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**Risk and Resilience in Three
Southeast Asian Cross-Border Areas:
The Greater Mekong Subregion,
the Heart of Borneo and the Coral Triangle**

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Abstract

This paper investigates the security impacts of climate change in three Southeast Asian cross-border areas– the Greater Mekong Subregion, the Heart of Borneo and the Coral Triangle – through an examination of the ways in which climate change results in human insecurity and possibly social unrest, tension and conflict. The three cross-border areas are significant in that they host unique but threatened large-scale freshwater, terrestrial forest, coastal and marine ecosystems. In addition, they are home to more than 400 million people and provide important ecosystem goods and services to many countries in the region. This paper explores and evaluates regional agreements and actions in each of the three areas, with an emphasis on the mainstreaming of climate adaptation as well as mitigation in the development agenda. The analysis also points to the importance of reaching out to other actors beyond state and intergovernmental ones if adaptation and mitigation efforts were to succeed. There is a need to identify other actors, such as the business sector, local communities and the public, with the aim of getting them involved in these important issues.

This Policy Series presents papers in a preliminary form and serves to stimulate comment and discussion. The views expressed are entirely the author's own and not that of the RSIS Centre for Non-Traditional Security (NTS) Studies. The paper is the result of research conducted under the Asia Security Initiative programme on internal challenges supported by the MacArthur Foundation. Visit www.asicluster3.com to find out more about this initiative. More information on the work of the RSIS Centre for NTS Studies can be found at www.rsis.edu.sg/nts.

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Biographies

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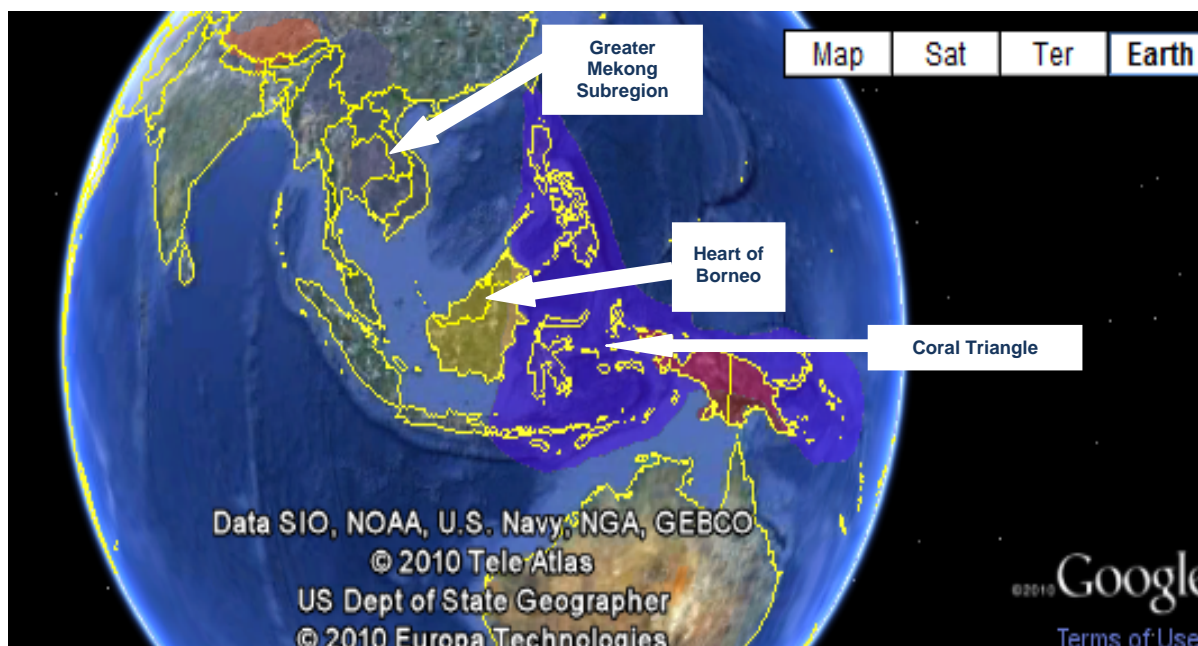
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Introduction

Countries in Southeast Asia share many important cross-border areas rich in terms of their biodiversity and natural resources; these areas have excellent economic potential, in the form of goods and services derived from natural resources, such as food, fibre, energy, tourism and others. Significant cross-border areas in the region include the Greater Mekong Subregion (GMS), the Heart of Borneo (HoB) and the Coral Triangle (CT) (see Figure 1). Together, the three areas are home to more than 400 million people.¹ The residents of these areas, and also others living beyond them, depend on the resources, goods and services from within them for their livelihoods.

However, Southeast Asia and its important cross-border areas are being threatened by climate change; it is likely to bring disruptions to these areas and their associated resources, and have detrimental effects on the population (ASEAN 2009, p. 1; Yusuf and Francisco 2009, pp. 13–14). The impacts of climate change will become increasingly severe and will be irreversible unless action is taken today to begin to stabilise and then reduce global greenhouse gas (GHG) emissions (Dessler and Parson 2010, pp. 119, 125–6; O'Hare et al. 2005, pp. 350–2).

Figure 1: The Greater Mekong Subregion (GMS), the Heart of Borneo (HoB) and the Coral Triangle (CT) areas in Southeast Asia.



Source: Google Earth.

The observed and projected impacts of climate change include an increase in the severity of droughts, floods, fires and coral bleaching; a gradual rise in sea level; and a higher frequency of extreme weather, including storms, which destroy natural and human-made

¹ It is estimated that more than 300 million people live in the GMS, half a million in the HoB and more than 150 million in the CT (Greenwood Jr 2007, p. 1; Payne 2006, p. 4; The Nature Conservancy 2010, p. 1).

systems (Azis 2008, p. 35; Case et al. 2007, pp. 1–3; CASPI 2007, pp. 6–8; Goeltom 2008, pp. 4–5; O’Hare et al. 2005, pp. 350–2). The impacts of climate change will affect ecosystems already under pressure from illegal and destructive logging, over-fishing and over-exploitation of natural resources (Goeltom 2008, p. 5; Raleigh and Urdal 2007, p. 676). According to a number of official reports and studies, these problems have security implications, for example, in some cases these are perceived to have led and may further contribute to tensions among countries as well as conflicts and social unrest among players and stakeholders on the ground (Buhaug et al. 2008, p. 5; Nordås and Gleditsch 2007, pp. 628–9; Raleigh and Urdal 2007, p. 675).

Climate change is likely to accelerate and worsen disruptions from which socio-ecological systems may not be able to recover, and directly challenge the resource base upon which communities and individuals depend, eroding or entirely diminishing the ability of the systems to perform their functions of sustaining human populations as well as populations of other species (Deutsch et al. 2008, p. 6668; Joint Science Academies 2008, p.1; O’Hare et al. 2005, pp. 355–77; Parry et al. 2009, p. 1102). Many governments, research institutions and non-governmental organisations (NGOs) have dubbed climate change one of the biggest threats facing the world since it can increase the vulnerability of human systems and ecosystems, reduce socio-ecological resilience and threaten human security (Adger 2010, pp. 279–81; Deutsch et al. 2008, p. 6668; DFID 2006, p. 12; Joint Science Academies 2008, p. 1; Mazo 2009, p. 129; Scott 2008, pp. 605–8; Trombetta 2008, pp. 594–5).

Therefore, the aim of this paper is to investigate the security impacts of climate change in three cross-border areas in Southeast Asia – the GMS, the HoB and the CT – through an examination of the ways in which climate change results in human insecurity and possibly social unrest, tension and conflict. It explores regional agreements and actions in each of the three cross-border regions and evaluates them against ideal-type models, with an emphasis on the mainstreaming of climate adaptation as well as mitigation in the development agenda. For instance, countries in these three important cross-border areas have adopted pledges, programmes and plans to address these issues through joint ministerial collaborations, regional initiatives and others (ADB 2010a, p. 1; Coral Triangle Initiative Secretariat 2010, p. 1; MRC 2010, p. 1). This paper will assess whether stronger climate adaptation strategies were incorporated into the various pledges, programmes and plans, and if they led to a variety of appropriate actions which will contribute to healthier ecosystems and the strengthening of the resilience of communities to climate change.

When it comes to discussing adaptation and resilience, the analysis in this paper will point to the importance of identifying and engaging with other actors such as the business sector, local communities and the public (in addition to working with state and intergovernmental actors). This is crucial since a major challenge facing governments is to devise climate-smart development strategies that mainstream climate change adaptation and mitigation (ASEM 2008, pp. 3–4; Klein 2008, pp. 1–2; Mitchell and Tanner 2006, p. 10; UNDP 2007a, p. 12). This challenge cannot be met if the threats are not addressed in an integrated and coordinated way. This should be done within a harmonised regional legal framework and supported by a wider range of key actors (ASEM 2008, pp. 5–6; Mitchell and Tanner 2006, p. 32; UNDP 2007b, p. 18).

Climate Change as a Security Threat to Southeast Asia

Climate change is generally accepted as a grave threat to the economies, societies and the natural environment of the Asia-Pacific region, including Southeast Asia (ADB 2009a, pp. 1–8; Azis 2008, p. 35; Goeltom 2008, p. 5; Timmer 2008, pp. 30–3). However, it has not been seen as a security threat to states until recently. Traditionally, the concept of security rests on the idea of the sovereignty of states, which has confined the term to inter-state relations. From a traditional security perspective, perceived threats to a state take the form of political and military threats by other sovereign entities, namely, other states, and security dilemmas arise in the pursuit of a balance of power in the international system (Buzan et al. 1998, pp. 1–3).² However, other interests such as economic, social and environmental concerns have begun to share top priority in the political agenda of governments across the world (Buzan et al. 1998, pp. 2–3). As perceptions of states, societies and the international community undergo significant changes, so do the concepts underlying traditional security.

Since the early 1990s, the realm of security studies has been significantly redefined. Many scholars argue that issues outside the conventional political and military context can be framed through a process of ‘securitisation’. The so-called Copenhagen School identifies five general categories of security – military, environmental, economic, societal and political security (Buzan et al. 1998, pp. 7–8).³ The security and political dynamics of each category are determined by the ways in which actors perform the securitisation process by declaring a referent object (which is no longer confined to states) as existentially threatened (Waever 1995, pp. 46–86)⁴.

Climate change is increasingly framed as a security threat since its impacts are projected to affect entire economies, redraw maps and reshape coastal territories, as well as erode ecosystems to the extent that they would fail to serve the societies depending on them (Adger 2010, p. 275). It is not seen as a singular security threat, but as a multiplier to existing social, economic and political insecurities (Mazo 2009, p. 127). These existing insecurities are the same as the structural factors – poverty, weak governance and resource management problems, for example – behind a society’s vulnerability to the impacts of climate change (Brown and McLeman 2009, p. 294; Mazo 2009, p. 127).

The institutionalisation of climate change research in the form of the Intergovernmental Panel for Climate Change (IPCC) appears to have been a significant factor contributing to a recognition of the adverse impacts of climate change as potential security threats (Lacy 2005, pp. 35–7; Adger 2010, pp. 277–9). A breakthrough in the debates on climate science came in 1995 during the IPCC’s second period of assessment, when the conclusion was made that the ‘balance of evidence suggests a discernible human influence on global climate’ (Lacy 2005, p. 37). Assessment reports in the past decade by the IPCC have not only identified occurrences in nature which indicate that climate change is real and happening but have also underlined that climate change is an anthropogenic phenomenon (IPCC 2007, pp. 30, 36–7; Lacy 2005, pp. 35–6). The IPCC (2007, pp. 53, 65–6) also warns that the impacts of climate change will become increasingly severe and will be irreversible unless humans take action today to begin to stabilise and then reduce global GHG emissions (Dessler and Parson 2010, pp. 119, 125–6; O’Hare et al. 2005, pp. 350–2).

² For a more comprehensive discussion on the development of security studies, see Buzan et al. (1998).

³ The School’s most prominent scholars, Barry Buzan and Ole Waever, pioneered the securitisation framework.

⁴ For a detailed discussion on securitisation, see Waever (1995).

The IPCC assessment reports helped to eliminate certain levels of uncertainty within climate science, a step that was key to the adoption of climate change as a security issue (Lacy 2005, pp. 35–8). Other non-state actors with multinational reach, or which are part of networks, such as the Climate Action Network (CAN) and similar environmental and conservation organisations, have also played a pivotal role in introducing climate change to security debates and moving climate-change related issues up to become one of the most important concerns on the global policy agenda (Lacy 2005, pp. 34–7). One of the early results was the UN Security Council deliberations on the political and security implications of climate change on 17 April 2007 (Dupont 2008, p. 29; Nordås and Gleditsch 2007, p. 628; Scott 2008, p. 603). Nevertheless, during this meeting, state representatives remained divided over whether to consider climate change and, more generally, environmental degradation, a security issue and hence no resolution was passed (Trombetta 2008, p. 586).

Another example of climate change being perceived as a security threat is a paper published in March 2008 by the High Representative and the European Commission to the European Council led by Javier Solana (Adger 2010, p. 279). The report suggests to European heads of government that climate change, both as observed reality and as a likely prospect, requires a preventative security policy and that it already has profound implications for international security (Adger 2010, p. 279). In Southeast Asia, scholars and policymakers have also concluded that climate change has potential implications for security, in all its non-traditional aspects, and these merit further deliberations (ASEAN Regional Forum 2009, p. 4). They suggest that further information is needed, particularly to assess how and where the impacts of climate change – including disasters and the potential shortages of food and water, as well as the potential for socioeconomic stress factors developing and having cascading effects – may produce instability and affect security issues including human security (ASEAN Regional Forum 2009, p. 4).

In general, there have been two ways in which climate change has been conceptualised as a threat to global security (Scott 2008, pp. 605–7). Firstly, climate change may cause violent conflicts as its impacts introduce new sources of tensions or exacerbate existing social, political and economic ones (Buhaug et al. 2008, p. 12; Raleigh and Urdal 2007, pp. 677–81; Scott 2008, p. 606). Some studies and reports claim that climate change will increase cross-border migration and internal population displacement resulting in a huge number of refugees between now and 2050, which could be a destabilising factor in a region where competition over food, water and other natural resources is already harsh, and that this – under certain conditions and in interaction with several socio-political factors – may help produce insurgencies, genocide, guerrilla attacks, gang warfare and global terrorism (Buhaug et al. 2008, pp. 5, 20; Mazo 2009, p. 129; Nordås and Gleditsch 2007, p. 632).

The above argument, however, is not without criticism from other scholars (Busby 2005, pp. 2, 9; Cormier 2010, pp. 18–19; Raleigh and Urdal 2007, p. 675). These scholars argue that despite the breadth of this security concern in the public debate, statements about security implications have so far largely been based on speculation and questionable sources (Nordås and Gleditsch 2007, p. 628). In response to this, the research frontier is being pushed forward in both climate change research and conflict research, and social scientists as well as military and intelligence analysts are beginning to tackle this dual challenge (Nordås and Gleditsch 2007, p. 628). Military and intelligence analysts around the world have begun to focus on climate change as a serious security issue, as indicated by an initiative in 2002 by Andrew Marshall, a US Pentagon thinker and analyst and a more recent one in 2010 by Colonel Jeremiah Canty of the US Marine Corps (Canty 2010, pp. 76–8;

Dupont 2008, p. 30). Marshall commissioned a report from the US Central Intelligence Agency on the security implications of a climate change event and this agency, together with Australia's main intelligence assessment agency, the Office of National Assessment, completed classified reviews of the climate change threat to national and international security in 2008. Canty in his assessment firmly concludes that climate change is a strategic issue that needs to be taken seriously by the US Navy and may result in a shift of its cultural and doctrinal foundations (Canty 2010, p. 78; Dupont, 2008, p. 30).

While much of the early climate security literature refers to climate change as a threat to governments and their ability to defend their territories, maintain economic objectives and social order as well as the relationship between states, climate change is also increasingly framed in academic texts and UN reports as a threat to human well-being (Adger 2010, pp. 275–6; Dupont 2008, pp. 31, 46; Floyd 2008, p. 61; Scott 2008, pp. 606–7). This is a second approach to conceptualising climate change as a threat to global security – using the framework of human security. Climate change is perceived as a threat to human security since its impacts will directly affect human life and well-being through the occurrences of extreme weather events, causing losses, casualties and displacement (Nordås and Gleditsch 2007, p. 631). The UN *2007–2008 Human Development Report – Fighting Climate Change: Human Solidarity in a Divided World* states that climate change is a massive threat to human development and in some places it is already undermining the international community's efforts to reduce extreme poverty (UNDP 2007b, p. 49). Proponents of the human security approach emphasise the crucial interdependency of socio-ecological systems and note that climate change and its impacts would disrupt those systems and impede development, thereby increasing inequality (Floyd 2008, p. 62). Furthermore, the application of the human security approach to climate change has helped place the issue of vulnerability, adaptation and resilience at the heart of the climate security discourse (Adger 2010, p. 276).

This second conceptualisation is perhaps more appropriate to the situation of Southeast Asia. In this region, observed and projected climate change effects have the potential to lead to damage to natural, communal and business assets – loss of agricultural outputs due to droughts, flooding, transboundary haze and unseasonal weather and disruption to business from infrastructure damage due to extreme weather (ADB 2009a, pp. 2–8; Case et al. 2007, pp. 1–3). The Asian Development Bank (ADB) considers the region to be one of the world's most vulnerable regions to the impact of climate change and projects that the worst is yet to come (ADB 2009a, pp. 2, 4). There has been an observed decrease in rice yield and a rise in the price of agricultural products as a result of water scarcity, loss of soil moisture, floods and storm surges, and other physical impacts as well as competition from other land uses (ADB 2009a, p. 4; Azis 2008, p. 35; WWF 2007a, p. 2). In some areas, other important sectors of the economy and human life, including tourism and fisheries, have been disrupted by impacts of climate change such as sea level rise and the destruction of coral reefs, forests and other national tourism assets (Dasgupta et al. 2007, pp. 27–33; WWF 2007a, p. 2).

The Secretary-General of ASEAN said in 2009 that while the whole world would suffer, the region is especially vulnerable to the impacts of climate change (ASEAN 2009, p. 1). Recently, while receiving delegates to the 7th ASEAN Chiefs of Defence Forces Informal Meeting (ACDFIM-7), the Chief of General Staff of the Vietnam People's Army, Senior Lieutenant-General Nguyen Khac Nghien said that new security issues such as the impacts of global warming were threatening peace and stability in the region. He elaborated that

these threats stem from severe natural catastrophes and the spread of diseases as a result of climate change, linking them to challenges in maritime, food and energy security (*Vietnam News* 2010, p. 1). The vulnerability of Southeast Asia to non-state and to transnational security threats has also been addressed in a study by Jasparro and Taylor (2008). The study looks at how climate change could play a role in increasing such vulnerability by extrapolating from the magnitude of existing threats. The authors conclude that climate change is likely to put pressure on livelihoods and social systems, and strain the capacity of states and societies to deal with the threats, increasing overall vulnerability and, furthermore, producing incentives and opportunities for a variety of illegal activities and crimes (Jasparro and Taylor 2008, p. 250).

As noted in the introduction, countries in Southeast Asia share many important areas rich in natural resources and biodiversity and having excellent economic potential in the form of goods and services such as food, fibre and tourism. The region and its cross-border areas possess unique natural ecosystems and resources which feed the world and sustain the global environment (ASEAN 2009, p. 1). These areas include the GMS, the HoB and the CT.

The GMS, comprising Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, the Tibet Autonomous Region, and the Qinghai and Yunnan Provinces of the People's Republic of China, is home to nearly 300 million people and contains some of the richest and most valuable habitats on earth (Dosch 2005, p. 1). Around 80 per cent of the population depends on the productive capacity of its healthy natural systems to sustain key ecosystem services such as clean water, food and fibre (Goh 2006, p. 225). The Mekong River itself provides food security to at least 60 million people whose main protein source is fish (Keyuan 2004, p. 345). The GMS, established in 1992 by the ADB, comprises 60 million hectares (ha) of tropical forests and rivers having high conservation values (Dosch 2005, p. 2; Hensengerth 2009, p. 330; Keyuan 2004, p. 345).

The HoB, stretching along the borders of Indonesia, Malaysia and Brunei, covers 24 million ha of equatorial rainforest, including some of the most biologically diverse habitats on earth (ADB 2010a, p. 1; Heart of Borneo Resources 2010, p. 1). These forests possess staggeringly high levels of endemism across all groups of plants and animals and the HoB is one of the only two places on earth where orangutans, elephants and rhinoceroses still co-exist and where forests are currently large enough to maintain viable populations (Meijaard and Sheil 2007, p. 3054; WWF 2007b, pp. 1–3). The HoB area is the source of 14 of Borneo's 20 major rivers – these rivers play a critical role in ensuring the supply of clean water and food (fish) to a large number of human settlements (WWF 2007b, p. 2). The island of Borneo is home to about 16 million people and a high percentage of the populace is heavily dependent on agricultural products and forest produce for their livelihoods (Payne 2006, pp. 3–6).

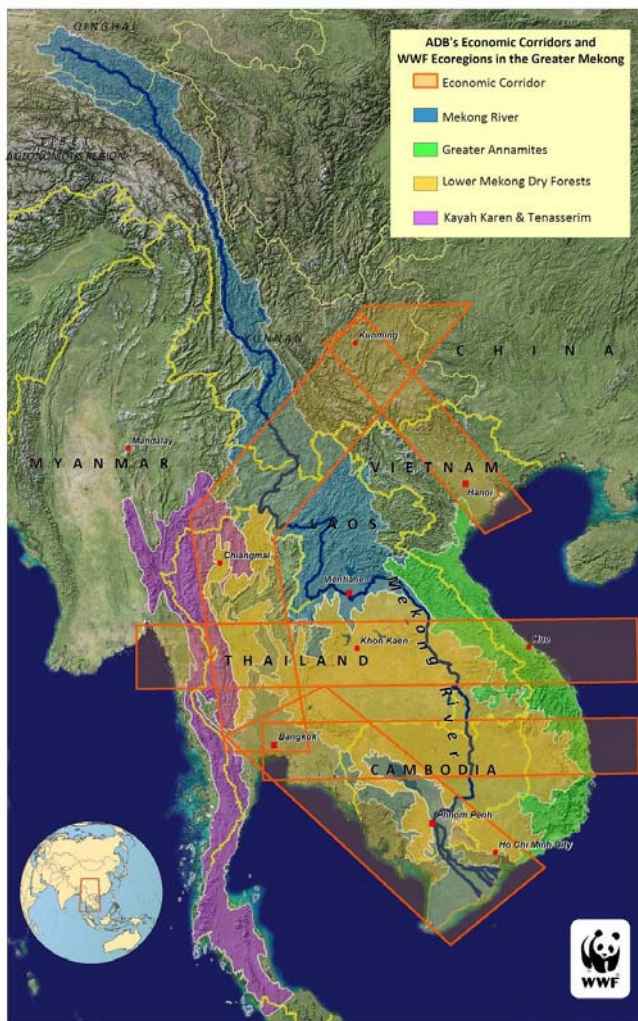
The CT spans 600 million ha of the so-called CT6 archipelagic countries, that is, Indonesia, Malaysia, the Philippines, Papua New Guinea, the Solomon Islands and Timor-Leste (Clifton 2009, p. 91; Coral Triangle Initiative Secretariat 2010, p. 1; Mcleod et al. 2010, p. 208). These CT countries have significant coral reef areas, which host 30 per cent of the world's coral reefs, 76 per cent of its reef-building coral species, and more than 35 per cent of its coral reef fish species as well as vital spawning grounds for other economically important fish such as tuna. Thus, the CT is important for the global fisheries and conservation effort (Clifton 2009, p. 91; Mcleod et al. 2010, p. 208). The area is also home to over 100 million

people who depend on the products and services derived from coastal and marine resources and ecosystems (Clifton 2009, p. 91).

However, as previously discussed, climate change will profoundly affect biodiversity, water resources and the economy in these three cross-border areas, all of which will in turn have an impact on human populations (ADB 2009a, pp. 4–7; ASEAN 2009, p. 1; Yusuf and Francisco 2009, pp. 13–14). As mentioned in the discussion on the nexus of climate change and security, the impacts of climate change on these important areas will disrupt socio-ecological systems, affect human life and well-being, and impede development, thereby increasing inequality and undermining efforts to reduce extreme poverty (Nordås and Gleditsch 2007, p. 631; UNDP 2007b, p. 49). Some immediate known and future projected impacts of climate change on these areas which may lead to human insecurity are discussed in the following section.

Human Security Impacts on the Important Cross-border Natural Resource Management Areas of Southeast Asia

Figure 2: The Greater Mekong ecoregions overlapped by the ADB's economic corridors.



Source: WWF (2009c, p. 2).

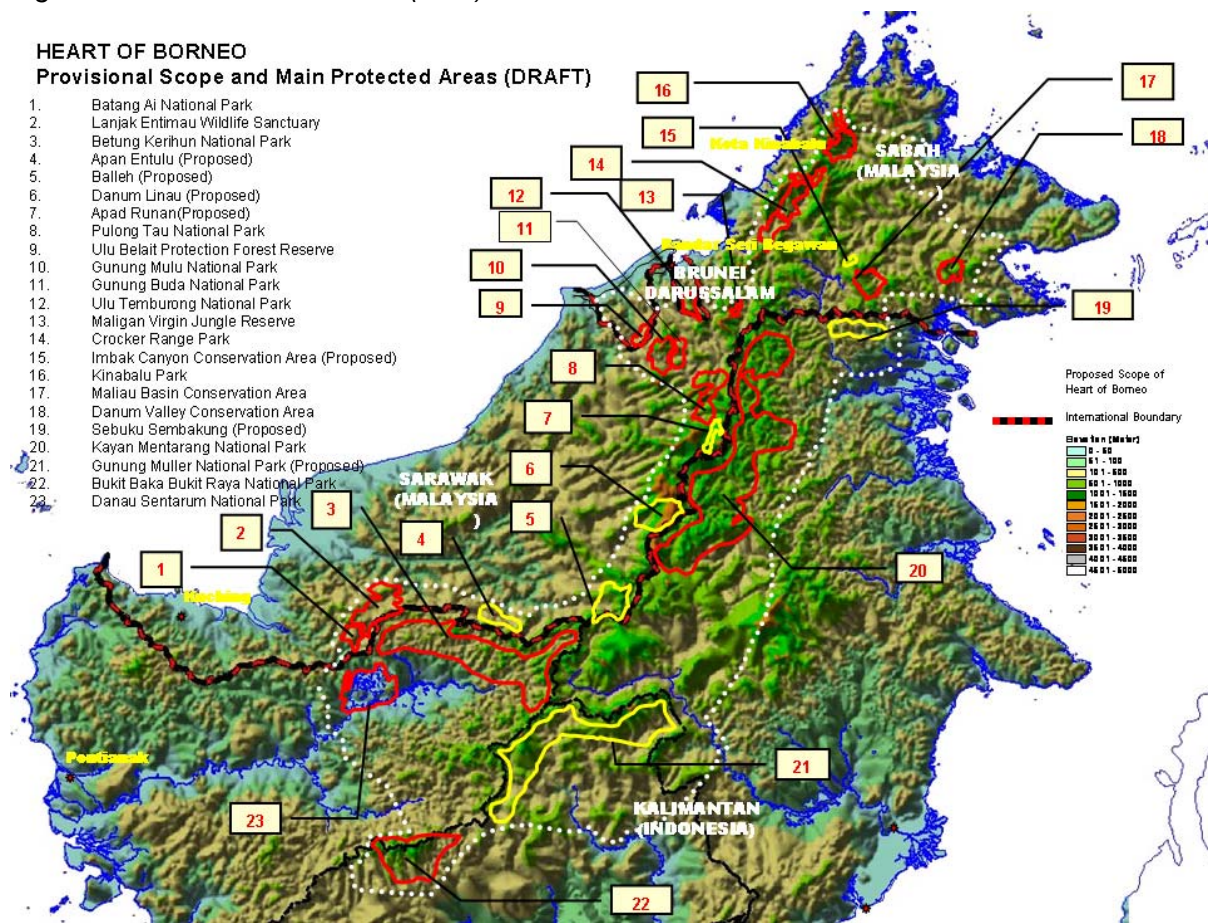
In the Greater Mekong area (see Figure 2), research on future climate change impacts have been carried out since the 1990s but, given the complex dynamics and mechanisms influencing Southeast Asia's climate, the projection of impacts has often been difficult (Jacobs 1996, p. 13). Nevertheless, even more than a decade ago, it was calculated that temperature would likely be higher in the future for the entire Lower Basin, with projections ranging from an increase of 0.2°C to 2–4°C (Jacobs 1996, p. 13). The most recent models for the Greater Mekong area suggest continued warming, increased climate variability, and more frequent and damaging extreme climate events (Eastham et al. 2008, pp. 19–23). Wetter rainy seasons are expected to lead to increased flooding, and drier dry seasons will exacerbate water shortages (ADB 2009a, p. 5; Kraisoraphong 2010, p. 2). Altered precipitation patterns and warmer temperatures will likely reduce the productivity of agriculture and fisheries, threatening food security, and substantially altering the composition and function of the region's ecosystems (ADB 2009a, p. 5). Rising seas and saltwater intrusion will cause major coastal impacts especially in the Mekong Delta, which is one of the three most vulnerable deltas on earth (IPCC 2007, pp. 49–50; Yusuf and Francisco 2009, pp. 6, 13).

Climate change would particularly affect four important water-related sectors in the GMS, namely, water supply, human settlement and urbanisation, natural wetlands and agriculture (Chinvanno 2004, pp. 113–5). A drought across China and Southeast Asia recently brought the Mekong River to its lowest level in 50 years (*Voice of America* 2010, p. 1). This situation has led to debate over the future of this vital source. The already visible water-related conflicts in the Mekong River Basin could be exacerbated since climate change could lead to an increase in vulnerability to floods, typhoons and other disasters, which might eventually weaken state institutions and socioeconomic conditions, further heightening political tensions and increasing the risk of conflicts (Academy of Finland 2010, p. 1; OxResearch 2008, p. 4; *Voice of America* 2010, p. 1). According to Padowski and Jawitz (2009, p. 105), major global organisations such as the UN, the United States Agency for International Development (USAID) and the International Water Management Institute have had to step in to help mediate conflicts over water and resources in the Mekong area.

In addition, an increase in water scarcity and environmental catastrophes due to climate change may also lead to a decline in farm output and quality of life, and this situation may thus force people to leave the area, adding to the number of international refugees or internally displaced persons (Reuveny 2007, pp. 658–9). Fleeing environmental destruction may not necessarily result in violence but when migrants encroach on the territory of people who may also be resource constrained, the potential for violence rises (Nordås and Gleditsch 2007, p. 631). According to Dalby (2002, pp. 35–7), if not well-anticipated, migration and displacement of communities may lead to breakdown of societies, political instabilities and violence. Reuveny (2007, p. 659) describes how the arrival of environmental migrants can burden the economic and resource base of the receiving area, leading to native-migrant contests over resources (with pressures expected to rise with the number of migrants and residents), particularly when resources are scarce and property rights underdeveloped in the receiving area. In countries in the Mekong region where land tenure systems are weak, a rise in migration, conflict and social unrest could further increase the marginalisation of subsistence and smallholder agriculture and agriculturalists (WWF 2009a, p. 1).

In the HoB (see Figure 3), a climate simulation for a particular forest corridor along the Betung Kerihun National Park and the Danau Sentarum National Park in the Kapuas Hulu district of West Kalimantan Province (on the Indonesia side of the HoB) suggests that occurrences of drought and forest fires may have an adverse impact on local livelihoods and also threaten the remaining population of orangutans within the corridor (Firdaus 2010, pp. 20–38). On a larger level, severe droughts associated with El Niño⁵ / Southern Oscillation (ENSO) events have become more frequent and these have created conducive conditions for uncontrolled fires, leading to extensive damage to forest areas in Sumatra and Borneo (Fredriksson et al. 2007, p. 1824).

Figure 3: The Heart of Borneo (HoB).



Source: Brunei Forestry Department (2009, p. 1).

Massive forest and land fires have occurred since the 1980s (Aiken 2004, p. 59; Field et al. 2009, p. 185). Records indicate that 3–5 million ha of primary forests in Borneo were affected by fires in 1982–1983 (Fredriksson et al. 2007, p. 1824). During the severe forest and land fires of 1997–1998, over 5 million ha were affected in Kalimantan (Aiken 2004, p. 65; Fox 1998, p. 1; Fredriksson et al. 2007, p. 1824). Areas previously affected by fires have

⁵ The term El Niño refers to the extensive warming of the central and eastern Pacific resulting in a major shift in weather patterns across the Pacific. For more on El Niño and the Southeast Asian haze, see Wheeler (1998).

become susceptible to more intense fires as a result of high fuel loads and rapid desiccation, even during 'normal' dry seasons (Fredriksson et al. 2007, p. 1824; WWF 2007b, pp. 1–2; ASEAN 2008, p. 1). Millions of people have been affected by the fires and the resulting smoke and haze; according to a government report, between September and November 1997, the fires caused 527 deaths, 36,000 people to seek outpatient treatment, and 16,000 to be hospitalised for respiratory diseases or other health issues (Aiken 2004, p. 71; Fox 1998, p. 1; Keyuan 2004, pp. 347–8; Mayer 2006, p. 204; WWF 2007b, pp. 1–2). The economic costs have been estimated to exceed USD9 billion and the fires are estimated to have released 1–2 billion tons of carbon (Aiken 2004, p. 64; ASEAN 2008, p. 1; Taylor 2010, p. 1026). This release of carbon contributes significantly to global carbon emissions and could eventually accelerate climate change.

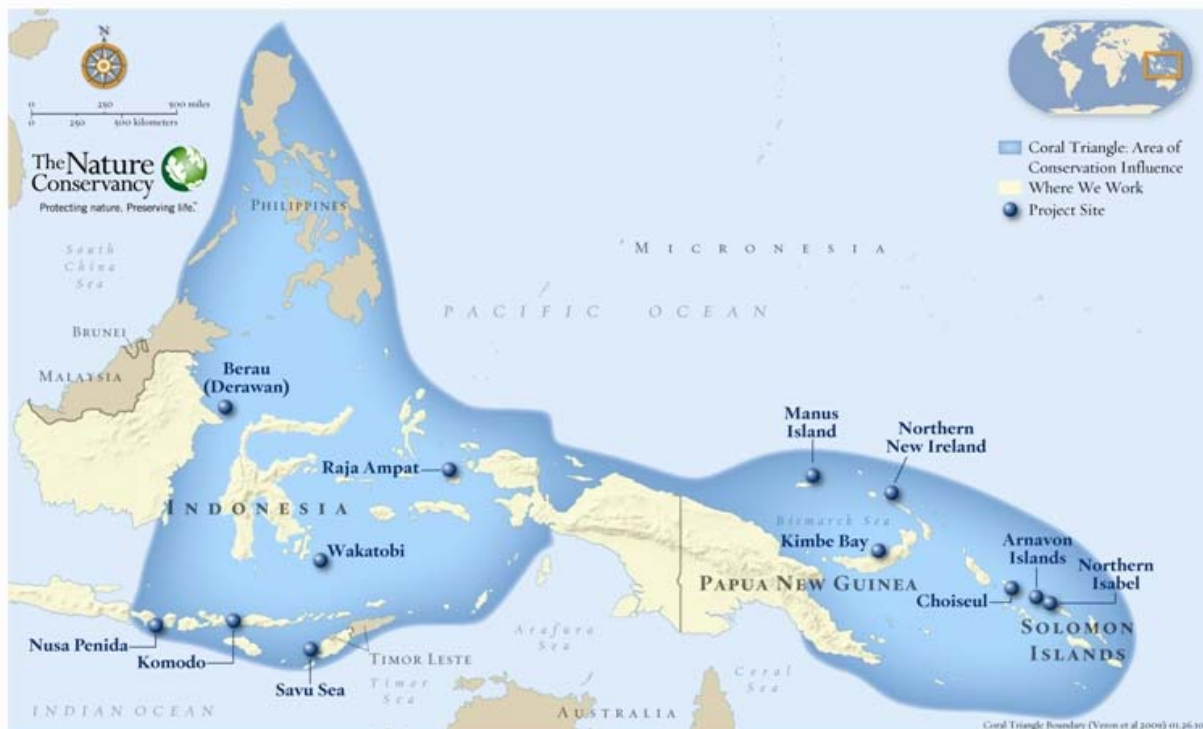
Some scholars argue that the 1997–1998 massive fires created an environmental crisis, and that this, combined with the financial crisis and political turmoil in the same period, arguably triggered the fall of Suharto and the emerging reform of the government in Indonesia (Aiken 2004, p. 64; Mayer 2006, p. 204). At the regional level, another crisis surfaced. Inter-state tensions rose whenever smoke and haze – and the associated illegal logging issues – affect neighbouring countries (Keyuan 2004, p. 348). Popular outrage in Malaysia and Singapore at perceived Indonesian government inaction or lack of political will in relation to the control of fires has motivated diplomatic action, including the push for an ASEAN Haze Agreement (Mayer 2006, pp. 203–5). Furthermore, in 2006, Singapore reported the transboundary haze coming from Indonesia to the UN, which strained relations between the two neighbours (Ooi 2006, p. 1). On the other hand, Malaysian and Singaporean companies have also been on the receiving end of accusations, due to their investments in Indonesian oil palm plantations thought to be largely responsible for the fires (Aiken 2004, p. 216).

While an unusually strong El Niño played a role during massive forest and land fires, the fires were mostly set by humans. In Southeast Asia, fire is used primarily to clear vegetation waste and is closely associated with land clearing activities for deforestation and agricultural expansion (Field et al. 2009, p. 187). Borneo's later deforestation is characteristic of broader development patterns, as reflected in the trends for population, agricultural expansion and investment in land utilisation; these changes resulted in increased fire activity from shifting cultivation and the conversion of forests into oil palm and pulp wood plantations (Aiken 2004, p. 59; Field et al. 2009, p. 187; Langner et al. 2007, p. 2329). The trend towards increasingly devastating fires has continued in recent years, with 2002 and 2006 having the highest rates of forest fires in Indonesia's history. In September 2006 alone, there were 26,561 hotspots, the highest since August 1997, when 37,938 fire hotspots were recorded (Hariri and Ardiansyah 2007, pp. 1–2).

Humans are not the only victims of forest and land fires. Hundreds, if not thousands, of orangutans were killed during the forest fires of 1997–1998 (WWF 2007b, p. 2). Some studies estimate that there are only around 50,000 orangutans left in the remaining forests of Borneo and Sumatra, where they are respectively classified as 'endangered' and 'critically endangered' species (Nelleman et al. 2007, p. 9; Ritter 2009, p. 77). More importantly, the increase in the frequency of fires reduces the structural and biological complexity of the forests, and may eradicate tree growth, which could transform the remaining forests into savanna-like landscapes (Fredriksson et al. 2007, p. 1824).

Moving to marine and coastal areas (see Figure 4), a report entitled *The Coral Triangle and Climate Change: Ecosystems, People and Societies at Risk* released in 2009 states that if the world does not take effective action on climate change, coral reefs would disappear from the CT by the end of the century, the ability of the region's coastal environments to feed people would decline by 80 per cent, and the livelihoods of around 100 million people would be lost or severely impacted (Hoegh-Guldberg et al. 2009, p. 4). Depletion of fish stocks is likely to increase competition which could lead to potential conflicts and the use of destructive fishing technologies (for example, dynamite and cyanide). As the number of fish declines, according to Pollnac (Wilson Center 2008, p. 1), 'the competition increases, and so we've got competition between people who are using different gear types. We've got competition of migrants versus locals. We've got competition concerning small-scale versus commercial fisheries'.

Figure 4: The Coral Triangle.



Source: The Nature Conservancy (2010, p. 1)

Most scientists recognise that fish environments can vary and patterns of fish abundance can be linked to patterns in climate-ocean conditions (McFarlane et al. 2000, p. 148). According to a panel of scientists from the American Association for the Advancement of Science (AAAS), climate change is increasing the temperature and acidity of seawater (leading to coral bleaching) and altering atmospheric and oceanic circulation (*ScienceDaily* 2008, p. 1). This means that seas are likely to warm up and large areas of once iridescent coral will be rendered lifeless as a result of climate change (Ardiansyah and Leck 2009, p. 22). A massive breakdown of the CT ecosystem will limit the ability of that ecosystem to support people living on the coast, and the effects will be felt wherever people make a living from the sea – from small coastal settlements to megacities (Ardiansyah and Leck 2009, p. 22). In a study conducted in Southeast Asia, Jaspardo and Taylor (2008, p. 244) argue that as climate change affects marine food chains and depletes fish stocks, incentives and

opportunities for illegal activities, including illegal fishing and piracy, increases. Southeast Asia has always been marked as piracy and illegal fishing hotspots; such activities have traditionally served as additional income for impoverished fishermen in the area (Jasparro and Taylor 2008, p. 243). The deteriorating fishery conditions may mean even more people resorting to criminal activities, thereby increasing the incidence of illegal fishing and piracy.

The truly frightening part is that many of these changes are already observable – such as sea level rise, more intense storm surges or tropical cyclones, shifts in weather patterns and changes in the behaviour of marine species (Ardiansyah and Leck 2009, p. 22; Hoegh-Guldberg et al. 2009, p. 15; Mcleod et al. 2010, p. 508). Island nations and countries with significant coastlines would be particularly affected by sea level rise. Such a rise could also contribute to saltwater inundation, which could taint the limited supply of freshwater available to some island nations. The cost of damages associated with the projected sea level rise in the CT is expected to be highest in the Philippines (USD6.5 billion per year) while it is anticipated that coastal flooding would affect nearly 5.9 million people in Indonesia (Mcleod et al. 2010, p. 507).

The overall observed and projected impacts in each of these three cross-border areas could contribute to increases in the levels of poverty and food insecurity, and economic problems, as well as possible increases in the migration of coastal people to urban areas, putting pressure on the cities in the region and also the surrounding nations already experiencing environmental degradation and other threats. The following section will discuss a variety of existing environmental challenges in each of the three cross-border areas which are likely to be escalated when compounded by climate change.

Existing Environmental Degradation in the Three Cross-border Areas

Even without the additional factor of climate change, the three Southeast Asian cross-border areas under discussion already face continuous environmental degradation challenges. Such challenges have become a regional problem and a source of insecurity. Environmental insecurity in Southeast Asia is characterised by the growing scarcity of goods and services derived from nature and encompasses the degradation and depletion of what are often referred to as the new strategic resources – water, forests and arable land (Elliott 2001, p. 439). Such scarcity has been linked to existential threats to people in the region, and thus to broader human security concerns (Dalby 2002, p. 43). Environmental scarcity, albeit rarely the determining factor in major or acute conflict between states, is an important common security concern of countries in the region as it could undermine political stability, economic development and social welfare (human security) (Elliott 2001, p. 443). In fact, there have been cases of scarcity causing direct physical damage and political disruptions, leading affected countries to categorise it as a security threat (Dalby 2002, pp. 43–4).

At the governmental level, environmental security is gradually being taken seriously as an important component of a state's security approach although most countries in Southeast Asia still predominantly base their security policy approach on a traditional security view (Singh 2008, pp. 3–7).⁶ This is not to say that governments do not address issues such as poverty and the environment; it is just subsumed under different ministries or couched in different terms. As the breadth of security actors widens to go beyond traditional state actors

⁶ Examples of countries gradually considering environmental security will be provided in the next section when discussing policy mainstreaming of climate change and the environment in the three cross-border areas.

to include non-state and sub-state actors such as NGOs, corporate entities and the individual, the relevance of the concept of non-traditional security (NTS) which includes environmental security is amplified. The themes of environmental degradation and issues in resource management are widely documented in a number of publications on the subject.⁷

The Greater Mekong Subregion (GMS)

In the Mekong area, particularly in the GMS, ecosystems are under increasing pressure. Only 1.3 per cent of the biodiversity-rich Mekong Delta remains in a semi-natural condition, and the degradation of wetland habitats and hydrological regimes poses perhaps the greatest threat to the viability of one of the most important freshwater fisheries in the world (Belay et al. 2010, p. 62). There has been a cumulative decline in the volume of total catch and the average size of fish (Bush 2008, p. 332). Water supply has also become an issue. Parts of the Mekong River were close to completely drying up in early 2010, affecting some 65 million people who rely on the river for water, ruining farmers' crops and shutting down trade along the usually busy waterway (*The Wall Street Journal Asia* 2010, p. 10). Forests and rivers are in a state of rapid ecological decline due to human over-exploitation (Oxfam 2007, cited in WWF 2009b, p. 1; *Voice of America* 2010, p. 1). Environmental organisations argue that the ability of natural resources to continue to support poor peoples' livelihoods in the Mekong region is at a crisis point (Oxfam 2007, cited in WWF 2009b, p. 1).

Previous, ongoing and future economic development, such as the GMS Economic Cooperation Program supported by the ADB, promotes the free flow of goods and people across national borders and emphasises the rapid growth of the region's economies along 'corridors' (see Figure 2) that link infrastructure across national boundaries (ADB 2010b, p. 1). These corridors, with their focus on the agricultural products and raw materials fuelling the resource-hungry economies of China, Vietnam and Thailand, transect priority conservation areas, degrading biodiversity, fragmenting critical landscapes and impairing the integrity of ecosystem functions such as watersheds (see Figure 2). In general, major challenges facing the GMS include water resource management (hydro-politics), including the sensitive issue of the damming of the Mekong, forest exploitation resulting in severe deforestation through both legal and illegal logging, the environmental impact of major infrastructure development and energy generation, and environmental pollution (Goh 2001, pp. 469–75; Strange 2005, pp. 43–4).

Riparian states in the GMS face both sustainability problems and socio-environmental conflicts (Goh 2001, p. 471). The concerns surrounding the dams along the Mekong River provide an excellent illustration of these environmentally induced conflicts. As drought is prolonged and water becomes scarce, conflicts between and within countries and people emerge in the Mekong (Academy of Finland 2010, p. 71). Hydroelectric dams built along the Mekong in the southwest Yunnan province of China were suspected to have benefited Chinese users of water at the cost of people downstream in Thailand, Lao PDR, Cambodia and Vietnam (*The Wall Street Journal Asia* 2010, p. 10). Farmers in northern Thailand have prompted their Prime Minister to ask Beijing to 'help manage the water flow along the river better' (*The Wall Street Journal Asia* 2010, p. 10). Considered a threat to the countries and people in the Mekong, these conflicts have definitely grabbed the attention of NGOs and the media throughout the Mekong – even the media in Lao PDR dared to criticise Beijing over

⁷ Environmental themes were also included in a number of regional publications on the subject: Dalby (2002), Goh (2006) and Salayo et al. (2006).

this water crisis (Academy of Finland 2010, p. 71; *Voice of America* 2010, p. 1; *South China Morning Post* 2010, p. 8; *The Wall Street Journal Asia* 2010, p. 10).

Water conflicts do not occur only between Southeast Asian countries and China, but also among Southeast Asian countries. It has been recorded, for example, that Lao PDR and Cambodia have a dispute over Xelampao (Tonle Repou) in the western section of the Mekong River; there is a huge ongoing debate over the allocation and use of water, especially for large-scale irrigation projects (Baird 2010, p. 205). With the construction of dams, a lot of forest, and agricultural (including those producing cash crops) and pastoral land, have been submerged, and many people have been displaced, having had to move from inundated areas to locations away from the river bank or to faraway places (Belay et al. 2010, p. 62).

The existing environmental challenges in the Mekong have increased the occurrence of environmental risks and disputes as well as personal or community disagreements (Keyuan 2004, p. 342; Gleick 2010, p. 1). These challenges have been exacerbated by socio-political issues, including widespread poverty, high population growth, a history of conflict and a weak governance structure (Belay et al. 2010, p. 62). The increased disputes over fisheries resources in the GMS, albeit often misreported and marginalised by competing water development agendas, illustrate this (Bush 2008, pp. 332–3). For decades, disputes over fisheries have contributed to the emergence of the GMS as one of the most contested natural resource frontiers in Southeast Asia, as fisheries' communities, sovereign riparian governments and the international community all assert their interests (Bush 2008, p. 329). These disputes could lead to fatalities as shown in an incident in the 1970s along the border between Lao PDR and Cambodia whereby fishermen were fired upon and killed (Baird 2010, p. 200). Overall, over-fishing and pollution (from aquaculture, agriculture and industrial wastewater) have contributed to a serious decline in fish stock and eventually put pressure on the 40 million people who are actively involved in fishery activities (Belay et al. 2010, pp. 65–6).

The Heart of Borneo (HoB)

The island of Borneo has one of the world's highest deforestation rates. It was once almost completely covered in forests but today only approximately half of the island's rainforest remains (Langner et al. 2007, p. 2330; Ritter 2009, pp. 77–8). The remaining forests are mostly situated in the HoB. Between 1985 and 2005, Borneo lost an average of 850,000 ha of forest area annually, or roughly a third of the island's rainforest in total due to indiscriminate logging or forests being cleared for oil palm plantations (Langner et al. 2007, pp. 2329, 2337; Ritter 2009, p. 78). These problems are major factors contributing to soil loss, land degradation, siltation, changes in water retention and run-off patterns, and food insecurity (Elliott 2001, p. 440). In addition, transmigration, uncontrolled shifting cultivation and poorly planned development projects also contribute to the loss of natural ecosystems and have resulted in increased fire activity (Ichikawa 2007, p. 403; Langner et al. 2007, p. 2329).

Deforestation and associated illegal logging activities in Indonesia and Malaysia especially those occurring along the border of the two countries on the island of Borneo have also created tensions between the two nations. The Indonesian government has been at odds with neighbouring countries Malaysia and Singapore over the two latter countries' perceived lack of cooperation in stemming the illegal flow of Indonesian timber across the border in

order to rein in illegal logging (Obidzinski et al. 2006, pp. 10, 21, 24, 26–7; Wadley 2006, pp. 125–6). On the other hand, Malaysia and Singapore often questioned perceived Indonesian government inaction or lack of political will on the issue of controlling fires and pursued diplomatic action based on that (Mayer 2006, pp. 203–5; Ooi 2006, p. 1). Deforestation and associated illegal logging have also caused conflicts within communities, between communities and large-scale companies, and between communities and the state. These conflicts arise because the state (and holders of timber or oil palm concessions) and local and indigenous communities have overlapping claims over forest land zoned for logging or cultivation (Deddy 2006, p. 89). Local and indigenous communities are often marginalised by these large-scale development activities which are likely to lead to disruptions to their livelihoods and a breakdown of their *adat* or customary identities due to being denied access to goods and services from the forest (Deddy 2006, p. 90). Disputes, including those between communities, over land and natural resources could gradually turn into serious conflicts and violence. Peluso (2008, pp. 48, 55) argues that the forestry and resettlement programmes which have brought a large number of non-indigenous people into Borneo represent one of the bases for the triggering of communal violence between indigenous groups (Dayaks) and migrants (Madurese) in late 1996 and early 1997. Those large-scale development and resettlement programmes have largely converted forests important to indigenous people into state-controlled timber and oil palm concessions or transmigration settlements (Peluso 2008, p. 55). In addition, the destruction of the forest in the HoB would affect the main water catchment areas of at least 14 of the island's 20 major rivers, disrupting the island's water and food supply and contributing to droughts and fires (WWF 2007b, pp. 1–2).

The Coral Triangle (CT)

Coastal and marine ecosystems in the CT (as with coral reefs elsewhere) are already under extreme pressure from locally and regionally originating factors such as declining water quality, resource extraction, destructive fishing practices and over-fishing (Ainsworth et al. 2008, p. 361). If the destruction continues, this will disrupt the multi-billion dollar economic activities associated with the tuna, tourism and coral reef ecosystems. The CT is part of an area that has emerged as one of the planet's economic hubs. Although population growth has slowed, population size and density in the coastal zones of the CT have increased over the past few decades due to migration from non-coastal areas (McLeod 2010, p. 208). This, coupled with economic growth, has fuelled unsustainable coastal development and boosted demand for marine resources including tuna, shark fin, turtle products and live reef fish. This can lead to fishery depletions and eventually conflicts which are often due to competition among various groups for access to the fisheries (Salayo et al. 2006a, p. 220). Salayo et al. (2006b, pp. 11–12), based on their study of fishery conflicts across Southeast Asia, conclude that most of the conflicts arise from excessive fishing efforts due to increasing population as well as economic motivations. They describe two research projects aimed at identifying the sources and types of fishery conflicts in eight sites in Bangladesh, Cambodia, India, the Philippines and Thailand (Salayo et al. 2006b, p. 12). The study reveals that conflicts were associated with declining fishery resources as a result of excessive fishing, as indicated by an increasing number of fishers and boats as well as an increasing variety of resource users (Salayo et al. 2006b, pp. 14–16). This decline in fishery resources resulted in conflicts emerging among resource users, including fights over fish rights between traditional fishermen and trawl operators. The operations of 'favoured' fishers such as trawl operators have been, due to their use of destructive or illegal fishing methods, perceived as threats to

the survival of fisheries, and thus the livelihoods of traditional fishermen (Salayo et al. 2006b, pp. 14, 17).⁸

Overall, in these three cross-border areas and their respective countries, environmental degradation has contributed to the growing vulnerability of human inhabitants to environmental insecurity. The impacts of climate change can only worsen and multiply the pressure on ecosystems which are already under threat, and lead to increased vulnerability. Emerging insights from scholars and empirical studies suggest that building resilience in both human and ecological systems is effective in reducing vulnerability and coping with environmental change characterised by future surprises or unknowable risks (Tompkins and Adger 2004, p. 10). Resilience implies a systematic, widespread, organisational, structural and personal strengthening of subjective and material arrangements to better able anticipate and tolerate disturbances in complex worlds without collapse, to withstand shocks and to rebuild as necessary (Lentzos and Rose 2009, p. 243). Resilience is not only about being persistent or robust in the face of disruptions but it is also about the opportunities that disruptions open up in terms of the recombination of evolved structures and processes, the renewal of the system and the emergence of new trajectories (Folke 2006, p. 259).

Lentzos and Rose (2009, pp. 241–3) state that governments commonly define resilience in terms of security and safety, as an attitude or attribute of the community which enable it to withstand and overcome challenges deemed disruptive to the system. Resilience in a policy context is often used to refer to a strategy to respond to risks and threats that could escalate into emergency situations and become the realm of emergency planners such as the UK's Civil Contingencies Secretariat (CCS) and the US Federal Emergency Management Agency (FEMA) (Cole 2010, pp. 49–50). Some governments, such as the UK government, define security challenges to include floods and food security issues (Cole 2010, p. 46; Lentzos and Rose 2009, p. 241).⁹ In the context of sustainability and climate change, resilience determines the persistence of relationships within a system, and is a measure of the ability of these systems to absorb changes in state variables, driving variables and parameters, and still persist (Holling 1973, p. 17). Holling (1973, p. 21) argues that, as an approach to natural resource management, the resilience view dictates the need to draw boundaries around areas where species populations can stabilise and persist in the face of various threats, including those threats arising from random events forceful enough to define the shape, size and characteristic of the area, such as major climatic occurrences. Resilience, initially developed in ecology, is eventually applied to socio-ecological systems, namely, systems in which ecological and social units interact with each other and are interdependent on each other (Folke 2006, p. 253; Schoon 2005, p. 2; Walker and Salt 2006, p. 37).

The challenge now for the countries sharing these cross-border areas is to develop appropriate ways to increase resilience since this will allow these countries and their people to eventually adapt to climate change. Walker and Salt (2006, pp. 1–2) state that, for it to be

⁸ Trawl operators (who undertake destructive/illegal fishing operations) are considered politically favoured relative to traditional, small-scale fishermen (who use more basic equipment) because of their close association with law enforcers, including government fishery officers and the Navy. For more details, see Fegan (2003).

⁹ In 2001 the UK government established the Civil Contingencies Secretariat (CCS) at the Cabinet Office, which reports directly to the prime minister. This body is responsible for identifying, assessing and anticipating various risks across sectors to prevent future crises. As stated in the official website (<http://www.ukresilience.info/>): 'The Government's aim is to reduce the risk from emergencies so that people can go about their business freely and with confidence. This website exists to provide a resource for civil protection practitioners, supporting the work which goes on across the United Kingdom to improve emergency preparedness.'

considered resilient, a socio-ecological system has to be able to meet 'the challenge of servicing current system demands without eroding the potential to meet future needs'. The concept of resilience is, therefore, key to sustainability (Walker and Salt 2006, p. 37). The following section will discuss policies and actions formulated and taken by countries in each of the three cross-border areas to deal with climate change and environmental security. The section will further assess whether these policies and actions have made the concept of resilience part of the mainstreaming of climate change adaptation and mitigation in the development agenda.

Mainstreaming Climate Change Adaptation and Mitigation in the Development Agenda

Climate change adaptation strategies and a variety of appropriate actions which can contribute to healthier ecosystems and stronger community resilience to climate change have to be developed within the GMS, the HoB and the CT. Given that ecosystems stretch beyond the artificial borders of individual states, governments are compelled to recognise the harmful cross-border impacts of environmental degradation and climate change originating in an area outside their own and to resort to a mutually agreed approach to tackling the source of the threat. Therefore, cooperation among countries at the regional level is essential, and coordination among various sectors and different levels of government pivotal, for the success of adaptation initiatives (Ardiansyah and Muhammad 2009, p. 22).

Adaptation initiatives basically aim at improving adaptive capacity, which is the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in behaviour and in resources and technologies, which in turn increase socio-ecological resilience. The presence of adaptive capacity has been shown to be a necessary condition for the design and implementation of effective adaptation strategies so as to reduce the likelihood as well as the magnitude of harmful outcomes resulting from climate change (Brooks and Adger 2005, cited in Adger et al. 2007, p. 727). New studies carried out since the Third Assessment Report of the IPCC show that adaptive capacity is influenced not only by economic development and technology, but also by social factors such as human capital and governance structures (Adger et al. 2007, p. 728).

Fortunately, there is still a window of opportunity for countries in these three cross-border areas to get their acts together to solve the climate and other environmental challenges facing them.¹⁰ At the global level, these countries need to push for a stronger global climate agreement that sets out clearly plans and rules for reducing emissions so that they can develop their economies with confidence while avoiding the increased vulnerability and impacts that accompany severe climate change (such as the economic disruptions and social upheaval discussed in the previous sections). It is also essential that adaptation be incorporated into this agreement because even with the assumption that we can limit the rate and extent of climate change, we will still need to respond to the change that is already inherent in the system and buy some time for ecosystems as emissions are reduced. As there is a substantial time lag before the effects of GHGs in the atmosphere are realised, we are locked into additional change from the concentrations of GHGs already in the atmosphere today (Hansen et al. 2003, p. 10). A new and stronger global climate agreement that combines mitigation and adaptation will provide new socioeconomic opportunities by

¹⁰ Countries in the GMS are Cambodia, Lao PDR, Thailand and Vietnam; in the HoB, Indonesia, Malaysia, and Brunei; and in the CT, Indonesia, Thailand, the Philippines, Papua New Guinea, the Solomon Islands and Timor-Leste.

driving technological development and transfer, and improving asset turnover, which in turn will lower the cost of emissions reductions and adaptation activities. Climate protection and economic development can go hand in hand; indeed they must for either to be successful.

Policies and actions in the Greater Mekong Subregion (GMS)

In the GMS, climate change will amplify development pressures, making this area one of the most vulnerable in the world (Yusuf and Francisco 2009). The challenge facing governments is to devise climate-smart development strategies which also conserve the areas' globally important biodiversity, ecosystems and natural resources. This challenge can be met if the threats are addressed in an integrated and coordinated way within a harmonised regional legal framework. This means that the GMS needs to implement integrated water resources management (IWRM), a process that promotes the coordinated development and management of water, land and related resources, in order to distribute the resultant economic and social welfare benefits in an equitable manner without compromising sustainability (Belay et al. 2010, p. 67). To be able to achieve this, the GMS requires enforcement capability, a willingness and ability to implement agreed treaties, and an effective dispute settlement mechanism (Ma et al. 2008, p. 1076). For countries in the Mekong, coordination is not a new thing. Cooperation in the management of the Mekong can be traced back to 1957 when four countries – Cambodia, Lao PDR, South Vietnam and Thailand – formed the Mekong River Committee (Keyuan 2004, p. 345). In 1995, the Mekong River Commission (MRC) was established based on the Agreement on the Cooperation for the Sustainable Development of the Mekong River (Keyuan 2004, p. 345). However, the performance of the MRC and its predecessor appears to be unsatisfactory, especially on the issues of overall water flow management, enforcement capacity, treaty implementation and a dispute settlement mechanism (Belay et al. 2010, p. 67; Ma et al. 2008, pp. 1077, 1082, 1085). A major weakness of the MRC is perhaps the absence of China and Myanmar, the other two Mekong River countries (Keyuan 2004, p. 347). Without the involvement of these two countries, the MRC cannot share the crucial data and management strategies required to sustainably manage the Mekong (*South China Morning Post* 2010, p. 8).

To deal with the new challenge of climate change, Asia's first regional climate adaptation agreement has been proposed in the GMS (WWF 2009a, p. 1; MRC 2010, p. 1). This proposal would provide a substantial framework for adaptation efforts, forging innovative cooperation, incorporating sustainable solutions, and linking these solutions across all social, economic and environmental sectors. This proposed agreement would respond to the threats that undermine the region's development and its poverty reduction achievements, transforming the region's development to create a climate-resilient and low-carbon future. The agreement would establish common targets for development and conservation as well as implementation mechanisms coordinated at the regional scale to support the development aspirations of neighbouring countries. It would incorporate climate change adaptation in development planning, guarantee transboundary management of high conservation value areas, implement regional standards for sustainable development and ensure that subsequent development is integrated around agreed regional land use plans. The success of this proposal would clearly depend on the support and active participation of the Mekong countries, including China and Myanmar.

On 19 June 2009, actions to strengthen the GMS's resilience to climate change, as well as design and develop adaptation initiatives, were incorporated into the Joint Ministerial Statement on the GMS Economic Cooperation Program (ADB 2009b, p. 1). This Statement also touches on the importance of reducing environmental risks to local livelihoods and in GMS development plans, including those posed by climate change and poor ecological infrastructure (ADB 2009b, p. 4). Under this Statement, countries in the Mekong region pledge to: (i) be cognisant of the environmental threats, including climate change and ecological loss, to the subregion; (ii) develop effective measures to counter these threats, and help their neighbours adapt to climate change and protect the ecosystem; (iii) in the short term, use opportunities from the Biodiversity Conservation Corridors Initiative (BCI) to combine climate change resilience-enhancing and ecosystem protection efforts with effective channelling of economic stimulus to the rural poor within the economic corridors; and (iv) among the medium- to long-term priorities, develop renewable and clean energy, as well as environment-friendly and economically efficient transport, and sustainable agricultural development (ADB 2009b, p. 4). This pledge is a good starting point, and if the aims expressed in the pledge are realised on the ground in the GMS, and countries in the Mekong region learn from their past experience, a better outcome could be expected. In April 2010, during high-level talks in Hua Hin, the Prime Ministers of Cambodia, Lao PDR, Thailand and Vietnam agreed on the substance of the proposal, stating that adjusting to the challenges posed by climate change is a regional priority (MRC 2010, p. 1). It is planned that, by 2011, these governments would reach further consensus on the need for a legally binding agreement.

Policies and actions in the Heart of Borneo (HoB)

In the HoB, a series of meetings resulted in pledges on the importance of having a wider management unit to protect and sustainably develop inland areas. These meetings led to a collective understanding of the issues and the intention to develop sub-regional cooperation to conserve, maintain and manage forest connectivity. After years of high-level discussions within ASEAN and among the three HoB countries, an expression of commitment was made through a declaration entitled 'Three Countries, One Conservation Vision' announced in Bali, Indonesia, on 12 February 2007 (*Environment News Service* 2007, p. 1). Implementation frameworks to make this partnership operational were discussed at the first trilateral meeting hosted by the government of Brunei Darussalam on 19–20 July 2007. Programmes and plans of action incorporating five pillars – namely, transboundary management, protected areas management, sustainable natural resource management, ecotourism development and capacity building – were developed. Under these programmes and plans of action, countries in the HoB and multilateral organisations including the ADB have stated their interest in protecting, conserving and sustainably managing the remaining forests and their adjacent areas, in order to ensure climate change mitigation and adaptation, the management of watersheds, as well as conservation and benefit sharing of riches from biodiversity, carbon stocks and other environmental services (ADB 2010a, p. 1). The HoB vision supports the maintenance of forests and other sustainable land use practices already in place, either unexploited or managed under sustainable harvesting practices. The HoB initiative was successful in halting the development of 1.8 million ha of land slated for oil palm on the border of Kalimantan and Malaysia (Ritter 2009, p. 79). The initiative was able to give the initial option to governments and communities in these three countries to develop forest and terrestrial ecosystems in a sustainable manner.

Nevertheless, this regional action may not be adequate in dealing with the constant pressures coming from the global demand for commodities such as palm oil, timber, pulp, biofuel and coal which provide the impetus for large-scale conversion of forests. Thus, the HoB initiative could also benefit from a global initiative which develops policy approaches and provides positive incentives for reducing emissions from deforestation and forest degradation (REDD). REDD incentives, if managed appropriately, could provide significant support for the HoB. As a first step, initial investment has to be made to support the formulation of strong and credible REDD architecture in the HoB, which includes capacity building and the creation of policies and measures to reduce and monitor deforestation. There is a substantial need to support early action in the testing of REDD implementation. This includes testing institutional arrangements and benefit sharing mechanisms to ensure that they are fair and just, and of course, measuring the reduction of emissions as a result of activities designed to decrease deforestation.

There have been some positive outcomes in terms of the implementation of processes within communities on issues such as seedling and nursery management, institutional arrangements and capacity strengthening. These are the basis for good community-based forest restoration and sustainable forest and agriculture management, and eventually REDD actions at the local level. If done properly, these actions will also strengthen the resilience of communities to climate change, particularly since there have been indications of a shifting of the seasons and an increase in the frequency of natural disasters and extreme events in the HoB (Firdaus 2010, p. 30). For instance, a reduction of forest coverage will reduce the rate of infiltration and groundwater recharge in Borneo and this condition is likely to be detrimental to forests, people and wildlife living within the HoB and its surrounding areas. Appropriate adaptation measures, including forest restoration and sustainable forest management, are therefore needed to address this problem (Firdaus 2010, p. 29).

Policies and actions in the Coral Triangle (CT)

In May 2009, the CT6 governments launched a Regional Plan of Action for the next decade (which was adopted at the World Ocean Conference in Manado, Indonesia). The leaders of the CT6 identified the urgent need to shield some of the poorer communities living along the coast from the devastating impacts of climate change (Ardiansyah and Leck 2009, p. 22). This is one of the most detailed plans for ocean conservation and the fruit of an ambitious partnership – the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI) founded in December 2007 in Bali. With regard to climate issues, there is a need for stronger actions to reduce the social, economic and biological impacts of climate change, by developing adaptation policies and providing funding, especially for establishing and managing networks of marine protected areas and the promotion of sustainable coastal livelihoods. Effective management of coastal resources through a range of options including locally managed regional networks of marine protected areas, the protection of mangrove and seagrass beds, and effective management of fisheries would contribute to a slower decline in coastal and marine resources.

There is also a significant need for CT6 countries to push the world's leaders to support them in their efforts to protect their most vulnerable communities from rising sea levels and the loss of food and livelihoods by helping them to strengthen the management of their marine resources and by forging a strong agreement on GHG reductions at the meetings of the UN Framework Convention on Climate Change (UNFCCC). The incorporation of ocean

issues into the text of a climate agreement will be viewed as a sign that governments are willing to address the issue.

To further succeed, the CTI not only needs unprecedented collaboration among the six national governments, but it would also have to engage many stakeholders within and outside the region in an effort that recognises:

- a coastal population base of more than 100 million people, and hundreds of political jurisdictions and entities, within the CT. For example, some indigenous coastal communities may have traditional knowledge which could be used to adapt to climate change and increase the resilience of coastal communities.
- millions of consumers outside the CT.
- potentially hundreds of NGOs and scores of major donors.
- large industries such as fisheries and tourism.

Managing the competing interests of these different stakeholders is challenging. Therefore, the CTI has to be open, combining top-down and bottom-up approaches so that stakeholders will not view the initiative as exclusive. The CTI needs to be driven by not just biodiversity conservation but rather a multidimensional agenda which recognises the important issues mentioned above, in particular, poverty, livelihood and development. If this is carried out, the CTI could get further buy-in from the abovementioned stakeholders. The support of these stakeholders would allow the development of wider programmes which could ensure improved adaptive capacity and strengthened resilience in the CT area.

Overall, countries in the GMS, the HoB and the CT need to proactively utilise practical decisions made during the UNFCCC processes since the 13th COP (Conference of the Parties) in Bali in 2007, which incorporate, among others, REDD and an adaptation fund. There is an opportunity for these countries to play a stronger role, especially in pushing key issues which are still being negotiated, such as a clear target for reducing emissions and the support for doing so, commitments from developed countries to financially and technically assist developing countries on present and projected impacts of climate change, and agreement on the dimensions of equity and responsibility. Obtaining these three decisions is crucial to helping developing countries in the three cross-border areas develop their economies while ensuring a reduction in carbon emissions and improved adaptive capacity in dealing with the impacts of climate change.

Conclusion

As elaborated in this paper, climate change is a grave threat to global economies and societies as well as the natural environment. If climate change continues unabated, the economic status and livelihood of a large proportion of the population, especially in the three important cross-border natural resource management areas (that is, the GMS, the HoB and the CT areas), would be in jeopardy. Climate change impacts have gradually made themselves felt in these three cross-border areas. These include an increase in the severity of droughts, floods, fires and coral bleaching; a gradual rise in sea level; and a higher frequency of extreme weather, including storms which destroy or severely disrupt both natural and human-made systems in the area. The impacts of climate change will worsen the situation for ecosystems which are already under pressure due to illegal and destructive logging, over-fishing and over-exploitation of natural resources. These problems, as

previously discussed, have contributed to tensions among countries as well as conflicts and social unrest among players and stakeholders.

The decision to mitigate the threat of climate change and environmental degradation does not rest in the future, but with today's governments, business and society. The countries in these three important cross-border areas have adopted joint collaborative initiatives which try to mainstream climate change adaptation and mitigation, and address existing environmental challenges. This is a good starting point. Stronger climate adaptation strategies and a variety of effective actions are expected to be further developed and eventually implemented within the GMS, the HoB and the CT. These will hopefully contribute to healthier ecosystems and an increase in communities' adaptive capacity and resilience to climate change in the three cross-border areas.

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