



# Climate Change

Is Southeast Asia up  
to the challenge?

**IDEAS Special Reports** are unique one-off research products that harness LSE's academic expertise to present in-depth analyses of issues of fundamental international importance. Special Reports can be commissioned on request.

**LSE IDEAS** is a centre for the study of international affairs, diplomacy and grand strategy. Its mission is to use LSE's vast intellectual resources to help train skilled and open-minded leaders and to study international affairs through world-class scholarship and engagement with practitioners and decision-makers. As its name implies, IDEAS aims at understanding how today's world came into being and how it may be changed, in line with LSE's old motto: *rerum cognoscere causas* - to understand the causes of things.

**IDEAS Reports** Editor  
Dr. Nicholas Kitchen  
Email: [IDEAS.reports@lse.ac.uk](mailto:IDEAS.reports@lse.ac.uk)  
Phone: +44 (0)20 7849 4918  
Fax: +44 (0)20 7 955 6514

CREDIT: Front cover image - reuters.com

# Contents ]

<b>Foreword:</b> <b>Climate Change - Is Southeast Asia up to the Challenge?</b> Dr. Munir Majid, Senior Visiting Fellow, LSE IDEAS	<b>2</b>
<b>Opening Address</b> Mr. Gita Wirjawan, Head of Indonesia's Investment Coordinating Board	<b>4</b>
<b>The economics of climate change in Southeast Asia:</b> <b>A regional review</b> Mr. Jörn Brömmelhörster, Asian Development Bank	<b>8</b>
<b>The costs of neglect of climate change consequences:</b> <b>The example of the forestry sector</b> Dr. Tim Forsyth, LSE	<b>22</b>
<b>The impact of climate change and climate variability on</b> <b>haze occurrences in Malaysia / Southeast Asia region</b> Prof. Fredolin Tangang, National University of Malaysia	<b>36</b>
<b>Is there an ASEAN policy on climate change?</b> Dr. Raman Letchuraman, ASEAN Secretariat	<b>50</b>
<b>NGO activity on climate change in Southeast Asia. How far</b> <b>has civil society been involved?</b> Mr. Abdon Nabadan, Indigenous People's Alliance (AMAN)	<b>63</b>
<b>Natural or unnatural disasters: the relative vulnerabilities</b> <b>of Southeast Asian megacities to climate change</b> Mr. Rafael Senga, WWF International	<b>66</b>
<b>Closing Address</b> Dr. Surin Pitsuwan, Secretary-General ASEAN Secretariat	<b>71</b>

# Climate Change: Is Southeast Asia up to the challenge?



Southeast Asia will be the worst affected among the regions of the world by the ravages of climate change, which could cost the region twice as much as the global average by 2100. This is among the key findings of the ADB (Asian Development Bank) regional study on the economics of climate change which estimates that the total damage is equivalent to losing 6.7 per cent of GDP each year by the beginning of the next century.

This sombre assessment is reason enough to look at the region particularly and to ask – Climate Change: Is Southeast Asia Up To The Challenge? This was the subject of a workshop organised by the LSE IDEAS Southeast Asia International Affairs Programme (SEAP) before the Copenhagen climate change summit in December. Sadly, the consensus at the workshop, which was held in Jakarta on 5-6 November, was that the region was not up to the challenge, despite robust argument by representatives of the Association of Southeast Asian Nations (ASEAN) Secretariat, who collaborated in organizing the event, that much was being done.

The Copenhagen summit of course did not succeed. But it did not fail either, falling somewhere in between, perhaps closer on the side of failure. A similar lack of clarity seems to inform all the concern in Southeast Asia about the challenge of climate change. Much is being said (whether in the form of Road Maps, Blueprints and Declarations, much beloved of ASEAN), and there is plenty of hand-wringing, but on the ground, there is insufficient movement.

One problem could be that 2100 seems far away, another time. Another, there is a lack of leadership too, as states look to other countries to act first before they can get moving together. Overall, the participants at the workshop felt the level of awareness of the problem, let alone any sense of its urgency, is low in the region. The Southeast Asian public is not seized of the issue of climate change in the same way as civil society in Europe is. For instance in domestic political systems, to the extent issues of public interest are heard, climate change is not a matter that will make or break incumbent governments. If there is one clear conclusion from the workshop, it is that there must be a higher level of Southeast Asian public awareness of the threat of climate change. I would suggest this is not just a matter for governments, non-governmental organizations and civil society alone. The business community should get involved by sponsoring information and advertisement time, in both the digital and conventional media, to draw attention to the risk and to the threat of climate change, similar to anti-smoking and anti-drugs campaigns. This should be in addition to whatever green initiatives they may be involved in.

The findings of the ADB regional study, with all those dire predictions, have so far only been presented to ASEAN environment ministers. At the workshop, participants from the secretariat said they would next be brought to the attention of the energy ministers as well. Actually, they should be splashed across the region and drummed into the heads of public and policy-makers. All techniques of modern communication must be employed to put across the severe threat that climate change poses to their lives.

The pages that follow amply and vividly record how in Southeast Asia there is such an enormous gulf between statements of good intentions and what takes place - or does not take place - on the ground. The so-called "haze", for instance, which is really a euphemism for thick, sickly, seasonal smog, has consumed the good health of many people in Indonesia, Malaysia, Singapore and Brunei especially in the 12 years since 1997 when open-burning first coincided with the El Nino phenomenon - and yet all that is being heard is that cooperative steps are being taken to address the issue. As reported at the workshop, almost 100 million people in Southeast Asia were exposed to acute health risks during the 1997 "haze" episode; 20 million people in Indonesia suffered from respiratory problems; in Malaysia 18 million people (83.2 per cent of the population) were exposed to health risks during the period.

It is hard to imagine in any free and open society such neglect of the well-being of citizens, with no sufficient care for the public good. But such tolerance has been the case in Southeast Asia and, tragically, it has encouraged continued neglect, insufficient concern and many empty words. The degradation of both the human and the environment is really reflective of what is at the heart of the challenge of climate change.

To take another example, the devastating floods that hit the Philippines in October 2009 were not inflicted by the hand of God but by the act of man, as was documented by an expert from the World Wildlife Fund (WWF) at the workshop. A new study by WWF warns of greater devastation to come in a number of Asian cities, with Jakarta, Manila, Phnom

Penh and Ho Chi Minh City particularly vulnerable. Will governments take heed and take preventative and preemptive measures, or blame mother nature again for their own inaction?

Governments do not like to be told off, especially through arguments which could undermine their legitimacy. Therefore academic experts and climate change activists must show that theirs is a call to action to save the planet, and not for regime change. In this regard, the attitude of the ASEAN Secretary-General Surin Pitsuwan in seeking expert advice through a panel at the secretariat is positive and forward-looking. If his closing address at the end of the workshop is not to remain mere words, academic experts and activists should grasp at the invitation and meaningfully embark on a common cause. In particular, it presents an opportunity to the many experts from the LSE to get into the practical mix - be it in green development and stimulus packages, the issues of deforestation and land use and a myriad other climate change matters.

If nothing else, the main achievement of the workshop could be the active engagement of LSE academic experts, and other regional activists, with the ASEAN secretariat in helping Southeast Asia take on, more effectively, the challenge of climate change.

On behalf of SEAP, I wish to acknowledge the indispensable support of paper presenters and participants at the workshop. The ASEAN Secretariat, in particular its Secretary-General Surin Pitsuwan, have been strong supporters and partners with whom SEAP looks forward to work with in the future. In the background, I also benefited from the assistance of John Pearson of the British Foreign and Commonwealth Office based in Singapore and from numerous Indonesian friends generous with their time and suggestions of useful paper presenters. To everyone, including the SEAP Administrator, Vinna Baptist, I wish to express my heartfelt thanks.

**Dr. Munir Majid**

Senior Visiting Fellow, LSE IDEAS  
Southeast Asia International Affairs Programme  
19 January 2010



# Climate change: A global concern

**Mr. Gita Wirjawan** Head of Indonesia's Investment Coordinating Board



It is a pleasure and an honour for me to have the opportunity to address you at this 'LSE IDEAS Climate Change Workshop'.

Climate change is indeed a global concern. We have seen over the years an intensive discourse on this subject. There have been discussions among global leaders at the APEC summit in Sydney, the UN Conference on climate change in Bali, the ASEM summit in Beijing, the G-8 outreach in Japan, the recent G-20 Summits in Washington DC and London, the UN High level summit in New York, and of course the recent meeting in Copenhagen.

These discussions highlight the need to work together as global citizens, since what we do in our respective countries has a bearing on the rest of the world. The talks also highlight the importance of continuing to move forward on this agenda even in the midst of the global financial crisis.

Southeast Asia is vulnerable to the impact of climate change. We have seen recently the impact of climate change in the region, such as the rising frequency of typhoons and natural disasters in the region. The world is becoming dangerously warmer. As neighbours, it is important for us to better understand the impact of climate change in our region, and try to find regional solutions to them. As a group, we have a better chance of addressing climate change collectively rather than individually. Together, we can more easily share technology, working together as a regional block to overcome challenges of global warming.

I am not an environmental specialist or an expert in climate change. I am a businessman and a banker. Some even call me a musician and a golfer. So I will leave the technical details on climate change for all of you to discuss.

Instead, I would like to talk today more generally about Indonesia's aspirations and approach to climate change. I would also like to talk to you about another type of climate issue that I know better – investment climate, and how a good investment climate could support climate change efforts.

## 1. Indonesia's approach to climate change

During the UN Climate Change Conference held in Bali in 2007, 187 nations acknowledged the indisputable evidence of global warming and risks of severe climate change impacts. The conference produced the Bali Road Map, which became a significant milestone in global efforts to address the impact of climate change.

The ramifications of global warming included an increase in tropical cyclone intensity, salinity of the sea, changes in wind patterns, change in the reproductive period of animals and plants, and epidemics. Climate change is also expected to influence various ecosystems in high latitude including the Arctic and Antarctic, as well as coastal ecosystems. Some of these effects will only be felt in the long-run, some

in the not-too-long-run and some, such as the rise in the frequency and intensity of extreme weather with all of its consequences, are already evident now, as manifested recently in the Philippines, Vietnam, Cambodia and Laos.

Predominantly coastal Southeast Asia has been particularly vulnerable to the impact of climate change. In Indonesia, for example, the majority of the population lives within 100 km of the coast. Around 14 percent of Indonesia's GDP is generated from agriculture, and 15 percent from coastal and fisheries activities – both combined representing over 40 percent of Indonesia's labour force. Over three percent of Indonesia's GDP comes from tourism.

The Indonesian government has made clear repeatedly in many international forums that it is committed to taking its part in this global effort. Indonesia sees itself as the voice of the developing nations.

Developing countries such as Indonesia still face many challenges in their national development. Indonesia is currently doing relatively well. In the midst of a global financial crisis, Indonesia continues to grow positively at over 4.5 percent, one of the highest growth rates in the world. Indonesia's political condition also remains remarkably stable. Indonesia recently carried out, for the third time in a row, a peaceful and successful election, with President Yudhoyono obtaining a strong mandate from the Indonesian people to lead for the next five years. Various reform efforts including improving good governance, continue to be on track.

However, we are still a long way off from the degree of prosperity that we see in developed countries. Many of our people are still in poverty and/or unemployed. We are still working on providing adequate infrastructure, health care and education to our citizens. Given these challenges, many of us from the developing and underdeveloped countries ask how we can spend the limited resources that we have

on climate change, rather than on these development priorities. This question becomes even more important when the world is in the midst of a global financial crisis. Moreover, several developing nations hold the view that climate change we experience today is caused by the pollution generated by industrial countries from decades ago. In other words, they should bear the responsibility.

It is therefore important to find an approach that reconciles the development objectives of developing countries with climate change prerogatives. In his speech on climate change at the recent G-20 forum, President Yudhoyono called this a principle of "common but differentiated responsibilities and respective capabilities". This means that developed, developing and underdeveloped countries should do more and not continue with a "business as usual" attitude. This means that developed countries must take the lead on the effort, but developing countries must also seriously do their part. In addressing climate change, it is also important to bear in mind that developing countries lack sufficient technology, human capacity and funds to contribute optimally to a solution. In many instances, they also face unfavourable climatic trends.

As such, developing countries need support in terms of financing, technology, research, among others, from the developed world. We are pleased to see mechanisms such as the carbon market and Clean Development Mechanism (CDM) and Reduced Emissions from Deforestation and Degradation (REDD), although a lot more still needs to be done for them to be optimally utilised.

It is our hope that the principles based on "common but differentiated responsibilities and respective capabilities" be emulated by other countries as we move forward in this global agenda.

## 2. Climate change and investment climate: a win-win solution.

As I mentioned earlier, developing countries like Indonesia have their development aspirations and goals, and at the same time are committed to taking part in the global efforts to addressing climate change. Often these two objectives are viewed as in conflict with one another. However, this is not necessarily always the case. In fact, there are ways to achieve our development objectives without polluting our planet. As Indonesia straddles both ends of the global warming debate, it is well-positioned to take a win-win solution.

Let me give you several illustration, using the two main sources of emissions in Indonesia: land use and energy.

The national council on climate change reported that Indonesia emits around 2.3 billion tons of CO<sup>2</sup> per year, or 8 percent of the global emission. It is the world's third largest emitter after United States and China. Out of this number, around 80 percent comes from land use, especially peat lands and forests. Worldwide, forests and peat lands act as biological carbon sinks slowly lowering the amount of greenhouse gases in atmosphere by storing atmospheric carbon in biomass. These carbon sinks are threatened by deforestation and drainage, which leads to greenhouse gas emission, either slowly due to degradation and decomposition, or quickly through fires. Imagine if Indonesia can attract billions of dollars from reducing these emissions. Indonesia could offer a new approach for a global deal to mitigate climate change against a backdrop of international efforts to deal with the problem.

If we take Indonesia's emission from land-use, which is around 1.8 billion tons of CO<sup>2</sup>, and multiply it with the current price of carbon traded in the market, which is around €14 per ton of CO<sup>2</sup>, Indonesia could potentially attract over €25 billion per year, equivalent to over US\$33 billion per year, a significant amount which can then be invested in communities, new technologies, and other investments that improve livelihoods. This could be a solution where actions

to mitigate and reduction emission are in line with our development objectives. It will not be an easy task to realise them, but it is also not impossible to achieve. The land use sector is gaining momentum in climate change negotiations, and initial steps in the right direction are in place. Allow me to give you another illustration. Indonesia's greenhouse gas emission from energy is relatively small compared to deforestation. However with the projected rapid increase of energy demand (estimated at around 7-9 percent per year), it is projected that greenhouse gas emissions from energy sources will also grow rapidly, and will surpass that of deforestation in the not so distant future.

At the same time, Indonesia is rich in renewable energy resources and could benefit from increasing its use of renewable energy sources, including geothermal, hydro, biomass, and solar power. This would not only contribute to meeting rising demand and enhancing energy security, but also help constitute sustainable development that is in-line with climate change mitigation efforts.

Indonesia has nearly 40 percent of the world's potential geothermal resources which could be a viable addition or alternatives for base load power generation. Geothermal generation can be developed at a scale that would be economically feasible, especially if coal prices keep rising. Biomass and hydro-electric resources are abundantly available in most of the outer islands and can be an attractive option for switching away from the largely diesel-based generation in many of these locations.

To use these resources, Indonesia has started developing an energy mix policy and has begun to address the technical, policy and commercial barrier that hinder progress. Indonesia is also exploring the use of a spectrum of fiscal and other policy instruments to promote energy efficiency, reduce the energy-intensity of industry and promote investment in renewable resources.

As Indonesia is working towards improving its policies, institutional arrangements and programs towards a healthier investment climate in green energy, access to global support and instruments are also needed. Financial and investment flows required for these new investments are beyond the financial capacity of Indonesia. Therefore, attracting new investments in renewable energy is the other side of the coin where significant support would be needed.

Sustainable development often requires quick technology turn around, allowing new greener technology to enter the market. It requires large investments to enter the country. Being a dynamic and modern country, Indonesia could reconcile its development goals and climate change targets. Indonesia is committed to making this happen by improving its investment climate.

Although still relatively modest, Indonesia's ease-of-doing-business ranking has been improving every year, showing progress in the right direction, moving from 129 in 2008 to 122 in 2009. We are on the right track to improve good governance. Given the cross-cutting nature of investment climate, the government has given a stronger mandate to the Investment Coordination Board to coordinate the different parties involved. This includes the one-stop-shop program, which would allow investors to process its business licensing at the investment board, rather than having to go to individual ministries or departments. We are also working towards making business licensing to be available on-line, to make it more accessible to investors.

All these efforts, combined with a focus in infrastructure and continued good management of macroeconomic condition, would help Indonesia play a bigger role. ■

# The **economics** of climate change in Southeast Asia: A regional review

Dr. Jörn Brömmelhörster Asian Development Bank



Southeast Asia is already suffering from the effects of climate change and the worst is yet to come. According to IPCC (2007), without global mitigation, by the end of this century, the global mean temperature increase—from 1980–1999 levels—could be more than 4.0°C. The modelling work carried out under this study suggests that the region's mean temperature by 2100 could reach 4.8°C from the 1990 level under the same emissions scenario.

Combating climate change is a global issue and requires a global solution built on common but differentiated responsibility. Given its high stake in actions against global warming, great adaptation needs and significant mitigation potential, Southeast Asia should contribute to the global solution by implementing both adaptation and mitigation measures.

The five countries—Indonesia, Philippines, Singapore, Thailand, and Vietnam—have made significant efforts in adapting to climate change impact, but more is needed to mainstream adaptation in development planning; to enhance and build adaptive capacity, especially of the poor; and to implement proactive measures in key climate-sensitive sectors. While adaptation is the region's priority, Southeast Asia should make greater mitigation efforts — as low-carbon growth also brings significant co-benefits—in particular, by reducing emissions from deforestation and degradation, implementing win-win mitigation options in the energy sector, and exploring the mitigation potential of the agriculture sector.

International funding and technology transfer are essential for the success of adaptation and mitigation actions in Southeast Asia. The region should enhance its capacity to make better use of existing and potential international funding sources.

Regional cooperation offers an effective means to deal with many cross-boundary issues, such as water resources management, forest fires, extreme weather events, and disease outbreaks, as well as for learning and knowledge sharing.

Climate change issues cut across many sectors, and Southeast Asian countries should strengthen policy and planning coordination among different ministries and levels of government.

There is an urgent need in Southeast Asia for more research to better understand climate change challenges, in particular at the local level, and cost-effective adaptation and mitigation solutions. The economic crisis and the fiscal stimulus packages designed to combat climate change offer an opportunity to start a transition toward a climate-resilient and low-carbon economy in Southeast Asia.

## A. Climate Change and Its Impact in Southeast Asia

**Southeast Asia—highly vulnerable to climate change—is already suffering from its effects, and the worst is yet to come.**

This study confirms that climate change has already had an impact on the region, as evidenced by increasing mean temperature, changing precipitation patterns, rising sea level, and increasing frequency and growing intensity of extreme weather events. Climate change is exacerbating water shortages in many parts of the region, constraining agricultural production, causing forest fires and degradation, damaging coastal and marine resources, and increasing the risk of outbreaks of infectious diseases.

Southeast Asia is projected to suffer more from climate change in the years to come, with the impact likely to be worse than the global average. If not adequately addressed, climate change could seriously hinder the region's sustainable development and poverty eradication efforts. The study shows that a wide range of adaptation measures are already being applied, and that the region has great potential to contribute to global mitigation actions. The cost to the region and globally of not addressing climate change now far exceeds the cost of adaptation and mitigation—there is no time for delay.

**If no action is taken, the four countries—Indonesia, Philippines, Thailand, and Vietnam—could suffer a loss equivalent to 6.7% of GDP annually by 2100, more than double the global average loss.**

The results of an integrated assessment of the economy-wide cost of climate change show that for the four countries as a whole, while the cost is relatively low in the medium term, each year it rises very significantly beyond that; by 2100, the mean cost could reach 2.2% of GDP each year if one considers market impact only, 5.7% of GDP if non-market impacts related to health and ecosystems are included, and 6.7% of GDP if catastrophic risks are

also taken into account. This is more than double similar estimates for the global average and, more importantly, would occur annually.

## B. The Need for a Global Solution

**Addressing climate change requires a global solution built on common but differentiated responsibility.**

Climate change is the most significant market failure the world has ever witnessed. Like any market failure, it can only be resolved through the intervention of public policy. Governments need: (i) to put in place effective national climate change policy frameworks; (ii) devise cost-effective implementation strategies; (iii) mobilize sufficient resources from both external and domestic sources including the private sector and ensure their efficient allocation; (iv) create strong incentives for implementing adaptation and mitigation actions and eliminate various market distortions that impede such actions; (v) fill knowledge and information gaps; (vi) and raise public awareness of the urgency of addressing climate change. But government interventions alone are not enough. Successfully tackling climate change problems requires the participation and action of all stakeholders, including households, firms, individuals, non government organisations, and civil society.

**As a global public good, addressing climate change requires all nations in the world, developed and developing, to work together on a global solution.**

Large income gaps among different parts of the world today imply that there are significant variations among countries in capacity and affordability when undertaking adaptation and mitigation actions. Further, the observed climate change and its impacts are a result of past emissions largely by developed countries. These considerations raise an important issue of equitable burden sharing, and point to the need for common but differentiated responsibility. Developing countries need to be aware that without adequate global effort in reducing GHG

emissions, their prospects for income growth and poverty reduction would be under serious threat. Developed countries should also recognise the need and legitimacy of developing countries to narrow their income gaps with the developed world, and appreciate their desire to ensure that addressing the climate change challenge would not come at the cost of a slower pace of development. These considerations also highlight the importance of including both mitigation and adaptation in any global solution to the climate change problem.

**An essential component of an effective global solution would, therefore, involve adequate transfer of financial resources and technological know how from developed to developing countries.**

Estimates of financing needs for climate change mitigation and adaptation vary widely, reflecting the uncertainties associated with potential climate change scenarios and their likely impact. However, emerging estimates of the additional investment needed for mitigation and adaptation in developing countries indicate a financing gap of hundreds of billions of dollars per annum for several decades to come. This is far greater than the resources that have been committed or established by developed countries through global financing mechanisms, such as the Clean Development Mechanism (CDM), the Global Environment Facility (GEF), the various dedicated funds such as the Clean Energy Investment Framework and Climate Investment Fund, and other regional and bilateral mechanisms. This is a cause for serious concern.

**Global climate change cannot be tackled without the participation of developing countries.**

This is because, first, there is great potential for cost-effective emissions reductions in developing countries; and, second, GHG emissions by developing countries are expected to grow faster than those by developed countries in the coming decades, given their more rapid population and economic growth. An effective global solution would therefore,

inevitably involve developing countries mainstreaming climate change considerations in policy making and integrating adaptation and mitigation actions into strategies for economic growth, poverty eradication, and sustainable development.

**The international community has now agreed to the Bali Road Map to step up efforts to combat climate change.**

The past few years have witnessed the emergence of a consensus on the urgency of addressing climate change, culminating in the formulation of the Bali Action Plan by the 13th Conference of Parties (COP13) of the United Nations Framework Convention on Climate Change (UNFCCC) in December 2007, in order to enhance the implementation of the UNFCCC and to initiate negotiations toward comprehensive, long-term cooperation. The Bali Action Plan has set the COP15 in Copenhagen in December 2009 as the deadline for agreeing to the terms of an international climate regime beyond 2012.

The terms will embrace climate change mitigation, including reducing emissions from deforestation and degradation (REDD), adaptation, technology development and transfer, and provision of financial resources in support of developing countries' actions. In July 2008, the Group of Eight rich nations agreed to adopt the goal of achieving at least a 50% reduction of global emissions by 2050, recognising that the global challenge can only be met by a global response, in particular, by contributions from all major economies, consistent with the principle of common but differentiated responsibilities and respective capabilities.

## **C. What Should Southeast Asia Do?**

**Southeast Asia has in recent years taken encouraging action to adapt to climate change impacts and to mitigate GHG emissions.**

Each country in Southeast Asia has developed its own national plan or strategy for climate change, established a ministry or agency as the focal point to deal with climate change and its impact, and implemented many programs supporting adaptation and mitigation activities. But more action is needed. There is urgent need for: (i) raising awareness of climate change impacts and risks; (ii) mainstreaming climate change considerations in development planning and policy making; (iii) putting in place an effective institutional framework for better policy coordination; (iv) investing more resources in climate adaptation and mitigation; (v) providing adequate information on win-win adaptation and mitigation; (vi) addressing market failures and eliminating market distortions that impede the implementation of such options; (vii) strengthening international and regional cooperation in knowledge, technology, and financial transfers; (viii) undertaking more research and filling knowledge gaps on climate change-related challenges and solutions at local levels; and (ix) making more capacity building efforts.

### **(i) Adaptation toward enhanced climate resilience**

**Southeast Asian countries should continue efforts to enhance climate change resilience by building adaptive capacity and taking technical and non-technical adaptation measures in climate-sensitive sectors.**

A country's resilience to climate change depends first and foremost on its adaptive capacity. At a more fundamental level, a country's adaptive capacity depends on its economic, social, and human development, which are closely related to: (i) income, inequality, poverty, literacy, and regional disparity; (ii) capacity and governance of public institutions and public finance; (iii) availability or adequacy of public services including education, health, social protection, and social safety nets; and (iv) capacity for economic diversification, especially at local levels. In all these aspects, there are wide variations across Southeast Asia and significant gaps between the region as a whole and the developed world. Eliminating these gaps by keeping growth strong and making development sustainable and inclusive will go a long way toward improving Southeast Asia's adaptive capacity.

Strengthening adaptive capacity also requires mainstreaming climate change adaptation in development planning. This means that adaptation should be considered as an integral part of sustainable development and poverty reduction strategies. In this context, the study identified some immediate priorities: (i) stepping up efforts to raise public awareness of climate change and its impact; (ii) undertaking more research to better understand climate change, its impact, and solutions, especially at the local level, and stepping up efforts in information and knowledge dissemination; (iii) enhancing policy and planning coordination across ministries and different levels of government for climate change adaptation, including linking climate change adaptation with disaster risk management; (iv) adopting a more holistic approach to building the adaptive capacity of vulnerable groups and localities and their resilience to shocks, including developing their capacity



to diversify local economies, livelihoods, and coping strategies beyond tackling the natural systems; and (v) developing and adopting more proactive, systematic, and integrated approaches to adaptation in key sectors that are cost-effective and that offer durable and long-term solutions.

**Many sectors have adaptation needs but water, agriculture, forestry, coastal and marine resources, and health require particular attention.**

Adaptation action has been taken in a number of key sectors where climate change impacts are most visible or damaging in Southeast Asia, including in these sectors. But adaptation inherently suffers from several market failures. The market failures arise because of uncertain information associated with large-scale and long-term investment such as climate proofing of building and defensive infrastructure; the positive spillover effects and the public goods nature of certain adaptive measures such as research and coastal protection; and the need for coordination among many multiple stakeholders. As a result, private markets and autonomous actions alone will not lead to an adequate level of adaptation.

Many measures need to be driven by public policy and government interventions. Box 1 describes areas of adaptation for scaling up in the key sectors.

### Box 1. Policy Recommendations on Adaptation

- Enhance adaptive capacity by keeping growth strong, sustainable, and inclusive; and by mainstreaming climate change adaptation in development planning.
- Step up efforts at raising public awareness of climate change and its impact.
- Undertake more research to better understand climate change, its impact, and solutions, especially at the local level, and step up efforts in information and knowledge dissemination.
- Enhance policy and planning coordination across ministries and different levels of government for climate change adaptation, including linking climate change adaptation with disaster risk management. Addressing climate change requires leadership at the highest level of government.
- Adopt a more holistic approach to building the adaptive capacity of vulnerable groups and localities and their resilience to shocks, including developing their capability to diversify local economies, livelihoods, and coping strategies.
- Develop and adopt more proactive, systematic, and integrated approaches to adaptation in key sectors that are cost-effective, offer durable and long-term solutions, and are relevant to each country's circumstances:
  - » Water resources sector: scale up existing good practices of water conservation and management, and apply more widely integrated water management, including flood control and prevention schemes, early warning flood systems, irrigation improvement, and demand-side management.
  - » Agriculture sector: strengthen local adaptive capacity by providing public goods and services, such as better climate information, research and development on heat-resistant crop variety and other techniques, early warning systems, and

efficient irrigation systems, and explore innovative risk-sharing instruments such as index-based insurance schemes.

- » Forestry sector: enhance early warning systems and awareness-raising programs to better prepare for potentially more frequent forest fires as a result of climate change; and implement aggressive public private partnerships for reforestation and afforestation.
- » Coastal and marine resources sector: implement integrated coastal zone management plans, including mangrove conservation and planting.
- » Health sector: expand or establish early warning systems for disease outbreaks, health surveillance, awareness-raising campaigns, and infectious disease control programs.
- » Infrastructure sector: introduce "climate proofing" of transport-related investments and infrastructure.

## (ii) Mitigation toward a low-carbon economy

**Southeast Asia should be an important part of the global solution to stabilise GHG concentrations in the atmosphere.**

While the response of the largest current and future GHG-emitting economies under the UNFCCC is key to a successful global solution, southeast Asian countries should also be an important part of this global solution given that its rapid economic and population growth will likely cause its GHG emissions to grow further, and because a low-carbon growth path brings significant co-benefits. This study has shown that Southeast Asia has considerable potential for GHG emissions reductions. Based on the contribution of different sectors, mitigation should target the land use change and forestry sector, the energy sector, and the agriculture sector (Box 2).

**As Southeast Asia's largest contributor to emissions, the forestry sector is key to their successful reduction.**

Major mitigation measures for the forestry sector include maintaining or increasing forest areas through REDD; afforestation and reforestation; and improving forest management. Reducing and/or preventing

deforestation would have the largest and most carbon stock impact in the short run.

Since REDD also provides significant sustainable development co-benefits, Southeast Asian countries should address the causes of deforestation relevant to their own national circumstances. The creation of global financing mechanisms that are effective, predictable, sustainable, performance-based, and supported by diversified resources, including market and non-market mechanisms, is an urgent priority for REDD. In order to benefit from a future global REDD mechanism, the region's technical and institutional capacities to undertake forest carbon inventories and implement appropriate forest policies and measures should be strengthened.

Southeast Asian countries should also step up efforts in reducing deforestation, supporting reforestation and afforestation, and enhancing national and provincial governance systems for sustainable forest management. These require policy reforms appropriate to national and local circumstances, such as monitoring and controlling illegal logging, increased government rent capture for forest concessions, lengthened concession cycle and tenure



security, and enhanced competition for access to concessions. Since forests are also home to many indigenous communities, policies must be designed to fully recognize and respect their rights and priorities, and ensure their participation in the design and implementation of REDD policies.

**Mitigation in the energy sector should start with win-win options with which GHG emission reductions can be achieved at a relatively low cost or even a negative net cost.**

Although Southeast Asian countries together contributed about 3.0% of global energy-related CO<sub>2</sub> emissions in 2000, this share is expected to rise in the future, given relatively higher economic and population growth compared to the rest of the world. Southeast Asia has considerable mitigation potential in both the energy supply and demand sectors. On the supply side, major mitigation options include efficiency improvement in power generation, fuel switching from coal to natural gas, and use of renewable energy including biomass, solar, wind, hydro and geothermal resources. On the demand side, the key sources of GHG emissions are the residential and commercial building, industry (steel, cement, pulp and paper, and others), and transport sectors.

## Box 2. Policy Recommendations on Mitigation

Target key sources of the region's emissions, namely, the land use change and forestry sector, the energy sector, and the agriculture sector.

### Land use change and forestry sector

- Address key drivers of deforestation, and strengthen technical and institutional capacities to undertake forest carbon inventories and implement appropriate forest policies and measures, in order to benefit from the future global REDD mechanism. Step up efforts in reducing deforestation.
- Step up efforts in reforestation and afforestation.
- Enhance national and local governance systems for sustainable forest management by implementing context-specific policy reforms, such as monitoring and controlling illegal logging, increased government rent capture for forest concessions, lengthened concession cycle and tenure security, and enhanced competition for access to concessions.
- Design policy to fully recognize and respect rights and priorities of indigenous communities and ensure their participation in the design and implementation of REDD policies.

### Energy sector

- Explore mitigation options both on the demand and supply sides.
- On the supply side, improve efficiency in power generation, promote fuel switching from coal to natural gas, and encourage the use of renewable energy, including biomass, solar, wind, hydro and geothermal resources.
- On the demand side, improve energy efficiency and promote energy conservation in the

residential and commercial building, industry (steel, cement, pulp and paper, and others), and transport sectors.

- Explore and implement win-win mitigation options—involving mainly energy efficiency improvements—by identifying and eliminating the binding constraints to the adoption of these options, including information, knowledge, and technology gaps; market and price distortions; policy, regulatory, and behavioural barriers; lack of necessary finance for upfront investment; and other hidden transaction costs.
- Cut general subsidies on the use of fossil fuels, and provide targeted transfers to poor and vulnerable groups.
- Step up efforts in developing and switching to clean, renewable, and low-carbon energy sources as well as clean and sustainable transport by putting in place an appropriate policy framework, including creating incentives and supporting research and development, with the support of existing and future international financial and technology transfer mechanisms.
- Incorporate the negative externalities of GHG emissions in cost-benefit analysis of public sector energy investment.

### Agriculture sector

- Improve land and farm management.
- Promote emissions reduction through a combination of market-based programs, regulatory measures, voluntary agreements, and international programs.

There are many win-win mitigation options in Southeast Asia, with cost savings from mitigation exceeding expenses. Energy efficiency improvement measures fall in this category. A policy priority is to identify the binding constraints to the adoption of these options. Such binding constraints could include information, knowledge, and technology gaps; market and price distortions; policy, regulatory, and behavioural barriers; lack of necessary finance for upfront investment; and other hidden transaction costs. A thorough review of these possible constraints is needed in order to eliminate them. A prominent market distortion in the energy sector in many Southeast Asian countries involves general subsidies for fossil fuels and electricity generated from such fuels. Governments should gradually reduce general fuel subsidies and provide targeted transfers only to the poor and vulnerable.

Given its rapid economic and population growth, Southeast Asia's energy demand is likely to continue to expand, and new sources of energy supply will have to be developed in the longer term. With the support of existing financial transfer and technology cooperation mechanisms and those to be agreed in the near future, Southeast Asian countries should step up their efforts in developing and switching to clean, renewable, and low-carbon energy sources as well as clean and sustainable transport systems. Governments should encourage this switch by putting in place or further strengthening an appropriate policy framework, creating appropriate financial and tax incentives, and supporting research and development. Public sector energy investment should incorporate the negative externalities of GHG emissions in cost-benefit analysis. Southeast Asia should join the global effort in moving toward a low-carbon economy.

**Southeast Asia is estimated to have the highest technical potential to sequester carbon in agriculture in the world.**

Being the third largest source of GHG emissions in Southeast Asia, the agriculture sector also provides significant potential for mitigation. Major mitigation options in agriculture include improved crop and grazing land management; restoration of organic soils (including peatland) that are drained for crop production, and restoration of degraded lands; livestock management; manure and bio-solid management, and bioenergy use (IPCC 2007). These measures can lead to a reduction of fertilizer and methane related emissions, reversal of emissions from land use change, and increased sequestration of carbon in the agro-ecosystem. Currently, however, progress in implementing these measures in the region has been slow.

Measures for reducing GHG emissions from the agriculture sector could be explored through the combination of market-based programs, regulatory measures, voluntary agreements, and international programs. Examples of market-based programs are taxes on the use of nitrogen fertilizers, and reform of agricultural support policies. Regulatory measures could include limits on the use of nitrogen fertilizers and cross-compliance of agricultural support to environmental objectives. Voluntary agreements on better farm management practices could be promoted, alongside labelling of green products. International programs could support technology transfer in agriculture.

**(iii) Funding, technology transfer, and international/regional cooperation**

**International financial and technology transfers are essential for the success of adaptation and mitigation efforts in Southeast Asia.**

The region should enhance institutional capacities to make better use of the existing and potential international funding resources. Existing funding sources, albeit inadequate in view of the vast task

at hand, provide initial support and can be used as a catalyst for raising co-financing. Southeast Asia has not yet made full use of these funding sources, and its representation in the global carbon market is still limited. Government needs to facilitate access to these current and potentially available sources through better information dissemination and technical assistance. There is a need to increase the region's presence in making use of CDM, REDD-related, and other financing mechanisms (Box 3).

Technology needs vary greatly within and across Southeast Asian countries. The international climate regime will need to do more to facilitate the transfer of technologies that have been identified, while key performance indicators for transfer of low-carbon technologies should be developed. A regional framework should also be established to support south-south technical cooperation and information sharing among neighbouring countries in Southeast Asia, as it is likely easier to apply mitigation and adaptation measures introduced by neighbouring countries that successfully utilise locally available materials and traditional environmental management skills. Opportunities for technological leapfrogging, especially in the energy, infrastructure, and waste management sectors, should be effectively explored.

In the longer term, there is also a need to explore innovative forms of financing, such as risk-sharing instruments like catastrophe bonds, weather derivatives, and micro-insurance index-based schemes through partnerships involving the private sector. Following the example of the International Finance Facility for Immunisation, a regional financing facility for supporting adaptation initiatives, could be considered. Private investment in the form of venture capital and mutual funds focusing on low-carbon and energy efficiency technologies could also play a role in funding adaptation and mitigation.

**Southeast Asian countries could also consider creating a regional emissions trading scheme (ETS) in the longer term.**

Besides making use of international funding mechanisms and participating in the international carbon market through effective use of mechanisms such as programmatic CDM—and possibly sectoral approaches and policy-based CDM likely to become part of the future climate regime—the region could, in the longer term, also consider creating a regional ETS. Such a scheme would help reduce costs associated with emissions reductions and facilitate faster deployment of low-carbon technologies. The scheme would also help create a mechanism to consider environmental externalities, thereby encouraging energy-intensive firms to adopt low-carbon technologies in an incremental manner. The experiences of the Republic of Korea and Hong Kong, China in launching pilot domestic ETS, and of India in mandating specific energy consumption decreases in large energy-consuming industries through a system of trading energy savings certificates among companies, could be helpful. However, several functional prerequisites, including institutions and governance systems, must be met before introducing a regional ETS.

**Many climate change issues can be better addressed through regional cooperation.**

Because most countries in the region experience similar climate hazards, regional strategies are likely to be more cost-effective than national and sub-national actions in dealing with many transboundary issues, including integrated river basin and water resources management, forest fires, extreme weather events, threatened and shared coastal and marine ecosystems, climate change-induced migration and refugees, as well as regional outbreaks of heat-related disease, such as dengue, malaria, and cholera.

Regional cooperation could effectively address some climate change mitigation challenges, for example, by promoting power trade using different peak times among neighbouring countries to minimize the need for building new generation capacity in each country; developing renewable energy sources; and promoting clean energy and technology transfer, and regional benchmarking of clean energy practices and performance.

Regional cooperation also has an important role to play in promoting good policies and practices, sharing information and knowledge on issues such as disaster management, and promoting and undertaking climate related research and development in the region. Regional cooperation is important in developing regional climate scenarios and models to monitor and evaluate the impact of climate change.

### Box 3. Funding, Technology Transfer, and International/Regional Cooperation

#### Funding

- Promote the region's use of CDM, REDD-related, and other international financing mechanisms, existing or likely to become available in the future, by facilitating access through better information dissemination and technical assistance and by enhancing institutional capacities for using such mechanisms.
- Explore innovative forms of financing, such as catastrophe bonds, weather derivatives, and micro-insurance index-based schemes through public-private partnerships. Private investment in the form of venture capital and mutual funds focusing on low-carbon and energy efficiency technologies could also play a role in funding adaptation and mitigation.

#### Technology Transfer

- Facilitate the transfer of technologies of low-carbon technologies.
- Establish a regional framework to support south-south technical cooperation and information sharing among neighboring countries in Southeast Asia.
- Explore opportunities for technological leapfrogging, especially in the energy, infrastructure, and waste management sectors.

#### Regional Cooperation

- Consider creating a regional emissions trading scheme in the longer term, after meeting several functional prerequisites including enhancing institutions and governance systems.
- Adopt regional strategies in dealing with transboundary issues, including integrated river basin and water resources management, forest fires, extreme weather events, threatened and shared coastal and marine ecosystems, climate change-induced migration and refugees, as well as regional outbreaks of heat-related disease and vector-borne infectious diseases such as dengue and malaria.
- Improve regional cooperation toward effectively addressing climate change mitigation challenges, for example, by promoting power trade using different peak times among neighboring countries to minimise the need for building new generation capacity in each country; developing renewable energy sources; promoting clean energy and technology transfer, and regional benchmarking of clean energy practices and performance.
- Expand the role of regional cooperation in promoting good policies and practices, sharing information and knowledge on issues such as disaster management, and promoting and undertaking climate-related research and development in the region, such as in developing regional climate scenarios and models to monitor and evaluate the impact of climate change.

### (iv) Strengthening government policy coordination

Given that climate change is an issue that cuts across all parts and levels of the government, there is a need for strong inter-governmental agency policy coordination. Addressing climate change requires leadership at the highest level of government.

Climate change is an issue involving not only the ministries of environment and related offices, but also the economic and finance ministries, and so on. Strong inter-ministerial coordination and planning are critical for the effective implementation of adaptation and mitigation policy. For example, if the environment ministry plans to raise tax on petrol as part of an overall climate change strategy, this proposal should have full government backing and not be blocked by a ministry which, for example, is concerned about the objections of automobile producers. In the case of adaptation, there is a strong case for linking it with disaster risk management. There is also a need for putting in place or enhancing central government-local authority coordination, planning, and funding mechanisms to encourage local and autonomous adaptation actions, and to strengthen local capacity in planning and implementing adaptation initiatives. For effective coordination strategies, see (Box 4).

### Box 4. Strengthening Government Policy Coordination

- Strengthen inter-government agency planning and policy coordination for the effective implementation of adaptation and mitigation policy, involving not only environment ministries but also economic and finance ministries.
- Put in place or enhance central government-local authority coordination, planning, and funding mechanisms to encourage local and autonomous adaptation actions, and to strengthen local capacity in planning and implementing adaptation initiatives.
- Improve coordination by having the government agency responsible for formulating and implementing the development plan and strategy take the lead.
- Build in fiscal stimulus packages “green investment” programs that combine adaptation and mitigation measures with current efforts to shore up the economy, create jobs, and reduce poverty



## (v) Undertaking more research on climate change–related issues

### More research is required to better understand climate change challenges and cost-effective solutions at the local levels and to fill knowledge gaps.

Despite the emergence of more and more regional and country-specific studies on climate change in Southeast Asia in recent years, knowledge gaps remain huge. There is an urgent need for undertaking more research in Southeast Asia to better understand:

- climate change and its impact, risks and vulnerability, adaptation needs, and mitigation potential at local levels;
- cost-effective technical and non-technical adaptation solutions in key climate-sensitive sectors including water resources, agriculture, forestry, coastal and marine resources, such as optimal cultivation and cropping patterns, heat-resistant crop variety, sound practices in forestry management, early warning systems for extreme weather events;
- sound adaptation practices and strategies dealing with issues beyond the natural Systems, such as migration, social protection mechanisms, livelihoods of small-scale farmers and fishermen, and governance of adaptation at all levels;
- cost-effective mitigation measures, in particular those win-win options, and policy, institutional, behavioural, and technological constraints to their adoption.

Southeast Asia also needs to develop regional research and development networks for climate change and strengthen regional climatic research capacity. Regional bodies such as the Association of Southeast Asian Nations could enhance collaboration with international agencies to enable better information sharing on low - carbon technologies. Technical cooperation and information sharing among neighbouring countries in the region should be encouraged. Measures that promote the use of renewable energy sources could also be undertaken in the framework of regional cooperation, such as capacity building programs and benchmarking of clean energy practices.

## (vi) Turning the economic crisis into an opportunity

The world is experiencing its worst economic turbulence since the Great Depression of the 1930s on the back of multiple crises—fuel, food, and financial—in 2008. The impacts of the crises are still unfolding. The global economy has already slid into recession. Developing Asian countries face weakening external demand, lower flows of remittances, falling investment, and rising unemployment, with adverse consequences for the region's poverty eradication prospects. Southeast Asian countries are not immune to the global economic turbulence. The Asian Development Bank recently predicted that Southeast Asian GDP growth is likely to fall from 4.3% in 2008 to 0.7% in 2009 (ADB 2009). This could result in tens of millions of people in poverty, who would otherwise be lifted out, and would make the achievement of the MDGs more challenging.

The economic downturn could make the task of combating climate change more difficult. Government development priorities could be diverted to tackling short-term

macroeconomic stabilisation problems and away from addressing longer term climate change and other environmental issues. Policies and public resources to cope with the economic recession may be considered more urgent, with climate change initiatives postponed. With credit tightening, private investment in adaptation and mitigation may not be forthcoming.

This does not have to be the case. Recognising the urgency of tackling both the global economic crisis and the planetary climate crisis, the UN Environment Programme (UNEP) has proposed a “Global Green New Deal”. It calls for developed countries to use “green” investment measures (improving energy efficiency, expanding clean energy options, and developing sustainable transport) equivalent to 1% of GDP in the next two years, as a fiscal stimulus. The Deal also calls for developing countries to invest in clean water and sanitation for the poor and to develop well-targeted safety net programs. The Deal is already being backed by many governments.

A number of countries, developed and developing, have included specific “green measures” in their proposed or announced fiscal stimulus packages. Leaders of the G20 at the 2009 London Summit agreed to make the best possible use of investment funded by fiscal stimulus programs toward the goal of building a resilient, sustainable, and green recovery, and to make the transition toward clean, innovative, resource-efficient, low-carbon technologies and infrastructure. Green development plans are already

on the agenda in many countries in the region, such as the People's Republic of China, Japan, and Republic of Korea.

In Southeast Asia, fiscal stimulus is also being used by many countries, including Indonesia, Philippines, Singapore, and Thailand, to support domestic demand through tax cuts, investment in infrastructure, and increasing spending on social programs. There may be scope for building into such stimulus packages “green investment” programs that combine adaptation and mitigation measures with efforts to shore up the economy, create jobs, and reduce poverty. The present crisis offers an opportunity to start a transition toward a climate-resilient and low-carbon economy in Southeast Asia. ■

## References

ADB. 2009. Asian Development Outlook.. Rebalancing Asia's Growth. Asian Development Bank, Manila.

IPCC. 2007. Climate Change 2007: Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom, and New York: Cambridge University Press.

UNFCCC. 2007. Investment and Financial Flows to Address the Climate Change. Background paper. UNFCCC Secretariat, Bonn.

---

The full report from Asian Development Bank can be found on their website:  
<http://www.adb.org/documents/books/economics-climate-change-sea/default.asp>

---

# Forest and Climate Change Policy: What are the **costs of inaction**?

Dr. Tim Forsyth London School of Economics and Political Science



## Abstract

Deforestation and forest degradation are some of the main contributors to anthropogenic climate change. Accordingly, policies to arrest deforestation or increase forest areas are proposed as important forms of climate change policy. This paper summarizes current proposals for addressing the contribution of forests to climate change, and the political problems of implementing these policies, especially in developing countries. The paper argues that current estimates of the likely sequestration benefits and costs of forest policies need to be tempered according to the political barriers and need for local consultation in formulating and implementing these proposals. These problems are likely to be most felt concerning current plans for Reduced Emissions from Deforestation and forest Degradation (REDD).

## Introduction

According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), one third of anthropogenic greenhouse gas emissions during the last 250 years have resulted from changes in land use, and especially deforestation. Sir Nicholas Stern's report on climate change suggested avoiding this deforestation was a 'highly cost-effective option' to mitigate climate change (Stern, 2007: 537). Today, various schemes have been proposed to integrate forests into global climate change policy, which seek to protect existing forests, or plant new trees.

This paper summarizes the challenges and proposals to mitigate anthropogenic climate change, and with special reference to Southeast Asia. The paper argues that many projections of costs have been made about deforestation and forest policies concerning climate change. But these costs are difficult to assess without understanding the difficulties of implementing forest policies in diverse political settings in Asia, or without acknowledging the political opposition to some of these policy proposals.

The paper starts by considering the information about the impacts of deforestation on anthropogenic climate change. It then proceeds to analyse the different proposals for integrating forests into global climate change policy, and especially recent debates about Reduced Emissions from Deforestation and forest Degradation (REDD). The paper concludes by arguing that the estimated costs of deforestation and forest policies are of little benefit without also considering the costs and difficulties of formulating and implementing effective policies.

## Deforestation and anthropogenic climate change

According to recent statistics, Southeast Asia contributed 12 percent of global greenhouse gas emissions in the year 2000 (WRI, 2008). Some 75 percent of these emissions came from land use change and forestry. Climate change policy in Southeast Asia is therefore clearly connected to forest policy at an unusually high level.

Deforestation contributes to climate change in three important ways. First, the removal of trees often includes the burning or decomposition of vegetal matter. These processes release carbon dioxide, but also the additional and more powerful greenhouse gases of nitrous oxide and methane. Second, removing, or changing land cover usually reduces the absorption (or sequestration) of carbon dioxide from the atmosphere, and can change the reflection of heat into the atmosphere (or albedo). And thirdly, many new land uses might release further emissions, such as cattle ranching or enhanced fertilizer use, which also release methane and nitrous oxide.

According to the IPCC (2007), global emissions from deforestation in the 1990s alone were estimated to be 5.8 Gigatons of carbon dioxide equivalent per year (Gt/CO<sub>2</sub>-eq/yr). Related to this change in land use and land cover, the IPCC (2007) also estimated that some 35-40 percent of global methane emissions arise from livestock-related emissions, and more than 60 percent of nitrous oxide emissions to fertilizer use (see Nabuurs et al, 2007).

These themes are particularly important in Southeast Asia. Indonesia is a country with large levels of forest, and alone accounted for 59 percent of the region's total greenhouse gas emissions in 2000 (WRI, 2008). The second highest emitter, in terms of proportion, was Thailand with just six percent. Indonesia also has the highest levels of deforestation in the region, of some 1.9 thousand hectares a year – although this is still some way behind the world's leading deforester of Brazil with 3.1 thousand hectares (FAO, 2005). Myanmar has Southeast Asia's second highest rate of deforestation with nearly five hundred thousand hectares. The Philippines and Papua New Guinea also feature highly. A key contributor to greenhouse gas emissions from forests is uncontrolled fires, such as occurring during drier (El Niño) years. According to one estimate, burning of rainforests and peatlands in Indonesia, Malaysia, and Papua New Guinea released an average of 128 million tons of carbon (or 470 million tons of carbon dioxide) per year between 2000 and 2006. Borneo and Sumatra were largest sources (van der Werf et al 2008).

Not surprisingly, much debate about mitigating climate change has focused on how these emissions related to deforestation can be controlled or reduced. Some of the most common suggestions are:

- **Avoided Deforestation** – or policies to reduce levels of deforestation, such as by slowing down agricultural expansion or illegal logging.
- **Afforestation and Reforestation** – afforestation is planting trees in new locations, reforestation is replacing lost trees. When conducted well, planting trees can also increase the fixing of carbon in soil through the growth of roots and the accumulation of organic matter.
- **Extend the carbon retention of harvested wood products** – this allows wood products to be used for longer before they deteriorate. For example, it might mean protecting wood products used in housing or construction, or reducing the disposal of wood through burning.
- **Product Substitution** – finding alternatives to wood to supply certain products or services such as fuelwood.
- **Producing biomass for bio-energy** – for example, some tree crops such as oil palm can replace fossil fuels or even reduce demand for fuelwood. Indeed, the IPCC (2007) has estimated that biomass from forestry can contribute roughly 0.4-4.4 GtCO<sub>2</sub>/yr depending on whether biomass replaces coal or gas in power plants.

Related to these, the IPCC (2007) also estimated the potential contribution of these actions towards mitigating climate change. These estimates are based on assuming a carbon price of 100 US\$/tCO<sub>2</sub>-eq. Furthermore, there is a range of estimates according to whether mitigation is estimated using global climate models or ground surveys and additional data. Using the more conservative ground survey data, forest policies could mitigate between 1.3 and 4.2 GtCO<sub>2</sub>-eq/yr (or an average 2.7) in 2030. Using the more ambitious global models, this number rises to 13.8 GtCO<sub>2</sub>-eq/yr in 2030.

The IPCC also estimates that about half of these actions could be achieved at a cost of under 20 US\$/tCO<sub>2</sub> (or, approximately 1,550 MtCO<sub>2</sub>/yr). But, clearly, the costs and attractiveness of different options vary according to location and activities. One important debate is whether it is more attractive to implement forest policies in developed or developing countries. Developing countries are often considered more attractive for forest policies because much deforestation is occurring in these countries now. Furthermore, labour, land and inputs can be cheaper than in developed countries. Trees often grow faster in tropical climates. Accordingly, the IPCC (2007) has estimated that the costs of carbon sequestration forestry projects can vary between 0.5 US\$ to 7 US\$/tCO<sub>2</sub> in developing countries, and between 1.4 US\$ to 22 US\$/tCO<sub>2</sub> in developed countries (Cacho et al., 2003; Richards and Stokes, 2004). But all of these figures are openly acknowledged to be estimates and hence likely to contain errors (see Nabuurs et al, 2007).

Figure 1 shows the IPCC (2007) summaries for the likely impacts, costs, and timing of costs associated with each of the proposed mitigation activities involving forest policies. This diagram shows, for example, that increasing the forest area might have upfront costs but long-term benefits. In macro terms, the Stern Review (2007) estimated that halving global deforestation would cost around US\$5 billion per year.

	Mitigation Activities	Type of Impact	Timing of Impact	Timing of Cost
1A	Increased forest area <i>(eg. new forests)</i>	↑		
1B	Maintain forest area <i>(eg. prevent deforestation, LUC)</i>	↓		
2A	Increase site-level C density <i>(eg. intensive management, fertilize)</i>	↑		
2B	Maintain site-level C density <i>(eg. avoid degradation)</i>	↓		
3A	Increase landscape-scale C stocks <i>(eg. SFM, agriculture etc)</i>	↑		
3B	Maintain landscape scale C stocks <i>(eg. suppress disturbances)</i>	↓		
4A	Increase off-site C in products <i>(but must also meet 1B, 2B and 3B)</i>	↑		
4B	Increase bioenergy and substitution <i>(but must also meet 1B, 2B and 3B)</i>	↓		

Legend

Type of Impact	Timing *change in Carbon over time	Timing of cost *dollars (\$) over time
Enhance sink ↑	Enhance sink	Enhance sink
Reduce source ↓	Reduce source	Reduce source
	Sustained or repeatable	On-going

**Figure 1:** Estimates of the timing of costs and impacts for forest-based climate change mitigation policies (IPCC, 2007) (note: C = carbon)



## Political opposition

Implementing these forest policies globally, however, has encountered controversy. One of the earliest controversies lies over the extent to which controlling deforestation in developing countries is an ethical or appropriate request to make to countries that are undergoing industrialization. In 1990, the US-based think tank, the World Resources Institute (WRI) published a report concerning national responsibility for anthropogenic climate change that was based on an index that gave particular attention to rates of deforestation (WRI, 1990; later published as Hamilton et al 1991). Perhaps unsurprisingly, this report listed China, India and Brazil among the top six emitting countries.

This report started one of the most famous disputes in global environmental politics. In response, the Indian NGO, the Centre for Science and Environment (CSE), published a critical report called *Global Warming in an Unequal World* (Agarwal and Narain, 1991). In this report, the CSE pointed out that the WRI index was based on total national emissions, rather than on per capita emissions. At the time of the report, the USA had per capita emissions of approximately six tons per person, while India and China had less than 0.5 tons. Secondly, the index used highly simplistic estimates for both deforestation and methane emissions. For example, estimates of wet-rice methane emissions were extrapolated globally from Italian figures; deforestation was treated uniformly, with no distinction made between export-led logging and smallholder food production; and no account was taken of the impacts of vegetation that might replace forest. Thirdly, the index focused chiefly on current tropical deforestation, and did not consider historic deforestation in developed countries (which is important as greenhouse gases can exist for many years).

Together, these arguments implied that the standardized statistical analysis applied by WRI did not take into account important questions of social justice in greenhouse gas emissions, concerning whether deforestation in developing countries was because of poverty and food production. Moreover, they also

implied that developed countries should not ask developing countries to protect forests when richer countries had already conducted deforestation, and when many current greenhouse gas emissions might be linked to affluence rather than just livelihoods.

These themes have influenced debates about the role of forests within climate change policy since. At the First Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) at Berlin, in 1995, it was agreed in principle to investigate the possibility for achieving future national greenhouse gas emission reduction targets through investing in projects in other countries. This tentative agreement led to the establishment of so-called Activities Implemented Jointly (AIJ) as a pilot phase for international cooperation on reducing greenhouse gas concentrations, and which saw a number of carbon-offset forestry projects established in a number of countries by large emitters such as Japan and the USA. Such projects were also supported by additional organizations such as the United States Initiative on Joint Implementation, and by the World Bank Prototype Carbon Fund (operational from 2000).

The arguments for forest-based climate change policies were clear. Forests offered important contributions to greenhouse gas concentrations, and protecting, or increasing forest areas, could reduce these concentrations. Moreover, statistics from the IPCC (mentioned above) suggested that so-called 'sinks,' or land-use, based investments in developing countries could be significantly cheaper than projects in richer countries, or projects involving industrial technology and energy efficiency. Many developing countries, however, criticised forests-based projects because they saw these investments as ways of clever accounting to allow richer countries to avoid responsibility for reducing emissions at home. Moreover, some developing countries preferred to see investment go towards industrial technology transfer, and feared that forests projects might not assist with industrialization, and might even reduce livelihood opportunities for poorer farmers. Critics also claimed that forest projects that could generate

good sequestration and local development benefits would always be more costly than those predicted by the IPCC.

As a result of these concerns, the 1997 Kyoto Protocol produced a compromise under the Clean Development Mechanism (CDM). The CDM was one of the three so-called flexible mechanisms of the Kyoto Protocol, which also included Joint Implementation (allowing climate-friendly investment within Annex I countries), and Emissions Trading (between the national targets of Annex I countries). (Annex I countries are the richer countries that had specific greenhouse gas-reduction targets allocated to them at Kyoto).

The CDM was different to other flexible mechanisms because it specifically referred to investment in climate-friendly activities from Annex I countries in non-Annex I countries (usually developing countries). Furthermore, the CDM was intended to offer a 'development dividend' that helped create local sustainable development in host countries as well as cheap climate change mitigation (see Grubb et al, 1999).

But the demand for forests-based climate investment was still strong. For many environmentalists, reforestation has been represented as somewhat of a 'magic bullet' to address a range of environmental problems comprising climate change; declining biodiversity; controlling erosion and water shortages; and the aesthetics of lost wilderness.

For example, the British explorer and popular writer, Robin Hanbury-Tenison, wrote, somewhat romantically:

Carbon sinks... these are exactly the elements of the Kyoto protocol that offer our last hope of saving the rain forests.

(Hanbury-Tenison, 2001)

And Lester Brown, a founder member of the Worldwatch Institute wrote:

Restoring forests... means reversing decades of tree cutting and land clearing with forest restoration, an activity that will require millions of people planting billions of trees. ...A small area devoted to plantations may be essential to protecting forests at the global level.... At present tree plantations cover some 113 million hectares. An expansion of these by at least half, along with a continuing rise in productivity, is likely to be needed both to satisfy future demand and to eliminate one of the pressures that are shrinking forests. This, too, presents a huge opportunity for investment.

(Lester Brown, 2001:82, 85, 95)

But against these kinds of statements, critics argued that simply planting trees as a response to increasing greenhouse gas concentrations was partly a strategy to reduce pressure for reducing industrial emissions at source. Indeed, one reporter noted that an official at the US Department of Energy allegedly claimed in 1994 that ‘tree planting will allow US energy policy to go on with business as usual out to 2015’ (in Lohmann, 1999:2). There was also worry that emphasizing plantation forestry would restrict local livelihoods and development options within poorer countries. One angry African negotiator told a meeting in London in 1997, ‘Our countries are not toilets for your emissions!’ (Forsyth, 1999:255). Similarly, other critics, such as the Uruguay-based NGO, the World Rainforest Movement, have claimed that carbon offset forestry is equivalent to ‘CO2lonialism.’

Furthermore, many observers have pointed out, rightly, that carbon-offset forestry is difficult to measure on account of establishing clear baselines for measuring the additionality of projects, or whether forest conservation in location might cause ‘leakage’, or displacing deforestation elsewhere (Cullet and Kameri-Mbote, 1998). Such concerns, in turn, have influenced how forests have been defined by the UNFCCC. Between 1997 and 2000, some 130 definitions of ‘forest’ were mentioned in debates among states alone, before a universal definition of forest was defined by the Conference of the Parties to the UNFCCC at The Hague in November 2000:

‘Forest’ is an area of land of 0.3–1.0 hectares (ha) with tree crown cover (or equivalent stocking level) of more than 10–30 percent with trees with the potential to reach a minimum height of 2–5 meters (m) at maturity in situ. A forest may consist either of closed forest formation where trees of various storeys and undergrowth cover a high proportion of the ground; or open forest formations over an area of 0.3–1.0 ha with a continuous vegetation cover in which tree crown cover exceeds 10–20 percent. Young natural stands and all plantations which have yet to reach a crown density of 10–30 percent or tree height of 2–5 m are included under forest (UNFCCC/ SBSTA/ 2000/ CRP.11; pp.7, November 2000) (UNFCCC, 2000).

This definition is useful because it clarifies which kinds of forest are permissible for accreditation under the UNFCCC. But it also excludes certain forms of land cover such as savanna that have been called forests by biologists, or the various social and livelihood services offered by forest ecosystems. This definition of ‘forest’ is also related to the debate concerning official certification of forests through other means, such as by the Forest Stewardship Council, which has provided official certification to several monoculture plantations, to the concern of NGOs such as the World Rainforest Movement.

Indeed, in 2000, a number of NGO activists, including representatives from Greenpeace and the Rainforest Action Network, signed the ‘Mount Tamalpais Declaration’ (after the site in California) to oppose the use of the CDM for supporting plantations, and to urge greater consultation of local users of forests in decisions about climate change policy.

### Reduced Emissions from Deforestation and forest Degradation (REDD)

REDD is the proposal to incorporate forests into climate change policy by rewarding actors for slowing down deforestation, or taking further action to increase forest areas. It is a market-based mechanism that allows actors to demonstrate climate-friendly activities concerning forests, and then to sell these achievements on the international carbon market. Furthermore, REDD is also a political mechanism that can allow developing countries with large areas of forest to participate in, and benefit from, the UN Climate Change Convention. In effect it offers incentives such as payments to countries, and sub-state actors to protect forests.

For the sake of clarity, it is worth defining some terms. The basic term of REDD refers to the ability to slow down deforestation by taking demonstrable action to reduce emissions resulting from deforestation and the degradation of forest areas. Over time, however, two further terms have emerged. REDD+ refers to the reduction of deforestation in addition to acts of afforestation and reforestation. And REDD+ with co-benefits refers to all of these activities plus the establishment of additional socio-economic benefits such as livelihood options for people living in forest areas, or the enhancement of local biodiversity. As discussed above, the historic debates about the role of forests in climate change policy has influenced these terms. Many negotiators would like to see REDD+ as a policy focusing mainly on mitigation of climate change. REDD+ with co-benefits, however, is more attractive to negotiators who wish to see a more holistic form of climate change policy that can provide a ‘development dividend’, and which avoids social impacts of controlling land use change.

The objectives of REDD (or its associated terms) are, again, very clear. Changes to forest and land use are important contributors to rising greenhouse gas concentrations. To date, efforts to reduce deforestation have been hampered because deforestation is caused by many diverse factors, such as commercial logging; illegal logging; and agricultural expansion by state-led activities in countries such as Indonesia and Brazil, or by large-scale settlement and food production by poorer populations in developing countries. International treaties to address deforestation have also been difficult because many developing countries with forests have rejected the idea that they should not use their forest resources when so many developed countries have already done so. Moreover, in some countries states have little domestic capacity to control local governments or farming communities who wish to extend agricultural production into forest areas.

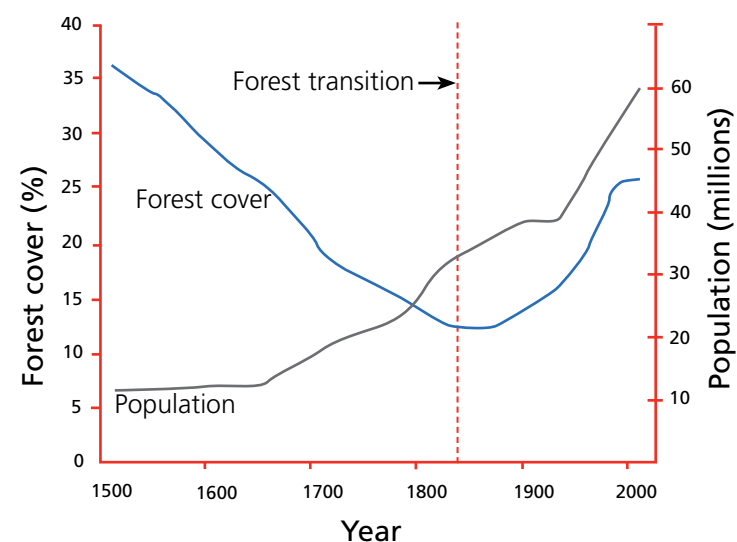
The question of ‘avoided deforestation’ has also been discussed at UNFCCC meetings for some years, but with controversy. Many scientific observers rightly

pointed to the contribution of land-use change and deforestation to global anthropogenic climate change. But some developing countries such as Brazil, and NGOs such as Greenpeace argued that avoided deforestation was a spurious concept because it focused on emissions that were not yet occurring, and that international discussions should focus on reducing industrial greenhouse gas emissions at source. Moreover, as with most activities involving forests and climate change, it can be very difficult to demonstrate additional and measurable changes to carbon sequestration, or overall declines in deforestation – although in principle, these measurements are technically feasible.

Since 2000, however, there have been important steps towards incorporating the principles of REDD into global climate change policies. One important step here was the ninth UNFCCC Conference of the Parties in Milan in 2003, which was known as the ‘forests conference’ because it involved much discussion on establishing rules and methodologies for evaluating afforestation and reforestation. This was followed by the creation of the Coalition of Rainforest Nations (CfRN) in 2005, after a speech by Sir Michael Somare, Prime Minister of Papua New Guinea at Columbia University. (The economist, Jeffrey Sachs, who works at Columbia was an important encourager of this initiative). The aim of the Coalition was to bring together developing countries with large areas of forest in order to make a unified voice calling for economic incentives for forest conservation. At the thirteenth UNFCCC Conference of the Parties at Bali in 2007, some agreement on forests (incorporating REDD) was mentioned as part of the so-called Bali Roadmap, which was a list of important themes to be clarified before the agreement of the post-Kyoto climate agreement.

One of the important dilemmas of REDD is to incorporate countries with different levels of forest cover. Figure 2 demonstrates a common representation of the so-called Forest Transition. This concept is based on the idea that countries will initially have a large area of forest cover, which

will decline as population and economic or agricultural development increases. Rewarding countries for avoiding deforestation, or increasing forest areas, might therefore require providing different mechanisms for both sides of the Forest Transition. Countries with existing forest stocks might require funds to help protect forests and build monitoring systems to ensure this is happening. Countries that have already lost forest areas might need different funds to increase forests. Figure 2 shows this proposed transition for the case of Vietnam (Meyfroidt and Lambin, 2009) – although it is worth noting this model is controversial for reasons stated below.



**Figure 2:** *The Forest Transition (as reported in Meyfroidt and Lambin, 2009)*

The UNFCCC negotiations have accordingly proposed a variety of levels to the REDD mechanism (UNFCCC, 2006). Proposals are for three key funds:

- The basic REDD Mechanism: providing credits for countries that have produced demonstrable reductions in emissions resulting from deforestation or forest degradation. These credits can then be sold in international carbon markets.
- A REDD Stabilisation Fund: to encourage countries that have already stabilised deforestation to continue (and hence avoid perverse incentives for these countries to increase deforestation in order to be rewarded under REDD for then reducing them).
- And a REDD Enabling Fund: to provide upfront finance to build capacity for countries without accounting or monitoring infrastructure. These funds could be paid to countries such as Myanmar or the Democratic Republic of Congo, which have relatively larger areas of existing forest, but little official capacity to monitor rates of deforestation or illegal logging.

Furthermore, new funding for REDD-related activities have emerged from the World Bank's BioCarbon Fund (2004), and Forest Carbon Partnership Fund (2007). The Global Environment Facility has provided a new Tropical Forest Account, and the UN has its new REDD Programme. Various other regionally specific funds have also emerged such as the Congo Basin Forest Fund; the Norwegian Forest and Climate Initiative; and the Asia-Pacific based International Forest Carbon Initiative. Private-sector investment might also be attracted

and forthcoming. In one estimate, the Stern Review (2007) proposed that halving global deforestation would cost around \$5 billion per year.

But, predictably, there are also many important question marks and criticisms of current proposals for REDD. We have already mentioned the ongoing problems of measuring reduced deforestation, additionality and leakage. But in addition, some critics have argued that REDD (or REDD+) in its current proposed form does not take into account the needs and rights of local forest users, or the implications of REDD+ for large-scale industrial plantations. According to one representative of the NGO, the Forest People's Programme,

'there is a growing realisation that REDD policies as currently proposed contain serious moral hazards because they plan to reward polluters with a history of forest destruction, but would fail to recognise and reward the role of indigenous and local forest custodians who protect and sustainably use standing forests' (Griffiths, 2008: 2).

Some research on existing payment for environmental services schemes have also suggested that poorer, forest-dependent people might not always benefit. For example, Granda (2005) assessed a Dutch-sponsored monoculture tree plantation in Ecuador, and concluded there were immense costs and problems in implementing a meaningful level of participation within the scheme. The research claimed communities were never informed by the carbon forestry company about payments they would receive per hectare; local people did not know the purpose of carbon credits; they did not know about penalty clauses, and consequently were now in debt in order to pay such penalties. Villagers also felt aggrieved they had to pay all unforeseen costs of forest plantations, such as failed seedlings or fire damage.

A further report by Greenpeace (2007) in the Democratic Republic of Congo argued that the World Bank's strategies there increased, rather than avoided deforestation, by using logging as a form of economic development – and that logging titles have frequently been allocated without acknowledging local land rights. Indeed, the report claimed payments of just salt and beer have been made to community leaders in return for logging rights. In another study of the World Bank in Guyana, Griffiths (2008: 11) argued, 'the national REDD concept submitted to the [Forest Carbon Partnership Fund]... contains misleading and inaccurate information on land tenure, governance and deforestation,' and that in Peru, the Bank's technical advisors explicitly refused to acknowledge forest peoples as key rights holders in REDD.

These kinds of problems have given rise to a new term in forest management of carbon tenure. Carbon tenure is the rights of individuals or the state to hold, or profit from the ability to use forests for purposes of climate change mitigation. In Papua New Guinea in 2008, local farmers were surprised to learn that the national government claimed all carbon rights relating to forests in this country. On one hand, this decision gives the state more incentives to agree to, and implement REDD-based policies. On the other hand, some critics see this as restricting the rights of local landholders. (Marshall, 2008) Furthermore, some critics such as the World Rainforest Movement have claimed that the movement towards REDD+ (including afforestation and reforestation rather than avoided deforestation alone) will legitimise the movement towards large-scale plantations, rather



than the protection of old-growth forest. Indeed, large-scale industrial plantations can frequently sequester more carbon than old-growth, or more biodiverse forests because the newer forests grow more quickly. Consequently, the model of the Forest Transition (see Figure 2) is useful for showing forest land cover alone: it says nothing about forest quality, or the proportion of forest land covered by plantations.

In response to these dilemmas, development-oriented NGOs have called for a more inclusive and longer-term approach to planning REDD or REDD+ in developing countries. For example, one approach known as Free and Prior Informed Consent (FPIC) has been urged by various analysts (Forest People Programme, 2007; Global Witness, 2008; Wilson, 2009). Indeed, Griffiths (2005, 2008) has argued that the World Bank approach to forest-related climate investment has used the term 'consultation' to imply a higher level of participation than actually achieved, and that FPIC should be the driving principle for REDD projects.

The arguments for implementing a more inclusive form of REDD are to ensure that local people do not have livelihoods restricted by heavy-handed regulations or new plantations. Moreover, extra consultation will probably lead to more successful REDD policies if local people are in favour of them and understand the objectives. The argument against more consultation is that it takes more time and raises costs. But there are some emerging examples of successful implementation of REDD, or models that can involve more consultation. Wilson (2009: 31) outlines the activities by one investor (Veracel) for ensuring social participation in Brazil. These activities include a social networks program (to engage communities with collaborations); a social inventory (to map communities); social articulation and mobilisation (to allow business employees to work with communities); and dialogues with local governments and neighbouring landowners. Veracel's main work is in eucalyptus plantations, but it also engages in environmental restoration in degraded land.

### Conclusion: What are the costs?

Forest policies are fundamentally important for any international regime to address anthropogenic climate change. There is no doubt that addressing problems of deforestation and forest degradation will impact beneficially on global attempts to mitigate climate change. It will also bring benefits to protecting biodiversity, and – if done in a consultative way – will also help address poverty and development by maintaining and protecting local livelihoods in poorer countries.

But the discussions about formulating and implementing forests-based climate change policies are so far dominated by discussions of their costs and benefits that do not take into account the political realities of what these policies actually mean, or need, in order to be implemented successfully.

For example, this paper started by repeating Sir Nicholas Stern's initial statement that avoided deforestation was a 'highly cost-effective option' (Stern, 2007: 537). Moreover, the IPCC Fourth Assessment Report (2007) has stated that forest-based projects are likely to be significantly cheaper in developing countries than in richer countries.

But Stern later added: 'clarity over boundaries and ownership, and the allocation of property rights regarded as just by local communities, will enhance the effectiveness of property rights in practice and strengthen the institutions required to support and enforce them' (Stern, 2007: 541). Yet, these actions are necessary in order to make forest-based climate change policies work. Moreover, paying attention to these matters will also probably mean that political opposition to REDD or other forest-based policies will not undermine the suggestion in the first place. Neither Stern nor the IPCC (2007) pay any attention to how these considerations will affect initial estimates of costs or cost effectiveness. In particular, many estimates within the IPCC (2007) Fourth Assessment Report are based on an assumption that carbon prices might reach US\$100 per ton. In late 2009, the European Trading System priced one ton at close to €14. Much more public acceptance of the need for carbon trading, and a resulting rise in carbon prices need to occur before we can accept these estimates based on higher carbon prices.

REDD (and its associated forms), of course, is still in its early days. Cautionary examples should not be taken as proof that REDD will fail. But it would be foolish to assume that difficult tensions between different stakeholders can be ignored. If REDD is to succeed – and especially where there are local forest users – there is a need for a multi-actor, multi-level form of governance that can anticipate different capacities, objectives, and values of various stakeholders. Some analysts might consider that these processes are too time consuming or costly. The obvious response to these concerns are that implementing policy without acknowledging different values and objectives between stakeholders will only result in failure, and in an additional loss of trust in the UNFCCC and climate change policy process. The climate change negotiations need more attention to these political processes rather than just considering simple estimates of the likely impacts of policies on greenhouse gases, or the relative costs without considering these politics. ■

## References

- Agarwal, A. and Narain, S. (1991) *Global Warming in an Unequal World*, New Delhi: Centre for Science and Environment.
- Brown, L. (2001) *Eco-Economy: Building an economy for the Earth*, London and Washington DC: Earthscan and Earth Policy Institute.
- Cacho, O.J., R.L. Hean, and R.M. Wise, 2003: Carbon-accounting methods and reforestation incentives. *The Australian Journal of Agricultural and Resource Economics*, 47, pp. 153-179.
- Cullet, P. and Kameri-Mbote, P. (1998) 'Joint implementation and forestry projects: Conceptual and operational fallacies,' *International Affairs*, 74 (2), 393-408.
- FAO (Food and Agriculture Organization of the United Nations) (2005) *Forest Resources Assessment 2005*, Rome: FAO.
- Forest Peoples' Programme (2007) *Making FPIC – Free, Prior and Informed Consent – Work: Challenges and prospects for indigenous peoples*, FPIC Working Papers, Forest Peoples' Programme.
- Forsyth, T. (1999) 'Flexible mechanisms of climate technology transfer,' *Journal of Environment and Development* 8:3 238-257.
- Global Witness (2008) *Honest Engagement: Transparency and civil society participation in REDD*, London: Global Witness
- Granda, P. (2005) Carbon Sink Plantations in the Ecuadorian Andes: impacts of the Dutch FACE-PROFAFOR monoculture tree plantations, project on indigenous and peasant communities, WRM Series on Tree Plantations No. 1, WRM, Montevideo.
- Greenpeace (2007) *Carving up the Congo*, London: Greenpeace. <http://www.greenpeace.org.uk/media/reports/carving-up-the-congo>
- Griffiths, T. (2008) Seeing 'REDD'? Forests, climate change mitigation and the rights of indigenous peoples and local communities, Moreton-in-Marsh: Forest Peoples Programme. [http://www.forestpeoples.org/documents/ifi\\_igo/seeing\\_redd\\_update\\_may09\\_eng.pdf](http://www.forestpeoples.org/documents/ifi_igo/seeing_redd_update_may09_eng.pdf)
- Grubb, M., Brack, D. and Vrolijk, C. (1999) *The Kyoto Protocol, A Guide and Assessment*, London: Earthscan and the Royal Institute of International Affairs.
- Hammond, A., Rodenburg, E., and Moomaw, W. (1991) 'Calculating national accountability for climate change,' *Environment* 33:1 11-15, 33-35.
- Hanbury-Tenison, R. (2001) 'The Greens must not be allowed to ruin our planet,' *The Daily Telegraph* July 19, 2001, pp. 26.
- Lohmann, L. (1999) *The Dyson Effect: Carbon 'Offset' Forestry and the Privatisation of the Atmosphere*, Briefing number 15, The Corner House, Sturminster Newton, UK <http://cornerhouse.icaap.org/>.
- Marshall, S. (2008) 'Carbon trading tension mounts in PNG,' *ABC News*, <http://www.abc.net.au/news/stories/2008/11/13/2419153.htm>
- Meyfroidt, P. and Lambin, E. (2009) 'Forest transition in Vietnam and displacement of deforestation abroad,' *Proc Natl Acad Sci U S A*. 106:38 16139–16144.
- Nabuurs, G.J., O. Masera, K. Andrasko, P. Benitez-Ponce, R. Boer, M. Dutschke, E. Elsiddig, J. Ford-Robertson, P. Frumhoff, T. Karjalainen, O. Krankina, W.A. Kurz, M. Matsumoto, W. Oyhantcabal, N.H. Ravindranath, M.J. Sanz Sanchez, X. Zhang, 2007: 'Forestry.' In B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds) *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge: Cambridge University Press.
- Richards, K.R., C. Stokes, 2004: A review of forest carbon sequestration cost studies: a dozen years of research. *Climatic Change*, 63, pp. 1- 48.
- Stern, N. (2007) *The Stern review on the economics of climate change*, London: HMSO.
- UNFCCC (2006) *Subsidiary Body for Scientific and Technological Advice (SBSTA) Twenty-fourth session, Bonn, 18–26 May 2006, Agenda item 6: Reducing emissions from deforestation in developing countries*, FCCC/SBSTA/2006/L.8. <http://unfccc.int/resource/docs/2006/sbsta/eng/l08.pdf>
- UNFCCC (2006) *Subsidiary Body for Scientific and Technological Advice (SBSTA) Thirteenth session, The Hague, 13-18 November 2000, Agenda item 9 (a): 'Methodological issues land-use, land-use change and forestry'*, FCCC/SBSTA/2000/CRP.11. <http://unfccc.int/resource/docs/2000/sbsta/crp11.pdf>
- van der Werf, G. R., J. Randerson, L. Giglio, N. Gobron, and H. Dolman (2008), Climate controls on the variability of fires in the tropics and subtropics, *Global Biogeochem. Cycles*, 22,
- Wilson, E. (2009) *Company-led approaches to conflict resolution in the forest sector*, London: The Forests Dialogue.
- WRI (World Resources Institute) (1990) *A Guide to the Global Environment*, New York: Oxford University Press.
- WRI (World Resources Institute) (2008) *CAIT Database* <http://cait.wri.org/>
- WRM (World Rainforest Movement) (2000) 'Sinks that stink,' *WRM Bulletin*, June 2000

# The roles of climate variability and climate change on smoke haze occurrences in Southeast Asia region

Professor Fredolin Tangang with Mohd Talib Latif and Liew Juneng  
National University of Malaysia



## Abstract

This paper discusses the smoke-haze episodes in the Southeast Asia region and how their occurrence can be related to climate variability and future climate change in the region. The haze episode over this region has been an almost yearly occurrence but becomes severe during the prolonged dry period associated with the El Niño phenomenon. The longest and most severe case was the episode of September to November 1997 that occurred in conjunction with the extreme 1997/98 El Niño. This event resulted in more than US\$4 billion in economic losses to the region and a colossal 93% of the cost was incurred in Indonesia.

There have been other serious episodes including those in 1982-83, 1987, 1991, 2002, 2004, 2005, 2006 and the episode that occurred this year (2009). Prior to the 1980s, fire outbreaks were mainly in Sumatra; it was only after the 1980s that large fires were recorded in Kalimantan. These patterns of large fire occurrences in Sumatra and Kalimantan were attributed to changes in land-use and an increase in population. Despite the increased role of humans in biomass burning, El Niño has been identified as a major contributing factor that induces a drier than normal condition over the Southeast Asia region especially during the period from June to November. Interestingly, despite expected changes in the mean climate, both the droughts occurred under warmer environments and the El Niño characteristics of the 21st century remain similar to that of the 20th century in this region. These findings, although yet to be assessed by the Intergovernmental Panel on Climate Change (IPCC), seem to suggest that the risks associated with the El Niño induced drought would not be significantly affected by anthropogenic climate change. Nevertheless, the risk may increase if unsustainable practices in land use in the region were to continue without effective mitigation measures.

## 1. Introduction

Haze episodes have become a major environmental problem for countries in the Southeast Asian region especially Malaysia, Indonesia, Singapore and Brunei since the late 1980s. Previous episodes occurred in 1982-83, 1987, 1991, 1994, 1997-98, 2002, 2004, 2005, 2006 and the most recent one was this year, 2009. Most of these haze episodes occurred in conjunction with a period of prolonged drought associated with the El Niño phenomenon. Prior to the 1980s, fire outbreaks occurred mainly in Sumatra (Field et al. 2009). The most extreme episode was the 1997-98 event that occurred during the extreme El Niño that year. This episode was considered the most costly and exerted huge impacts on countries in the region. A conservative estimate of the damage by the Economy and Environment Program for Southeast Asia (EEPSEA) and the Worldwide Fund for Nature (WWF) was US\$4.5 billion (e.g. Schweithelm and Glover 2006). Despite the apparent roles of large-scale climate phenomenon

such as El Niño that induces an anomalously dry condition; unprecedented levels of human activity have been a major factor in the fire outbreaks that cause the haze (e.g. Field et al. 2009). The activities related to shifting agriculture, timber extraction and palm oil plantations contribute to fire outbreaks during the extremely dry period associated with El Niño and subsequently induce haze episodes (e.g. Cotton, 1999). As haze episodes become a regular recurrence, the question remains as to whether their frequency and severity would increase in the future. Coupled with increases in land use patterns, an intensification of El Niño under a warmer environment due to anthropogenic climate change would exacerbate both the intensity and frequency of haze over this region. This paper investigates this issue, particularly the roles of climate variability and future climate change on future occurrences of smoke-haze episodes.

## 2. Haze episodes in the Southeast Asia region

There have been several haze episodes since the early 1980s including 1982/83, 1987, 1991, 1994, 1997, 2002, 2004, 2005, 2006 and this year's 2009 episode (e.g. Nicol 1997; Heil and Goldammer 2001). Field et al. (2009) described the occurrence of haze episodes for a period from 1960 to 2006. During the period 1997 – 2006, there were two major fires (1997/98, 2006) and two minor episodes (2002, 2004) based on the Global Fire Emissions Database (GFED). According to Field et al. (2009), prior to 1997 there were no high-quality or continuous records of fires. Thus in their study, the so-called monthly mean extinction coefficients were derived from visibility records from the World Meteorological Organization's meteorological stations in Sumatra and Kalimantan for the period 1960 - 2006. The extinction coefficients provide an index of visibility where high values indicate poor visibility (and hence a smoke-haze episode). Interestingly, the re-constructed index managed to capture the events prior to the 1980s. Based on this index, a clear distinction can be made between the Sumatra and Kalimantan haze episodes and the differences can be related to land use changes and population density (Field et al. 2009). Historically, large fires have occurred since at least the 1960s. There were three notable events based on the extinction coefficient index i.e., 1961, 1963, and 1972 (Figure 1). All these events occurred during the El Niño period. In contrast, in Kalimantan, the history of biomass burning was different as severe haze episodes were only recorded from 1982 onwards despite the drought episodes prior to the 1980s (Figure 2). These records showed that there was a significant change in Kalimantan during the period between the 1972 and 1982 droughts; leading to Kalimantan's fire environment changing from highly resistant to highly fire-prone. Field et al. (2009) attributed this to the human amplification of drought-induced biomass burning through the land use pattern in these regions. From 1950 to 1985, the rate of deforestation in Kalimantan was only 0.7% i.e. half that of Sumatra (1.4%). It was only between 1985 and 1997 that the deforestation rate in Kalimantan (i.e. 2.2%) began to equal that of Sumatra (2.6%). Kalimantan's accelerated deforestation is attributed to broader development patterns as reflected by the increase in agriculture and population (Field et al. 2009).

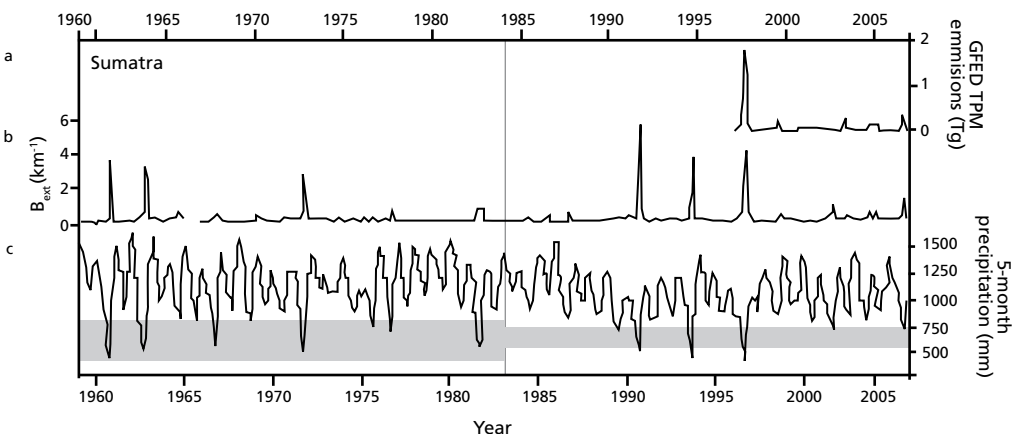


Figure 1: Monthly time series for Sumatra: (a) GFED TPM emission estimates,, (b) mean extinction coefficients ( $B_{ext}$ ) and (c) the precipitation time series (After Field et al. 2009)

The transmigration program, part of the Indonesian government's policy to ease the population pressure on Java, targeted Sumatra throughout the 1960s and 1970s, whereas Kalimantan only began to have a similar program in the 1980s. In Kalimantan, the situation was exacerbated by a change in land use pattern from small-scale subsistence agriculture to large-scale industrial agriculture and agro-forestry. One good example was the draining of the peatlands under the Mega Rice Project in the 1990s; resulting in the largest contribution to emissions across all of Indonesia during the 1997 fire event (Field et al. 2009).

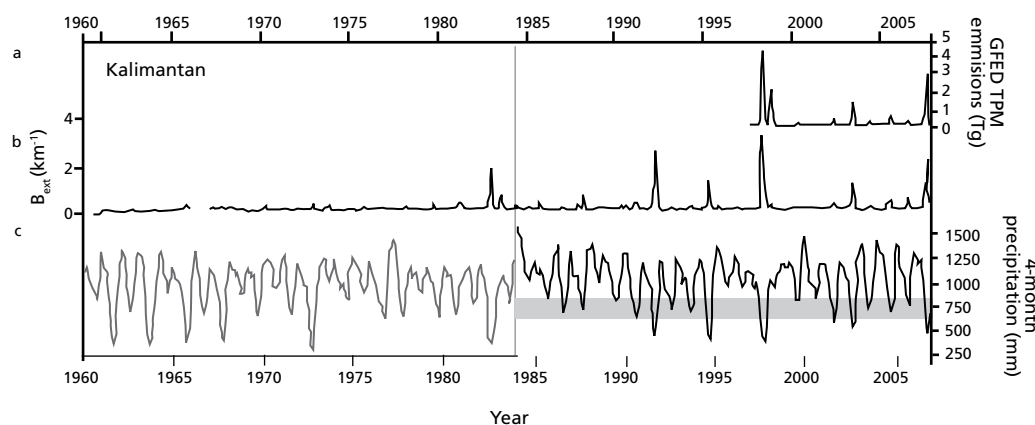


Figure 2: As for Figure 1 but for Kalimantan (After Field et al. 2009)

### 3. Chemistry and constituents of haze

The generally established constituents of haze due to biomass burning comprise a large variety of chemical pollutants such as particulate matter ( $<10 \mu\text{m}$ ), which was the most consistently elevated pollutant in haze episodes, as well as inorganic gases such as  $\text{SO}_2$  and  $\text{NO}_2$ , hydrocarbons, aldehydes and polycyclic aromatic hydrocarbons (PAH), with benzopyrene being the most carcinogenic (Stephen and Low, 2002). Gas compounds released include carbon dioxide ( $\text{CO}_2$ ), carbon monoxide ( $\text{CO}$ ), oxide of nitrogen ( $\text{NO}_x$ ), ammonia ( $\text{NH}_3$ ), and hydrogen ( $\text{H}_2$ ) (Heil and Goldammer, 2001). Generally, more than 95% of the carbon emitted by biomass fires is in the form of  $\text{CO}$  and  $\text{CO}_2$ . Smoke particles emitted during biomass combustion are generally  $<10 \mu\text{m}$  in diameter. Studies of biomass fires reveal that the particles cover a broad size spectrum. Particles from  $0.01$  to  $43 \mu\text{m}$  in diameter have been measured with a pronounced number concentration peak at  $0.15 \mu\text{m}$ . Between 40 and 95% of the mass of particles consist of particles  $<2.5 \mu\text{m}$  in diameter, while particles  $>2.5 \mu\text{m}$  but smaller than  $10 \mu\text{m}$  account for less than 10% of the particle mass (Radojevic, 2003). Other than gases, aerosols are a main component of haze. Aerosols usually contain small particles and water vapour. In the case of anions and cations, the composition of aerosols based on the composition of dust fall are dominated by ammonium and sulphate (Latif and Rozali, 2000). The high composition of sulphate in aerosols collected due to biomass burning in Indonesia has been correlated to the amount of sulphur in peat swamp areas due to accumulated volcanic sulphur through wet and dry deposition. Indonesia's arc of volcanoes have been permanently degassing for thousands of years, thereby contributing significantly to the total emission of sulphur species in that region. Abas et al. (2004a) identified a high concentration of tracers for smoke (e.g., levoglucosan) and almost all were found in samples collected during a haze episode. The concentration of n-alkanols and n-alkanals are higher in samples collected during the day, whilst n-alkanoic acids and PAHs are almost absent in the daytime samples, which may be attributed to enhanced

photooxidation processes. Levoglucosan (1,6-anhydro- $\beta$ -D-glucopyranose) is an organic molecule that can be used as an indicator of biomass burning (Abas et al., 1995; Abas et al., 2004b; Bergauff et al., 2008; Elias et al., 2001; Engling et al., 2006; Puxbaum et al., 2007; Wang et al., 2007). It is formed through the thermal breakdown alteration of the cellulose present in vegetation (Dos Santos et al., 2002). Levoglucosan was reported to have been present in the fine particle phase and remained stable in the atmosphere, showing no decay over an eight hour exposure to ambient conditions and sunlight (Larsen III et al., 2006; Puxbaum et al., 2007). The organic material within smoke aerosols is composed of a highly complex mixture of compounds covering a wide range of molecular structures, physical properties, and reactivity. Graham et al. (2002) showed that water soluble organic compounds (WSOC) of aerosols collected in the Amazon Basin during the 1999 burning season. This indicates that the product of biomass burning is a complex mixture of oxygenated compounds derived primarily from biomass burning. The pronounced increase in organic composition is due to the production of a secondary organic compound as a result of photochemical reactions.

### 4. Impacts of Haze

#### 4.1 Impact on the climate system and environment

The air pollutants from biomass burning can affect the climate system in several ways. The greenhouse gases (GHGs) emitted during the fires (e.g.  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{N}_2\text{O}$ ) contribute to global warming (Radojevic 2003). Under drought conditions, large-scale biomass burning, especially in Sumatra and Kalimantan, is a disproportionate contributor to the emission of GHGs. The smoke particles also alter the earth's radiation balance by scattering and absorbing radiation. The smoke particles also act as could condensation nuclei (CCN) and affect the precipitation processes and patterns.



## 4.2 Impacts on Human Health

Deteriorating air quality during haze episodes brings significant health risks to populations in the region. Almost 100 million people in the Southeast Asia region were exposed to acute health risks during the 1997 smoke-haze episode. An estimated 20 million people in Indonesia suffered from respiratory problems during the episode (Heil and Goldammer 2001). In Malaysia an estimated of 18 million people (or 83.2% of the population) were exposed to health risks during the episode. The major pollutant that causes adverse health is the particulate matter, particularly the fine particle fraction. The fine particle (PM<sub>2.5</sub>), has been correlated with the increase in daily mortality (Schwartz et al. 1996). The Malaysian Ministry of Health has identified a number of illnesses which are common and most likely to increase during a haze episode due to a direct relationship between the disease and the haze constituents. The most significant immediate health impacts of haze are respiratory and eye-related illnesses such as asthma, bronchitis, upper respiratory infections (URI) and conjunctivitis (Stephen and Low, 2002). The most significant immediate health impacts of the 1997 haze in Indonesia were URI, bronchial asthma, diarrhoea, eye irritation and skin diseases. The number of URI cases decreased significantly in parallel with the decreased incidence of forest fires (Aditama, 2000).

Other studies indicate the effect of air pollution in Malaysia on human health especially air pollution related to suspended particulate matter and haze conditions (Afroz et al., 2003; Mott et al., 2005; Omar et al., 2006; Sastry, 2002). Whether the effect of dust from biomass burning is more toxic than the dust from vehicles and industries is still being debated (Vedal and Dutton, 2006), but there are clear indications of an increasing trend of people with acute and respiratory infection and asthma requiring treatment at the hospital during the haze episode (Brauer and Hisham-Hashim, 1998; Heil and Goldammer, 2001a; Latif and Othman, 2001). A study by Mott et al. (2005) in Sarawak between 1995 and 1997 found significant increases in respiratory hospitalisation during the 1997 haze episode, particularly for asthma-sufferers

within the age categories of 19-39 and 40-64 years. In addition to immediate health risks, exposure to smoke-haze also has long-term health implications. Some of the organic micro-pollutants observed in haze are known or suspected carcinogens, mutagens and teratogens (e.g. benzene, toluene, xylene, PAHs) (Radojevic 2003).

## 4.3 Economic Impact

### 4.3.1 Malaysia

Every serious haze episode exerts significant socio-economic impacts on Malaysia. However, the 1997 episode was the only well-documented episode with respect to economic impact. Shahwahid and Othman (1999) provided a comprehensive estimate of economic losses associated with the episode. Based on this study, the estimated value of haze damage to Malaysia for the period of three months from August to October 1997 was RM802 million (US\$321 million based on the exchange rate at the time). These losses were collated from various sectors including health, production, tourism, transportation and fisheries. The poor air quality exposed people to various illnesses such as asthma, bronchitis, upper respiratory infections and conjunctivitis. The incremental cost incurred by the population for treatment of haze-related illnesses (both at private and government hospitals and clinics) and for self-treatment was about RM5.02 million (US\$2 million). The number of hospitalisations due to haze-related illnesses also went up with an incremental cost of about RM1.2 million (US\$580,000). However, Malaysia also suffered losses in productivity due to health-related illnesses. Hence the adjusted incremental cost of illnesses for the 1997 haze episode from August to October 1997 was RM21.02 million (US\$8.408 million) (Shahwahid and Othman 1999). During the 19-28 September 2007, a state of emergency was declared in Sarawak when the Air Pollution Index (API) exceeded 500. Shahwahid and Othman (1999) estimated the loss in profit due to this state of emergency at RM393.5 million (US\$157.2 million). This amount contributed

to almost half of the total economic loss. The second largest contribution with around 40% of the total loss came from the sharp decline in tourist arrivals during the haze period. Shahwahid and Othman (1999) estimated the figure at around RM318.55 million (US\$127.42 million). Two other sectors that contributed substantially to losses were fisheries, in terms of a decline in fish landings, and the cost of fire-fighting, with RM 40.58 million (US\$16.23) and RM25 million (US\$10 million), respectively. These figures represent 5 and 3.12% of the total losses, respectively. Other contributions came from cloud seeding operations at RM2.08 million (US\$.83 million, 0.26%), expenditure on masks at RM0.71 million (US\$0.28 million, 0.09%) and the cancellation of flights at RM0.45 million (US\$.18 million, 0.06%).

### 4.3.2 Singapore

Hon (1999) provided an assessment of the economic impact of the 1997 haze episode. The losses to Singapore were between S\$97.5 million to S\$110.5 million (US\$69.3 million to US\$78.8 million). This estimate represents about one-fifth to one-fourth of Malaysian's economic losses during the same episode. Between 75 to 85 % of the total amount came from the tourism sector while about 10 % was contributed by losses from the airline industry and the health sector contributed the rest. However, these estimates were conservative as other costs were not taken into account.

### 4.3.3 Indonesia

Indonesia suffered much higher economic losses compared to Malaysia and Singapore. Ruitenbeek (1999) estimated that the economic losses to Indonesia exceeded US\$3.7 billion. The health costs that included medical costs, productivity and indirect impacts amounted to US\$924 million or 22.62% of the total loss. The losses related to the tourism sector, including tourism impacts, airline impacts and airport closures amounted to US\$87.89 million or 2.15% of the total damage. Both impacts to the health and tourism sectors are related to the haze which amounted to US\$1,011.89 million (or 24.77%). A large chunk of the total economic damage was attributed to fire impacts. With regards to the direct impact on Indonesia, fire impacts included timber losses, agricultural/ plantation losses, direct forest ecosystem production losses, indirect forest ecosystem function losses, domestic biodiversity losses and fire-fighting costs, amounting to US\$2,787.79 or 68.5% of the total damage. The sub-total of the global impact due to fires, including carbon release, global biodiversity losses and fire-fighting costs amounted to US\$285.56 million or 7.01% of the overall total. Overall the direct economic losses to Indonesia amounted to US\$3,798.69 million i.e. more than 11 times those incurred by Malaysia or 50 times larger than the economic losses incurred in Singapore.

## 5. Climate variability and its role in the haze episode

The Southeast Asia region is subjected to the influence of a climate phenomenon known as El Niño. This is a naturally occurring climate phenomenon associated with atmosphere-ocean interaction over the Pacific Ocean. This interaction generates an oscillation known as the El Niño–Southern Phenomenon (ENSO) that exerts its influence around the globe. The El Niño event is the dry phase (or warm phase) of ENSO while the La Niña event is the wet phase (or cold phase) of ENSO. The Southeast Asia region receives the direct influence of this phenomenon as it is located over the rising branch of the east-west zonal atmospheric circulation known as the Walker Circulation. This “rising branch” coincides with a low pressure centre whilst the “descending” branch located over the eastern Pacific Ocean coincides with a high pressure centre. The east-west atmospheric pressure gradient actually drives the Walker Circulation. In normal years, moisture converges to the region to feed the deep convection that normally occurs over this region. However, during an El Niño event, changes in the tropical Pacific sea surface temperature distribution triggers an eastward migration of the low pressure centre from the Southeast Asia region to the central Pacific Ocean, leaving this region with diminished ascending motions and an increasing atmospheric stability. The establishment of a high pressure centre and a strong divergence over this region suppresses precipitation for the months of an El Niño event. This causes reduced rainfall that basically prolongs the atmospheric residence time for fire products as they are less influenced by precipitation (Heil and Goldammer 2001).

Several studies have been conducted to understand the relationship between anomalous rainfall over the Southeast Asia region and the evolution of ENSO (e.g. Tangang and Juneng 2004; Juneng and Tangang 2005; Aldrian and Susanto 2003; Chang et al. 2003). Juneng and Tangang (2005) showed that the most dominant mode of inter-annual variability of anomalous precipitation over the Southeast Asia region (Figure 3) was that associated with the ENSO phenomenon. This mode or pattern explains about one-

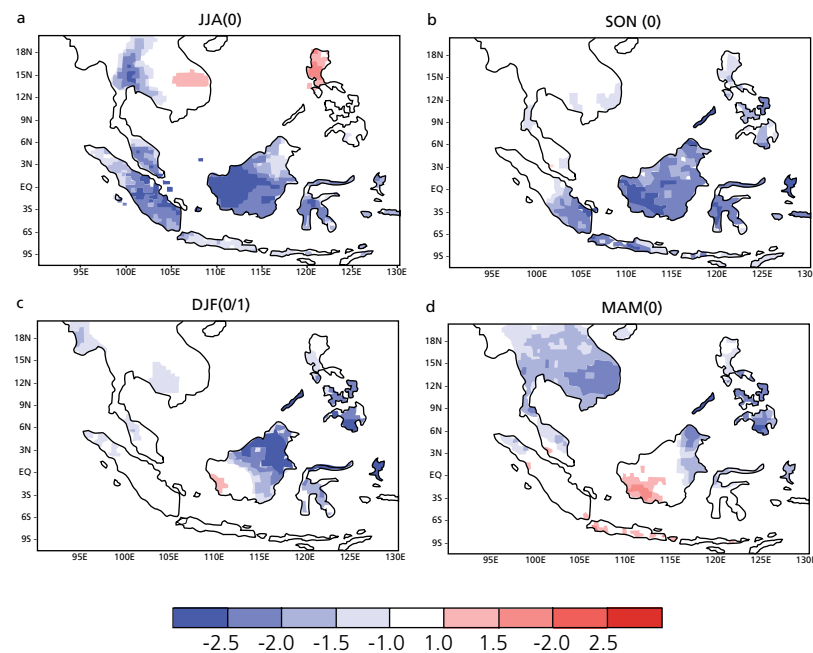


Figure 3: The spatial pattern of the most dominant mode of the anomalous Southeast Asia precipitation using the extended empirical orthogonal function (EEOF) analysis. The shaded values represent the eigenvector of the EEOF (After Juneng and Tangang 2005)

fifth of the total variance. The shaded values in the figure represent the so-called the eigen vector of the first mode of the extended empirical orthogonal function (EEOF) analysis. During an El Niño event, negative values (blue) represent deficit rainfall while positive values (red) indicate surplus rainfall. The period from JJA(0) to MAM(1) represents the one year evolution period of a typical El Niño from the July-June-August (JJA) season of the El Niño year (i.e. year 0) to the March-April-May (MAM) season of the following year (i.e. year 1). As an example for the 1997/98 El Niño, the JJA(0) represents the JJA of 1997 whilst the MAM(1) indicates the MAM of 1998. Figure 4 represents the time evolution of the patterns plotted with the time evolution of the most dominant mode of anomalous sea surface temperatures of the tropical Pacific and Indian Oceans shown in Figure 5. Clearly the seasonal evolution of the pattern of anomalous Southeast Asia precipitation in Figure 4 is not random but tightly coupled with the evolution of the anomalous sea surface temperature associated with the ENSO phenomenon.

The sequence depicts a northeastward movement of the drought affected area from the beginning of an El Niño event to the period when it weakens. This evolution is related to the strengthening of the ocean-atmosphere interactions in the Southeastern Indian Ocean (SIO) during the SON(0) and in the western north Pacific (WNP) region during the DJF(0/1) period (Wang et al. 2003; Juneng and Tangang 2005). During the developmental stage of an El Niño (JJA(0)), almost the entire Maritime Continent experiences deficient rainfall.

This condition, coupled with lower seasonal rainfall and warm temperature associated with El Niño, (e.g. Tangang et al. 2007) creates an extremely favourable and conducive environment for large-scale fire outbreaks in Sumatra and Kalimantan. However, the role of El Niño would be secondary in nature to human related activities in agriculture, forestry and plantation sectors would be the main factor in initiating this sequence (e.g. Field et al. 2009). Anomalous wind during this period is southerly

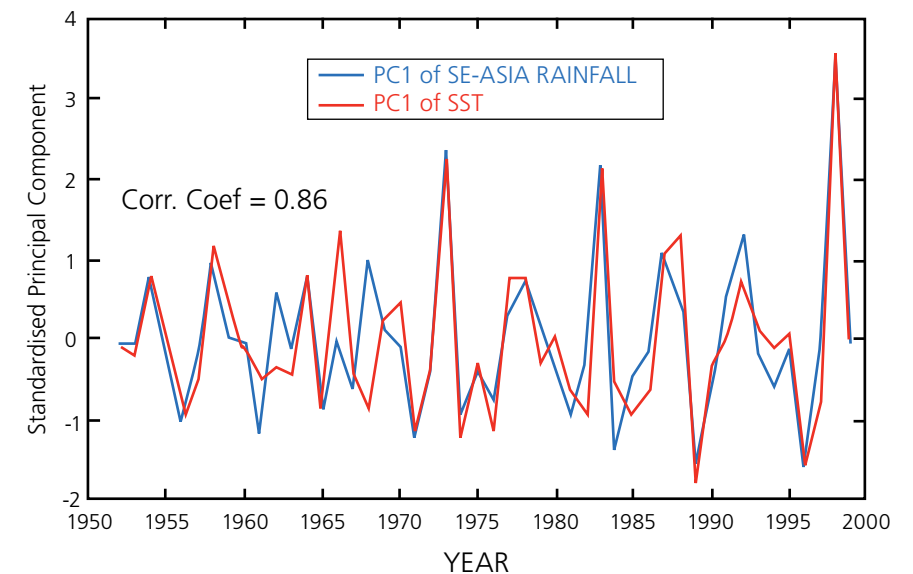


Figure 4: The time series represent the temporal evolution of the dominant pattern of the Southeast Asia anomalous rainfall shown in Figure 3 and that of the anomalous SST shown in Figure 5 (after Juneng and Tangang et al. 2005).

i.e. the winds blow to the north from Kalimantan and Sumatra. This enhances the seasonal wind during the period (i.e. the southeasterly winds) which facilitates the advection of smoke-haze from Sumatra and Kalimantan northward to Singapore, Peninsular Malaysia, Sarawak, Brunei and Sabah. During the SON(0) period, the southern parts of Sumatra and Kalimantan continue to experience deficit rainfall whilst the condition over Peninsular Malaysia returns to normal. However, the area of deficit rainfall extends northward to cover the whole of Borneo. At this stage the condition over Southern Sumatra and Kalimantan remains extremely favourable for large-scale fire outbreaks. Anomalous southeasterly wind over the region during this period facilitates the advection of smoke-haze to other regions from Kalimantan and Sumatra. However, during this period, the northern parts of Borneo begin to experience drought and this condition continues until the mature period of El Niño (DJF(0/1)) creating favourable conditions for fire outbreak in this region. The occurrence of haze in Sarawak, Brunei and Sabah in 1998 was related to local fires associated with dry conditions in this region (Radojevic 2003). By the MAM(1) period, only the northern tip of Borneo experienced drought. During both the DJF(0/1) and MAM(1) periods, the conditions in Peninsular Malaysia, Sumatra and Kalimantan returned to normal or slightly below normal, minimizing the risk of fire outbreak in this region.

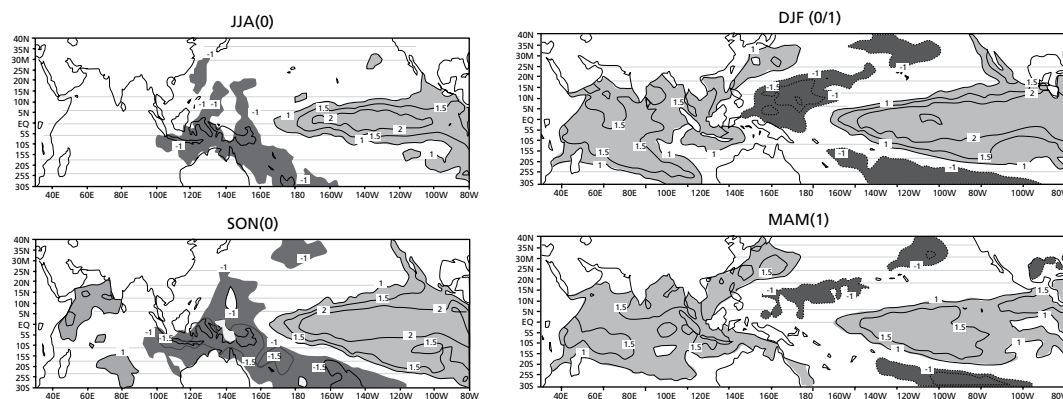


Figure 5: As in Figure 3 except for the anomalous sea surface temperature (after Juneng and Tangang 2005).

The evolution of a rainfall deficit area over the Malaysian and Indonesian regions from the JJA(0) to the MAM(1) periods unveils the susceptibility of the region to drought and hence the risk of forest fires during the occurrence of El Niño. This typical seasonal evolution of deficit rainfall and anomalous atmospheric circulation over the region during an El Niño event provides useful meteorological information. Coupled with the fact that El Niño itself is a predictable event by at least 6 months in advance (e.g. Tangang et al. 1998)), this information is relevant in mitigating the risk of forest fires and the recurrence of smoke-haze. In fact, Juneng and Tangang (2008) showed that precipitation anomalies in the region can be forecasted at least 5 months in advance using sea surface temperatures in the tropical Pacific as predictors. However, there could be other phenomena that could influence smoke-haze episodes. Field et al. (2009) identified that the Indian Ocean Dipole (IOD) could also be a contributing factor. The IOD is an ENSO-like phenomenon associated with atmosphere-ocean interaction over the Indian Ocean (Saji et al. 1999). It can occur in conjunction with the El Niño or independently. A recent study by Juneng et al. (2009) also showed the possible modulation of PM10 distribution by intra-seasonal fluctuations (10-20 days and 30-60 days associated with the Madden-Julian Oscillation (MJO)).

## 6. Climate change and future climate projection over the Southeast Asia region

Section 5 describes the roles of El Niño induced drought in increasing the risk of fire outbreak and smoke-haze. However, questions remain as to how future characteristics of drought over this region might change in relation to anthropogenic climate change. The behavior of droughts over this region would determine to some extent the trend and characteristics of future smoke-haze episodes. This section discusses the projection of mean climate, drought and El Niño in the 21st century.

### 6.1 Change in mean climate and extreme events such as drought

The Fourth Assessment of the Inter-Governmental Panel on Climate Change states that the warming of the climate system is unequivocal based on evidence from observed increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level (IPCC AR4 2007). Recent and potential increases in global temperatures will likely impact the hydrological cycle, including changes in precipitation and increases in extreme events such as droughts and heat waves. Increases in the occurrence of drought over this region would eventually raise the risk of large-scale forest fires and widespread haze. To date there has been no prior investigation of future drought trends focusing on this region. However, useful information can be gathered from those of global scale studies mainly based on low resolution general circulation models (GCMs). Although the usefulness of such studies is limited for a particular locality, on a regional scale the information is relevant and useful. The IPCC AR4 showed that for the last 100 years or so, the temperature over Southeast Asia has been increasing at the rate of 0.15-0.25°C per decade. However, the warming rate has been accelerating over the last 2-3 decades. Tangang et al. (2007) showed that for several locations in Malaysia, the rates of warming for the last 40 years were as high as 0.4°C per decade. In contrast to global air temperature, the long-trend of global precipitation is difficult to establish. However, Zhang et al. (2007) was able to attribute the zonal mean precipitation around

the globe to anthropogenic climate change. For the tropical region (including the Southeast Asia region), precipitation from 1925 to 1999 appears to be decreasing. This appears to be consistent with the time series of the Palmer Drought Severe Index (PDSI) produced by Dai et al. (2004) and highlighted in the IPCC Technical Paper VI on Climate Change and Water (Bates et al. 2008, Fig. 3.1). For the last two decades the Southeast Asia region experienced drier than average conditions.

Depending on the emission scenario, the projected global mean temperature at the end of the 21st century is between 1.8°C (for B1 Scenario) to 4.0°C (for A1F1 scenario) with a likely range of 1.1°C to 6.4°C (IPCC AR4 2007). The warming of the atmosphere is likely to cause changes in hydrological cycles including precipitation, soil moisture, runoff, evaporation and evapotranspiration (Bates et al. 2008). The frequency and intensity of extreme events such as droughts, floods and heat waves would also change. Sheffield and Wood (2008, yet to be assessed by the IPCC) described projected changes in drought occurrence under future global warming based on multi-model, multi-scenario IPCC AR4 simulations. This study indicated that for future projections, the models show decreases in soil moisture globally for all scenarios with a corresponding doubling of the spatial extents of severe soil moisture deficits and twice the frequency of short-term (4-6 month duration) droughts from mid-20th century to the end of the 21st century. Long-term droughts (more than 12-month duration) become three times more common. However, these increases in trends of drought occurrences vary regionally. The Southeast Asia region appears to be less affected compared to regions such as Central America, Central North America, the Mediterranean and southern Africa. This result may suggest that the characteristics of drought for the Southeast Asia region in the 21st century do not differ from those of the middle of the 20th century. The results of this study may also be interpreted to indicate that there will be no significant change in the risk of forest fire and smoke-haze in the 21st century.



## 6.2 Projected changes in El Niño characteristics in the 21st century

Section 5 highlights how the seasonal evolution of El Niño-induced drought over the region could prolong atmospheric residence time for forest fires to grow out of control and cause smoke-haze episodes. However, the interaction between anthropogenic climate change and ENSO may change future drought characteristics. A recent study by Coelho and Goddard (2009, yet to be assessed by the IPCC) highlighted the separability of climate change and ENSO-climate variability in the tropics. Thus the changes in mean precipitation within the tropics are largely independent of a model's ENSO characteristics. Coelho and Goddard (2009) also found that there is no significant change in relative El Niño strength or robust change in frequency based on various model simulations for the 20th and 21st centuries. However, as mean climate is projected to change in the 21st century, the risk of a predefined event such as drought will change. Based on models with good fidelity in reproducing ENSO, an increased risk has been found in some regions especially western Africa. However, there appears to be no significant change of risk for the Southeast Asia region and thus the results of this study are broadly consistent with that of Sheffield and Wood (2008). However, these findings have yet to be assessed by the IPCC. The preparation of the IPCC Fifth Assessment Report (AR5) is in progress and expected to be completed by 2013. The IPCC AR5 would provide greater regional emphasis and issues related to drought risks over this region are expected to be discussed in this report.

## 7. Conclusion and recommendations

The investigation by Field et al. (2009) reiterated Man's role in amplifying drought-induced biomass burning in Indonesia. Although the characteristics of both El Niño and droughts may not be affected by the changing of mean climate associated with anthropogenic forcing, the present ENSO oscillation guarantees the region an El Niño occurrence once in every 2-7 years and there is always a possibility of an extreme El Niño like the 1997/98 event recurring. Hence mitigation and policy response in reducing the risk of future large fire outbreaks and smoke-haze episodes are relevant. As indicated by Schweithelm et al. (1999), steps to improve fire management and steps taken to address the causes of fires need to be implemented. Various measures have been recommended to manage and prevent fires and reduce the risk of recurrence of large-scale smoke-haze such as the 1997 episode. Unfortunately, these measures were advocated about a decade ago, yet we have experienced at least another five smoke-haze episodes since 2000, including this year. Thus the issue of how to minimize and prevent smoke-haze episodes is far from over. Countries concerned may need to evaluate present mitigation measures and examine why they were ineffective in preventing the recurrence of smoke-haze. The smoke-haze episode of 1997 was a major disaster with colossal economic impacts and the region certainly cannot afford it to recur in future.

## Acknowledgment

We are grateful to Robert Field of University of Toronto for the materials he provided and useful discussion. Prof. Tangang is also grateful to the generosity of the organizer of the LSE Workshop on "Climate Change: Is Southeast Asia up to the challenge?" for the travel support and also to Tan Sri Dr.. Munir Majid for an invitation to this workshop. ■

## References

- Abas, M. R., Simoneit, B. R. T., Elias, V. O., Cabral, J. A., and Cardoso, J. N. (1995). Composition of higher molecular weight organic matter in smoke aerosol from biomass combustion in Amazonia. *Chemosphere* 30, 995-1015.
- Abas, M. R. B., Rahman, N. A., Omar, N. Y. M. J., Maah, M. J., Samah, A. A., Oros, D. R., Otto, A., and Simoneit, B. R. T. (2004a). Organic composition of aerosol particulate matter during a haze episode in Kuala Lumpur, Malaysia. *Atmospheric Environment* 38, 4223-4241.
- Abas, M. R. B., Oros, D. R., and Simoneit, B. R. T. (2004b). Biomass burning as the main source of organic aerosol particulate matter in Malaysia during haze episodes. *Chemosphere* 55, 1089-1095.
- Aditama, T. Y. 2000. Impact of haze from forest fire to respiratory health: Indonesian experience. *Respirology* 5: 169-174.
- Afroz, R., Hassan, M. N., and Ibrahim, N. A. (2003). Review of air pollution and health impacts in Malaysia. *Environmental Research* 92, 71-77.
- Aldrian E, Susanto RD (2003) Identification of three dominant rainfall regions within Indonesia and their relationship to sea surface temperature. *Int J Climatol* 23:1435–1452
- Balasubramanian, R., Victor, T., and Begum, R. (1999). Impact of biomass burning on rainwater acidity and composition in Singapore. *Journal of Geophysical Research D: Atmospheres* 104, 26881-26890.
- Bates, BC., Kundzewicz ZW, WU S and Oalutikof JP, Eds, 2008: Climate Change and Water. Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210 pp.
- Bergauff, M., Ward, T., Noonan, C., and Palmer, C. P. (2008). Determination and evaluation of selected organic chemical tracers for wood smoke in airborne particulate matter *International Journal of Environmental Analytical Chemistry* 88 473-486
- Brauer, M., and Hisham-Hashim, J. (1998). Fires in Indonesia: Crisis and reaction. *Environmental Science and Technology* 32, 404A-407A.
- Chang CP, Wang Z, Ju J, Li T (2003) On the relationship between western Maritime Continent rainfall and ENSO during northern winter. *J Clim* 17:665–672
- Coelho CAS and Goddard L (2009), El Niño-induced tropical droughts in climate change projections, *J Clim*, DOI: 10.1175/2009JCLI3185.1
- Cotton, J (1999), The "Haze" over the Southeast Asia: Challenging the ASEAN Mode of Regional Engagement, *Pacific Affairs*, 72, 331-351.
- Dai, A, Lamb PJ, Trenberth KE and Qian T (2004), A global data set of Palmer Drought Severity Index for 1870-2002; relationship with soil moisture and effects of surface warming, *J. Hydrometeorol.*, 5, 1117-1130.,
- Dos Santos, C. Y. M., Azevedo, D. D. A., and De Aquino Neto, F. R. (2002). Selected organic compounds from biomass burning found in the atmospheric particulate matter over sugarcane plantation areas *Atmospheric Environment* 36 3009-3019
- Elias, V. O., Simoneit, B. R. T., Cordeiro, R. C., and Turcq, B. (2001). Evaluating levoglucosan as an indicator of biomass burning in Carajás, amazônia: a comparison to the charcoal record. *Geochimica et Cosmochimica Acta* Volume 65, 267-272



- Engling, G., Carrico, C. M., Kreidenweis, S. M., Collett Jr., J. L., Day, D. E., Malm, W. C., Lincoln, E., Hao, W. M., Iinuma, Y., and Herrmann, H. (2006). Determination of levoglucosan in biomass combustion aerosol by high-performance anion-exchange chromatography with pulsed amperometric detection. *Atmospheric Environment* 40 40 (SUPPL. 2), 299-311
- Field RD, van der Werf GR, and Shen SP (2009). Human amplification of drought-induced biomass burning in Indonesia since 1960s, *Nature Geoscience*, 2, 185-188.
- Graham, B., Mayol-Bracero, O. L., Guyon, P., Roberts, G. C., Decesari, S., Facchini, M. C., Artaxo, P., Maenhaut, W., Koll, P., and Andreae, M. O. (2002). Water-soluble organic compounds in biomass burning aerosols over Amazonia - 1. Characterization by NMR and GC-MS. *Journal of Geophysical Research-Atmospheres* 107, art. no.-8047.
- Heil, A., and Goldammer, J. G. (2001). Smoke-haze pollution: A review of the 1997 episode in Southeast Asia. *Reg. Environ. Change* 2, 24-37.
- Hon PML (1999). "Singapore" in *Indonesia's Fire and Haze, the cost of catastrophe*, Glover D and Jessup T (eds), the Institute of Southeast Asia Studies (ISEAS), 22-50
- IPCC, 2007: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.
- Juneng, L and F.T. Tangang (2005). Evolution of ENSO-related rainfall anomalies in Southeast Asia region and its relationship with atmosphere-ocean variations in Indo-Pacific sector. *Climate Dynamics*, 25:337-350
- Juneng L, and Tangang FT (2008). Level and source of predictability of seasonal rainfall anomalies in Malaysia using canonical correlation analysis. *International Journal of Climatology*, 28: 1255–1267
- Juneng , L, Latif M T, Tangang FT and Masnor H (2009), Spatio-temporal characteristics of PM10 concentration across Malaysia, *Atmospheric Environment* 43, 4584-4594.
- Larsen III, R., Schantz, M., and Wise, S. (2006). Determination of levoglucosan in particulate matter reference materials. *Aerosol Science and Technology* 40 781-787
- Latif, M. T., and Rozali, M. O. (2000). Inorganic component of dust fall during 1997 haze episode. *Malays. J. Environ. Manage* 1, 55-72.
- Latif, M. T., and Othman, M. R. (2001). Concentration of several air pollutants and its effect to human health. In "National Seminar on Environmental Management Issues and Challenges in Malaysia", pp. 524-531. Pusat Pengajian Siswazah, Universiti Kebangsaan Malaysia.
- Mott, J. A., Mannino, D. M., Alverson, C. J., Kiyu, A., Hashim, J., Lee, T., Falter, K., and Redd, S. C. (2005). Cardiorespiratory hospitalisations associated with smoke exposure during the 1997 Southeast Asia forest fires. *International Journal of Hygiene and Environmental Health* 208, 75-85.
- Nicol J (1997), Bioclimatic impacts of the 1994 smoke-haze event in Southeast Asia, *Atmospheric Environment*, 31, 1209-1219
- Omar, N. Y. M. J., Mon, T. C., Rahman, N. A., and Abas, M. R. B. (2006). Distributions and health risks of polycyclic aromatic hydrocarbons (PAHs) in atmospheric aerosols of Kuala Lumpur, Malaysia. *Science of the Total Environment* 369, 76-81.
- Puxbaum, H., Caseiro, A., Sañchez-Ochoa, A., Kasper-Giebl, A., Claeys, M., Gelencsér, A., Legrand, M., Preunkert, S., and Pio, C. A. (2007). Levoglucosan levels at background sites in Europe for assessing the impact of biomass combustion on the European aerosol background. *Journal of Geophysical Research D: Atmospheres* 112.
- Radojevic, M. (2003). Chemistry of forest fires and regional haze with emphasis on Southeast Asia. *Pure and Applied Geophysics* 160, 157-187.
- Ruitenbeek, J (1999), "Indonesia" in *Indonesia's Fire and Haze, the cost of catastrophe*, Glover D and Jessup T (eds), the Institute of Southeast Asia Studies (ISEAS), 86-129.
- Sastry, N. (2002). Forest fires, air pollution, and mortality in Southeast Asia. *Demography* 39, 1-23.
- Schweithelm J and Glover D (1999), Causes and Impacts of the Fires, in *Indonesia's Fire and Haze, the cost of catastrophe*, Glover D and Jessup T (eds), the Institute of Southeast Asia Studies (ISEAS), 1-21.
- Schweithelm J, Jessup T and Glover D (1999), "Conclusion and Recommendations" in *Indonesia's Fire and Haze, the cost of catastrophe*, Glover D and Jessup T (eds), the Institute of Southeast Asia Studies (ISEAS), 130-143
- Shahwahid M H O and Othman J (1999), "Malaysia" in *Indonesia's Fire and Haze, the cost of catastrophe*, Glover D and Jessup T (eds), the Institute of Southeast Asia Studies (ISEAS), 22-50
- Sheffield, J and Wood EF (2008), Projected changes in drought occurrence under future global warming from multi-model, multi-scenario, IPCC AR4 simulation, *Clim Dyn*, 31:79-105
- Stephen, A., and Low, L. G. (2002). Impact of haze on health, mortality and mitigation programme. In "World Conference on Land and Forest Fire Hazards 2002", pp. 319 - 323, Kuala Lumpur.
- Tangang, F.T and L. Juneng (2004). Mechanisms of Malaysia rainfall anomalies. *J Clim*, 17(18), 3615-3621.
- Tangang, F.T., L. Juneng and S. Ahmad (2007). Trend and interannual variability of temperature in Malaysia: 1961-2002. *Theoretical and Applied Climatology*. 89, 127-141.
- Tangang FT, Tang B, Monahan AH, Hsieh WW (1998) Forecasting ENSO events: a neural network-extended EOF approach. *J Clim* 11(1):24–41
- Vedal, S., and Dutton, S. J. (2006). Wildfire air pollution and daily mortality in a large urban area. *Environmental Research* 102, 29-35.
- Wang, Q., Shao, M., Liu, Y., William, K., Paul, G., Li, X., Liu, Y., and Lu, S. (2007). Impact of biomass burning on urban air quality estimated by organic tracers: Guangzhou and Beijing as cases. *Atmospheric Environment* 41, 8380-8390.
- Wang B, Wu R, Li T (2003) Atmosphere–warm ocean interaction and its impacts on Asian–Australian monsoon variation. *J Clim* 16:1195–1211
- Zhang et al. (2007), Detection of human influence on twentieth-century precipitation trends, *Nature* 448, 461-465.

# Is there an ASEAN policy on climate change?

**Dr. Raman Letchumanan**

Head of the Environment Division, ASEAN Secretariat



## Abstract

The ASEAN Heads of State/Government have proactively led ASEAN's efforts to address climate change issues in the region and beyond. They have issued a declaration to the 2007 Bali UN Climate Change Conference which set the two-year road map for the current negotiations, and on 24th October 2009 issued a Joint Statement to the December 2009 Copenhagen UN Climate Change Conference where a new climate change arrangement is expected to be concluded. The Road Map for an ASEAN Community 2009-

2015 adopted by the Leaders situates the ASEAN climate change agenda in the context of sustainable development outlining strategies and actions in the ASEAN Socio-cultural Community Blueprint, ASEAN Economic Community Blueprint, ASEAN Political-Security Community Blueprint, and the Initiative for ASEAN Integration 2nd Work Plan. ASEAN is therefore addressing climate change, not just through a policy on climate change, but through the framework of ASEAN Community building, with strategies and actions rooted in the various development and sectoral areas. This paper highlights the ASEAN climate change agenda, and actions planned to address climate change.

## ASEAN Region At a Glance

The ASEAN region lies within the waters of the Pacific Ocean, Indian Ocean, Andaman Sea and South China Sea, and stretches more than 3,300 kilometres from north to south (latitudes 30° North to 11° South) and 5,600 kilometres from west to east (longitudes 92° West to 142° East). ASEAN borders China to the north, India and Bangladesh to the northwest, and East Timor and Papua New Guinea to the southeast. The region also has a long coastline, measuring about 173,000 kilometres in total, and is surrounded by major seas and gulfs such as the South China Sea, the Andaman Sea and the Gulf of Thailand. In view of its proximity to the equator, the region enjoys a warm and humid climate throughout the year.

**Natural Resources.** The ASEAN region is endowed with rich natural resources that sustain essential life support systems both for the region and the world. The rich marine life and abundant mineral resources supports important economic activities such as oil exploration, commercial and small-scale fisheries, and tourism. Apart from providing water, food and energy, these natural resources play an important role in sustaining a wide range of economic activities and livelihoods. The ASEAN region is blessed with a variety of unique ecosystems such as the Mekong River Basin, Ha Long Bay and Lake Toba. The strategic location of ASEAN has also brought about numerous economic advantages to the region, particularly through international shipping and foreign trade.

**Population.** ASEAN is highly populated. The total population of AMS in mid-2008 was about 580 million (Fig. 1), which accounted for 8.7 percent of the world's total. In terms of regional distribution, the ASEAN region has the fourth largest population after South-Central Asia, Eastern Asia, and Sub-Saharan

Characteristics	Facts
Population	About 580 mil people (2008)
Population density	130 people per sq km (world average: 49 people per sq km)
Population in urban areas	44% of region's total population; projected to increase to 55% by 2020
Coastlines	173,000km (14% of the world total)
Forest cover	1,904,593 sq km (2007)
Mangrove	Over 52,000 sq km
Peatland	25 million hectares (60% of global tropical peatlands)
Coral reefs	34% of the world total
Poverty incidence (% of population living below respective poverty line)	Cambodia (34.7%), Indonesia (16.6%), Lao PDR (32.7%), Malaysia (3.6%), Myanmar (26.6%), the Philippines (30.0%), Thailand (8.48%), Vietnam (14.75%)

Figure 1. ASEAN Facts and Figures

Africa. Indonesia is the most populous country in the region with 229 million people and the fourth most populous country in the world after China, India, and the United States. Six AMS are among the top 50 most populous countries in the world, namely, Indonesia, Philippines, Vietnam, Thailand, Myanmar and Malaysia.

## Climate Change as an Issue

Climate change has become a defining and most challenging sustainable development issue of the twentieth first century. It is defining in the sense that it is now dictating the pace and nature of economic growth, development and social progress, while potentially becoming the greatest threat to humankind and survival if left unchecked. It is challenging because of its multifaceted nature, affecting almost all sectors and the basic means and lifestyle of human existence. It is no more a mere environmental issue that can be fixed by technology or finite human and capital resources. It is more urgent in the sense that we are talking in terms of years or at most a few decades

to address climate change before the earth reaches a turning point at which stage the climate change devastating impacts becomes irreversible.

The climate change crisis aptly amplifies the consequences of not acting in a holistic and integrated manner. It cannot be fixed by technology or finite human and capital resources alone. It is also the most urgent in the sense that, if remedial measures are not taken, a point of no return would be reached in the next few decades. The climate change crisis is the embodiment of what can go wrong, if action is not taken globally based on the principle of common but differentiated responsibility.

The authoritative Intergovernmental Panel on Climate Change (IPCC), the scientific advisory body to the United Nations Framework Convention on Climate Change (UNFCCC) has estimated that globally, emissions reductions of 25-40% of 2000 levels are needed if the global temperature fluctuations are to be maintained within a range of 2°C, a level which is generally taken to sustain life without any irreversible damage. The Stern Review on the Economics of Climate Change has estimated that the cost of inaction could cost up to 20% or more of global GDP, while in contrast the costs of action undertaken now to address climate change to avoid the worst impacts can be limited to 1% of global GDP each year.

In the on-going negotiations for renewed and urgent actions on climate change, the debate on mitigating greenhouse gases, essentially carbon dioxide, is fast turning into a development issue – how much growth each nation can pursue given the constraints on the limiting capacity of atmospheric carbon space. The key argument is that the developed countries, with their historically unfettered industrial growth, have enjoyed these rights and have crowded out the carbon space, which is now limiting the development potential of developing countries, given that they too should have the right to equitable development. This draws attention to the stark reality that the environment cannot be separated from economic growth and social development. Each has to support and complement the other.

ASEAN is particularly vulnerable to the impacts of climate change due to the concentration of people and economic activities in the coastal areas, its rich biological diversity, resource-based economies, and the increased vulnerability of the people especially the poor. Due to its geological and geographical factors, the region is also one of the world's vulnerable regions to suffer from a range of climatic and natural hazards such as earthquakes, typhoons, sea level rise, volcanic eruptions, droughts, heat waves and tsunamis which are becoming more frequent and severe. In addition, the geophysical and climatic conditions shared by the region have also led to common and trans-boundary environmental concerns such as air and water pollution, urban environmental degradation and trans-boundary haze pollution.

### ASEAN Region: Responding to the Challenge

The ASEAN Leaders have expressed their concern and commitment for ASEAN to play a proactive role in addressing climate change through their declarations to the 2007 Bali and 2009 Copenhagen UN Conferences on Climate Change. They view the protection of the environment and the sustainable use and management of natural resources as essential to the long-term economic growth and social development of countries in the region. The ASEAN Vision 2020 calls for "a clean and green ASEAN" with fully established mechanisms to ensure the protection of the environment, sustainability of natural resources, and high quality of life of people in the region.

To realise the ASEAN Vision, in October 2003, the Heads of State/Government of ASEAN Member States (AMS) 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". The Roadmap for an ASEAN Community 2009 - 2015 lays out the goals, strategies and actions to realise the ASEAN Community by 2015 – an ASEAN Community that is politically cohesive and peaceful, economically integrated and vibrant, and socially responsible and caring.

ASEAN has been actively engaged in international negotiations in ensuring a fair, effective and equitable outcome for a new climate change regime. The ASEAN Member States made a number of declarations and statements supporting climate change since 2007. These include:

- a. ASEAN Declaration on Environmental Sustainability (13th ASEAN Summit in 2007)
- b. ASEAN Declaration on COP-13 to the UNFCCC and CMP-3 to the Kyoto Protocol (13th ASEAN Summit in 2007).
- c. Singapore Declaration on Climate Change, Energy and the Environment (3rd EAS Summit in 2007)
- d. Joint Ministerial Statement of the 1st EAS Energy Ministers Meeting (2007)
- e. Ministerial Statement of the Inaugural EAS Environment Ministers Meeting (2008)
- f. ASEAN Joint Statement on Climate Change to COP-15 to the UNFCCC and CMP-5 to the Kyoto Protocol (15th ASEAN Summit in 2009)
- g. Singapore Resolution on Environmental Sustainability and Climate Change (11th AMME in 2009).

The 13th session of Conference of the Parties to the UNFCCC. Indonesia hosted the 13th Conference of Parties (COP13) of the UNFCCC in Bali in 2007, which set in place the Bali Roadmap initiating the current talks to conclude a new global climate change deal in Copenhagen in December 2009 at COP15. The

ASEAN Leaders at their 12th Summit in Singapore in November 2007 issued a Declaration highlighting ASEAN's concerns and expectations of the climate change talks for COP13 in Bali.

ASEAN, in the declaration on the 13th session of Conference of the Parties to the UNFCCC and the 3rd Session of the CMP to the Kyoto Protocol, was resolute in its commitment to address the issue and importance of climate change and achieve its objectives of sustainable development. In its continuing efforts to stabilise the concentration of greenhouse gases in accordance with the UNFCCC and Kyoto Protocol, ASEAN has pledged to address the issue of climate change beyond 2012 through realising an effective, fair, flexible, and comprehensive multilateral arrangement. ASEAN has also ensured their commitment towards effective bilateral, regional and global partnership to promote the development and transfer of low carbon technologies including cleaner and climate-friendly technologies.

Building partnerships with international financial and development cooperation institutions to encourage innovative financing options is predicted to stimulate investment in climate-friendly technology and development for ASEAN and the rest of the world. It is recognised within this context that economic and social development, including poverty eradication and environmental protection, are principal priorities of developing countries. It is also accepted in ASEAN that fossil fuel consumption underpin AMS's economies. It is devised within the declaration that the underlying goals in sustainable development, along with alternative fuel sources, will be a reality in the foreseeable future. Any action to mitigate climate change should be in a manner that complements and enhances sustainable development and sustained economic growth.

The ASEAN Leaders also issued an ASEAN Summit Declaration on Environmental Sustainability, and together with their EAS counterparts issued the Singapore Declaration on Energy, Climate Change and Environment. Thailand, the current ASEAN Chair played host to the Bangkok Climate Change Talks

for two weeks from 28th September 2009, a crucial event which will determine whether a new climate change deal can be reached in Copenhagen. The Prime Minister of Thailand attended the G20 Meeting in Pittsburgh in September 2009 where he articulated, among others, ASEAN's concerns and expectations on climate change.

The ASEAN Leaders who met at their 15th Meeting on 24th October 2009 issued a Joint Statement to the 15th session of the Conference of Parties to the UN Framework Convention on Climate Change and the 5th session of the Conference of Parties serving as the Meeting of the Parties to the Kyoto Protocol. ASEAN is committed to fully implement various measures to address climate change as outlined in the strategy and actions of the ASCC Blueprint 2009 – 2015.

### The ASEAN Institutional Framework

The ASEAN Charter entered into force on 15th December 2008. The Charter bestowed a legal personality upon ASEAN, which for the past 42 years has operated as a coalition of nations born out of the Bangkok Declaration of 1967. To realize the purposes of the Charter, the ASEAN Leaders adopted a Roadmap comprising three community blueprints – political-security, socio-cultural, and economic – and the Initiative for ASEAN Integration 2nd Work Plan.

The ASEAN Charter while rationalizing and maintaining existing institutions, has created several new institutions to better coordinate enhance and streamline the work of the various sectoral bodies. The ASEAN Summit, the supreme policy-making body of ASEAN, now meets twice a year in addition to having special or ad-hoc meetings. The ASEAN Leaders provide the vision and broad thrust for co-operation in various sectors, including co-operation on environment.

A newly constituted ASEAN Coordinating Council comprising the ASEAN Foreign Ministers will, among others, coordinate with the ASEAN Community Councils to enhance policy coherence, efficiency and cooperation among them. Each of the three Communities will have a new ASEAN Community



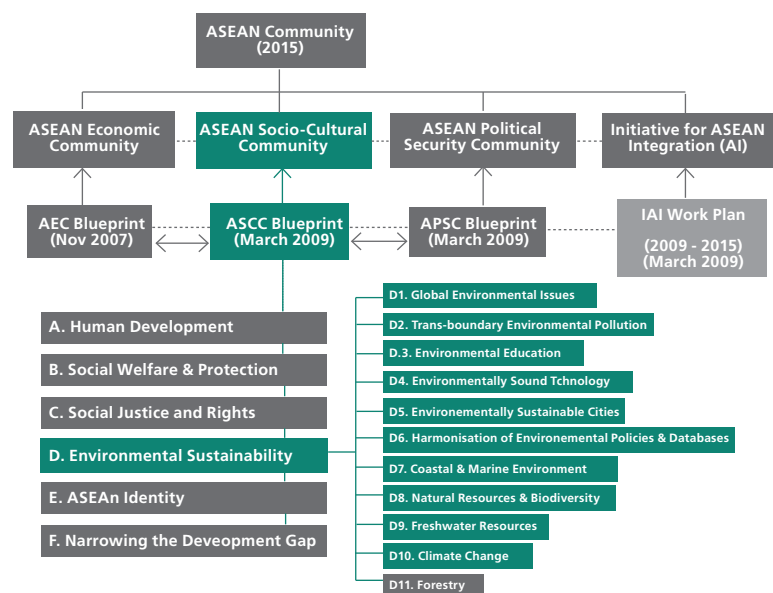


Figure 2. ASEAN Snapshot

Council which will, among others, ensure the implementation of the relevant decisions of the ASEAN Summit, and coordinate the work of the different sectors under its purview and on issues which cut across the other Community Councils. The ASEAN Socio-cultural Community Council will oversee the work of the ASEAN Environment Ministers.

The ASEAN Environment Ministers meet on a formal basis once every three years and since 1994, have also been meeting on an informal basis annually while the ASEAN Senior Officials on the Environment (ASOEN) meet annually and are responsible for supporting the ASEAN Environment Ministers in terms of formulation, implementation and monitoring of regional programmes and activities. ASOEN comprises heads of environmental ministries/departments/agencies that are responsible for environmental matters in their respective countries. The ASEAN Environment Ministers are primarily responsible for policy and strategic matters related to the environment.

The ASEAN Senior Officials of the Environment (ASOEN) also serve as the national ASOEN focal points for promoting ASEAN's activities in their respective countries. ASOEN is assisted by six subsidiary bodies, namely the ASEAN Working Group

on Coastal and Marine Environment (AWGME), the ASEAN Working Group on Environmental Education (AWGEE), the ASEAN Working Group on Environmentally Sustainable Cities (AWGESC), the ASEAN Working Group on Multilateral Environmental Agreements (AWGMEA), the ASEAN Working Group on Nature Conservation and Biodiversity (AWGNCB), and the ASEAN Working Group on Water Resources Management (AWGWRM) (Fig.3). The ASEAN Secretariat coordinates and reports to ASOEN on all other activities that do not fall within the purview of the respective working groups, such as promoting environmentally sound technology and harmonizing environmental policies and databases.

The ASEAN Environment Ministers meeting as the Conference of the Parties (COP) is responsible for the implementation of the ASEAN Agreement on Trans-boundary Haze Pollution (Haze Agreement). In addition, considering the different circumstances and weather patterns in the southern ASEAN and Mekong regions, sub-regional institutional frameworks have been established to address the fire and haze situations in the respective regions. Environment Ministers from Brunei Darussalam, Indonesia, Malaysia, Singapore and Thailand meet regularly as the Sub-Regional Ministerial Steering Committee (MSC) on Trans-boundary Haze Pollution

## Institutional Framework (Environment)

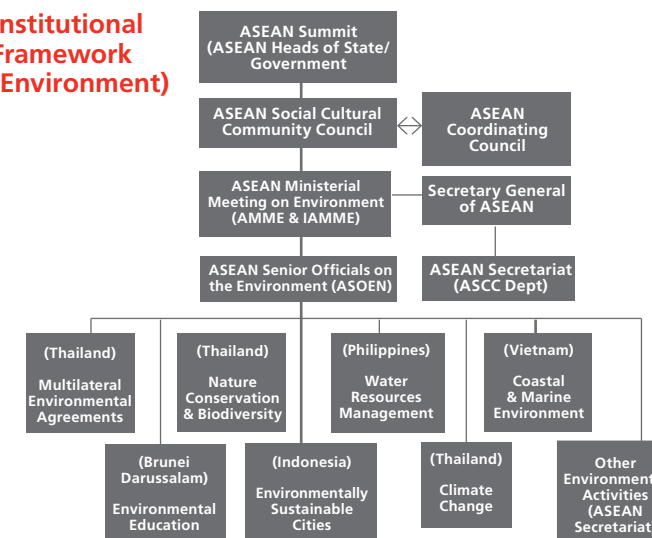


Figure 3. ASEAN Institutional Framework (Environment)

to undertake activities for the southern region. The MSC is supported by a Technical Working Group comprising senior officials.

There are two subsidiary bodies established under the COP, namely: (i) the Committee comprising senior officials to support implementation of the Agreement and provide relevant information to the COP for decision and guidance; and (ii) the Technical Working Group on Trans-boundary Haze Pollution in the Mekong Sub-Region to develop and implement programmes and activities to enhance cooperation among AMS in the Mekong sub-region, i.e. Cambodia, Lao PDR, Myanmar, Thailand and Vietnam on fire and haze pollution control.

The ASEAN Secretariat provides support for all these institutional bodies. In particular, the ASEAN Secretariat acts as a resource base, providing advice and information. The ASEAN Secretariat also coordinates the implementation of regional activities and programmes, in addition to providing support services for the meetings of the ASEAN bodies. The ASEAN Secretariat ensures proper coordination on related activities of various other sectoral bodies so as to promote synergy and avoid duplication. Another

important role played by the ASEAN Secretariat is the coordination between ASEAN bodies and its programmes with those of ASEAN Dialogue Partners and other international organisations in terms of resource mobilisation, programme implementation and in general enhancing institutional linkages.

The ASOEN recognising the need for regular, sustained and more structured engagement among CSOs and ASEAN bodies, has supported the process of creating such mechanisms, in particular an ASEAN Civil Society Organisations Forum on Environmental Protection and Sustainable Development. This would bring multiple mutual benefits such as enabling CSOs to bring up emerging issues and concerns on environment to ASEAN decision makers, support ASEAN in designing and implementing regional projects, effectively deliver people-centred programmes, gain formal recognition of CSOs as a key partner of ASEAN, and obtain the backing of ASEAN in mobilising resources for CSO initiated programmes. The ASEAN Secretariat has assisted in convening the first meeting of the proposed CSO Forum which laid the basic groundwork for establishing the Forum and remains committed to follow through on the initiative.



## The ASEAN Strategies and Actions on Climate Change

Recognising the importance of environmental cooperation for sustainable and regional integration, ASEAN has since 1977 cooperated closely in promoting environmental cooperation focusing on ten priority areas of regional importance as reflected in the Blueprint for the ASEAN Socio-cultural Community (ASCC Blueprint) 2009-2015, as follows:

- D1. Addressing global environmental issues
- D2. Managing and preventing trans-boundary environmental pollution
  - Trans-boundary haze pollution
  - Trans-boundary movement of hazardous wastes
- D3. Promoting sustainable development through environmental education and public participation
- D4. Promoting environmentally sound technology (EST)
- D5. Promoting quality living standards in ASEAN cities/urban areas
- D6. Harmonising environmental policies and databases
- D7. Promoting the sustainable use of coastal and marine environment
- D8. Promoting sustainable management of natural resources and biodiversity
- D9. Promoting the sustainability of freshwater resources
- D10. Responding to climate change and addressing its impacts

The ASCC Blueprint provides priority actions in responding climate change and addressing its impacts under section D10 of the Blueprint. The section's main strategic objective is to enhance regional and international cooperation to address the issue of climate change and its impacts on socio-economic development, health and the environment, in ASEAN Member States through implementation of mitigation and adaptation measures, based on the principles of equity, flexibility, effectiveness, common but differentiated responsibilities, respective capabilities, as well as reflecting on different social and economic conditions. The same section identifies 11 priority actions responsive to climate change issues which will be implemented and pursued by ASEAN Member States from 2010-2015, namely:

- Encourage ASEAN common understanding on climate change issues and where possible, engage in joint efforts and common positions in addressing these issues;
- Encourage the efforts to develop an ASEAN Climate Change Initiative (ACCI);
- Promote and facilitate exchange of information/knowledge on scientific research and development (R&D), deployment and transfer of technology and best practices on adaptation and mitigation measures, and enhance human resource development;
- Encourage the international community to participate in and contribute to ASEAN's efforts in afforestation and reforestation, as well as to reduce deforestation and forest degradation;
- Develop regional strategies to enhance capacity for adaptation, low carbon economy, and promote public awareness to address effects of climate change;
- Enhance collaboration among ASEAN Member States and relevant partners to address climate related hazards, and scenarios for climate change;
- Develop regional systematic observation system to monitor impact of climate change on vulnerable ecosystems in ASEAN;

- Conduct regional policy, scientific and related studies, to facilitate the implementation of climate change convention and related conventions;
- Promote public awareness and advocacy to raise community participation on protecting human health from the potential impact of climate change;
- Encourage the participation of local government, private sector, non-governmental organisations, and community to address the impacts of climate change; and
- Promote strategies to ensure that climate change initiatives lead to economically vibrant and environment friendly ASEAN Community taking into account win-win synergy between climate change and the economic development.

## The Climate Change Challenges & ASEAN Initiatives Across Sectors

The ASEAN Socio-cultural Community Coordinating Council in 2009 agreed to enhance coordination mechanisms to synergise efforts across the corresponding sectoral bodies, communities, and across issues such as climate change. Climate change impacts on almost all sectors and these are highlighted in the context of ASEAN regional cooperation areas as below:

- **Environment.** All areas particularly conservation of biodiversity, water resources management, coastal and marine environment, public awareness and environmental education, forest fires and trans-boundary haze pollution etc.
- **Agriculture and Forestry.** Food security, forest degradation.
- **Disaster Management.** More and severe weather related disasters such as floods, droughts, typhoons etc.
- **Science and Technology.** Weather monitoring and forecasting, research and development on climate related impacts and responses, vulnerability studies etc.
- **Health.** More and severe weather related diseases.
- **Human Development.** Impact on poverty, sustainable livelihoods, social development, and generally on the achievement of the MDG goals.
- **Economic Growth.** Affects production and transaction costs through internalising environmental costs, change in products, services and markets, drag on GDP growth, carbon taxes, allocation and trade of environmental rights, new market opportunities for environmental goods and services.
- **Energy Transportation.** Renewable energy, energy conservation, mass and efficient transportation, etc.
- **Political and Human Security.** Environmental security issues, political debate influenced more and more by environmental issues, in particular climate change.

### 1. Environment

#### ASEAN Climate Change Initiative (ACCI)

The ASEAN Environment Ministers have endorsed the Terms of Reference of the ASEAN Climate Change Initiative (ACCI). ACCI is 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. The scope of collaboration through the ACCI will include: (i) policy and strategy formulation; (ii) information sharing; (iii) capacity building; and (iv) technology transfer. The ASEAN Environment Ministers

have also established an ASEAN Working Group on Climate Change (AWGCC) to implement the ACCI and D10 actions of the environment ASCC Blueprint.

The ACCI seeks to enhance regional and international cooperation to address climate change and its impacts on socio-economic development, health and the environment, in AMS through implementation of mitigation and adaptation measures, based on the principles of equity, flexibility, effectiveness, common but differentiated responsibilities, respective capabilities, as well as reflecting on different social and economic conditions. The ASEAN Climate Change Initiative is being coordinated by the ASEAN Working Group on Climate Change chaired by Thailand and shall be reporting to the ASOEN.

#### **Cool ASEAN, Green Capitals Initiative**

This is an initiative proposed by Dr. Surin Pitsuwan, Secretary-General of ASEAN and supported by the ASEAN Environment Ministers. The initiative aims to address climate change through environmentally friendly means in meeting the daily needs of cities such as transportation, waste management, energy conservation, etc. through grass-roots actions and by the people. The Governor of Bangkok has agreed to take the lead on the implementation of the initiative. ASEAN Secretariat shall play an enabling and supporting role. World Bank has agreed to partner with ASEAN on this initiative.

#### **Good Offices of the Secretary-General of ASEAN**

A proposal is therefore made to make use of the good offices of the Secretary-General of ASEAN to facilitate and address the issues addressed above. This suggestion is made following the success of the role of the Secretary-General of ASEAN as the ASEAN Humanitarian Assistance Coordinator which greatly helped ASEAN's response to the Cyclone Nargis in particular, and disaster management and humanitarian assistance in general.

This proposal will allow the good offices of the Secretary-General of ASEAN supported by the ASEAN Secretariat to meet the demand for greater coordination and consultation, and in general to

better serve the interests of ASEAN and Member States by implementing the actions as articulated above, and responding timely to any emerging needs.

#### **The ASEAN Agreement on Trans-boundary Haze Pollution**

ASEAN continued to implement concerted and focused on-the-ground actions to tackle the smoke haze problem through the ASEAN Agreement on Trans-boundary Haze Pollution. The ASEAN Conference of the Parties (COP) comprising the ASEAN Environment Ministers, is responsible for the implementation of the ASEAN Agreement on Trans-boundary Haze Pollution (Haze Agreement). In addition, considering the different circumstances and weather patterns in the southern ASEAN and Mekong sub-regions, sub-regional institutional frameworks have been established to address the fire and haze situations in the respective regions. Environment Ministers from Brunei Darussalam, Indonesia, Malaysia, Singapore and Thailand meet regularly as the Sub-Regional Ministerial Steering Committee (MSC) on Trans-boundary Haze Pollution to undertake activities for the southern region.

ASEAN is also pursuing concrete on-the-ground activities in the Mekong and southern regions of ASEAN, including bilateral initiatives by Malaysia and Singapore with Indonesia. Regional and national plans of actions and targets have been set to reduce fires through monitoring of hotspot activities and preventive actions. The ASEAN Peatland Management Strategy is in place, and a major regional peatland project with activities in several pilot sites across the region is being implemented to address the major source of fires. As forest fires destroy ecosystem and biodiversity, and contributes to climate change by releasing carbon, it is important that the global community becomes more engaged and work with ASEAN to address this recurring problem.

#### **The Rehabilitation and Sustainable Use of Peatland Forests in South East Asia Project**

The Project aims to demonstrate, implement and scale up sustainable management and rehabilitation of peatland forests in Southeast Asia. This four-year

project focuses on four (4) main areas: 1) strengthening institutional capacity and frameworks; 2) reducing the rate of degradation of peatlands in Southeast Asia; 3) demonstrating integrated management and rehabilitation of peatlands at target sites; and 4) engaging the private sector and local communities in sustainable peatland management. It fits within the framework of the ASEAN Peatland Management Initiative, and directly supports the ASEAN Peatland Management Strategy, and associated National Action Plans on Peatlands in the participating ASEAN countries, namely: Indonesia, Malaysia, Philippines, and Vietnam. This project is financed by the Global Environmental Facility (GEF) and implemented by the International Fund for Agricultural Development (IFAD).

#### **ASEAN Heritage Parks (AHP) Programme**

The ASEAN Heritage Parks Programme is one of ASEAN environmental flagship programmes whereby member countries designate their selected national protected areas and reserves as ASEAN Heritage Parks (AHP). To date, 28 sites have been designated as AHP. Two National Marine Parks of Thailand are currently in the process to be inscribed as AHP. Philippines had recently nominated the Mount Kitanglad Range Natural Park as the 28th AHP.

#### **ASEAN Strategic Plan of Action on Water Resources Management**

Recognising the importance of freshwater resources, ASEAN has embarked on cooperation in integrated water resources management with the formation of the ASEAN Working Group on Water Resources Management (AWGWRM) in 2002. Following the endorsement of the ASEAN Long Term Strategic Plan for Water Resources Management in 2003, ASEAN has also adopted the ASEAN Strategic Plan of Action on Water Resources Management (2005) which aims to tackle issues relating to demand and supply allocation, water quality and sanitation, extreme events, and governance and capacity building.

#### **ASEAN Marine Water Quality Management Guidelines & Monitoring Manual**

To help build the capacity of ASEAN Member States to

implement the ASEAN Marine Water Quality Criteria, ASEAN, in cooperation with Australia, conducted the Project on "Capacity Building for the Implementation of AMWQC – Phase I (2004-2005) and "Capacity Building for the Implementation of AMWQC – Phase II (2007-2008). The ASEAN Marine Water Quality Criteria: Management Guidelines and Monitoring Manual was published as the outcome of the Project, which aims at providing a reference document for ASEAN Member States in coordinating marine water quality management policies and monitoring approaches within each and among the countries. The ASEAN Working Group on Coastal and Marine Environment (AWGCME) will discuss follow-up actions to the recommendations of the Project.

#### **ASEAN initiative on Environmentally Sustainable Cities (AIESC)**

With the increasing trend of urbanisation in the region, ASEAN is implementing the ASEAN Initiative on Environmentally Sustainable Cities (AIESC) which focuses on addressing urban environmental challenges such as air pollution due to vehicular emissions, solid waste management and water pollution along with access to clean water. Currently, 25 ASEAN cities are participating in the programme.

#### **ASEAN Environmentally Sustainable City (ESC) Award Programme**

To further provide incentive and value to the AIESC, ASEAN commenced an ASEAN Environmentally Sustainable City (ESC) Award programme. The conferring of the first ASEAN ESC Award was held in Hanoi, Vietnam on 8 October 2008, back to back with the 11th Informal ASEAN Ministerial Meeting on the Environment (IAMME). The ESC Award is expected to encourage ASEAN Member Countries to promote Clean Air, Clean Water, and Clean Land to realise environmentally sustainable cities in ASEAN region.

#### **ASEAN Environmental Education Action Plan (AEEAP)**

The ASEAN Environmental Education Action Plan 2008-2012, a successor plan to the AEEAP 2000-2005, was adopted by the ASEAN Environment Ministers in 2007 to serve a regional framework to

undertake coordinated action at the national and regional levels to promote environmental education (EE) in order to ensure that the people develop from their own social and cultural values a sense of civic responsibility to care for the environment. The focus of the action plans are in four areas, such as: (1) Formal Education; (2) Non-formal Education; (3) Capacity Building; and (4) Networking and Partnerships. The AEEAP 2008-2012 also supports UN Decade on Education for Sustainable Development (2005-2014).

### **Heart of Borneo Initiative (HoB)**

The HoB is a collaborative regional partnership programme among the three (3) ASEAN Member States: Indonesia, Malaysia, and Brunei Darussalam in promoting effective conservation of protected areas, sustainable management of productive forests and sustainable land-uses.

### **Coral Triangle Initiative (CTI)**

The CTI is a collaborative partnership between Indonesia, Philippines, and Malaysia working together with Papua New Guinea, Solomon Islands, and Timor Leste in implementing various interventions to protect the diverse marine and coastal resources covering the six participating countries.

## **2. Disaster Management**

Disaster risk reduction measures are immediate response measures to adapt to climate change. The ASEAN Committee on Disaster Management (ACDM) has included climate change adaptation (CCA) as part of the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme, 2010-2015. As a cross-cutting issue, the intention is to take into account climate change adaptation (CCA) in the relevant strategic components of AADMER Work Programme (2010-2015), such as 'Prevention and Mitigation', 'Risk Assessment, Early Warning and Monitoring', 'Preparedness and Response', and 'Recovery and Rehabilitation'. These core components represent the disaster risk reduction (DRR) components or provide windows of opportunities to mainstream DRR within AADMER. The AADMER Work Programme (WP) serve to operate the provisions in AADMER and to

realise the ASEAN vision of a disaster-resilient and safer community by the year 2015.

## **3. Energy and Transportation**

Climate change has increasingly become an important element in energy policy in ASEAN. More attention has been given to the need to adopt integrated approaches to energy policy making by taking into account climate change issues to achieve greater energy security in the future. In fact at the 27th ASEAN Ministers on Energy Meeting (AMEM) held recently in Mandalay, Myanmar in July 2009, the new ASEAN Plan of Action for Energy Cooperation (APAEC) 2010-2015 was adopted with the theme of "Bringing Policy to Actions Towards a Cleaner, More Efficient and Sustainable ASEAN Energy Community."

The three key initiatives of the ASEAN energy security policy/plan within which environment and climate change appears as important elements in the next five (5) years include:

### **a. Energy Efficiency and Conservation (EE & C)**

EE & C is considered as one of the most cost-effective ways of enhancing energy security in addressing climate change as well as promoting competitiveness in the ASEAN region.

The strategic goals of ASEAN's EE & C in APAEC 2010-2015 include: a) pursuing the aspirational goal of reducing regional energy intensity of at least 8% by 2015 based on 2005 level; b) achieving higher end-use energy efficiency for all sectors through regulatory and market approaches, where appropriate; c) enhancing institutional and human capacity emphasising the development of energy efficiency technology and service providers in the ASEAN region; and d) encouraging private sector participation, especially financial institutions to support EE & C investment and implementation.

### **b. Renewable Energy (RE)**

In 2004-2009, ASEAN has met its 10% target to increase the installed RE-based capacities for power generation. For 2010-2015, ASEAN commits that renewable energies are crucially needed to increase

the diversity of energy supply and to reduce the environmental impact of energy use in the region. The strategic goals include: a) achieving a collective target of 15% for regional renewable energy in the total power installed capacity by 2015; b) strengthening of regional cooperation on the development of renewable energy and alternative energy including hydropower and biofuels; c) promoting the development of centres of research and development on renewable energy in the region; and d) promoting open trade, facilitation and cooperation in the renewable energy sector and related industries as well as investment in the requisite infrastructure for renewable energy development.

### **c. Coal and Clean Coal Technology**

In the ASEAN region, coal is well-known as the fastest growing energy source due to the increasing demand of fuel for electricity generation as well as in the industrial sector since 2005. The energy plans of the ASEAN Member States indicate the rapid growth of coal utilization for power generation which presents an opportunity to promote and increase cleaner coal use and trade that could bring in mutual economic benefits towards regional energy security.

Despite the growing environmental controls, more coal power projects are moving forward with increasing preference for clean coal technologies. Collective action is therefore needed to strengthen cooperatives partnerships in the promotion and utilisation of coal and clean coal technologies among the ASEAN member States. The Strategic goals of ASEAN's Coal and CCT in APAEC 2010-2015, include: a) promoting and increasing cleaner coal use and trade for regional energy security; b) encouraging the use of clean coal technologies through regional cooperation; and c) building the perception of coal as a cleaner fuel as a result of clean coal technologies.

The following initiatives are being undertaken in the transport sector in addressing the issues of climate change and environmental protection:

### **a. ASEAN-Japan Action Plan on Environmental Improvement in Transport Sector (AJ-APEIT)**

Under ASEAN-Japan Transport Partnership, the ASEAN-Japan Plan of Action on Environment Improvement in Transport Sector (AJU-APEIT) is currently being developed. The plan will serve as a basic framework for ASEAN and Japan to implement measures for environmental improvement with the objective of achieving sustainable development by realizing low-carbon and low-pollution transport systems in the ASEAN region. The Plan, which will be completed for adoption at the ASEAN-Japan Transport Ministers Meeting in December 2010, will cover human and institutional capacity development, compilation of best practices, infrastructure improvement, experiments and information sharing for 2010-2014.

### **b. Energy Efficiency and Climate Change Mitigation for the Land Transport Sector**

The ASEAN-Germany technical assistance project on "energy efficiency and climate change mitigation for the land transport sector is expected to limit the increase and ultimately reduce fuel consumption and greenhouse gas emissions through higher energy efficiency of land transport systems in ASEAN.

### **c. ASEAN Air Transport Integration Project (AATIP)**

ASEAN-EC is in its final stage of concluding a technical assistance on AATIP, which is expected to commence in 2010. This project addresses the issue of limiting the environmental impact of aviation through exchanges of international rules and regulations, including collaborative research and development, and evaluation of other possible measures to reduce noise and CO<sup>2</sup> and other emissions from aviation.



#### 4. Agriculture & Forestry

Responding to the urgent need to address the growing threat and impact of climate change, the 30th Meeting of the ASEAN Ministers on Agriculture and Forestry (AMAF) in October 2008 agreed to the development of an ASEAN strategic approach to address the issue in agriculture, forestry and fisheries sectors. This was followed by the ASEAN High-Level Seminar on “Climate Change Adaptation and Mitigation: Towards a Cross-Sectoral Programme Approach in ASEAN” held on 23-25 March 2009 in Berlin, Germany, wherein an “ASEAN Multi-Sectoral Framework on Climate Change (AFCC) and Food Security (AFCC-FS)” as a comprehensive program to address the emerging issues of climate change was recommended to be developed.

The overall goal of the AFCC is to contribute to food security through sustainable, efficient and effective use of land, forest, water and aquatic resources by minimizing the risks and impacts of and the contributions to climate change. To achieve its goal, sectoral activities will be carried out under the two major objectives of: (i) coordination on the development of adaptation and mitigation strategies and (ii) cooperation on the implementation of integrated adaptation and mitigation measures.

AFCC pursues a cross-sectoral program approach for effective policy making and implementation and also provides an arena for ASEAN to better coordinate the support from its partners. Along with its focus on the agriculture, fisheries and forestry sectors, it will coordinate with the environment, health and energy sectors. In particular, it complements to the efforts of current ASEAN Climate Change initiatives and is designed to work closely with the ASEAN Working Group on Climate Change under the ASEAN Senior Officials on Environment and other ASEAN bodies in energy sector.

#### Conclusion

This paper has elaborated the various policies, strategies, programs and actions being taken to address climate change. Responses to climate change should not be viewed in a narrow perspective, but every sector has a contribution to make to address climate change. The discussion here therefore has taken a broad based approach highlighting how actions in various sectoral areas could contribute to addressing climate change though the immediate linkage may not be apparent. ASEAN is committed to pursuing this broad based approach, to play its role in taking voluntary and appropriate mitigation actions, and adaptation measures enabled by technology transfer, provision of concessionary financial assistance, and capacity building to address climate change issues in a proactive and responsible manner. ■

## Civil Society Engagement in the Current Negotiation on Climate Change: Mainstreaming a Human Rights Based Approach

**Mr. Abdon Nabadan**

Secretary General, The Indigenous Peoples' Alliance of the Archipelago, INDONESIA (AMAN)



### The Importance of Human Rights

International human rights standards serve as a guide for measures to tackle climate change, underscoring the fundamental moral and legal obligations to protect and promote full enjoyment of the rights enshrined in the Universal Declaration of Human Rights and in core universal human rights treaties.

In the case of indigenous peoples, the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), is of crucial importance, as it reflects the existing international consensus regarding individual and collective rights of indigenous peoples. There is a widespread misconception that UNDRIP establishes special or new rights for indigenous peoples.

UNDRIP is coherent with, and expands upon, international human rights standards, including the interpretation of human rights instruments by international supervisory bodies and mechanisms. UNDRIP largely reaffirms and applies already existing legally binding human rights standards to the specific historical, cultural, economic and social circumstances of indigenous peoples. Although, the UNDRIP is not legally binding in the same way as an international treaty, it is nevertheless the most authoritative expression of the international consensus regarding individual and collective rights of indigenous peoples.

UNDRIP provides a framework of action aiming for the protection and implementation of the rights of indigenous peoples, including their rights in the context of climate change. The Office of the UN High Commissioner for Human Rights (OHCHR) has recently submitted a report to the UN Human Rights Council – the United Nations principal body for the promotion and protection of all human rights – contained in document A/HRC/10/61 15 January 2009. OHCHR concludes that climate change-related impacts, as set out in the assessment reports of the Inter-governmental Panel on Climate Change, have a range of implications for the effective enjoyment of human rights. OHCHR recognizes that within countries, existing vulnerabilities are exacerbated by the effects of climate change. A number of groups, including indigenous peoples, are identified as particularly vulnerable to the adverse effects of climate change on the enjoyment of their human rights.

In its resolution 10/30 (2009), the UN Human Rights Council, recognizes that climate change-related effects have a range of implications, both direct and indirect, for the enjoyment of human rights including, Inter alia, the right to life, the right to adequate food, the right to highest attainable standard of health, the right to adequate housing, the right to self-determination and human rights obligations related to access to drinking water and sanitation. The Council emphasizes that in no case may a people be deprived of its own means of subsistence. The Council recognizes indigenous peoples as specifically vulnerable in the context of climate change.



## What any agreement on Climate Change should cover

The relevance and importance of human rights, including the human rights of indigenous peoples, should be adequately emphasized at appropriate places in all agreement on Climate Change.

The text should clearly recognise that climate change-related effects have a range of implications, both direct and indirect, for the enjoyment of human rights including, inter alia, the right to life, the right to adequate food, the right to highest attainable standard of health, the right to adequate housing, the right to self-determination and human rights obligations related to access to drinking water and sanitation.

The text should recognise and respect the rights of indigenous peoples, in particular their rights to lands, territories and resources, in accordance the UNDRIP and other relevant international human rights instruments and obligations, and bearing in mind that UNDRIP article 43 recognises that “the rights recognised herein constitute the minimum standards for the survival, dignity and well-being of the indigenous peoples of the world.”

Any Agreement should recognise indigenous peoples’ right to participate in decision-making which may affect their rights, lands, territories and resources, through representatives chosen by themselves in accordance with their own procedures.

Any Agreement/Action should recognise the principle of free, prior and informed consent is a fundamental criterion under contemporary international human rights law whenever considering legal or administrative measures affecting indigenous peoples’ rights.

The text should reflect that indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands, territories and resources.

## Protection of Indigenous Peoples’ Rights: The main elements to be covered in Climate Change negotiation

- The UN Declaration on the Rights of Indigenous Peoples
- The right to Free, Prior and Informed Consent
- The right to Traditional Knowledge and indigenous peoples’ innovations
- Full and Effective Participation in decision making process affecting IPs life.

## Why should ASEAN Countries promote Indigenous Peoples’ (IP) Rights?

- Asia is most diverse region in the world
- Asia is the home of 250 million indigenous peoples or about 70% of 350 million world’s indigenous peoples
- Indigenous peoples are the poorest among the poor. For example in Malaysia - the poverty pockets are indeed indigenous peoples’ territories
- IPs are the most vulnerable from climate crisis, due to their location, culture and lifestyle, THEREFORE, IPs are the most in need of protection
- All ASEAN Countries voted for the Adoption of the UNDRIP at the UN General Assembly, 13 September 2007.

(Source: World Bank, ADB, UN Permanent Forum on Indigenous Issues)

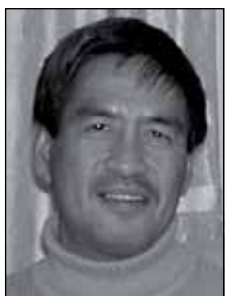
## Relevant organisations engaging in the current Climate Change negotiations

Organisations	Area of Engagement
People’s Action for Climate Change (hosted by IBON, Philippines)	1. A People’s Protocol was adopted during the Bali UNFCCC 2. Public campaign specially in the EU Countries 3. Support from NGOs in EU Countries and North America
The Third Word Network (Malaysia)	Active Campaign and Lobby (on-going negotiations)
TEBTEBBA (Philippines)	1. Active Campaign and Lobby 2. Conduct research on Indigenous Peoples’ and Climate Change
Asia Indigenous Peoples’ Pact (An organisation of Asia’s Indigenous Peoples, based in Chiang Mai, Thailand)	Engaging in CC negotiations and Campaign at international level (current UNFCCC negotiation)
AMAN and Partners NGOs and Network	1. Advocacy at National Level 2. Advocacy at International Level - Asian Indigenous Peoples’ Summit on CC (Bali, February 2009) - Global Indigenous Peoples’ Summit on CC (Anchorage, Alaska: April 2009) - Active Lobby at all UNFCCC meeting (including the ongoing one in Barcelona) 3. Multilateral Organisations policy interventions: WB (FIP and FCPF) and UN REDD

# Natural or Unnatural Disasters: the Relative Vulnerabilities of Southeast Asian Megacities to Climate Change

Presented by **Mr. Rafael Senga**

Manager for Energy Policy in Asia-Pacific - WWF International



Asia is among the regions of the world most vulnerable to climate change. Climate change and climatic variability have and will continue to impact all sectors, from national and economic security to human health, food production, infrastructure, water availability and ecosystems. The evidence of climate change in Asia is widespread: overall temperatures have risen between 1°C and 3°C over the last 100 years, precipitation patterns have changed, the number of extreme weather events is increasing, and sea levels are rising. Because many of the largest cities in Asia are located

on the coast and within major river deltas, they are even more susceptible to the impacts of climate change. This report highlights the vulnerability of some of those cities with the goal of increasing regional awareness of the impacts of climate change, providing a starting point for further research and policy discussions, and triggering action to protect people and nature in and around Asia's megacities from mega-stress in the future.

Cities cover less than 1% of the planet's surface, and are home to around 50% of the world's population, and many of them see a rapid growth trend. Taken together, all cities and urban areas worldwide use 75% of the world's energy and are responsible for 75% of global greenhouse gas emissions. Without major breakthroughs on energy efficiency and emission reductions in cities, we will fail to avoid dangerous climate change in urban as well as rural areas. Cities are hotspots of innovation and technology and have therefore traditionally been the places where many of the solutions to the world's problems have been developed, making all cities potential leaders in the global effort for a low carbon future.

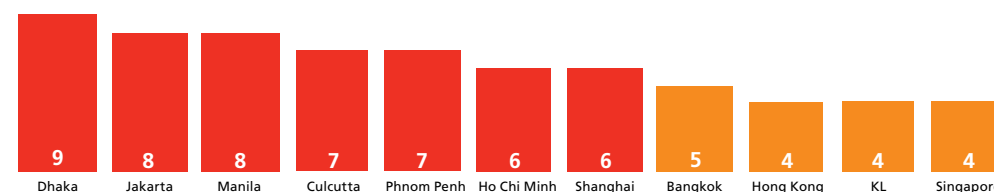
This report focuses on climate variability and the adaptive capacity of cities. It is divided up into four sections: context, methodology, scorecards, and policy. While we highlight the major climate change effects impacting 11 key Asian cities, this summary is by no means an exhaustive review. The cities chosen for this report represent large, mostly coastal cities which are all threatened by climate change. These particular cities were chosen because they represent a good cross section of coastal Asia and the impacts of climate change were assessed as significant. We encourage governments and all other relevant stakeholders to use this report as a catalyst for further discussions on the issue of climate change in the region, deciding where additional research is needed, and what the appropriate policies should be.

For each scorecard, we provide a short profile of the selected city, highlight the observed climatic change, summarize the major climate impacts the city is facing, and suggest some adaptation strategies that may decrease the city's vulnerability. For this analysis, the vulnerability of the cities is a function of their exposure, sensitivity, and adaptive capacity. These three categories were averaged to get the overall vulnerability score. It should be noted that WWF has approached the issue of vulnerability in this report with the most simplistic analysis possible, and we appreciate that there are many additional factors to consider and alternative methods for assessing vulnerability.

Below we highlight the overall vulnerability scores and rank them. However, apart from the overall ranking taking into account all the assessed criteria, this report also summarizes a number of other comparisons including which city is most at risk of environmental threats, which city is most socio-economically sensitive to climate change impacts and which city has the lowest adaptive capacity.

## Overall Climate Vulnerability Ranking

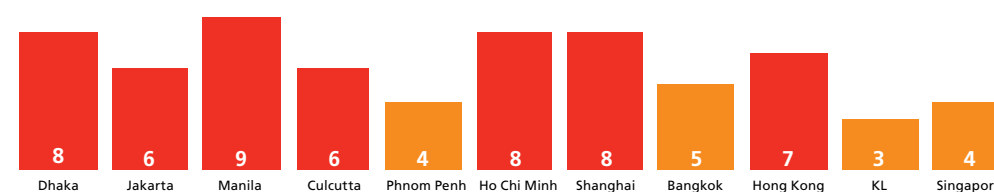
### Overall Vulnerability



Of the 11 cities examined, Dhaka in Bangladesh is most vulnerable to climate change impacts. This large, relatively poor city sits just metres above current sea levels, is regularly impacted by tropical cyclones and flooding, and has very limited adaptive capacity. Jakarta in Indonesia and Manila in the Philippines are also highly vulnerable cities and tied for the second rank, largely because of the size of the cities, degree of exposure (both experience frequent flooding), and relatively low adaptive capacity. Calcutta in India and Phnom Penh in Cambodia are tied for third most vulnerable city, largely because Calcutta is prone to salt-water intrusion and sea-level rise effects, while Phnom Penh has very low adaptive capacity. Ho Chi Minh City in Vietnam and Shanghai in China are tied for fourth most vulnerable city, because both are very susceptible to sea-level rise, even though Vietnam and China may have slightly higher adaptive capacity when compared to some of the other cities. Bangkok in Thailand is the fifth most vulnerable city, mostly because it has a relatively high socio-economic sensitivity to impacts (i.e., It has a large population and contributes a large proportion towards Thailand's gross domestic product). Kuala Lumpur in Malaysia, Hong Kong in China, and Singapore in the Republic of Singapore are all tied for the sixth most vulnerable city, mostly because all three have slightly more adaptive capacity than the other cities, even though the climate impacts are still significant.

## At Risk: Comparing Exposure To Climate Impacts

### Exposure



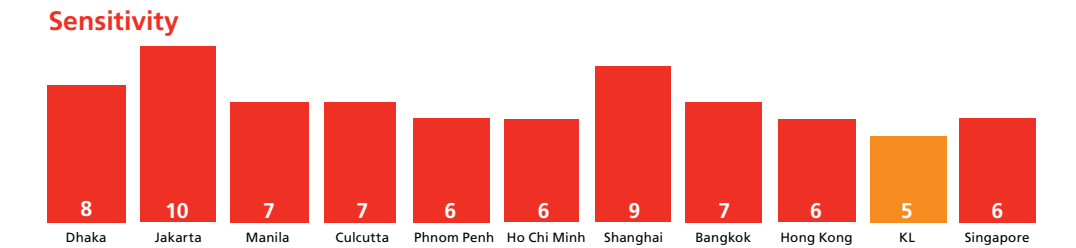
All examined cities will be significantly impacted by climate change, but when examining the selected impacts (tropical storms, sea-level rise and flooding and drought), the report found that some of the cities may experience more frequent or more intense events than others. For this report, exposure is the average of the three highlighted environmental categories including the susceptibility of the city impacted by

1m sea-level rise and 2m storm surge (as illustrated in the satellite photos at the end of each city chapter), historical frequency of extreme weather events including flooding and drought, and frequency of tropical storms and surges. When examining just the exposure to these impacts, we see a slightly different picture from the overall vulnerability ranking.

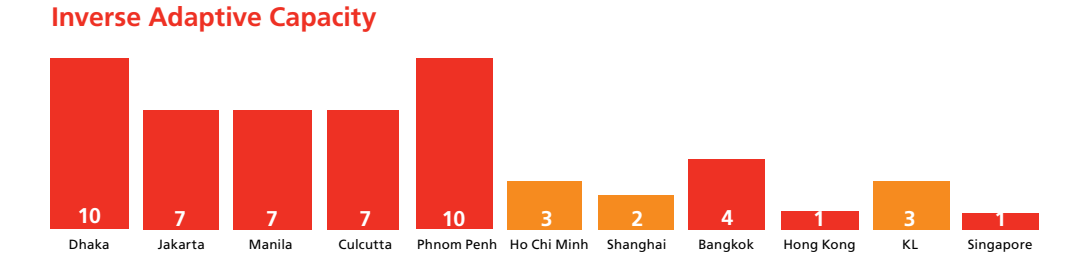
Manila, largely due to its exposure to tropical cyclones and flooding, tops the list as most exposed. The recent tropical storm Ketsana illustrates this exposure of Manila and the surrounding area to environmental threats. With flood waters reaching nearly 7m and hundreds of deaths during this one storm, Manila is truly vulnerable.

Dhaka, Ho Chi Minh City, and Shanghai tie for having the second highest exposure to climate change impacts, largely because of their susceptibility to flooding and tropical storms. Hong Kong ranks the third highest in terms of exposure to climate change impacts. However, Hong Kong has relatively high adaptive capacity and therefore is overall less vulnerable. Calcutta and Jakarta are ranked as having the fourth most exposure, with Bangkok coming in close in the fifth spot. Not surprisingly, Phnom Penh, Singapore and Kuala Lumpur are ranked at the low end of the exposure scale, but this is not implying that they are not at risk to climate change impacts. All cities examined already see substantial threats with loss of life and significant damage costs, and the situation is projected to worsen in the future.

**Sensitivity Ranking: People, Assets And GDP Under Threat**



The relative sensitivity of the 11 selected cities to climate change impacts is based on population, gross domestic product (GDP), and the relative importance of that city to the national economy. Using these criteria, Jakarta stands out as the most sensitive to climate change impacts. This is largely due to Jakarta's large population and huge contribution towards national GDP. The second most sensitive city to climate impacts is Shanghai for similar reasons. Dhaka is third most sensitive, while Calcutta, Manila, and Bangkok are all tied for the fourth most sensitive. Phnom Penh, Hong Kong, and Ho Chi Minh are fifth most sensitive, while Kuala Lumpur is sixth most sensitive to climate change impacts.



**Preparing To Face The Storm: Adaptive Capacity Comparison**

We estimated the adaptive capacity of these 11 cities by examining the overall willingness of the city to implement adaptation strategies (calculated by the number of available adaptation examples and/or responses to previous impacts) and the per capita GDP. It should be noted that a significant caveat of this study is that there are likely quite a number of adaptation examples that cannot be located with desk top reviews. For example, people may come up with their own adaptation strategies in the face of climate change. However, mass media, the internet, and peer-reviewed journals will likely not pick up this information. In essence, the estimates for these 11 cities are just that, estimates based on existing information. For uniformity, we inversed the adaptation capacity numbers so that low adaptive capacity is represented by a larger number (e.g., 10 equates to a very low adaptive capacity). Dhaka and Phnom Penh top the ranking as having the lowest adaptive capacity to climate change.

This is not a surprise as both countries, Bangladesh and Cambodia, are classified as Least Developed Countries by the United Nations. Calcutta, Jakarta, and Manila have the second lowest adaptive capacity. Bangkok is next, with Kuala Lumpur and Ho Chi Minh following. Shanghai has the second highest adaptive capacity, and Hong Kong and Singapore tie for having the highest capacity.

**Policy Recommendations: How To Adapt Mega-Cities To Mega-Stress**

It is undeniable, humans have caused climate change and the irreversible impacts resulting from it, and the window of opportunity to limit further damage is quickly closing. As outlined in this report, climate change impacts in Asia are real and happening now. The vulnerability of this region is relatively high and millions of people are being affected.

Fortunately, there are a number of no-regret (win-win) adaptation options that can be implemented immediately and that will help protect people, assets, and natural ecosystems. However, fast action is of the essence as the world has no time left to wait. Climate change and the associated impacts, such as sea-level rise, flooding, droughts and tropical storms will get worse in the future and the costs of responding now rather than later are significantly less. As climate-induced damages escalate, so too do the costs.

In response, the ultimate objective of the United Nations Framework Convention on Climate Change is to stabilise greenhouse gas (GHG) concentrations in order to avoid dangerous climate change. Recent studies indicate that an average global warming of 2°C will result in dangerous and irreversible effects to humans and nature, which rapidly worsen above 2°C warming. The benefits of strong and early mitigation action far outweigh the economic costs of not acting. The costs of avoiding the worst impacts of climate change can be limited to around 1% of global GDP/year, whereas the costs of inaction range from 5 to 20% of global GDP/year. GHG emissions research suggests that the chances of staying below 2°C are getting smaller, but scientists say that it may still be possible. Keeping warming below 2°C with more than a 50% chance

requires global emissions to peak before 2015 and to decline 80 to 95% below 1990 levels by 2050. Therefore, WWF calls on developed countries to cut their emissions by at least 40% by 2020 and at least 95% by 2050 compared to 1990 levels.

This report illustrates the high vulnerability of mega-cities in Asia and provides some general adaptation options. It is also a catalyst for societal discussion about the region's vulnerability, the different types of allowable risk, and what can be done to improve the situation. This will hopefully spark not only discussion about this region, but also in and about other vulnerable regions around the world, as well as about the historical inequality between the biggest polluters and the countries that have contributed the least to climate change but suffer most.

Implementing both mitigation and adaptation strategies is crucial. We need to implement ambitious and effective mitigation policies immediately, achieving peak emissions as soon as possible (but no later than 2015) and maintain at least 3% global emissions cuts annually thereafter. If we want to avoid additional irreversible consequences and even more costs then we need to dramatically reduce CO<sub>2</sub>-eq concentrations to reach less than 350 ppm as soon as possible. Currently the world is estimated to be at 396 ppm CO<sub>2</sub>-eq, including the cooling effects of aerosols in the atmosphere.

Another way of illustrating the limited window of opportunity for staying below 2°C is by examining the total allowable amount of carbon in the atmosphere. In order to accomplish this we must limit all CO<sub>2</sub> emissions from fossil fuels to around 1,000 billion tons of carbon in total from 2010 to 2050, and if we do there would be a good chance (over 70%) that the climate would not warm more than 2°C.

To keep the global average temperature increase well below 2°C, the energy system needs to be altered substantially; we need a new energy paradigm. A below 2°C energy future is realistic and the technology exists to dramatically increase the efficiency of our societies, produce energy with zero-to-low CO<sub>2</sub> and drive innovation.

The challenge rather is a political one whereby decision-making structures must be put in place in order to drive such change. It is not acceptable to dismiss 2°C without having attempted to change the politics so that we can avoid the associated impacts. Vast resources and decision-making structures have been put into place to deal with military conflicts which may have less likelihood of occurring than the impacts from climate change. Governments, businesses, and the scientific community should focus their efforts on delivering this kind of change, rather than slipping into a world where devastating impacts would be the result.

Time is running out and implementing both mitigation and adaptation strategies are of the utmost importance.

It is useful to remember that with both strategies we are not powerless to act on climate change, regardless of our position on the planet or role in governance. There are mitigation and adaptation opportunities for everyone.

Vulnerability is important to assess because planning for adaptation is essentially designing response options to key vulnerabilities. However, no plan should be created for a single vulnerability in a single location, rather effective planning requires that the various responses be woven together into a fabric that is composed of actions that work together to provide the greatest adaptive benefit for the greatest number of vulnerabilities or the highest priority vulnerabilities. To limit these vulnerabilities there needs to be a combination of local and regional adaptation action, and local, regional and global policy efforts to support both adaptation and mitigation. ■

.....  
The full WWF report 'Mega-Stress for Mega-Cities' can be found on their website: [http://www.wwf.org.uk/research\\_centre/?3454/Mega-Stress-for-Mega-Cities](http://www.wwf.org.uk/research_centre/?3454/Mega-Stress-for-Mega-Cities)  
.....

## Closing Address

**H.E. Dr. Surin Pitsuwan**  
Secretary General of ASEAN



First of all I wish to express my sincere appreciation to Tan Sri Munir Majid for putting together this workshop and lining up an impressive array of speakers to deliberate on the important issue of climate change which is now grabbing world attention at all levels. The rather provocative title he has chosen, "Is Southeast Asia up to the Challenge", certainly makes us reflect on what we have done, and whether we are doing enough to face the looming threat of climate change which is affecting our survival, livelihoods and development. For a person who claims that this is a "night time job", because of his many other engagements during the day, Tan Sri is certainly showing us that our capacity to act is limitless if we put our mind to it. I would also like to acknowledge the efforts of Mr. Rajaretnam who has connected the intellectual resources of the LSE with the ASEAN Secretariat.

Having been briefed on the deliberations that have taken so far, I am impressed with the line-up of very senior and high profile speakers and the diversity of topics, which any discourse on climate change has to address. Mr. Gita Wirjawan, Chairman of the Investment Coordinating Board of Indonesia has brought home the debate on climate change to the private sector and businesses, and how it may benefit the private sector as a "win-win" proposition, and for the businesses to seize this opportunity towards a resilient green economy. He highlighted the enormous wealth of natural resources, citing several examples in Indonesia, and argued convincingly that judicious management of natural wealth is good both for business growth and diversification and the environment.

Dr. Jorn Brommelhorster highlighted the key findings of the ADB-UK study on the economics of climate change. The predictions are clear; Southeast Asia will be the worst effected among all the other regions of the world. The worst case scenario points to a 4.8 degree Centigrade rise in temperature, rise of sea levels of up to 70cm, and loss of rice yields up to 75% by the year 2100, among others. In ASEAN, such predictions are a reality even now. The unrelenting spate of disasters recently is ample testimony to that. We look forward to working with ADB in further refining and doing shorter term sectoral analysis that will enable ASEAN to make better informed policy choices.

Dr. Tim Forysth has combined his academic knowledge with field experiences in Southeast Asia to present a very compelling case for climate change mitigation actions in the land and forestry sector, and has balanced it with caution of the many challenges and pitfalls in addressing forestry and climate



change. His exposé will be very useful for the policy makers who now have to negotiate the future framework on climate change through the Reducing Emissions from Deforestation and Forest Degradation (REDD) Mechanism.

Prof. Fredolin Tangang's numerical analysis on the fires and trans-boundary haze pollution is instructive. While acknowledging that humans are the cause of fires, the El Nino phenomena clearly exacerbates the impact of trans-boundary smoke haze pollution. He has highlighted that expansion of agriculture, land use change, resettlement etc. has combined to make a strong correlation between the El Nino and the spread of smoke haze. His message is clear, governments and all stakeholders need to do more, leveraging with climate change actions.

Dr. Dewi has highlighted what Indonesia has committed to do on climate change, considering that the country is reported to be third largest emitter of greenhouse gas emissions in the world. The President of Indonesia has committed his country to a voluntary emission reduction of 26% from the business-as-usual scenario by the year 2020 – certainly a wake-up call to the developed countries to commit to early and deeper cuts at Copenhagen under the Kyoto Protocol. Their emission reduction is substantiated by various options in different sectors, implemented through national resources and assisted by technology and finance from outside.

Mr. Abdon Nabadan has highlighted how the NGOs and civil society are contributing to combatting climate change, not only in terms of advocacy, but more importantly working with the poor and marginalised to bring the benefits of climate change reduction to them. If climate change actions are to succeed, the people have to be involved, and they need to see clear additional benefits to their daily lives; not just to the global cause, the business or the affluent communities.

Mr. Rafael Senga of WWF International has highlighted the vulnerabilities of ASEAN megacities to climate change. Coming from Manila which suffered the worst floods in decades recently, his presentation is very compelling, emphasising the need to act quickly before more and more cities become victims to such devastating effects.

I have highlighted the above discussions to show how important climate change is and why diverse stakeholders have a role to play in addressing it.

The ASEAN Secretariat has presented the ASEAN policy framework on climate change situated within the context of sustainable development through the Road Map for an ASEAN Community 2009-2015. The ASEAN Leaders have also been very proactive in articulating their concerns and positions in issuing various timely declarations/statement on climate change, committing to act responsibly to contribute to the global efforts on climate change.

However, our task is to translate all these policies and strategies into actions. As highlighted by the various speakers, leadership in implementation comes not only from the governments, but also the private sector, academics and researchers, technocrats, the NGOs and

community based organisations and from the people themselves. On my part, I have promoting actions on climate change using my good offices to ensure better coordination among various sectors and ASEAN community pillars, connecting all stakeholders with the ASEAN machinery, and ensuring sufficient resources for implementation. Just last week, we announced the Cool ASEAN, Green Capitals Initiative, a city-led, people-engaged effort to green city infrastructure, amenities and services to make ASEAN capitals and mayor cities in the forefront of addressing climate change.

I understand the deliberations over the course of the last two days have shown how important it is for the researchers and academics to unravel many of the intricacies of climate change, and to provide the necessary information for policy making and implementation. There is clearly a dearth of research and studies focusing on the unique circumstances of ASEAN, and developing countries in particular. I understand this Workshop has articulated these needs and priorities. ASEAN can provide the platform for further research in that direction and connect with the policy makes both at the national level and the regional level.

I would like to see this workshop as the start of a sustained engagement of the intellectual community with ASEAN. Thank you all for initiating this process of engagement. ■

**Climate Change: Is Southeast Asia up to the Challenge?**  
**ASEAN Secretariat, Jakarta, Indonesia**  
**5-6 November 2009**

**SPEAKERS**

- 01 H.E. Dr. Surin Pitsuwan Secretary-General, ASEAN Secretariat
- 02 Mr. Gita Wirjawan Investment Coordinating Board of Indonesia
- 03 Dr. Jörn Brömmelhörster Asian Development Bank
- 04 Dr. Tim Forsyth London School of Economics & Political Science (LSE)
- 05 Prof. Fredolin Tangang National University of Malaysia
- 06 Dr. Raman Letchumanan ASEAN Secretariat
- 07 Dr. Retno Gumilang Dewi Technology Institute of Bandung, Indonesia
- 08 Mr. Abdon Nabadan Indigenous People's Alliance (AMAN)
- 09 Mr. Rafael Senga WWF International
- 10 Tan Sri Dr. Munir Majid LSE IDEAS / Malaysia Airlines

**PARTICIPANTS**

- 11 Mr. M. Rajaratnam ASEAN Secretariat
- 12 Ms. Evangeline D. Emerenciana ASEAN Secretariat
- 13 Ms. Teh Lip Li ASEAN Secretariat
- 14 Mr. Htain Lin ASEAN Secretariat
- 15 Mr. Nguyen Ky Anh ASEAN Secretariat
- 16 Ms. Adelina Kamal ASEAN Secretariat
- 17 Ms. Erie Vitria ASEAN Secretariat
- 18 Mr. Hadianto Wirajuda London School of Economics & Political Science (LSE)
- 19 Ms. Yasmin Kapitan
- 20 Mr. Dian Sukmajaya ASEAN Secretariat
- 21 Ms. Rabiah Al Adawiyah T. Hussein ASEAN Secretariat
- 22 Ms. Riena Prasiddha ASEAN Secretariat
- 23 Ms. Natalia Derodofa ASEAN Secretariat
- 24 Ms. Vinca Safrani ASEAN Secretariat
- 25 Ms. Vinna Baptist London School of Economics & Political Science (LSE)



# Publications



## International Politics

A leading peer reviewed journal dedicated to transnational issues and global problems, International Politics subscribes to no political or methodological identity, and welcomes any appropriate contributions designed to communicate findings and enhance dialogue.

International Politics defines itself as critical in character, truly international in scope, and totally engaged with the central issues facing the world today. In keeping with IDEAS' interdisciplinary approach, it provides a global forum for a rapidly expanding community of scholars from a range of academic backgrounds.



## Cold War History

The leading journal in its field, Cold War History aims to make available to the general public the results of recent research on the origins and development of the Cold War. It seeks to analyse its impact on nations, alliances, and regions at various levels of statecraft, as well as such areas as the military and intelligence, the economy, and social and cultural developments. Cold War History publishes the best of emerging scholarship from a variety of disciplines and from newly available sources in order to refine, or in some cases destroy, old interpretations.

## IDEAS Special Reports

In 2009, IDEAS began producing a series of international affairs analysis publications. IDEAS Special Reports have four forms:

- Strategic updates: IDEAS' up-to-the-minute analysis on major issues in international affairs, featuring contributions from the world's leading experts in their fields.
- Special reports: IDEAS' in-depth reports harness world-class expertise to produce technically specialised reports.
- Conference and workshop proceedings may be published as substantive, original research publications.
- More substantial country or issue reports are available for commissioning by corporate or institutional clients.



All of the following Southeast Asia International Affairs Programme publications are now available for download on the LSE IDEAS website: [www.lse.ac.uk/collections/IDEAS/](http://www.lse.ac.uk/collections/IDEAS/)



## Special Report

This Special Report follows the LSE IDEAS Southeast Asia International Affairs workshop 'The Path to ASEAN Economic Integration' held in Kuala Lumpur in April 2009. It features contributions from among others Senior Visiting Fellow Dr. Munir Majid and ASEAN Secretary General Dr. Surin Pitsuwan.

## Situation Analysis

### 17 July Jakarta Bombing: Assessment of the aftermath and longer-term implications

Dr Munir Majid comments on the impact of the violence in Indonesia.

### The Maguindano Massacre, Critical Elections and Armed Conflict in the Philippines

Research Fellow, Dr Eva-Lotta Hedman writes about the recent massacre in southern Philippines and the politics behind these election-related violence.

## Other Publications

**Refugees, IDPs, and Regional Security in the Asia Pacific:** written for CSCAP (Council for Security Cooperation in the Asia Pacific) by Eva-Lotta Hedman.

Southeast Asia International Affairs Research Fellow Eva-Lotta Hedman published **Tsunami in a Time of War: Aid Activism and Reconstruction in Sri Lanka and Aceh**, South Focus Press (2009). The book brings together interdisciplinary perspectives to examine the political dynamics of interventions in complex humanitarian emergencies. This book is available for purchase on Amazon.co.uk.



# Southeast Asia Programme

The **Southeast Asia International Affairs Programme** focuses on the contemporary challenges in the international affairs of the region in the current era of economic globalisation and international instability.

The programme generates debate and stimulates research on critical issues of international relevance in Southeast Asia. This includes aspects of the region's security, economic growth, transnational cooperation, territorial disputes and handling of international terror. The aims of the programme are achieved through research, collaborative events and scholarly and practitioner engagements with experts and institutions from the region.

Email: [IDEAS.admin@lse.ac.uk](mailto:IDEAS.admin@lse.ac.uk)

Phone: +44 (0)20 7849 4918

Fax: +44 (0)20 7 955 6514

LSE IDEAS  
Houghton Street  
London WC2A 2AE  
United Kingdom  
[www.lse.ac.uk/collections/IDEAS](http://www.lse.ac.uk/collections/IDEAS)