

## 7 Moving forward in the climate change policies and practices

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### Introduction

Shaping the climate change regime has been fraught with challenges. While the science of climate change<sup>1</sup> has shown considerable progress, the politics surrounding the multilateral process of negotiations have faltered. The United Nations Framework Convention on Climate Change (UNFCCC),<sup>2</sup> the international regime for global action to address climate change, emerged some twenty years ago in 1992 during the United Nations Conference on Environment and Development or Rio Earth Summit. Central to the long-standing impasse in the climate change negotiations is the principle of "common but differentiated responsibilities and respective capabilities (CBDR)."<sup>3</sup> The principle was derived from some early discussions on the concept of responsibility and subsequently the United Nations General Assembly Resolution 44/228 attributed historical responsibility for certain global environmental problems to developed countries. But it was the Earth Summit that clearly stated the CBDR principle, a key element in the UNFCCC as well as in many other multilateral environmental agreements.

In recognizing the

common responsibility of States to protect the environment, or parts of it, at the national, regional and global level as well as the need to take into account the different circumstances, particularly each State's contribution to the problem and its ability to prevent, reduce and control the threat<sup>4</sup>

the multilateral process has tried to be fair. Furthermore, to strengthen global response to climate change, the Kyoto Protocol (KP),<sup>5</sup> which stipulates differences in commitments between and among developed and developing countries, was adopted in accordance with CBDR. Fairness to all Parties in the UNFCCC and KP, both legally binding agreements, is addressed via the concept of historical responsibility. The Protocol, which is of great significance to developing countries endorsing differential

treatment in their favor, has become contentious. Over recent years, it has been observed that a changing or evolving approach is taking place within the climate change regime.<sup>6</sup>

To recall, a number of the COP meetings have special significance because of the agenda or expected outcomes. Briefly, of the last five COP meetings, COP13 in Bali (2007), just after the release of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report<sup>7</sup> and culminating with the “Bali Road Map,” was considered a success. The Road Map was designed to launch a two-year negotiation process for the second commitment period—“Kyoto Phase 2”—or a post-2012 agreement. COP14, the following year, in Poznan, was then focused on building a foundation for the “Kyoto Phase 2.” Calls for a post-2012 legally binding commitments to reflect the CBDR principle were heard. At the same time, statements that patterns of emissions and even capabilities have changed since the adoption of the Protocol in 1997 were also declared. But the high expectations for a post-2012 agreement at COP15 in Copenhagen (2009) did not materialize and that the multilateral process had been hijacked to come out with the Copenhagen Accord was severely criticized.<sup>8</sup>

Interestingly, COP 16 in Cancun (2010), shifted in approach and instead of arriving at an agreement on a legally binding emissions target, it ended with a set of agreed initiatives called the Cancun Agreement. The agreement acknowledges that “adaptation must be addressed with the same priority as mitigation” and reflects greater support for developing countries in terms of adapting to the impacts of climate change and pursuing a low-carbon pathway. The initiatives are of significance for the ASEAN region and will be explored later in the paper.

The COP17 in Durban (2011), after extending negotiations beyond the scheduled deadline, concluded a set of agreements including the “Durban Platform for Enhanced Action.” The preamble to the Durban Platform notes with “grave concern” the gap between aspirational national emissions targets—declared in Copenhagen and Cancun—and the necessity for emissions to peak no later than 2020 to keep warming within the agreed target of “1.5°C to 2.0°C above pre-industrial levels.” The 2°C level is that which is generally accepted to sustain life without irreversible damage. The Durban Platform is committed to launch a “process to develop a protocol, another legal instrument or an agreed outcome with legal force under the United Nations Framework Convention on Climate Change applicable to all parties” to come into effect from 2020. There was no reference to “equity” or to the “common but differentiated responsibilities.” The second commitment to the Kyoto Protocol, while questions remained, was extended. The beautifully crafted Durban outcomes presented challenges in the Bonn meeting in May 2012 when Parties began debating the agenda and addressing the issues. What is clear is that Parties have different perspectives on moving forward.<sup>9</sup> The different perspectives could also be

observed within groupings of Parties such as within the G77 and China to which developing countries like Malaysia belong.

What is also clear is that the multilateral process is so participatory and that the negotiations tend to take a longer time cannot be denied. But the issues are complex and the multilateral process, which not only follows the United Nations' principles of transparency, inclusiveness, and equality but also decides on consensus, has often been challenged and the debates have been well documented.<sup>10</sup>

In view of the changing approach taking place within the climate change regime, this paper will explore implications for Malaysia in going forward to address climate change. It will also examine the existing regional mechanism, within the framework of ASEAN, in facing the challenges. Exercising goodwill and fostering trust will be needed in climate negotiations. For policy makers, climate change presents a "wicked problem"<sup>11</sup> that has much wider social, economic, and cultural impacts and is so complex that attempted solutions seem to have created more challenges. Closer to the region, the impacts of climate variabilities are already being felt and managing extreme climate-related events requires cooperation at all levels. Adaptation, which has been treated as a peripheral issue, must also be given priority because of the region's vulnerability to and low level of preparedness for climate change events.

### **Facing the challenges of climate change**

Malaysia has experienced a remarkable economic performance with the economy projected to grow at an average annual growth rate of 4.2 percent annually between 2005 and 2030, with real Gross Domestic Product (GDP) increasing from US\$300 billion in 2005 to US\$843 billion in 2030.<sup>12</sup> The rise in per capita income of its population has shown higher standards of living accompanied by rapid urbanization demanding greater energy services. The increasing population from 26 million in 2005 to 35 million in 2030—of which population growth rate is expected to be 1.3 percent per annum during the same period<sup>13</sup>—accompanied by increasing energy demand, will lead to challenges in terms of energy security and environmental sustainability.

Malaysia's final energy demand is projected to grow at 3.4 percent per annum, from 39.9 million tons of oil equivalent (Mtoe) in 2005 to reach 92.9 Mtoe in 2030.<sup>14</sup> This is driven largely by the demand for coal and gas in the electricity generation sector and for oil products in the transportation sector. Malaysia's attempt toward energy sustainability does not fare well in terms of indicators such as per capita energy consumption, energy intensity, carbon dioxide emissions per capita, or even the use of renewable energy. Domestic oil and gas supply has played a crucial role in the growth of the Malaysian economy. The combined oil, gas, and energy sectors represented approximately 35.91 billion USD or 19 percent of GDP

in 2009.<sup>15</sup> But after decades of production, Malaysia will need to take significant efforts to also tap from potentials in mature, smaller, and technically more complex fields for future growth. In terms of total primary energy supply for the country, the projection indicates an increase of 2.8 percent per annum from 65.9 Mtoe in 2005 to 130.5 Mtoe in 2030 with fossil fuel constituting more than 90 percent of supply.<sup>16</sup>

In parallel with Malaysia's economic growth, electricity generation<sup>17</sup> is expected to grow at an average annual rate of 4.7 percent, from 84.8 TWh in 2005 to 265.3 TWh in 2030. That the country's economic growth is closely linked to increasing usage of electricity which is predominantly based on natural gas, will have serious implications. First, the domestic energy landscape has changed over the years. Not only are local gas reserves depleting but a heavily subsidized gas pricing has caused a strain on the gas supply infrastructure.<sup>18</sup> However, the power sector will see a change with the government's subsidy rationalization plans. Prices of gas will determine the future generation energy mix for the country and Malaysia is projected to show an increasing dependency on coal in electricity generation. Second, coal use—which is expected to grow from 27 percent in 2005 to 37 percent in 2030—will be largely imported and subjected to the vagaries of market price. Malaysia's heavy reliance on fossil fuels must be managed judiciously in order to build a sustainable energy platform for growth and to address the challenge of greenhouse gas (GHG) mitigation.

Malaysia, as a signatory to the climate change convention, submitted the Initial National Communication (INC) to the UNFCCC in 2000 and the Second National Communication (NC2) in 2011. For Malaysia, the total GHG emissions increased by 55 percent, from 144.3 MtCO<sub>2</sub> in 1994 to 223 MtCO<sub>2</sub> in 2000. Between 1994 and 2000, GHG emissions increased by 13 percent per GDP and 32 percent per capita. Also noted in the INC inventory for 1994, the energy sector contributed about 68 percent of the total GHG emissions. Within this sector, the power generation sector was reported to record the highest CO<sub>2</sub> emissions at 47 percent followed by the transport sector at 28 percent.<sup>19</sup> The NC2 similarly indicates that the highest emissions were again from the energy sector accounting for 66 percent of total emissions in 2000. (In terms of ranking by countries for CO<sub>2</sub> emissions in 2008, Malaysia ranks twenty-seventh—out of 216 countries—accounting for 0.69 percent of global total whereas in terms of CO<sub>2</sub> emissions per capita, Malaysia ranks fifty-first accounting 7.7 metric tonnes of CO<sub>2</sub> per capita in 2008.<sup>20</sup>)

Of concern are the implications of future GHG emissions. Although a higher contribution of the services sector to real GDP is expected to reduce GHG emissions in the future, Malaysia's CO<sub>2</sub> emissions from fuel combustion in the energy sector will still be high and projected to increase by 83 percent from 151 MtCO<sub>2</sub> in 2005 to register at 339 MtCO<sub>2</sub> in 2030.<sup>21</sup> The electricity sector alone is reported to be the biggest contributor to the

growth in CO<sub>2</sub> emissions, contributing about 42 percent of the total 2030 emissions.<sup>22</sup> In this case, implications of aggressive energy-efficiency programs or expansion of renewable technology will have to be further explored. But the transition itself will involve huge investments, technology, research and design, infrastructure, and institutional reforms not to mention suitable responses from various actors.

Of equal concern for Malaysia is the transportation sector which is central to many economic activities. It is one of the most energy intensive sectors in the country, relying heavily on petroleum products—largely petroleum (54 percent in 2008) followed by diesel (32 percent in 2008).<sup>23</sup> The sector covers a wide range from roads, railroads, and civil aviation to shipping, but road transport—consisting largely of automobiles, vans and two-wheelers—accounted for 36.5 percent of total energy use in 2008. This is reportedly high compared to the world average of about 20 percent.<sup>24</sup> Moreover, the slow acceptance of hybrid vehicles and long-standing consumer behavior could further increase emissions from passenger travels. Meantime, the Malaysian government has introduced measures to address price and subsidy adjustments of petroleum products including diesel, but the assessments on the ramifications of subsidy removal including those on the energy efficiency of the transport systems or energy consumption and carbon emission by vehicle-type have been handicapped by available statistics.<sup>25</sup>

The total number of vehicles in the country has increased from about 5 million in 1991 to 19 million in 2009, registering an average annual growth rate of about 8 percent during this period.<sup>26</sup> Within this same period, automobiles have shown the highest growth rate—an average annual growth rate of about 9 percent. This is followed by two-wheelers at 7 percent and public transport modes (buses, taxis, and hire and drive cars) registering a much slower growth at about 5 percent. The increasing share of private modes is not surprising partly because of the promotion of the domestic automotive industry by the government as well as the subsidies that are still available for transport fuels. Greater motorization, increase in vehicle ownership as well as increase in vehicle-kilometers travelled, do not augur well for energy and environmental sustainability. Furthermore, vehicle source pollutants—where emissions tend to be released and concentrated in areas with highest population density—will be harmful to human health.

### **Facing low-carbon pathway**

Energy security is crucial in supporting Malaysia's rapid growth trajectory. At the same time, there is also a growing recognition of environmental change posing risks to the economic growth of the country, to the health and welfare of people, and to the communities in general. Interventions across economic, social, and environmental spheres are not new to the

country. But that the economy is very much linked to the global environment with the multidimensional challenges, Malaysia's economy must undergo significant changes.

Malaysia's transformation into a high income, inclusive, and sustainable economy saw the release of the New Economic Model, the Tenth Malaysia Plan (10MP) a rolling plan covering the period 2011–2015, as well as the projects under the National Key Economic Areas (NKEAs). The approach, which will be carried out through the Economic Transformation Program (ETP), will give priority to the most vulnerable. Policies to provide social safety nets and other protective measures will cushion the most vulnerable from the impact of the changes—such as to ensure their accessibility to affordable cleaner energy.

With policy measures of “sustainability,” “green growth,” and “energy efficiency” being incorporated in the broad range of initiatives articulated under the 10MP and in the ongoing ETP, issues of greater energy resource use and how Malaysia can decarbonize the economy are being analyzed. Some early assessments are already available on how Malaysia can execute a low carbon growth plan.<sup>27</sup> Working toward a voluntary reduction target<sup>28</sup> of up to 40 percent in terms of carbon emissions intensity of GDP by 2020 compared to 2005 levels, has witnessed Malaysia forging ahead with strategies to accelerate the transition into a low-carbon and resource-efficient development pathway.<sup>29</sup> The National Green Technology Policy to push for a low-carbon economy, for example, was launched in July 2009. For the Green Technology Development, fiscal and financial mechanisms to support growth of green industries, enhancement programs, human capital development, research, and innovation, as well as awareness programs, are being provided.

As a developing country, Malaysia will continue to adopt voluntary measures but Malaysia is not alone. Other developing countries including ASEAN member countries are taking similar moves especially after witnessing South Korea's positive role in promoting a much broader concept of green growth as a national strategy.<sup>30</sup> Furthermore, the economic crisis in 2008, saw many countries investing through their stimulus packages in green new deals for a low-carbon future.

Toward a greener Malaysia saw the restructuring of the energy sector through policy, technological, and economic innovations. One of Malaysia's early policy initiatives to supplement conventional sources of energy, was to adopt low-carbon technologies and hence the inclusion of renewable energy (RE) as the fifth fuel—the priority then was to address energy security and high oil prices. Specific RE targets to contribute to the energy mix during the Eighth Malaysia Plan (8MP) from 2001 to 2005 and the Ninth Malaysia Plan (9MP) from 2006 to 2010 did not materialize. But with greater awareness on carbon mitigation measures to combat GHG emissions as well as increasing concerns for energy security, concerted efforts to overcome obstacles—from financial, technical,

regulatory/institutional, to informational—hindering the growth of RE were identified and appropriate mechanisms have been proposed. The Feed-in Tariff (FIT), a policy mechanism adopted by Malaysia and an equally “popular” policy tool adopted by some other ASEAN countries,<sup>31</sup> needs to be briefly highlighted. FIT, whereby a fixed price is set (according to RE sources) for utility purchases of renewable energy, is reported to be the best single policy tool to improve efficiency on the supply side. But for FIT to be more effective, it must be combined with complementary policies such as the removal of subsidies for conventional energy sources, more accurate electricity pricing, and the provision of energy efficiency programs.

Malaysia has the potential to improve energy efficiency on the demand side in the industrial, building, and transport sectors. Embracing the energy efficiency policy tools saw the Malaysian government taking the decision to introduce a regulatory approach to supplement the voluntary approach. In the past, Malaysia has been using persuasive approaches to promote energy efficiency improvement to bring in a voluntary behavioral shift among energy users. But there are emerging challenges not within Malaysia’s control, for example, the ongoing debate over border carbon adjustments designed to address competitiveness concerns and carbon leakage. Countries like Malaysia have been vocal against such moves, but at the same time must find ways to encourage local industry players to plan strategies early to avoid being caught unprepared.

Accordingly, different strategies and actions have been identified. However, what must be recognized is that the actions must be approached across the board involving all stakeholders. To get a better understanding, a brief look at the energy institutional structure in Malaysia indicating fragmentation deserves some discussions (and see Table 7.1). The Ministry of Energy, Green Technology and Water (MEGTW) is in charge of policies related to electricity and gas supplies at reticulation ends. Promoting efficient use of energy, but limited to the electricity and gas supplies, is therefore the responsibility of MEGTW. To coordinate the issues of green technology and climate change between and across ministries, agencies, the private sector, and other stakeholders saw the establishment of the National Green Technology and Climate Change Council chaired by the Hon. Prime Minister. But one of the major attempts by the MEGTW is through the National Energy Efficiency Master Plan (NEEMP). The plan, carefully developed to stabilize energy consumption against economic growth as well as to address the issue of climate change, had been reviewed by the Peer Review Team from the Asia Pacific Economic Cooperation (APEC) and several of the recommendations were noted for consideration.

That NEEMP should have a comprehensive coverage by including the transport sector as one of the recommendations by the Team is not surprising in view of the high energy usage. While clear targets and strategies—in terms of public transport improvement, green-technology vehicles, and

Table 7.1 Energy policy and regulatory responsibilities

Policy making for the energy sector resides with the following institutions:

<i>Institutions</i>	<i>Areas of jurisdiction</i>
Prime Minister's Department	Petroleum (oil and gas) <ul style="list-style-type: none"> <li>• Privatization of the electricity supply industry i.e. Independent Power Producers (IPPs)</li> <li>• Nuclear energy</li> </ul>
Ministry of Energy, Green Technology and Water	<ul style="list-style-type: none"> <li>• Electricity supply industry</li> <li>• Energy efficiency</li> <li>• Renewable energy</li> </ul>
Ministry of Rural and Regional Development	Rural electricity supply

The economic and technical regulatory functions reside with the following institutions:

<i>Institutions</i>	<i>Areas of jurisdiction</i>
Energy Commission	<ul style="list-style-type: none"> <li>• Electricity in all states except in the state of Sarawak (technical including safety and economic issues)</li> </ul>
Departmental of Occupational Health and Safety	<ul style="list-style-type: none"> <li>• Safety in gas sector (at reticulation stage). Safety in oil sector (up-stream and down-stream)</li> </ul>
Prime Minister's Department (Economic Planning Unit)	<ul style="list-style-type: none"> <li>• Natural gas prices</li> </ul>
Ministry of Domestic Trade, Co-operatives and Consumerism	<ul style="list-style-type: none"> <li>• Price of petroleum products</li> </ul>
State Governments	<ul style="list-style-type: none"> <li>• Exploitation of coal resources</li> </ul>
Ministry of International Trade and Industry	<ul style="list-style-type: none"> <li>• Licensing on petroleum processing activities</li> </ul>
Ministry of Science, Technology and Innovation	<ul style="list-style-type: none"> <li>• Atomic energy licencing</li> </ul>

Source: adapted from the Ministry of Energy, Green Technology and Water at: [www.kettha.gov.my/en/content/government](http://www.kettha.gov.my/en/content/government).



Green Transport Plan—are already in place, the Peer Review reiterated the need for energy efficiency improvement needed for emission reduction in the transport sector as highlighted in the other two studies.<sup>32</sup>

The discussion on decarbonizing the transport sector will not be complete if biofuels are not mentioned. For the transport sector, any significant transition to biofuels that rely on a dedicated biofuel crop has raised questionable benefits relating to GHG emissions reduction.<sup>33</sup> This is related to Malaysia's other initiatives such as the issue of land-use, land-use change and forestry (LULUCF), one of the strategies to reduce GHG emissions. LULUCF has already been assessed in the NC2 where findings indicated potentials for emission reduction through initiatives, including reducing the rate of forest conversion, reforestation or afforestation, improving the forestry sector, and agroforestry. Malaysia currently retains 55 percent of its natural forest and earlier adopted the sustainable forest management and for countries such as Malaysia, Indonesia, and even Brazil that have programs on biofuel production, there exists the potential for sharing of best practices.

The challenges faced by Malaysia are immense. Pursuing a low-carbon pathway can bring multiple benefits—aside from energy savings and the associated benefits of energy security, there are others such as improved health, increase in asset values, and opportunities for job creation. However, the transition to a low-carbon growth, as highlighted earlier, is complex, requiring numerous changes affecting various sectors of the society. Moreover, the policy for investment, innovation, infrastructure to marketing, and promotion of technologies is largely anticipative in approach, implying taking the future into consideration. For developing countries like Malaysia, the transition requires cooperation at all levels with local and regional, as well as other international, partners. Currently in Malaysia, there are in-depth studies to assess the costs and benefits of mitigation and adaptation options for climate change as well as to prescribe measures in line with national priority. In the case of adaptation, it is no longer an option but a necessity.

### **Facing adaptation and disaster risk reduction challenges**

The occurrence of extreme weather events resulting in damage due to severe flooding or prolonged drought in Malaysia has increased. Over recent years flash floods, strong winds, and waterspouts as well as prolonged dry periods have become more frequent. But Malaysia, situated just outside the “Ring of Fire,” is relatively more fortunate compared to some other ASEAN member countries that are exposed to hazards such as earthquake, volcanic eruption, and typhoon. Southeast Asia is reported to be one of the world's most vulnerable regions to climate change because of its long coastlines, concentration of people and economic activities near coastal areas, and heavy reliance on climate-sensitive sectors such as

agriculture, fisheries, forestry, tourism, and natural resources.<sup>34</sup> Natural disasters such as the Boxing Day Tsunami of 2004, Cyclone Nargis in 2008, Typhoon Ketsana of 2009, the 2010 "Triple Disaster" in Indonesia, and the more recent destructive 2011 floods in Thailand, resulting in loss of life and property, have only illustrated the vulnerability of the people to changing climate and changing environment. However, it is important to note that while climate change can exacerbate disasters in this region, disasters are the result of interaction of the hazard phenomena and vulnerability of people and property when exposed to the hazard.

The manner in which climate change can impact and undermine the security of the people and the communities varies: multi-impact—from health to economic productivity to political instability; multi-subject—individuals and communities; multi-scale—local to global; and multi-temporal—present and future generations.<sup>35</sup> On the other hand, the ability to adapt to climate change is a function of a number of factors—the degree of support communities receive from the state, the effectiveness of the decision-making process, the communities' access to economic opportunities, and the extent of social cohesion within and surrounding vulnerable communities.<sup>36</sup> States can and do play a critical role, creating conditions and providing people with the means to act so that the things they value are not adversely affected.

Drawing from a review of climate change literature, the Asian Development Bank (ADB)<sup>37</sup> 2009 study indicates temperature increase projection of 2.1°C to 3.4°C by 2100 for Indonesia; 1.2°C to 3.9°C by 2080 for Philippines; for Singapore within a range of 1.7°C to 4.4°C; and for both Thailand and Vietnam about 2.0°C to 4.0°C by 2100. The ADB model projects temperature increase by as much as 4°C by 2100 under the worst case scenario of high emissions and sea level rise by 18 to 59 cm across the various scenarios of low to high emissions. The ADB study also indicates that water resources in Indonesia, Thailand, and Vietnam would be vulnerable to climate change and that millions in Indonesia, Thailand, and Vietnam would experience worsening water stress by 2050. In the case of agriculture, under worst case scenarios, where no measures are taken to control climate change, rice production could fall by 50 percent—by 2100 relative to 1990 level on average—in Indonesia, Thailand, Vietnam, and the Philippines.

In the case of Malaysia, from the NC2, the regional climate dynamic modeling undertaken to evaluate the extent to which the climate will be influenced by climate change is one of the significant achievements—although uncertainties in model projections will need to be reduced. By downscaling global climate models,<sup>38</sup> differences in terms of temperature and rainfall within Malaysia have been determined by institutions such as the National Hydraulic Research Institute of Malaysia (NAHRIM). (NAHRIM conducted its own climate change projections by downscaling global historical and climate change atmospheric databases developed by

the Canadian Global Climate Model First Generation at the scale of 9 km fine spatial resolution). Findings indicate projected temperature increase of 1.9°C in 2050 for Sabah (East Malaysia, situated in the island of Borneo), 1.6°C for Sarawak (also in East Malaysia) and 1.5°C degrees for Peninsular Malaysia.<sup>39</sup> The other model, Providing Regional Climates for Impact Studies (PRECIS), which was developed by the United Kingdom Meteorological Office, has been downscaled at 50 km spatial resolution by the Malaysian Meteorological Department (MMD) to provide regional climates for impact studies<sup>40</sup>—here Malaysia collaborates with other ASEAN member countries to understand climate change impact and adaptation needs.

Drawing from the NC2 using the climate modeling, the report indicates varying impacts of climate change. Oil palm yields could decrease by 30 percent should temperatures increase by 2°C above optimum levels (optimum annual temperature is 22°C–32°C). In the case of rice, an increase in daily temperature above 34°C will reduce potential yields. Although agriculture yields are influenced by other factors such as the type of cultivar, agricultural practices, and soil conditions; higher temperatures often trigger increased storm activity as well as rainfall intensity, resulting in flooding which is not at all conducive for agricultural production. While efficient drainage measures as well as studies examining newer breeds to withstand drought tolerance are being undertaken, the more important focus is to assess the suitability of adaptation options under the various simulation scenarios.

The projections<sup>41</sup> for Malaysia also indicate fluctuations in average annual rainfall pattern, from –5 percent to +50 percent for Peninsular Malaysia with the west coast of the Peninsula, which is more developed, getting a lesser percentage. For Sabah and Sarawak, a smaller fluctuation of –6 percent to +5 percent in terms of average annual rainfall pattern is projected. These fluctuations will impact on the water resources, and given that Malaysia's water supply is largely from surface water, resources with ground water contributing around only 3 percent, more attention has been given to this sector. Also within this sector, the other impacts of climate change include on drainage systems and catchment management, as well as the safety of dams and reservoirs. Thus, climate change adaptation activity and emphasis has largely focused on the water sector, addressed through integrated approaches for water management. However, increased rainfall accompanied by increased flooding and landslides, which are more frequent in and around the Greater Kuala Lumpur area, are more often dealt with through infrastructure builds such as the "smart tunnel" to overcome urban flooding.

That fluctuation in rainfall will affect public safety and well-being in terms of diseases has certainly caught the attention of medical practitioners as well as various other planners and policy makers at the local and national levels. Several diseases including vector-borne and food-and-water-borne diarrheal diseases are still endemic in the rural areas of

Malaysia.<sup>42</sup> While outbreaks are sporadic and are often associated with poor sanitation, increased flooding or prolonged dry periods, resulting in deterioration of water quality will only trigger more undesirable outbreaks. Of concern is the re-emergence of malaria. While vector-capacity modeling has been undertaken<sup>43</sup>—where a number of malaria cases are projected to increase by about 15–20 percent with an increase of 1.5°C to 2°C—there is a need to conduct more risk assessments on the possible impacts of climate change on health.

Another area of public safety is equated with disaster risk reduction (DRR) actions. DRR measures closely overlap with climate change adaptation (CCA) initiatives, in that they have a common objective of reducing factors that contribute to climate-related risks.<sup>44</sup> Second, both approaches use similar tools—pro-active anticipatory actions—to monitor, analyze, and address adverse impacts. Malaysia has demonstrated its commitment to reduce the risks of climate change and disaster through initiatives taken at both regional and international levels. Malaysia is an active partner in the regional effort through the ASEAN Agreement on Disaster Management and Emergency Responses (AADMER) and in the international effort through the Hyogo Framework for Action. While the strategic thinking regarding DRR has been initiated and institutional arrangements have been implemented, there is still a lack of synergy of efforts within the country. There is, in the first place, a need to integrate DRR and CCA in all national planning processes. But limited understanding of the concepts or desired outcomes such as dealing with uncertainty or defining acceptable levels of risks have proven to be barriers. Worth highlighting is the huge scope and opportunities for sharing and cross learning of experiences across the region.

Concerns for the coastal areas and the well-being of affected communities saw other achievements in the form of Coastal Vulnerability Index, Integrated Shoreline Management Plans, Enhanced Marine Park Management, and Inclusive Sustainable Island Development designed to assess vulnerability of populations, coastal developments, and related ecosystems.<sup>45</sup> However, gaps identified such as knowledge transfer, integrated modeling information, or policy effectiveness studies will need specific initiatives to address the concerns. On the regional scale with the other ASEAN member countries, Malaysia is also involved in other activities including the Coral Triangle Initiative because of the importance of the ecosystem in providing livelihoods to the communities as well as in capturing and storing carbon.

For Malaysia, it is also useful to look at ecosystem functions and the state of biodiversity to get another perspective of climate change impacts. A scoping study indicates Malaysia's ability to absorb climate change impacts as a result of its strong environmental management program.<sup>46</sup> However, climate variation is likely to exceed environmental thresholds where the ecosystems and habitats will not be able recover to existing

equilibrium and stable conditions. Biodiversity loss, for example, is extremely likely on examining the expected percentages of fauna that are vulnerable to ecosystem changes triggered by climate change—13.5 percent of amphibians, 5.8 percent of birds, and 5.4 percent of mammals are considered vulnerable.<sup>47</sup>

With forests as terrestrial storehouses of carbon, they play an important role in controlling the climate. Covering more than 50 percent of the country, the forestry sector also saw some achievements where protected forest areas and forest state parks have been expanded with the aim of enhancing natural adaptation processes of the forests. In addition, forestry management efforts undertaken will help in sustainable forest use as well as improving livelihood and food security of the people in time of climate variability.<sup>48</sup>

Although Malaysia introduced the National Policy on Climate Change<sup>49</sup> and adopted a “precautionary principle” and “no regrets option” in addressing climate change, observations indicate that initial actions toward adaptation have been reactive. This is not surprising because the design and implementation of adaptation policies are site-specific, complex, and require more local adjustments, not to mention the economic implications. Efforts in mainstreaming adaptation strategies into national development plans have not been easy. However, it is important so as to enable economic development to proceed in a sustainable manner and also to ensure the security of the people. The benefits will make certain that future projects are consciously aimed at reducing vulnerability as well as to ensure long-term sustainability of investments.

### Cooperation within ASEAN to address climate change

Tackling the challenges of climate change will reinforce Malaysia’s international position. In the negotiation process, with the CBDR principle being “diluted,” there is now a strong pressure for the Non-Annex I (developing) countries to initiate mitigation strategies in view of their increasing GHG emissions although per capita emissions are still low. Malaysia will need to search for new forms of collaboration within (and beyond) ASEAN especially if ASEAN member countries are to be drawn as a group to be more active in the climate change regime. However, to be able to do this it must be recognized that the ASEAN member countries are at different levels of development with different resource endowments, knowledge, skills, and governance structure. There are also differences in capacity and needs in addressing the impacts of and vulnerability to climate variability. While it is important for ASEAN member countries to craft their own initiatives to support their development aspirations, threats of climate change which have transboundary effects, as well as the sharing of common physical characteristics and systems within the region, merit the calls for regional cooperation.<sup>50</sup> Furthermore, the declaration that ASEAN

constituted "one ecosystem"<sup>51</sup> recognizing that in principle environmental problems including climate change could not be adequately addressed solely within the domestic context further strengthened the need for a regional approach

Within ASEAN, cooperative efforts on the environment started in the mid-1970s when "environment" was integrated into the complex system of regional consultations following the Stockholm Conference on the Human Environment in 1972. Environmental issues slowly gained prominence aligning environmental concerns at the international level. Cooperation began with the First ASEAN Sub-regional Environmental Program (ASEP-1) in 1977 and subsequently other environmental programs<sup>52</sup> followed. It is important to note that ASEAN's approach to environmental management,<sup>53</sup> stresses three norms: (1) non-interference or non-intervention in other member states' domestic affairs; (2) consensus building and cooperative programs preferred over legally binding treaties; and (3) preference for national implementation rather than reliance on a strong region-wide bureaucracy. It must be reiterated that the approach follows the traditional "ASEAN way" of non-interference. In addition, since ASEAN embraces the CBDR principle, it must ensure that member countries would carry out common and agreed measures or activities at the national level based on different levels of development and capacities of each member state. This is of course understandable in view of how the ASEAN institutional structure has evolved reflecting modest undertakings and according the highest priority to the preservation of national sovereignty.

Regional efforts on formulating climate-related policies could be traced back to ASEAN's initiatives in 2003, when the heads of state/government of ASEAN member states declared that

an ASEAN Community shall be established comprising three pillars namely political and security cooperation, economic cooperation, and socio-cultural cooperation that are closely intertwined and mutually reinforcing for the purpose of ensuring durable peace, stability and shared prosperity in the region.<sup>54</sup>

A strong commitment to accelerate the establishment of an ASEAN Community by 2015 was made during the twelfth ASEAN Summit in 2007 through the Cebu Declaration on the Acceleration of an ASEAN Community. The vision of ASEAN Community that is "politically cohesive and peaceful, economically integrated and vibrant and socially responsible and caring"<sup>55</sup> is an important one especially in terms of addressing climate change.

The ASEAN Economic Community Blueprint (AEC)<sup>56</sup> makes reference to climate change and emphasizes the importance of ensuring sustainable development while striving toward the establishment of the ASEAN

Community by 2015. Pursuing a sustainable economic growth as the way forward, the AEC notes the importance of securing energy supplies and curbing the energy sector's contribution to climate change. But the more significant pillar for the advancement of climate change is the pillar based on the Socio-Cultural Community. The ASEAN Socio-Cultural Blueprint (ASCC), as part of the roadmap for an ASEAN Community, presents a plan for building a regional identity that provides priority actions in responding to climate change. The Blueprint focuses on enhancing cooperation at regional and international levels to address the impact of climate change on the socio-economic development, health, and the environment based on the principles of equity, flexibility, respective capabilities, and common but differentiated responsibilities. While the Blueprints are well crafted, questions remain on how measures taken could be commensurate to what ASEAN has declared. That said, the intentions declared in the Blueprints are being addressed by the ASEAN member countries, in stages, but a more positive outcome is only possible if the establishment of the ASEAN Community is on the right track.

Some early initiatives in the form of non-legally binding declarations and statements were made as early as 2007. For example, the ASEAN heads of states recognized the climate-change threat through the ASEAN Declaration on Environmental Sustainability at the thirteenth ASEAN Summit in Singapore. The concern was also reiterated through another declaration, the Singapore Declaration on Energy, Climate Change and Environment together with the East Asian Summit counterparts in November of 2007. It must be noted that the declarations made were immediately prior to Indonesia's hosting of the COP13 to the UNFCCC. But from 2007, ASEAN saw other declarations made supporting climate change<sup>57</sup> initiatives. Of significance is the ASEAN Leaders' Statement on Joint Response to Climate Change to the seventeenth Session of the Conference of the Parties to the UNFCCC in 2011 where more detailed attention was given in terms of the needs of ASEAN in addressing climate change responses.

It is also interesting to note that climate change has slowly crept into the energy policy within ASEAN. The new ASEAN Plan of Action for Energy Cooperation 2010–2015 containing three key initiatives—namely energy efficiency and conservation goals, renewable energy goals, and coal and clean coal technology—is clearly and voluntarily committed in ensuring that environmental issues and climate change are being looked into.

To address the declarations made in the Blueprints saw other policy initiatives including the Multi-sectoral Framework on Climate Change and Food Security (AFCC-FS) formulated. The AFCC-FS is designed to have a cross-sectoral approach to ensure food security by taking into account environmental sustainability, energy efficiency, and effective coordination of all parties involved. One of the major components is to include impact studies and risk assessments of climate change on agriculture, forestry, and fisheries.

To facilitate regional response and cooperation, then saw the creation of the ASEAN Climate Change Initiative (ACCI). The ACCI was envisaged to be a consultative platform to further strengthen regional coordination and cooperation in addressing climate change and to undertake concrete actions to respond to its adverse impacts.<sup>58</sup> Within the regional framework, the ACCI is supported by the ASEAN Working Group on Climate Change (AWGCC) and the scope of the ACCI will include policy and strategy formulation, information sharing, and capacity building, as well as technology transfer. That the ACCI is legally grounded in the ASEAN Charter,<sup>59</sup> a legally binding agreement, is supposed to give it a clout—to enhance consultations and speak for its common interest. However, questions on the impact of ACCI on national climate change policies as well as its potential role in the climate change regime have been raised. A stronger ACCI backed by resources and greater support from ASEAN member countries has yet to materialize. For now, what can be observed is that the “ASEAN way” of non-interference or non-intervention may still act as impediments to the noble objectives of ACCI.

Thus, while a regional consensus on the need to address climate change exists, the more advanced of the ASEAN member countries have taken the lead to move ahead cognizant of the climate change politics and debates going on at the international level. Moreover, many took note of the ADB's estimate for the economy-wide cost of climate change—where the results indicate that cost due to global warming to be significantly lower with GHG stabilization at 450–550 ppm, suggesting that the cost of no action and therefore the benefits of action could be significant for the four countries (Indonesia, Philippines, Thailand, and Vietnam) studied.<sup>60</sup> Many could also see the opportunities arising from climate change and hence are taking the initiative to move to a low-carbon economy.

ASEAN member countries have considerable potential to undertake mitigation measures in various sectors including the energy supply and demand sectors. ASEAN has for some time acknowledged the need to mobilize investment in relatively cleaner generation fuels and in more efficient generation technologies. But this was not easy initially because of the subsidies and electricity pricing arrangements which were not supportive of new generation or transition investment. However, significant efforts have been made in Indonesia as well as in Malaysia in gradually reducing the subsidies and targeting the programs for the poor and the vulnerable.

Energy efficiency improvement measures can be achieved at a relatively low cost or even a net negative cost through appropriate policies, identifying constraints such as policy, regulatory, and behavioral barriers or price distortions or information and knowledge/technology gaps.<sup>61</sup> The important step is to assess the constraints and eliminate them accordingly.

While mitigation options for the demand side, ranging from the transport industry to the residential and commercial building sectors<sup>62</sup> are available for ASEAN, constraints such as technology and finance will have



to be addressed. Therefore, businesses must be on board with wider consultations to include industry, social entrepreneurs, and the banking sector. This involvement is crucial because innovations very often reside with the industry sector, while the financing options are with the banking sector and social entrepreneurs are the “change-makers” that can help societies face the new challenges.

This paper will not be complete if the following are not included. First, carbon dioxide capture and storage (CCS), which has its challenges, is a technology option for countries interested in continuing the use of fossil fuels. Also, for member countries using coal-fired units, raising thermal efficiency to address the carbon emissions must be explored. While further improvements are also possible through the introduction of transitional technologies, there must be greater sharing of experiences and transfer of best practices within and from outside ASEAN. Second, the debates for nuclear power generation as part of the solution to meet rising demand deserve attention. Briefly, for nuclear power generation, the ASEAN region will need to address the legitimate concerns related to safety and reliability of nuclear energy as well as practices. But technological innovations—for example the thorium fueled, heavy water reactor whose fuel cycle is proliferation-resistant as designed by India—present another option without the problem of safety and security prescriptions.<sup>63</sup> Third, there are also concerns in maximizing the region’s hydroelectric potential. For ASEAN, which possesses quite extensive resources, greater attention and cooperation in hydroelectric power—considered clean and renewable—will be required particularly in addressing the environmental and social externalities. Fourth, for the trans-ASEAN gas pipeline and the trans-ASEAN power grid—projects proposed to ensure security of energy supply for the region—the political, legal, and institutional framework, as well as the technical standards must be looked into to allow a trading system to take place

For ASEAN, the forestry sector has a lot to offer in terms of mitigation and adaptation to climate change. To a large extent the approach taken is greatly influenced by national policies and programs to prevent further degradation of forests and loss of biodiversity, and enhancing carbon storage. The various approaches, including reforestation and afforestation, early warning systems of dry spells to prevent forest fires, as well as reducing emissions from deforestation and forest degradation (REDD) initiative, have been well documented in the ADB study.<sup>64</sup> The study indicates significant progress made in Indonesia, Vietnam, and Thailand but such measures do require huge investments

An area that has received little attention but also highlighted in the ADB study is the technical potential to sequester carbon in agriculture. South-east Asia has vast areas of croplands and through proper cropland management could offer the means to sequester carbon in soils. The agriculture sector could also contribute to a reduction of emissions such as from land use change or a reduction of methane emissions from rice paddies.<sup>65</sup>

Mitigation is given considerable attention, especially in the early ASEAN climate change initiatives, but many have questioned the focus on mitigation having observed a number of ASEAN member countries that are already vulnerable due to their low level of preparedness. The ADB<sup>66</sup> not only considers the region to be one of the world's most vulnerable regions to the impact of climate change but also projects that the worst is yet to come. Decrease in rice yield and a rise in the price of agricultural products as a result of water scarcity has already been observed. Increased floods and storm surges are more frequent and competition from other land uses is already happening. As a developing region, a large number of the regional populace living along the coasts depend on natural resources for sustenance and livelihoods. For many, the main economic activities include tourism and fisheries but the security and well-being of the community have been affected by the sharp rise in the frequency of extreme weather events. The UN 2007–2008 Human Development Report<sup>67</sup> states that climate change is a massive threat to human development and in some places it is already undermining the international community's efforts to reduce poverty.

Adaptation has therefore gained attention within the region particularly in terms of reducing vulnerability and increasing the resilience of ecosystems, economies, communities, and individuals. Briefly, adaptation<sup>68</sup> measures imply some adjustments which often depend not only on the physical or geographical location, but also on the level of social and economic development, existing level of capabilities, institutional support, and social organization of the society.<sup>69</sup> To be able to respond appropriately, systematic assessment of possible risks in terms of time frame, scale, and frequency of impact as well as the degree of vulnerabilities must be carried out. For the ASEAN region, a "Climate Change Vulnerability Mapping for Southeast Asia"<sup>70</sup> was conducted with the support of international organizations. Vulnerable areas identified include all regions of the Philippines; the Mekong Delta region of Vietnam and the Bangkok region due to exposure to sea level rise; almost all of Cambodia; North and East Lao PDR; west and south Sumatra; western and eastern Java. Discussions among some experts within ASEAN have also revealed other areas such as the central part of Vietnam, which is relatively less developed. The important issue here is the ability to adapt and it is the adaptive capacity that plays an important role in changing the spatial pattern of vulnerability.

One interesting example of subregional cooperation within ASEAN that deals with climate change, through the conservation of protected areas and promoting of sustainable management of productive forests and sustainable land-uses, is the Heart of Borneo (HoB) initiative, which started in 2007. The HoB initiative stretching along the borders of Indonesia, Malaysia, and Brunei has some of the most biologically diverse habitats on earth. Home to more than 16 million people, HoB is where those millions depend for agricultural products and forest produce. The HoB initiative is considered an achievement; giving initial option to governments and

communities in the three countries to develop the forest and terrestrial ecosystems in a sustainable manner. Programs and plans of action involving the three countries with the support of ADB have resulted in protecting, conserving, and sustainably managing the remaining forests and the adjacent areas.<sup>71</sup>

The HoB initiative was successful in halting the development of oil palm on the border of Kalimantan and Malaysia. However, to overcome the constant pressure and demand for oil palm and timber, more effort will be required to provide some form of incentive. At that time, REDD, a form of offset payments to preserve the forests and contribute to the reduction or capture of carbon emissions, was proposed. REDD is not without its problems, such as sustainability, but at that point in time, the idea for REDD to succeed and support the HoB initiative, some initial investment was put up for consideration—for example capacity building, and policies and measures to reduce and monitor deforestation.

To complete the discussion on the HoB initiative, a climate simulation conducted within the HoB, suggests that occurrences of drought and forest fires may have an adverse impact on local livelihoods as well as the animal population, particularly the remaining orangutan population. Droughts associated with El Niño events/Southern Oscillation (ENSO)<sup>72</sup> have become more frequent and have created conducive conditions for fires—initially started for land clearing—to spread, causing transboundary haze pollution. Inter-state tensions are not uncommon whenever the smoke and haze affect neighboring countries. The ASEAN Agreement on Transboundary Haze Pollution (2002) was well crafted to address the issue and was considered an achievement but it has not been effective.<sup>73</sup> Fraught with many shortcomings including the lack of mechanisms for sanctions and dispute settlement, the absence of an ASEAN judiciary to enforce regional laws, and the lack of any monitoring mechanisms, the Agreement has not been able to deal with the problem of forest fires and transboundary haze.

Generally, sector-specific adaptation measures have been undertaken within ASEAN especially where climate change impact is seen damaging, for example, water resources, agriculture, health, forestry, and coastal and marine resources. But the measures taken are reactive in approach and more often the implementation is autonomous and not well planned. The region needs a more proactive, systematic, and integrated approach to adaptation in the key climate-sensitive sectors that will offer a more cost-effective and long-term solutions.

But how can ASEAN move forward in terms of creating resilience to climate change? A country's resilience to climate change depends largely on its adaptive capacity<sup>74</sup> and ASEAN should improve its adaptive capacity through appropriate policy intervention. As such, ASEAN will then need to look at the outcomes of the last two COP meetings, in particular COP16 where the adaptation section of the Cancun Agreement makes a priority of protecting the most vulnerable to the worst effects of climate change. The

Cancun Adaptation Framework calls for countries to “enhance actions on adaptation” through “planning, prioritizing and implementing adaptation options” on a country-driven approach.

This is important for ASEAN member countries seeking to conduct research on vulnerability, adaptation, needs assessment, and sustainable development in their respective countries. Furthermore, ASEAN must take this opportunity to tap into the technical resources available within the Adaptation Committee as well as into the Green Climate Fund (GCF)—for both mitigation and adaptation measures—to help those who are most in need of assistance. This is where the ACCI can play a more pro-active role.

For example, the forestry sector is one of the largest contributors to GHG emissions in the region but it also supports the livelihood of some of the more vulnerable and marginalized groups. The ACCI—through the sharing of information and exchanging of best practices—can help member countries to take advantage of the initiatives offered by REDD Plus (REDD+, the extension of REDD which includes the role of conservation, the sustainable management of forests, and the enhancement of forest carbon stocks) initiatives which are important avenues for mitigating GHG emissions due to deforestation but equally important do not put the vulnerable or marginalized groups further at risk.

Safeguarding the rights of the vulnerable and marginalized groups is observed, for example, in the UN-REDD program in Indonesia. There was pressure on the Indonesian government to ensure that the implementation of REDD+ would not impede the local forest communities with loss of livelihood or displacement. The problems of corruption, poor law enforcement, and vested interests as well as close ties between logging companies and officials were reported to hinder the success of REDD+ implementation.<sup>75</sup> To overcome such problems in forest governance, the application of monitoring, reporting, and verifying (MRV) initiatives reached in Cancun could prove useful. This is another area that ACCI can come in to support member countries in the MRV process.

ACCI can therefore help to strengthen the region’s technical and institutional capacities to undertake carbon inventories as well as support to stepping up efforts in sustainable forest management. At the same time, ensuring that member countries effectively use the fund to implement projects—at the local, national, or regional levels—that appropriately address the physical and social vulnerabilities faced as a result of climate change will be a positive contribution from ACCI.

There are, however, issues such as the modalities for the Adaptation Committee and Green Climate Fund to be resolved. Because of the level of development as well as the capacity, not all ASEAN member countries would be eligible to receive GCF support. Moreover, the assessment of a country’s vulnerability for the purposes of GCF funding can be a challenge in itself. But the region is highly vulnerable and ASEAN, through ACCI, may need to help member countries to look for other cooperative means.

Another important element is technology. Technology can also play an important role in adapting to climate change. Technology involving early warning systems, seasonal forecasting, flood defense mechanisms, and others in terms of improving infrastructure, are already available. There are yet others such as vector-capacity modeling for the health sector or climate-resistant crop varieties and genetically modified seeds that are drought-proof for the agriculture sector. One major concern here is the issue of technology transfer. Developing countries have very limited access to many of these technologies. The Technology Mechanism established in Cancun may be able to give the international support for technology and in so doing be able to encourage further inter-ASEAN cooperation and collaboration with the private sector in the development and transfer of technology.

While ASEAN can provide the basis for regional collaboration and coordination, ultimately it is the national governments that must initiate appropriate measures and provide the necessary support for better adaptation. The national governments within ASEAN are aware of the adaptation needs but are also mindful of the limited availability of financial resources, experts, accurate information on the climate change scenario, technological options, and many others. Adaptation initiatives are therefore constrained and efforts taken so far have been largely through collaboration with international organizations.

In general at the ASEAN level, there are still a number of actions that ASEAN can take to foster effective climate change responses. ASEAN may need to take a different approach, such as properly targeting the most vulnerable sectors of the society or safeguarding the rights and welfare of the vulnerable and marginalized, that will help to achieve a more integrated approach. In addition, such an approach will be more consistent with ASEAN's people-centered approach in ensuring social welfare and protection as well as justice.

### **Moving forward in the international climate change negotiations**

ASEAN member countries recognize the evolving change in the climate negotiations and although they have been involved in a number of mitigation and adaptation initiatives, they are not clear about what outcomes can be expected under the future regime. As seen from the discussions above, ASEAN as a region is addressing climate change, not through a policy mechanism, but through the framework of ASEAN community building. But the question is often asked—is ASEAN capable of having one strong voice in the international climate negotiations? ASEAN leaders have expressed their concerns and their commitment to address the challenges posed by climate change in the various declarations. But ASEAN's traditional decision-making process based on consensus and non-interference

has made it a divided group where consensus was not reached. ASEAN member countries belong to the Group of 77 and China (G77+China) which is the main coalition for developing countries. The general position of G77+China is to respect the CBDR principle and to insist on developed countries cutting their own emissions before requiring developing countries to do the same.

But there are moves for a redefinition of developed and developing countries and there are also signs that ASEAN will have a stronger voice as a southern bloc within the G77+China. A stronger ASEAN voice will strengthen the position of the G77 grouping. The emergence of the BASIC countries, consisting of Brazil, South Africa, India, and China in 2009, saw a strong alliance within the grouping where these countries defined a common position on emission reductions and climate aid money. While arguing that "equitable access to carbon space must be considered in the context of sustainable development,"<sup>76</sup> the BASIC countries have announced voluntary commitments as well as discussed the possibility of providing financial and technical aid to the poorer nations of the G77 grouping. It will indeed be a challenge for ASEAN to come out with a common position but for the sake of the 600 million habitants of ASEAN and with the recent developments such as greater openness for political decision-making and multi-stakeholder networking, ASEAN can have a stronger voice. Discussions within ASEAN do have potential, by providing inputs, to stimulate progress for developing countries in the climate negotiations. ASEAN needs to be pro-active since the UNFCCC is the only multi-lateral process in which developing countries can be heard.

Moving to the next step, some ASEAN member countries have in fact taken positions in the negotiating process. Singapore, the more wealthy and advanced among the developing countries, is in favor of voluntary commitments to reduce GHG emissions through "nationally appropriate mitigation actions" (or NAMAs) but such measures are to be made conditional on developed countries' technology and financial support. Indonesia's continued economic growth and resilience has enhanced its international reputation. But as one of the major GHG emitters amongst the developing countries, Indonesia has its eyes on the forest agreements and is also in favor of voluntary action. Malaysia and Thailand have articulated the argument for developed countries to take the lead in combating climate change and the associated adverse impacts as well as to provide developing countries with financial and technical support and, where appropriate, technology transfer. However, Malaysia, like its neighbor Indonesia, having made a voluntary commitment to the UNFCCC during COP 15, was reported to have placed national interest beyond that of ASEAN.

How should the climate change regime evolve? There are many factors to be considered. The Kyoto Protocol is a highly centralized, top-down agreement on climate change which has proven to be very rigid in its approach to reducing GHG emissions.<sup>77</sup> Is there a likelihood for bottom-up

diplomacy to emerge? Should a flexible system beyond the traditional top-down approach be an efficient way to move multilaterally in climate change? In other words, should bottom-up approaches which envision the international regime as an aggregation of nationally and regionally defined programs put forward by countries on voluntary basis, rather than top-down approaches, in which governments negotiate more or less binding international commitments, be considered?<sup>78</sup> There are also proposals of top-down burden-sharing architecture which still preserves the CBDR principle but eliminates the distinction between the so-called Annex I and non-Annex I countries. There are benefits to both the top-down and bottom-up approaches and perhaps a combination may be a possible step forward. What is important is to be able to slow down the GHG emissions globally and to try meeting the 2°C target.

Some early discussions have raised concerns that decisions made outside the UNFCCC process may have negative consequences on the legitimacy or credibility of the regime. However, it must be recognized that negotiations in smaller groups could lead to a more positive outcome which can then complement the multilateral process. Smaller group discussions can help in raising mutual awareness for specific regional problems, disseminating best practices and strengthening networking. Equally important, it can help to keep climate change concerns and cooperative frameworks on the agenda.

Available for some time is the plentiful academic literature on possible ways to move forward to build the climate change regime. While several institutions such as the World Resources Institute<sup>79</sup> have attempted to survey and capture the diverse interests and views, there have been limited attempts for a similar review within institutions of the ASEAN member countries. As such, there is a lack of discussion on bottom-up approaches or alternatives such as the "Contraction and Convergence" principle supposedly to provide a more realistic way to improve the UNFCCC approach.<sup>80</sup> What can be observed is that some advanced ASEAN member countries have conducted assessments, but of national interest, and subsequently made voluntary pledges—independently of ASEAN. Moving forward, there has yet to be an assessment on what an individual member country does within ASEAN and what ASEAN as a regional organization is hoping to achieve. The pledges are serious national political commitments indicating a significant shift from the business-as-usual approach.

The second observation is that while the bottom-up approach (pledge and review) is commendable in that it stimulates national action, an initial concern among ASEAN member countries raised was the review component—the proposal that NAMA targets be legally binding and subjected to international consultation and analysis (ICA) as well as funding conditionalities. But moving forward means greater transparency required as indicated in the outcomes of the last two COP meetings. Moreover, increased transparency will help to encourage increased funding.

The third observation is that governments of developing countries, including ASEAN, have started to incentivize the private sector to move forward to a green economy. Accessing funding and technology innovation will be critical and a robust low-carbon growth plan must therefore be developed to secure international funding. At this juncture, it is still too early to assess whether the initiatives taken by some ASEAN member countries have resulted in more job creation or GDP growth.

The fourth observation in facing the challenges is the issue of carbon footprint and carbon markets. The need to examine the carbon footprint of products, services, and events in any industry according to life-cycle analysis and eco-labeling approaches is not new. Such measures will send a signal to industry players that governments are looking for innovative ways to address climate change. For Malaysia, the oil palm industry is actively exploring global approaches in computing carbon balance.<sup>81</sup> What is important is that the industry must ensure that the carbon credit offered in the market is real in achieving GHG reduction. The demand for measuring carbon footprints saw ISO standards bringing together a common set of rules to avoid inconsistencies. Moving forward, the ISO standards and guidance for the quantification of carbon footprint claims will be useful for industries within ASEAN to ensure sustainability.

Destruction of rainforest and the much wider-reaching consequences for the global climate and for biodiversity, saw another positive move. The REDD+ mechanism whereby international players in developed countries help to facilitate forest preservation in developing countries as part of the climate change mitigation strategies is being actively pursued. The expanded mechanism, which includes protecting local rights to forest resources, offers considerable potential but REDD+ costs and benefits must be explored carefully. The wider social and economic benefits including land-use challenges for oil palm and food production will require careful analyses and to move forward wider consultation and cooperation with various stakeholders as seen in the Indonesian case will be an interesting case to follow.<sup>82</sup>

Developing country cooperation is equally important in moving forward. Cooperation, for example, in the development of more substantial climate data and analysis capabilities to project climate variability is essential. While data collection and analysis can be carried out at the national level, regional or international assistance will be useful in providing more detailed scientific data and climate information. Cooperation will also be useful in terms of advancing research and development, benchmarking or sharing of best practices as well as better understanding of the interlinkages between water, energy, and food sectors from the nexus-oriented approach as part of the solutions for a green economy.

One final observation is the changing dynamics in the negotiating process. Countries tend to forge new alliances and one of the most recent



is the Like Minded Group (LMG) which has identified itself as a formal negotiating bloc under the UNFCCC. It consists of the Arab group, China, India, emerging Asian economies such as Malaysia and the Philippines, and some South American nations including Venezuela, Bolivia, and Cuba. Many are from the G77+China, and are still associated with the grouping, but such positioning is interesting to see. Groups negotiate what they perceive are their own group interests. Moving to the next COP18, the common goal should be in achieving environmental effectiveness. While symmetry is to be achieved through "applicable to all," "legal force" has not got the same connotation as "legally binding." The issue of CBDR is taken care of "under the UNFCCC" but CBDR and equity may be redefined to reflect the changing dynamics.

### **Concluding remarks**

The main challenge of the climate regime is how to accommodate the diverse interests of the countries concerned as well as to instill trust and understanding. The UNFCCC has been successful in serving as the main vehicle for engaging developing countries on climate change. While developing countries do recognize the challenge of tackling climate change, and have been willing to do more, national priority has been given accordance. The approach to climate change thus far for developing countries has depended and will continue to depend very much on the political commitment, economic progress, and other domestic realities. For these countries, the opportunity to develop is a fundamental right, anything that diminishes these opportunities will only perpetuate poverty and cause further disadvantages. As such, countries will react to the negotiations primarily from a national standpoint.

For ASEAN member countries, in recognizing the need to address climate change mitigation and adaptation, they have accepted the challenges. The policy making is complicated by a number of factors such as huge investments in terms of research and development, infrastructure, human capital development, and knowledge building. Most importantly, the efforts taken by ASEAN should be supported at all levels—private, non-governmental, and governmental. ASEAN provides a platform for cooperation. Enhancing regional support through dialogues, flow of information, exchange of expertise, or sharing of best practices can contribute to a better understanding and help to strengthen the ASEAN community. In view of the vulnerabilities, ASEAN cannot afford to wait for others to act. ASEAN must strike a smart partnership and exercise goodwill to turn around some of the intractable issues and come out with constructive solutions.

It is important that ASEAN member countries understand the impact that climate change may have on their economies, the well-being of people and the ecological systems. It only through this understanding that

successful strategies on climate change responses can be crafted and implemented effectively. Furthermore, such understanding will enable ASEAN to tap and contribute to the pool of knowledge as well as make its voice heard at the international level.

## Notes

- 1 Scientific, technical, and socio-economic advice is largely channeled through the Intergovernmental Panel on Climate Change (IPCC). The IPCC has produced four multi-volume Assessment Reports, the first in 1990, the second in 1995, the third in 2001 and the fourth in 2007. The fifth is to be completed in 2014.
- 2 The United Nations Framework Convention on Climate Change (UNFCCC)'s supreme body is the Conference of the Parties (COP), in which all states that have ratified the treaty are represented. COP met for the first time in March 1995 and on a yearly basis thereafter. The purpose of the UNFCCC is to provide a framework of governance for climate change.
- 3 Please refer to L. Rajamani "The changing fortunes of differential treatment in the evolution of international environmental law," *International Affairs* 88: 3, 2012, 605–623; L. Rajamani "The principle of common but differentiated responsibility and the balance of commitments under the climate change regime," *Review of European Community and International Environmental Law*, 9: 2, 2000, 120–131 and The Centre for International Sustainable Development Law (CISDL)—A CISDL Legal Brief "The Principle of Common But Differentiated Responsibilities: Origins and Scope" for the World Summit on Sustainable Development 2002, Johannesburg, August 26.
- 4 This is considered as one of the fundamental elements of the principle of common but differentiated responsibility. Please refer to the Centre for International Sustainable Development Law (CISDL)—A CISDL Legal Brief.
- 5 In 1997, the Third Meeting of the Conference of Parties (COP3) adopted the Kyoto Protocol (KP) which entered into force only in 2005 after a complex ratification process. The Protocol commits developed countries (or Annex 1 countries) to an aggregated emission reduction target of 5 per cent below their 1990 levels by 2008–2012 or the "first commitment period." Developing countries (or Non-Annex 1 countries) have no binding commitments under the Protocol and have stood firm for non-binding targets for the second commitment period or post-2012. Please refer to [http://unfccc.int/essential\\_background/items/6031.php](http://unfccc.int/essential_background/items/6031.php).
- 6 Please refer to discussions by D. Bodansky "W[h]ither the Kyoto Protocol? Durban and beyond" Viewpoint, Harvard Project on Climate Agreements, online, August 2011, discussions by Rajamani, "The changing fortunes," as well as discussions by R. Leal-Arcas "Top-down versus bottom-up approaches for climate change negotiations: An analysis," *The IUP Journal of Governance and Public Policy*, 6: 4, 2011, 7–52.
- 7 The IPCC Fourth Assessment Report (AR4) clearly shows stronger links between human-induced emissions and increased global temperature and climate change. The IPCC has also estimated that global emissions reductions of 25–40 percent of 2000 levels are needed if global temperature fluctuations are to be maintained within the range of 2°C.
- 8 L. Elliot "COP15: A step forward or a step backward?" S. Rajaratnam School of International Studies RSIS Commentaries, December 24, 2009 and M. Khor, "The real tragedy of Copenhagen," *Economic and Political Weekly*, 45, 1, 2010.

- 9 Please refer to P. Gass *et al.* *Peering over the Ledge and Stepping Back (Again): The Bonn Climate Change Conference May 2012*, International Institute for Sustainable Development IISD Briefing Note, June 2012.
- 10 Debates are captured by various authors including J. Jackson Ewing "From Kyoto to Durban: The fits and starts of global climate negotiations," *NTS Insight*, February, Singapore: RSIS Centre for Non-Traditional Security (NTS) Studies, 2012, and M. Khor, "Strange outcome of Cancun conference," 2010, Third World Network, online.
- 11 "Wicked Problem" was coined by Horst Rittel and Melvin Webber in their article for Policy Sciences "Dilemmas in a General Theory of Planning" in 1973. Essentially, a "wicked problem" is a set of complex, interacting issues evolving in a dynamic social context—environmental degradation, terrorism, and poverty are some examples of "wicked problems." Also please refer to discussions by Richard J. Lazarus "Super wicked problems and climate change," *Environmental Law and Policy Annual Review*, 94, 2010, online.
- 12 Please refer to Asia Pacific Energy Research Centre (APEREC) *APEC Energy Demand and Supply Outlook*, 4th edition, 2009 (please note PPP is at 2005 constant price).
- 13 APERC, 2009.
- 14 Op. cit.
- 15 Performance Management and Delivery Unit (PEMANDU), Prime Minister's Department, Government of Malaysia *Economic Transformation Program: A Roadmap for Malaysia*, 2010 (Malaysia's gross national income per capita in 2009 was US\$6,700 or RM23,700).
- 16 APERC, 2009.
- 17 PEMANDU, 2010. In terms of electricity/power generation, by fuel type, natural gas is the major fuel used, and together with coal accounted for 92 percent of power production in 2009. Hydropower accounted for only 6.5 percent with others accounting for the remaining percentage for that year. Malaysia has three discrete power grid systems—West/Peninsular Malaysia supplied by Tenaga Nasional Berhad, Sarawak in East Malaysia by the Sarawak Electricity Supply Corp. (SESCO) and Sabah also in East Malaysia by the Sabah Electricity Sdn Bhd.
- 18 Malaysia's natural gas, discovered thirty years ago, benefitted the power-hungry industries of Japan, Korea, and Taiwan which drew up long-term supply contracts. Malaysia's main utility company, Tenaga Nasional Berhad (TNB) has been depending on natural gas for power/electricity generation. The future of the power sector, however, will see a change with the government's commitment to subsidy rationalization plan which was initiated in 2010.
- 19 Y. P. Leong *et al.* "Climate change challenges on CO<sub>2</sub> emission reduction for developing countries: A case for Malaysia's agenda for action," *The International Journal of Climate Change: Impacts and Responses* 2: 4, 2011, 9–26.
- 20 Data collected by US Department of Energy's Carbon Dioxide Information Analysis Center (CDIAC) for the United Nations. The data consider only CO<sub>2</sub> emissions from the burning of fossil fuels and cement manufacture but not emissions from land use, land-use change and forestry (LULUCF).
- 21 Leong *et al.* "Climate change challenges."
- 22 Op. cit.
- 23 Siti Indati Mustapa *et al.* "Energy efficient pathways for the transportation sector in Malaysia" 2011, online. The paper indicated that for the transport sector, usage of natural gas was minimal at 1.18 percent and of electricity at 0.09 percent.
- 24 Asia-Pacific Energy Cooperation APEC Peer Review on Energy Efficiency in Malaysia, final report for the APEC Energy Working Group, 2011, online.

- 25 C. H. Leong, and S. Kennedy "Energy efficiency in the transport sector for the next 20 to 25 years" 2008 paper submitted to ISIS Malaysia for discussion and also please refer to Sustainable Development Initiatives (SUDI) "Lowering the heat: Low carbon sustainable development options for Malaysia," CETDEM, 2012.
- 26 Please refer to Siti Indati Mustapa *et al.* "Energy efficient pathways." The authors noted that the growth in the number of vehicles in the country has been much faster than the growth in population (average annual growth rate of 2.5 percent from 1991 to 2009).
- 27 Khazanah Nasional Berhad "Opportunities and risks arising from climate change for Malaysia" online, 2010. The analysis however does not give the methodology used. SUDI's study "Lowering the heat" was constrained by cost and data availability. Also please refer to Endang Jati Mat Sahid *et al.* "Transition to sustainability: Energy demand and supply in Malaysia," in Hezri and Hofmeister (eds.), *Towards a Green Economy: In Search of Sustainable Energy Policies for the Future*, ISIS, 2012.
- 28 The 40 percent conditional voluntary target announcement was made by the Hon. Prime Minister of Malaysia during COP15.
- 29 Various initiatives such as Low Carbon City Framework and Low Carbon Society are already in place. Other initiatives such as eco-labeling and green procurement are being looked into.
- 30 The phrase "green growth" was first floated by the UN Economic and Social Commission for Asia and the Pacific much earlier but South Korea offers a broader concept to include sustainable development, poverty reduction and human development, green job creation, green technology dissemination, and energy security. The world saw South Korea, Asia's fourth largest economy, pouring 80 percent of its \$38billion stimulus program into green growth. Later, it committed 2 percent of its annual GDP over five years to the same national cause.
- 31 B. K. Sovacool "A comparative analysis of renewable electricity support mechanisms for Southeast Asia," *Energy*, 35: 4, 2010, 1779–1793. A survey on policy tools for energy efficiency was carried out and the author concluded that for southeast Asian countries, while policy makers have numerous options for energy efficiency, the data collected indicates FIT as the best option.
- 32 Leong and Kennedy "Energy efficiency in the transport sector," and the publication by Sustainable Development Initiatives (SUDI) "Lowering the heat" highlighted the need for energy data in the transport sector.
- 33 The majority of existing oil palm cultivation in Malaysia was converted from a previous crop such as rubber but further expansion of oil palm plantation will raise the question of new land clearing and removal of the carbon sink.
- 34 Please refer to IPCC Fourth Assessment Report (AR4) and Asian Development Bank (ADB) *The Economics of Climate Change: A Regional Review*, 2009, as well as the National Intelligence Council Conference Report, *Southeast Asia and Pacific Islands: The Impact of Climate Change to 2030: Geopolitical Implications*, a commissioned research report, 2009, Washington, DC, National Intelligence Council.
- 35 S. Khagram *et al.* "From the environment and human security to sustainable security and development," *Journal of Human Development*, 4: 2, 2003, 289–313.
- 36 J. Barnett and W. N. Adger "Climate change, human security and violent conflict," *Political Geography*, 26: 6, 2007, 639–655.
- 37 Asian Development Bank, *The Economics of Climate Change*.
- 38 General Circulation Models (GCMs) are the main tools used by scientists to project future climate change. These models simulate atmospheric and oceanic

circulations, as well as processes that occur on land. As a result, GCMs are very complex models, and they tend to have rather low spatial resolutions, on the order of 400 to 125 km. To obtain model information on the local and regional scales, such as for Southeast Asia, at higher resolutions than native GCM grid sizes, “downscaling” is used. Please refer to the National Intelligence Council Special Report 2009.

- 39 Government of Malaysia “Second National Communication to UNFCCC,” 2011.
- 40 Op. cit.
- 41 Please refer to Ahmad Jamalludin Shaaban “Malaysian climate change projections and potential impacts on water resources,” paper presented at the National Conference on the Impacts of Climate Change on Water Resources and their Consequence to Major Economic Sector, July 2011, Putrajaya, Malaysia as well as to Lee Jin and Lavanyer Rama Ayer “Position Paper on Malaysian Climate Change and Water Resources” paper delivered to the Academy of Sciences Malaysia for discussion, 2011.
- 42 Adaptation Knowledge Platform, *Scoping Assessment on Climate Change in Adaptation in Malaysia*, AIT-UNEP RRC.A, October 2011.
- 43 Lee Jin and Lavanyer Rama Ayer “Position paper.”
- 44 J. Velasquez and Phong Tran “Climate Change Adaptation and Disaster Risk Reduction Institutional and Policy Landscape in Asia and Pacific” 2010.
- 45 Government of Malaysia “Second National Communication.”
- 46 Adaptation Knowledge Platform *Scoping Assessment*.
- 47 Government of Malaysia “Second National Communication.”
- 48 Please refer to the Government of Malaysia “Second National Communication” and Adaptation Knowledge Platform *Scoping Assessment*.
- 49 The National Policy on Climate Change was approved by the Cabinet in 2009. The policy provides the framework to mobilize and guide government agencies, industry, and consumers as well as other stakeholders and major groups in addressing the challenges of climate change in an effective and holistic manner.
- 50 K. L. Koh and L. Bhullar “Adaptation to climate change in the ASEAN Region,” 2010, online.
- 51 The declaration that “The Ministers agreed to enhance cooperation to manage natural resources and to control transboundary pollution within ASEAN region as ‘one-ecosystem’” was made at the First Informal ASEAN Ministerial Meeting on the Environment in 1994.
- 52 The Second ASEAN Subregional Environmental Program (ASEP-II) for 1982–1987 and ASEP-III for 1988–1992, adopted by the ASEAN environment ministers, articulated the regional policies on the environment but kept to the ASEAN procedures and norms—soft law declarations, resolutions, and primacy of national laws. The ASEAN Strategic Plan on the Environment (ASPE), in 1994, influenced partly by UNCED, particularly the Agenda 21, called for institutional strengthening, harmonization of goals and policy measures, and the importance of operational and technical cooperation including joint action. The Hanoi Plan of Action (1999–2004) to achieve the goals of ASEAN Vision 2020, was also designed to protect the environment and promote sustainable development.
- 53 K. L. Koh and N. A. Robinson “Regional environmental governance examining the Association of Southeast Asian Nations (ASEAN) Model” in Esty and Ivanova (eds.) *Global Environmental Governance: Options and Opportunities*, Yale School of Forestry and Environmental Studies, Falls Village, CT, 2002, 101–120.
- 54 Declaration of ASEAN Concord II (Bali Concord II), October 7, 2003.

- 55 ASEAN Secretariat *ASEAN Socio-Cultural Community Blueprint*, 2009, online.
- 56 ASEAN Secretariat *ASEAN Economic Community Factbook*, 2011, online. The three Blueprints, the ASEAN Political-Security Community Blueprint, the ASEAN Economic Community Blueprint and the ASEAN Socio-Cultural Community Blueprint, were launched in 2009.
- 57 Declarations include:
- ASEAN Declaration on COP13 to the UNFCCC and CMP3 to the Kyoto Protocol (2007).
  - ASEAN Joint Statement on Climate Change to COP15 to the UNFCCC and CMP5 to the Kyoto Protocol (2009).
  - Singapore Resolution on Environmental Sustainability and Climate Change (2009).
  - ASEAN Leaders' Statement on Joint Response to Climate Change (2010).
  - other declarations also include the Joint Ministerial Statements of the East Asia Summit (EAS) Energy Ministers Meeting (The Joint Ministerial Statement of EAS Energy Ministers Meeting started in 2007 and the most recent, the Sixth, was in September 2012).
- 58 R. Letchumanan *Climate Change: Is Southeast Asia up to the Challenge?: Is there an ASEAN policy on climate change?* IDEAS reports, special reports, Kitchen (ed.) SR004, LSE IDEAS, London School of Economics and Political Science, London, 2010, online.
- 59 In 2007, the ASEAN Charter was adopted—one of the notes under the Preamble states “RESOLVED to ensure sustainable development for the benefit of present and future generations and to place the well-being, livelihood and welfare of the peoples at the centre of the ASEAN community building process.” The Charter sets out, among others, principles and procedures for decision making, implementation, and dispute settlement.
- 60 The 2009 ADB study estimates the economy-wide cost of climate change for the four countries—the results indicate that while the economy-wide cost of climate change without global mitigation efforts is relatively low in the medium term, it rises significantly beyond that; by 2100, the economy-wide cost each year on average could reach 2.2 percent of GDP if non-market impacts related to health and ecosystems are included, and 6.7 percent of GDP if catastrophic risks are taken into account. This is more than double similar estimates for global average.
- 61 Zhuang, Juzhong *et al.* *The Economics of Climate Change in Southeast Asia*, Asia Security Initiative Policy Series Working Paper No 9, RSIS Centre for Non-Traditional Security (NTS) Studies, Singapore 2010.
- 62 For the industry sector, one of the ways to reduce CO<sub>2</sub> emissions is through improvements in efficiency i.e., recycling of waste materials and changing product design, improved management practices such as energy audit and benchmarking, heat and power recovery, and fuel switching. For the building and residential sector, a variety of technologies are already available in terms of heating systems, lighting, appliances, and consumer products, as well as behavioral change. ASEAN member countries have stepped up their efforts to mitigate their emissions and this was well documented in the 2009 ADB study.
- 63 Please refer to discussions by U. Aswathanarayana *et al.* *Green Energy Technology, Economics and Policy*, Abingdon: Routledge/CRC Press, 2010.
- 64 Asian Development Bank *The Economics of Climate Change*.
- 65 Op. cit.

- 66 Op. cit.
- 67 United Nations Development Program *Human Development Report 2007–2008—Fighting Climate Change: Human Solidarity in a Divided World*, New York, UNDP, 2007.
- 68 According to IPCC “adaptation” means “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.” Adaptation can be “autonomous,” taken autonomously by private actors in reaction to actual or expected climate change or “planned” when taken as a result of policy intervention. Adaptation can also be “reactive” in response to climate change impact or “anticipatory” in response to anticipated climate change.
- 69 Barnett and Adger “Climate change, human security and violent conflict.”
- 70 Arief Anshory Yusuf and H. Fransisco, *Climate Change Vulnerability Mapping for Southeast Asia*, Economy and Environment Program for Southeast Asia (EEPSEA), Singapore, 2009.
- 71 Asian Development Bank “Heart of Borneo initiative,” online, 2010.
- 72 ENSO consists of *El Niño*, a dry phase and *La Niña*, a wet phase. The complex atmospheric circulation exerts an influence over southeast Asia, suppressing precipitation during an *El Niño* event. Anomalous wind during this period “transports” smoke-haze from Indonesia across the region northward to neighboring countries. The precipitation pattern and anomalous atmospheric circulation provides useful meteorological information. As *El Niño* itself is a predictable event, the information is relevant in mitigating the risk of forest fires and recurrence of haze pollution. However, there could also be other phenomena that could influence the haze episodes.
- 73 Please refer to A. K.-J. Tan, “The ASEAN Agreement on Transboundary Haze Pollution: Prospects for Compliance and Effectiveness in Post Suharto Indonesia,” *New York University Environmental Law Journal*, 13: 3, 2005, 647–722.
- 74 According to the 2009 ADB study, at a more fundamental level, a country’s adaptive capacity depends on the economic, social, and human development which are closely related to income, inequality, poverty, literacy, and regional disparity; capacity and governance of public institutions and public finance; availability of public services such as social protection and social safety nets; and capacity for economic diversification, especially at the local levels. There are wide variations across ASEAN and significant gaps between the region and the developed world which will have to be addressed by ASEAN.
- 75 J. Jackson Ewing, *Forests, Food and Fuel: REDD+ and Indonesia’s Land-Use Conundrum*, Asia Security Initiative Policy Series No 19, Singapore: RSIS Centre for Non-Traditional Security (NTS) Studies, 2011.
- 76 BASIC Joint Statement issued at the conclusion of the Fourth Meeting of BASIC Ministers, July 26, Rio de Janeiro, online, 2010.
- 77 C. Carraro *et al.* “Bottom-up approaches towards a global climate agreement: an overview,” online, 2012.
- 78 Leal-Arcas “Top-down versus bottom-up approaches.”
- 79 World Resources Institute *Building the Climate Change Regime: Survey and Analysis of Approaches: Summary for Stakeholder Comment*, online, 2011.
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- 81 K. W. Chan, “Carbon footprint of Malaysian palm oil and future areas of research,” online, n.d.
- 82 Ewing *Forests, Food and Fuel*.

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