given in Figure 3. The potential impacts of climate change here in Malaysia are classified as:

- food insecurity
- vulnerability on biodiversity and eco-system
- coastal and sea level rise
- vulnerability on human health for vector borne diseases
- natural disaster such as landslides, cyclones, flash floods, tsunami, severe droughts, peat fires
- political instability for international conflict of interests (Al-Amin et al., 2012).

For example, Al-Amin et al. (2011) recently made projections on rice agriculture up to the year 2080 and possible vulnerabilities by looking at Malaysian rice Self-Sufficiency Aspiration (SSL) by 90% from the current level of 70%. Their projections signify likely future climate changes and indicate that rice yield could

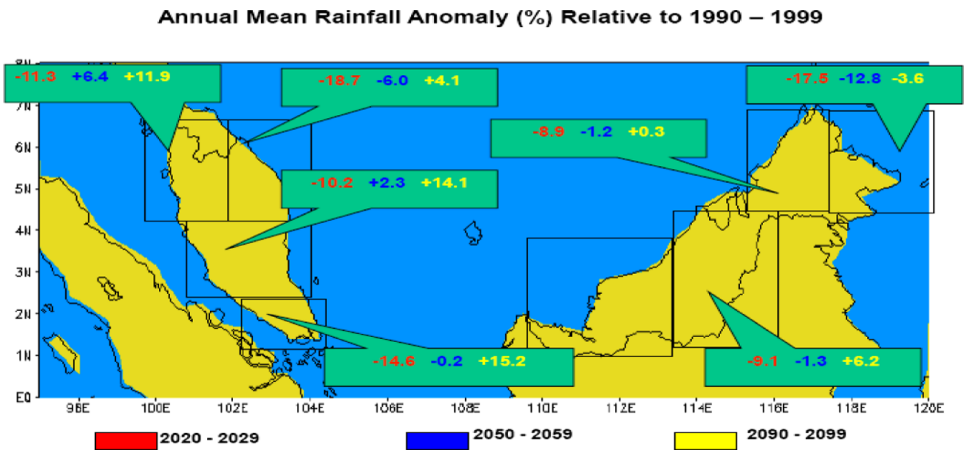
decline by 4.6–6.1% per 1°C temperature increase under the 400–800 CO_2 (ppm) concentration level and raised climate change issues. This can, in turn, lead to negative changes in yearly earnings (Ringgit Malaysia, RM) for rice cultivation by up to RM1, 387. Another example should be noted as Malacca caused the drying up of the Durian Tunggal Dam and resulted in prolonged water rationing in most parts of the state in the year 1991 (Baharuddin, 2007). More than 170,000 people were affected in an area comprising 2797 km^2 during a time period of 4–9 months. The estimated costs caused economic looses of RM7 million. In addition, 1580 km^2 suffered a wild fire, 100 km^2 of which were agricultural lands (Baharuddin, 2007). Similarly, flooding damaged infrastructure estimated RM 2.4 billion in economic losses yearly. About 9% of the land area in Malaysia is vulnerable to flooding, affecting 3.5 million people. Costs were estimated at RM100 million of the approximate direct average flood damage per year (Baharuddin, 2007). All these issues are the direct and indirect effects of climate change.

Figure 2 Projected temperatures in Malaysia up to 2099 (see online version for colours)



Source: MMD (2009)

Figure 3 Projected rainfalls in Malaysia up to 2099 (see online version for colours)



Source: MMD (2009)

However, the full consequences of climate change, such as temperature rises, rainfall fluctuations or Greenhouse Gas concentrations (GHGs) are sometimes controversial, but some of the direct effects of climate change are obvious in Malaysia. Here, the implication on agricultural production is already faced with multiple stressors for sustainable development. Malaysia realises the direct and indirect impacts or potential impacts of climate change on a national level. Therefore, some initiatives have been taken with national interests (Tan et al., 2009). Climate change is now one of the top priorities of national policies here. Malaysian national government formulated operational outlines that have taken into account environmental concerns to different extents and sector-specific contexts. Insights of some potential implications were gained during the preparation of Malaysia's Initial National Communication (INC), Malaysia's Second National Communication (INC2), national environmental regulations and acts, local climate change related documents and national development plans (Al-Amin et al., 2012). Specific concentration was given to several key economic and resource indicators following on a range of plausible future climate change issues. Some climate change-related policies currently under review includes

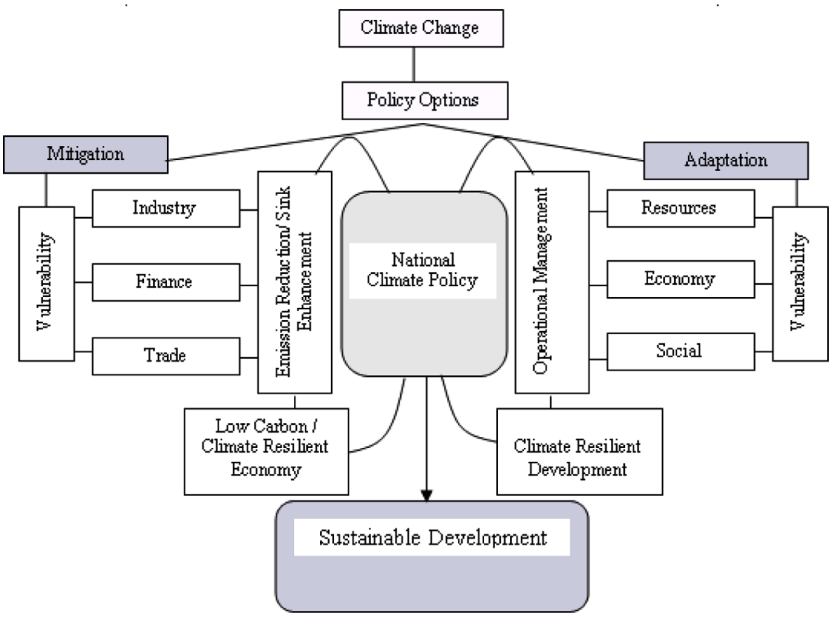
> "The National Policy on the Environment, National Energy Policy, Third National Agricultural Policy, National Forest Policy, Biodiversity Policy, National Land Policy and the recent and specific National Policy (draft) on Climate Change Issues." (Al-Amin et al., 2012)

The framework of the first National Policy on Climate Change is shown in Figure 4.

Currently, the Malaysian government is developing a national framework for adaptive strategies on climate change issues. This is very clear from the framework in Figure 4. Here, we find the long-term sustainable development concept as a result of climate change issues, and we find the policy of framework issues between national policy on climate change mitigation and adaptation and the way forward on climate change expansion pathways. This framework is also theoretically sound for pursuing national policy on low carbon development. This will strive to incorporate appropriate strategies within its target. However, like our proposed framework, national policy on climate change issues in Malaysia consists of several key elements, including objectives, strategic thrusts and actions, and is aimed at ensuring climate-resilient development and a low carbon economy (Pereira, 2008). It formulates strategic principles and directions on:

- development of a sustainable path which integrates national development plans in order to fulfil the country's aspiration for sustainable development
- sustainability of environment and natural resources which indicates climate change issues that contribute to environmental conservation and sustainable use of natural resources
- integrated planning and implementation which integrates planning and implementation of climate-proof development
- effective participation which indicates the improved participation of stakeholders for the effective implementation of climate change responses
- common but differentiated responsibility which incorporates the international involvement in climate change issues (Al-Amin et al., 2012).

Figure 4 National policy on climate change (see online version for colours)



Source: Authors

Among the key initiatives recently taken by the Malaysian government against global warming and climate change issue is the low carbon economy. In 2010, the ministry of natural resources and environment announced that carbon emissions would be reduced from 187 million tonnes to 74.8 million tonnes between 2005 and 2020 – which is equivalent to a 40% cut in carbon emissions. This is a part of alternative energy sources to offset the 2100 climate change transformation issues (Al-Amin et al., 2011). The national government established a programme called Small Renewable Energy Program (SREP). Some policies do not directly address climate change issues. However, they contribute indirectly in addressing climate change impacts (Pereira and Tan, 2008). The reviews on climate change issues and action plans, which are currently undergoing revision concerning development plans, include the Ninth Malaysia Plan (MDP, 2006). Malaysia has already approved CDM projects. A good number of effective references themed 'Towards Policy Changes' are also being considered in the future climate change policy in Malaysia following the UN Framework Convention on the Climate Change (UNFCCC) 13th Summit in Bali, Indonesia in the year 2007 (Al-Amin et al., 2012).

Similarly, climate change mitigation and adaptation strategies were adopted in the national climate policy (draft) and Malaysian mainstream strategy after the COP-15 conference held in Sweden in December 2009 (Al-Amin et al., 2012). However, many disputes and disagreements (from the West to the East) have emerged on post COP-15 agendas on county-specific carbon emission reduction strategies with partner countries, but Malaysia supports a 40% reduction in carbon emissions by 2020. Some other national policy studies and action plans were also adopted here to support enhanced interagency collaboration in addressing and adapting to climate change following the UNFCCC and Kyoto Protocol proposals. This includes post-2012 responses by the UNFCCC and Kyoto

Protocol, Malaysian climate change resilience documents, Malaysia's Third Outline Perspective Plan (OPP3), Malaysia's Initial National Communication (INC), Malaysia's Second National Communication (INC2) and Ninth Malaysia Plan (RMK9) of Malaysia (Tan et al., 2009).

3 Policy challenges in light of potential climate change impacts

The current policies must have essential ways of preventing climate change magnitudes. Here, Malaysia should consider mitigation policies or adaptation strategies such as building capacity to identify climate change risks, strengthening networks to monitor impacts on regional climate, familiarity with downscaling global climate models and building adaptive capacity or building capacity to reduce vulnerability to climate change. The mitigating options to climate change impacts and awareness of policy resources are frequently voiced in Malaysian mainstreaming policy relating to development activity, but specific operational guidance on how to take it into account is still lacking. A relevant cost-effective policy framework is obvious to contribute towards shaping appropriate policies to prevent climate change issue, but operational decisions are mainly controversial due to the cost-benefit estimation (Al-Amin et al., 2012).

Direct mitigation measures are also obviously necessary to offset the negative impacts in a long-term policy in Malaysia. Now the question arises as how we can mitigate climate change transformation. We believe that this is the most important challenge towards potential prevention of climate change impacts. We aim to figure out one specific challenge that is, we require appropriate instruments for mitigation strategies following economic analysis. If we consider climate change is a public good (obviously bad) par excellence/quality. Therefore, economic analysis, such as a cost-benefit analysis, can help identify the most efficient and appropriate policy instruments for mitigation by applying the formula developed by Stern review (Stern, 2007) as:

$$\delta = \rho + g\eta$$

where ρ is the social rate of time preference, g is the projected growth rate of average consumption and η is elasticity of social weight. However, the value of η is disputed among researches based on degree and relative magnitudes (i.e., $n \sim 1, 2, 3 \ldots$) and even greater controversy surrounds the time preferences on the value of ρ. There is, however, some controversy, dispute and uncertainty concerning some relevant assumptions on ρ and η and other plausible assumptions on damage function by the Stern Review (Stern, 2007) but the cost-benefit analysis would be a reasonable analysis for deciding whether Malaysian policy is justified or not. We can infer some mitigation instruments based on the Malaysian growth rate (i.e., 4–5% per annum) and some relevant assumptions on ρ and η. Taking the assessment of climate change scenarios by MMD (2009)[4] and NAHRIM (2006), the benefit on average of mitigating climate change issues, we can represent Malaysia like the Stern Review (Stern, 2007). Here, using the stern method, we find that the present value of benefits[5] (i.e., GDP > 1.5%) exceeds the present value of the costs (transformation profile cost = 1%).[6] Therefore, Malaysia would be better of, if it goes through effective mitigation (adaptation) policy.

In accordance with stern method and inference on mitigation policy and a fair amount of scenario references made by MMD and NAHRIM, whatever disputes on the projected

growth rate of average consumption (g) and elasticity of social weight (η); climate change issue is a valid concern for Malaysia and it cannot avoid the impacts of climate change in reality. A straightforward calculation shows that mitigation is better than business as usual – and any confusion in this issue that is out of the question. However, adapting to the future risk sometimes raises attention and judged more important for long-term policy, since climate change is a global problem. Mitigation measures require global integration by multilateral agreements, and that is a long intellectual process. However, not all environmental problems, so-called climate change issues, faced by Malaysia are caused by internal economic activities. As we know that Malaysia also faces pollution problem from across its borders. In such cases mitigation policies not only depend on internal policy but also need regional actions on a global scale. Therefore, we identify that mitigation policies are mostly disputable due to disagreement globally, as demonstrated by the Bali or post-Kyoto agreements (Al-Amin et al., 2011). Consequently, Malaysia faces the problem of making a fundamental choice; whether to emphasise mitigation policies or follow effective adaptation strategies.

Based on the above disagreement and concern, what is the best strategy for climate change issues – mitigation or adaptation? Which strategy should be used by Malaysian policy-makers? Sometimes the choice of strategy depends on suitability of county perspective. The perfect strategy not only needs to achieve efficiency within the mechanism, it also needs to be cost-effective. If we consider primarily adaptation issue, it must involve full economic cost of adaptation to address the adverse effects of climate change and it depends on a set of adaptive capacity in a regional level which involves ability to incorporate the adaptation into development strategy. It represents a way of coping with changes and uncertainties in climate, reducing vulnerabilities and promoting sustainable development (IPCC, 2001, 2007). Sometimes we state 'no regrets' adaptation strategy, which is obviously better than business-as-usual. However, strategy must involve adjustments to decrease the vulnerability of communities or regions towards climate change variability. Common distinctions should make between adaptation and mitigation purpose, strategies and time scale. However, like mitigation techniques adaptation option is not free from controversy. Building capacity to identify climate-change risks, building capacity to effectively access and utilise resources to minimise the costs and building capacity to reduce vulnerability are the three questions are very disputable on policy issues and these are widely focused in addressing adaptation concerns into Mainstreaming Adaptation to Climate Change (MACC) concerns.

Malaysian adaptation strategies are also lacking for short and long-term planning vision. The adjustment to adaptive climate change in the country at the community, local, sectoral and national level is not yet finalised. Governmental institutions such as ministries, regional agencies, private entities and NGOs are integrating climate change in planning, but the adaptation cost based on addressing the adverse effects of climate change and setting on adaptive capacities has not been completely revealed in Malaysia. The reason is simple, and this is due to limitation of research and funding on research projects. Gazetted or public documents are not available to measure the country-wide adaptation cost on the national planning. There is a need to come up with an adaptation challenge at a national level, such as:

- approaching adaptation
- identifying adaptation options, setting priorities, undertaking adaptation planning and a national policy framework and institutional arrangements
- determining resources needed to implement adaptation technology
- new and strengthened scientific and technical capabilities
- supporting institutions for the implementation of adaptation
- public awareness and participation.

Based on the Malaysian national agenda, most of the challenges have been voiced superficially. Ultimately, Malaysia has not identified controversial questions which mainly focus on addressing adaptation concerns into mainstreaming adaptation. Recently, there are a number of structured frameworks developed by the UNDP on Adaptation Policy Framework (APF) that can use to guide the process. However, this needs to be assessed by research programmes based on the country-specific capacity.

Besides identifying controversial questions, the chosen strategy for adaptation has to take into consideration in integral and moral aspects, bear in mind the certainty of welfare issue and the weighted cost for conserving the environment. This aspect is very crucial, because without proper execution no policy is safe at being abandoned. Faced with the problem of choosing between mitigation or adaptation strategies, Malaysia frequently comes across insufficient coordination and harmonisation to ensure an effective mechanism for implementing national policies from national to state and local levels (Anon, 2007). Some research findings reveal conflict between national future climate policy and climate change issues and emission scenarios (Jafar et al., 2008). Some research findings reveal disharmony in formulating climate change policy and guidance to existing policies, including planning implementation to climate-proof development and effective implementation of climate change responses (Al-Amin et al., 2012). Some research findings disclose disharmony between efficient environmental conservation and sustainable use of natural resources in mainstreaming climate change into national policies, technical barriers, program and plans (Tan et al., 2009). Regardless of the problems discussed, some basic issues on the adaptation policy framework need to be considered immediately by the Malaysian government. The reality is that by adopting an efficient policy the huge future threats and vulnerabilities can be avoided by incurring relatively modest threats today.

4 Conclusion and discussion

A western philosopher once said that through his mastery of technology man is the master of nature. We are currently standing at philosophical crossroads – are we to continue to live as self-imposed rulers of our pale blue dot and probably destroy ourselves in the process, or are we to strive towards harmony and unity with the environment from which we stem? To live, humans cannot avoid altering their surroundings. The changes we make generally benefit us as a race. However, our actions sometimes breed dangerous repercussions towards the environment. That is the reality of climate change issues which we are facing now and on our way forward.

The temperature rise and carbon concentration are not new issue, we have been hearing it since 1942 – long before the present concerns became drastic. The impact of the GHG gas emissions and temperature rise or so-called climate change issue can be easily traced by negative feedback, and any economist familiar with general equilibrium theory easily might guess the outcomes and deadlock of significant impacts. According to the stern review study, the carbon concentration will almost double over the next 25 years compared to the pre-industrial revolution era, and a million years would be needed to meet 550 parts per million (ppm) without the industrial revolution and post-era activities. That is the negative impact of technological mastery, which breeds dangerous consequences on the environment. Malaysia is not an exception in this cycle of dangerous consequences. However, Malaysia realises the climate change reality and acknowledges the impact of climate change is inevitable, if left unconstrained.

Although some uncertainties remain with the mitigation and adaptation strategies on the technical, social and economic aspects of climate change or even where the impacts of climate change are not yet obvious, but scenarios of future impacts made by MMD, NAHRIM or LESTARI justify ensuring that al least adaptation responses are needed to build into planning. Within the framework of climate change vulnerabilities by MMD (2009) and NAHRIM (2006) projections modelling, it is evident that Malaysia must be involved in the climate change exercise, either for mitigation policies or adaptation strategies. The more cost-effective measures are particularly essential for long-term development. The awareness of climate change and policy resources to be implemented need to be taken into consideration in development activity and specific operational guidance on how to take it into account are essentially ways of preventing negative magnitudes. Therefore, a policy framework to climate change is extremely obvious in contributing towards shaping nationally suitable policy. Malaysians need to be mastered towards the environmental issues and prepared either mitigation or adaptation solutions. The problem of choosing between mitigation and adaptation must be resolved soonest. Now needs more involvement by national people in the acquisition of a higher level of knowledge to sustainable development. The national aspiration of making Malaysia a developed country by the year 2020 must be pushed forward by proper development activity together with environmental care in mind. At the same time, every citizen needs to become more aware of moral values and have a strong sense of integrity. This would prepare Malaysia's human capital to a higher standard to face the challenges of tomorrow. Only then proper planning can be conducted to improve the overall performance and national development without severe imperfections.

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Notes

[1]The primary objective of exploiting vast amounts of natural resources was to power industries in Europe and to glorify the nation's wealth.

[2]We are much better off acting against negative impacts of climate change issues substantially than to suffer and risk the consequences of failing to meet this challenge.

[3]Global Circulation Model.

[4]450 ppm (parts particulate matter) carbon concentration.

[5]Assume that growth rate (i.e., GDP) from the current level would be more than 1.5% to 2099/per year on average.

[6]1% permanent reduction of transformation climate change and GDP rate times pro-file assumptions based on the Stern Review (Stern, 2007).